SEEDS OF PLENTY
SEEDS OF HOPE

On-farm conservation of Indigenous Genetic Resources :
The Asian Experience

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PREFACE

The COMPAS programme – "Endogenous Development and Cultural Diversity" has partners spread over Asia, Africa, Latin America and Europe who have been functioning as a network since its inception in 1995. This network which includes individuals, non profit agencies, academics and researchers is bound by the common concern of understanding and building upon traditional knowledge and values in its varied dimensions including technological, social, cultural and spiritual aspects. A large number of these groups are working actively in areas related to natural resources management particularly agriculture, livestock, agro-forestry and traditional systems of healthcare.

While the partners work in varied geographic areas and diverse themes there are a few themes that may be considered as – "cross cutting themes" which occur repeatedly. One of these themes is undoubtedly the issue of biodiversity. This is not surprising, when we see that along with land and water, biodiversity constitutes the most critical element for the survival of human beings in communion with the plants and animals. This book is an attempt to give an overview of the biodiversity conservation efforts of the COMPAS partners in the Asian region. While it highlights the activities of the COMPAS partners it is not confined and restricted to only their experiences and also draws upon the experiences of a large number of other like minded grassroots organisations and groups that share our visions and concerns.

Several people have contributed to this book and we would like to place our acknowledgement on record. We had sent out request letters to various organizations to write about their conservation efforts and quite a few of them had responded. We would like to thank Mr. Rajeev Khedkar of The Academy of Development Science, Maharashtra; Mr. Pandurang Hegde of Parisara Samrakshana Kendra, Sirsi, Karnataka; Ms. Sunita Rao of Malnadu Home Garden And Seed Exchange Collective, Karnataka; Dr. S.B. Nadagouda of Green Foundation, Bangalore; Dr. K.J.N. Gowtham Shankar of Integrated Development through Environmental Awakening (IDEA), Andhra Pradesh; Mr. V.K. Arunakumara of Krishi Prayoga Parivara (KPP), Sagara, Karnataka; Mr. Ashish Kothari of Kalpavriksh - Environment Action Group, Pune for providing information regarding their conservation efforts. We also wish to gratefully thank the Managing Editor of Leisa India, Mr. K.V. S. Prasad, for permitting us to reproduce articles from their magazine.

We would also like to thank various authors and publishers who have granted permission to reproduce articles which have appeared in books and journals. This has enriched the publication to a large extent. Last but not the least our sincere thanks are due to Mrs. Meera Rajagopalan who did a very efficient and timely job of providing editorial consultancy to this publication.

Chennai
December 2004

K. Vijayalakshmi
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INTRODUCTION

BIODIVERSITY AND FOOD SECURITY

It is well known that almost all the areas of high crop diversity as well as food crop origin of our planet are located in the so called "Third World" comprising of the developing countries. As per one rigorous attempt made by the Russian scientist Vivalov it is seen that out of the fourteen biodiversity hotspots (areas of high crop diversity and origin of food crops) twelve are located in Asia, Africa and Southern and Central America and only two of them are located in Northern America and Northern Europe. It is not surprising that these are the very spots on earth in the neighbourhood of which major human civilisations were nurtured for the last five millenia.

The last five centuries beginning from the time of exploration, discovery and conquests of these lands by people of European origin (beginning from 1490s marked by the voyages of Columbus) represents a period of major upheaval and disruption in many of these areas wherein large efforts were made to carry species that are native to one part of the World to widely different geographic areas and cultivate them on a large scale. These were also accompanied by the introduction of exotic and alien species and in some cases cultivation of extremely large areas of land with crops built upon a precariously low biodiversity. For example, in the last one hundred and fifty years there have been nine major famines / crop failures that can be tracked to large scale cultivation based on genetic uniformity. These range from the 1846 Irish potato famine and the attempts to cultivate coffee in Sri Lanka in 1800 to more recent events such as the failure of the rice crop in Indonesia in 1974 where three million tonnes of rice were destroyed or the failure of the citrus crop in Florida, USA in 1984 where eighteen million trees were destroyed. In the decades following the Second World War, many governments in the third world have promoted the Green Revolution package of farming which has in practice meant the selection and large scale promotion of a small number of varieties of major crops such as paddy and wheat which have been selected based on the sole criterion that they can respond to heavy doses of application of chemical fertilisers by producing increased yield of grain. This has led to a situation since the 1950s where most often farmers do not have access to a stupendous varieties of traditional seeds that they were cultivating through the millenia and which contribute to their food and nutritional security.

In many of these cases the wide diversity and genetic stock of crops had slowly disappeared from the fields and partly found refuge in the state supported or industry supported – grain storage banks. A majority of these banks were arrangements where the seeds were stored for long terms under extremely low temperature until a small number of them were planted on from year to year. It was considered that these seed storage structures would primarily be dealing with scientists, research laboratories and institutions rather than with farmers who were original sources and suppliers of the seeds as well as the information regarding them.

It is under these conditions that there have been a large number of grass root efforts that have taken up for the on-farm conservation of traditional seed varieties. This book attempts to capture these efforts that have been in progress in Asia. The coverage of the groups involved in this effort is by no means exhaustive and must only be considered as representative of this effort. It is meant to promote sharing and exchange of information as well as materials wherever desirable and feasible and also lead to the formation of networks and coalitions in this important area of work.

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PART ONE
THE EXPERIENCES

Live Gene Banks : Seed Conservation in the Hill Region of Western Ghats

The Parisara Samrakshana Kendra

The Parisara Samrakshana Kendra (Environment Conservation Centre) (PSK) has been working on the conservation of indigenous crop varieties in the hill regions of the Western Ghats for the last two decades. The hill region in the tropical forests has unique agricultural systems of growing crops and a spice garden in the small valleys in the midst of forests. The main cultivated crop in these regions of Uttara Kannada district, Karnataka are paddy, sugarcane , black pepper, cardamom, coconut, areca palm and nutmeg.

Farmers have successfully saved varieties which were on the verge of extinction. Thus, they have become saviours of the seeds.

Crop Diversity

The cultivated crop varieties are adapted to the specific microclimatic zones of the region. The farmers have evolved paddy varieties that are able to perform optimally in different types of lands. They have specific paddy varieties for saline resistance in the coastal ecosystem. They have also developed paddy varieties suited to low land and high rainfall (2800cm) regions in the coast. In the hills there are different varieties for upland and lowland paddy. The upland varieties are short duration varieties that need less water and the lowland varieties are long duration varieties that perform well in waterlogged lowland rice fields. There are varieties of short duration, which are grown in the drier region with very meagre rainfall.

The uniqueness of the paddy varieties developed by

farmers in this region is, they have been evolved to suit the diverse eco zones and to meet the taste needs of the communities. For example, the coarse grain paddy (kagga) grown in the coastal region is used for making parboiled rice which keeps the body cool in the hot coastal climate. Similarly, there are fine varieties to meet the taste of people in the hill region. There are scented basmati varieties for making sweets. There are also varieties specially grown to manufacture poha (puffed rice).

Farmers evaluate performance of varieties cultivated.

The spice garden developed in this region is a multidimensional horticultural garden wherein the spices are cultivated in the valley ecosystem. The main tree crops are areca nut, coconut, and black pepper vine on areca nut trees, banana, cardamom and nutmeg. In the intensive spice garden, the spice varieties and the seeds used show the very high skill in developing the varieties to suit the needs of the soil as well as to get maximum yields. The spice garden is a living example of sustainable agriculture that has stood the test of time for the past several centuries.

Threat to Cultivated Diversity

Farmers recognized the loss of paddy varieties due to the introduction of high yielding varieties and modern chemical farming. Similarly, pests and diseases affected the multicrop spice garden and the diversity of crops, reduced due to viral diseases. A virus destroyed the banana, a soil borne virus destroyed the pepper vines and the cardamom was lost to another soil borne nematode.

This threat to cultivated diversity was recognized as well as felt by farmers in the region. They were worried about losing paddy varieties and the reduction of crop diversity in the spice garden. At this junction, PSK initiated programmes of seed conservation in the region. The main features of the seed conservation programme are:

1. To assess the existence of indigenous crop varieties in the region and the varieties which are under threat.

2. To identify farmers who are interested in conservation of indigenous crop varieties.

3. To help/ assist farmers to retrieve these varieties by exchange of as well as the knowledge about the variety .

4. Organize exchange visits for farmers during the crop season to visit and see the performance of the varieties and to evaluate the varieties by other farmers.

5. To facilitate farmers to get the varieties they want and motivate them to conserve varieties.

6. To facilitate seed exchange network among farmers to conserve the indigenous varieties .

Live Gene Banks

PSK's seed conservation efforts are focused on the concept of a live gene bank. In this programe, it encourages the farmers to grow a number of paddy varieties in their fields. Thus, the farmer carries out the research in his field. This approach has the advantage of the farmer taking an interest and evaluating a specific variety in his land. This equips the farmers with the skills of research. They are also recognized in the farming community as seed savers.

In the live gene bank programme, PSK encourages the farmers to grow a number of paddy varieties in their fields.

Results

As a result of its seed conservation efforts, PSK has been able to conserve 60 varieties of paddy in their region. It has

160 accessions of paddy and the effort is to conserve the varieties in collaboration with farmers. The results of seed conservation are shared among farmers in Rice Workshops organised in villages. The results can be categorised as follows:

1. Establishment of live gene banks in farmers' fields. This innovative method of seed conservation has spread to different areas/ villages and many farmers have been motivated to become the custodians of 'live gene banks'.

2. Farmers to farmers exchange approach helps to exchange information and experience, as well as seeds at the level of farmers. The control of the programme is not with PSK but with the individual farmers and the community. PSK is just a facilitator in the process but the farmer plays the main role.

3. When a farmer in a village grows different paddy varieties, the neighbours observe the performance and there is increased awareness among farmers to conserve the different indigenous varieties.

The control of the research and results as well as the seeds is with the individual farmers and community. Thus, the seed diversity is with the farmers, in the community domain. The concept of community control over seeds is emphasized in the programme.

Reasons for Success

The seed conservation programme is not just limited to paddy varieties. PSK has been involved in motivating farmers to conserve numerous varieties of tree crops, fruit varieties like mango and wild food collected from the forests. The success of the seed conservation is possible due to the following reasons.

1. The region is part of the tropical forests and has the history of using numerous plant and crop diversity in agriculture. The basis of our seed conservation initiative is to build on the indigenous knowledge of the farmers. Thus, the existence of such knowledge as well as diversity is the key to revive the knowledge as well as to strengthen the individual efforts of farmers in seed conservation.

2. The region has a rich tradition of practising organic agriculture for several centuries. The integration of rearing of livestock, composting, using organic matter from natural forests as an input to agriculture is very much in practice. This living tradition of low input based organic agricultural systems is the basis on which our seed conservation work has flowered.

3. In addition to these two factors, there were farmers who were disillusioned with Green Revolution chemical agricultural practices, who had experienced the adverse impact on the soil and suffered with the yield and were willing to go back to indigenous varieties. This historical opportunity was used by the seed conservation programme to reinforce the conservation of crop diversity.

4. The existence of strong cultural roots of the farming community is another reason for PSK's success. These cultural roots reinforce the utilisation of specific crop varieties in specific festivals and fairs. There is also respect for farm animals as well as crop varieties. There is a tradition of growing different varieties by individual farmers.

Awareness Creation

PSK creates awareness through village level meetings. Usually these meeting are held in the village so that farmers can actually see and experience the performance of the varieties and understand the problems directly from the person who is experimenting. It also publishes small booklets in the regional language to create awareness on conservation of indigenous paddy varieties and other cultivated crops.

Source : Based on information provided by Pandurang Hegde of the organisation

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Traditional Seed Conservation in Shimoga, Karnataka

Krishi Prayoga Pariwara

Krishi Prayoga Pariwara (KPP), as the name indicates, is a fraternity of farmers practicing ecological agriculture, adhering to the time- tested principles and human values. KPP has its head office at Thirthahalli, Shimoga district, Karnataka state. The member farmers of KPP are spread all over the state. However, their activities are mainly concentrated in Shimoga district. The major activities are popularization of organic farming, traditional seed conservation, on farm trials based on indigenous agricultural technologies (which are collected from ancient texts) and documenting village knowledge, conducting trainings and seminars on organic farming and farming related activities, value addition to agricultural, horticultural and forest produce, direct producer and consumer linkage programmes and production of publications. Through these activities KPP is trying to evolve an alternative approach and a practical vision and a strategy for development in which not merely the economic but also moral, ethical, spiritual and ecological values and perceptions are promoted.

Local seed varieties are best suited for local climatic conditions, bio-geo environment and respond well to organic farming.

Seed Conservation Activity

Seed is central to any agricultural activity. The principle of organic farming or ecological farming emphasizes the requirement of local or traditional seed variety. Since the inception of KPP, the farmer groups started to grow traditional varieties of crops. The farmer members of KPP have understood the relevance and importance of local seed varieties in organic farming. These seeds are best suited for

local climatic conditions, bio-geo environment and respond well to organic farming.

KPP's activities are participatory in nature, involving local farmer groups.

As a formal organization KPP's work on seed conservation started in 2001. KPP joined the community seed bank network project of the Green Foundation, Bangalore in 2001. The work was initiated in two cluster villages of Thirthahalli taluka of Shimoga district in 2001-02 and then in one village of Soraba taluka of Shimoga district during 2003. Community seed banks were established in these villages to carry out the work of seed conservation.

Community Seed Banks (CSBs)

Presently KPP has three community seed banks (CSBs). The community seed bank at Kodlu village of Thirthahalli taluka is maintained by a women self help group whereas the CSBs at Chakkodubailu village of Thirthahalli taluka and Kanubailu village of Soraba taluka are maintained by both men and women farmer self groups. These groups have a very broad social base involving all the castes of the village and people of all economic levels.

These CSBs have traditional paddy and vegetable seeds in their collection. Most of the seeds collected in the banks are traditional to their own villages and others are from the neighbouring villages or from within the taluka/district. Since paddy is the staple food crop of the area, priority is given to paddy seed conservation. Farmers of Kodlu village have conserved nine paddy varieties, Chakkodubailu farmers have conserved 12 paddy varieties. The farmers of Kanubailu are involved in conservation and characterization of nearly 55 varieties of paddy which are documented in Sagara taluka of Shimoga district, the neighbouring Soraba taluka and in the native taluka also. Fifty-two farmers are associated with these seed banks.

The paddy seeds conserved in these banks have many special characters. Most of them have coarse grains. Some of them are red rice varieties which are very tasty to eat, some of them are scented, some others are drought resistant or dry land cultivable, some are deep water rice, one variety can withstand flood even up to forty days and some of them are grown for preparing special dishes also. Most of these varieties are pest and disease resistant with a few exceptions. Some varieties are known for good rice recovery percentage.

The seed bank at Kanubailu has its own building whereas the other two have hired a room for rent in their respective villages. The banks have samples of seed varieties that are grown in the villages. The groups maintaining the seed banks regularly meet and discuss the issues of conservation, organic farming and marketing of their produce.

Methods and Approaches

KPP's activities are participatory in nature. It works with local farmer groups either men or women or both. These farmer groups are involved in the planning of the work to be done. KPP meets these groups at regular intervals. They are given necessary training on aspects like organic farming, manure and compost preparation (including vermicompost), bio-pesticide preparation using locally available plants, participatory plant breeding and kitchen vegetable gardens.

The groups are also encouraged to produce organic, indigenous products as a source of supplementary income. Market support is found to a limited extent for products like organically grown rice, vermicompost, locally available minor forest produce like garcinia, amla, the value added products like processed garcinia, triphala (ayurvedic medicine), amla products, pickles, cow ghee, pappad and local handicrafts made using local resources like paddy straw, wild grass, paddy seeds. However, recently a big project has come up which will help marketing of all the organic products to a great extent.

In Sagara taluka KPP has identified farmers in different villages who are conserving traditional paddy varieties. Nearly 60 farmers are conserving 60 different paddy

varieties in different villages spread throughout the taluka. These people will be trained in organic farming, participatory rice breeding, harvesting and post harvest techniques. They will also be supported by providing a market which will fetch them a premium price for their paddy.

Krishinivasa Farm

KPP has a model farm at Thirthahalli by name Krishinivasa. The farm has an area of 10 acres in which paddy is grown in 5 acres of land. A minimum of two traditional paddy varieties of Thirthahalli taluka are grown here. This farm is also used as an experimental farm for paddy and other crops. The other major crops in the farm are areca nut, coconut, coffee, vanilla and some spices. Organic farming practices are being followed here since 1989. The farm also has a dairy unit.

The farm has a training centre and a library. Training on organic farming methods, compost preparation, biopesticide preparation, agronomical practices, different crop cultivation methods, harvest and post harvest methods are given here.

The farm is certified as organic by SKAL International, The Netherlands. Apart from this, 14 other farms of the same district have also been certified as organic. This certification is through a company from Mangalore which monitors and checks the quality parameters apart from the inspection agency.

Constraints

There are many reasons which force farmers to give up traditional seeds. They are:

- Most of the traditional varieties are of long duration which are not suitable to the present day rainfall pattern which is highly erratic in nature.
- Fragmentation of land holding has made the per capita availability of land very small. Hence it is necessary for the farmer to grow more within a small holding. This makes him go for chemical agriculture and high yielding varieties.

- It is difficult for a small farmer to grow many varieties within a small plot, instead he goes for a single variety which makes cultivation, harvest, processing and storage easy.

- Seds of high yielding varieties are abundant and easily available. It is not necessary for the farmer to store the seeds every season.

- Traditional seeds are suited for organic farming which is labour intensive and requires more biomass. Currently there is lack of biomass availability and the farmer is not prepared for laborious work.

- Information on traditional varieties are not readily available to farmers and also local seeds are scarce.

- Both farmers and consumers give importance to the colour and the look of rice than the taste.

There should be a careful selection of right traditional seeds for a particular locality which responds well for organic farming and gives good yield of both straw and grain. Information on the positive aspects of traditional varieties has to be spread among the farmers. This is what KPP is doing in conservation and popularisation of traditional varieties.

KPP had the problem of marketing traditional paddy in bulk. However it is sure that this problem will be overcome with the launch of the new project by name "Amrutha Satwa" of Sri Ramachandrapura Mutt, which demands nearly 50 tonnes of organic rice every month. Moreover, this project directly links producers with the consumers and helps in paying 50 per cent premium above the market price to organic paddy farmers.

Strengths

KPP can provide training for farmers, conduct field demonstrations, workshops, seminars and exhibitions on organic farming philosophy and practices. It can also provide consultancy in the cultivation aspects of local crops of that area namely

paddy, arecanut, coconut, spices, vanilla, coffee, cocoa and banana. It can also share its publications. Presently it is helping the farmers in marketing their organic products in a big way.

Source : Based on information provided by Mr.V.K.Aruna Kumara of the organisation.

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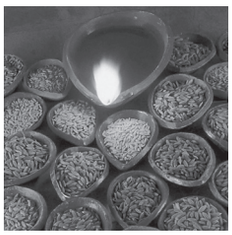
Organic Farming and Indigenous Seed Conservation Experiences from Tamil Nadu, India

Centre for Indian Knowledge Systems

Centre for Indian Knowledge Systems is an organization devoted to exploring the contemporary relevance and applications of traditional Indian knowledge systems. Headquartered in Chennai, South India, CIKS works in 125 villages spread over five districts in the state of Tamil Nadu. The centre's focus areas are biodiversity conservation, organic agriculture and Vrkshayurveda (The ancient Indian plant science).



Dr. Richharia estimated that, even today 2,00,000 varieties of rice exist in India - a truly phenomenal number. This means that even if a person were to eat a new rice variety every day of the year he would live for over five hundred years without reusing a variety.

Background

India is the home of one of the greatest diversity of both wild and cultivated crops. However in recent years, there has been a marked decline in the variety and diversity of cultivated crops such as rice and cereals. With the advent of the Green Revolution, the emphasis has been to a large extent on the increase of yield; consequently a small number of paddy varieties selected for their capacity to give high yields in response to the application of high doses of fertilizer are being promoted. As a result, today the genetic base has narrowed down considerably.

Industrialized agriculture favours genetic uniformity. Typically, vast areas are planted with a single, high yielding variety - a practice known as monoculture - using expensive inputs such as irrigation, fertilizer and pesticides to maximize production. In the process, not only traditional crop varieties, but long - established farming ecosystems are

obliterated. Genetic uniformity invites disaster because it makes a crop vulnerable to attack - a pest or disease that affects one plant quickly spreads throughout the crop.

During the 1970s, the Grassy-Stunt Virus devastated rice fields from India to Indonesia, endangering the world's single most important food crop. After a four-year search which screened over 17,000 cultivated and wild samples of rice, only one population of the species *Oryza nivara*, growing wild near Gonda in Uttar Pradesh, was found to have a single gene for resisting Grassy-Stunt Virus Strain 1. Today, resistant rice hybrids containing the wild Indian gene are grown across 1,10,000 sq. km. of Asian rice fields.

Diversity of Rice Crop in India

According to Dr. Richharia, the well known rice scientist 4,00,000 varieties of rice existed in India during the vedic period. He estimated that, even today 2,00,000 varieties of rice exist in India - a truly phenomenal number. This means that even if a person were to eat a new rice variety every day of the year he would live for over five hundred years without reusing a variety. Every variety has a specific purpose and utility. Dr. Richaria has collected and identified 20,000 types of rice in the Chattisgarh area of Madhya Pradesh alone.

In the alkaline soils of Tamil Nadu, an indigenous variety of paddy called Kalarpalai alone can be cultivated.

Farmers in every part of country have deep knowledge of their own rice varieties, of their environmental and nutritional requirements and their properties and peculiarities. This has enabled them to harvest a crop even under the most severe stress situations. Farmers also possess high yielding varieties of their own which are not recognised in agricultural extension programmes.

The alarming rate of ecological and biodiversity destruction has now been recognised and the need for conservation is acknowledged at the level of farmers and the state. There are a number of reasons for enlarging the diversity of cultivated crops such as rice and in this effort various indigenous varieties used by farmers have a key role to play.

Characteristics of Indigenous Rice Varieties

The community has to be convinced or has to feel the need to bring back lost biodiversity and any effort should be aimed at the community level.

There are many reasons why indigenous varieties are still conserved in spite of all odds. High yielding varieties are not suited to all farming conditions and there are situations where indigenous varieties are better suited. For example, in the alkaline soils of Tamil Nadu, an indigenous variety of paddy called Kalarpalai alone can be cultivated. Varieties like Vadan Samba are highly drought resistant. Most indigenous varieties are resistant to pests and they are less vulnerable and more hardy. Indigenous varieties require less farm inputs (such as chemical fertilisers and pesticides) and they yield straw which is valuable to farmers as cattle feed as well as roofing material. Many varieties fulfill specific nutritional and other dietary needs. Besides this, indigenous varieties provide the basic genetic material for developing any other variety in future.

Farmers Seed Banks for Indigenous Paddy Conservation

Though indigenous rice varieties are still preserved by a few farmers they are getting depleted at an alarming rate. It is becoming increasingly clear that to maintain biodiversity in farmers' fields an alternative system of seed supply has to be created. Although farmers greatly feel the need to regrow some of the traditional varieties they have lost, one has to be able to provide them with sufficient quantities of local seed varieties in order to fulfill this need. The community has to be convinced or

has to feel the need to bring back lost biodiversity and any effort should be aimed at the community level. Several groups across the country are trying to preserve these varieties through on farm conservation. CIKS has been involved in setting up farmer's seed banks in villages in different parts of Tamil Nadu. This article presents the Centre's experiences.

The Setting Up of a Seed Bank in the Valayampattu Village, Chengam Taluka, Tiruvannamalai District

In the year 1993 - 94, CIKS was working with farmers in the Valayampattu village on the use of plant products for pest control. It was involved in participatory experimentation in farmers' fields. The programme was quite successful and farmers realised the benefits of using plant products as alternatives to pesticides. During the farmers meetings, several farmers felt that it would be beneficial for them if they had access to some of the indigenous varieties which they had been cultivating before the Green Revolution era. It was around the year 1995 that CIKS came into contact with Navdanya. Navdanya is an all India effort by several voluntary organisations across the country to conserve indigenous varieties on farm. This movement is spearheaded by the well-known environmentalist Dr. Vandana Shiva. With the help and support of Navdanya, CIKS launched its on farm conservation activity in the year 1995 in Valayampattu.

On farm Conservation Activity Expands

The Centre's initial efforts in on farm conservation was in collaboration with NGOs in different parts of Tamil Nadu. In Valayamapattu village, it actively collaborated with the 'Save the Eastern Ghats' Movement for setting up the community seed bank. After a year CIKS expanded this programme to Tiruporur in Kanchipuram district with the help of the Grammiya Munnetra Sangam (GMS), to Nedumbaram village at Tiruttani with the assistance of the Centre for Development of Disadvantaged Peoples (CDDP), to the Mosavadi village, Vandavasi, with the help of the VISA Peace Centre and to the Manampathy village, Uthiramerur with the help of the Women's Welfare Development Association (WWDA). In the year 1998, it started its work in the Kattankalathur block of Kanchipuram district (the

then Chengalpattu district) in a major way with the support of the Council for Advancement of People's Action and Rural Technology (CAPART). Subsequently, this work has expanded to more than 125 villages spreading over the districts of Kanchipuram, Tiruvallur, Tiruvannamalai and Nagapattinam. CIKS has also been supported in this effort by different funding agencies like the IDRA, UNDP and Ford Foundation.

Survey and Collection of Indigenous Varieties

The Centre's initial effort was to get access to the indigenous varieties. In every area of its work detailed survey was taken up by CIKS field workers to find out the indigenous varieties of paddy already available in that area. It found that at least in some villages some farmers had the tradition of conserving these varieties for self consumption. CIKS collected / purchased the seeds from these seed savers. Besides this gazetteers, district reports, travellers accounts, gave information as to what were the traditional varieties that were grown in these areas before the hybrids came in. An attempt was made to get these varieties back to the farmers from other parts of the taluka / district or other parts of Tamil Nadu if these varieties were still available.

Seed Collection through Biodiversity Contests, Bija Yatra and Participation in Fairs and Festivals

Efforts were also made to collect indigenous seeds by involving youth particularly the students by announcing contests (Essay & Oratorical Competitions) in this subject. By means of this CIKS was able to not only collect information about the varieties but also to create awareness about the importance of conserving these varieties in farmers' fields amongst village students who are the future farmers of our country. A Bija Yatra was undertaken by several voluntary organisations to document information regarding the indigenous varieties available with the farmers and also information on indigenous varieties. CIKS was also part of this bija yatra and it collected information and seeds during this yatra.

CIKS also participated regularly in agriculture fairs and festivals, where it displayed its varieties and also exchanged varieties with farmers. Information regarding the

Centre's efforts was distributed in the form of pamphlets which brought the Centre in touch with more farmers who were interested in conserving these varieties and also with farmers who were conserving these varieties.

Collection of Seeds from Rice Research Stations

CIKS has also made some attempts to get access to some indigenous varieties from the rice research stations of Tamil Nadu such as Tirurkuppam, Ambasamudram and Aaduthurai.

Inventory of Conservators of Indigenous varieties

In every area of CIKS' work detailed surveys were made and an inventory of farmers in different villages who cultivate these varieties were made. This inventory contains information like the reasons for preservation of these varieties, special characteristics of these varieties, mode of cultivation etc.

Farmers Seed Banks for Seed Exchange Distribution and Utilisation

In every area of the Centre's work a network of farmers has been organised for exchange of seeds and exchange of information. Several meetings with the farmers were held in different villages regarding the importance of the indigenous varieties. Farmers put aside part of their land towards conservation of indigenous grain varieties. They are provided with the initial supply of seeds which has been procured by CIKS from that area and surrounding areas from farmers who already grow it. These farmers who are part of the programme are given the technical know how of manuring their field organically, treating pests by natural control methods, use of vermicompost etc. The farmers are provided seeds with the understanding that at the end of the season they return twice the quantity of seeds that they have taken from the seed bank. Farmers are also provided with bio inputs like biofertilisers (Azospirillum, Acetobacter etc) and neem seed cake.

Detailed documentation of every farmer is being maintained by CIKS. It has detailed information about the crop at every stage, the type and quantity of inputs used, pest control techniques used, characteristics of crop, yield obtained and other details.

Arogyam - A Marketing Support Programme for Conservation of Indigenous Varieties

During the course of CIKS work on conservation of indigenous varieties, one of the important constraints that the farmers met with was that of finding a market for their varieties. It was very depressing to note that they did not get a reasonable return in the regular market. To overcome this, CIKS evolved a programme of linking up the consumers with the farmers. Arogyam is a programme which has registered members. These members ensure the purchase of organically grown indigenous varieties. This programme is done on the initiative of the Centre and it provides a good market for the farmers cultivating indigenous varieties organically. This pilot programme on marketing has shown that it would be possible to make available organic products to the consumer at rates on par with the existing inorganic products and also provide the farmer a reasonable return. CIKS has other plans to strengthen the marketing network.

In Situ Conservation Centres

During the course of its work for the last 10 years on indigenous seed conservation, CIKS has collected more than 130 varieties of paddy suitable for cultivation in Tamil Nadu. There is a network of farmers who cultivate this and conserve this year after year. The farmers choose to cultivate one or two varieties depending on the soil type, irrigation facility and agroclimatic region to which they belong. However, all these varieties have to be conserved year after year. They also need to be conserved in more than one region so that they are not destroyed

In situ conservation centres have been established in the experimental farm of CIKS and selected farmers fields.

due to the vagaries of climate. Besides this the Centre experiments with any new variety that it get and cultivates it at least for a few seasons before passing it on to the farmers. Sometimes the Centre also gets access to rare varieties and the amount it gets may be a handful (say a few grains). These have to be cultivated with great care and propagated. In addition to all these, CIKS needs places where these varieties are cultivated year after year and farmers can come and take a look at the standing crop and decide for themselves what they would cultivate. For all these purposes *in situ* conservation centres have been established in the experimental farm of CIKS and selected farmers fields. In these *in situ* conservation centres more than 50 varieties are grown at a time.

Integrated Home Gardens

During the Centre's work with indigenous paddy cultivation it realised that the very concept of home gardens was fast vanishing. When it did a survey to find out the reasons, CIKS realised that the introduction of high yielding varieties and subsequent loss of local varieties was one of the main reasons for the disappearing home gardens. Women farmers could not afford the high price of hybrid seeds for home gardens and even if they did buy the seeds paying a high cost, the germination capacity of these seeds was very low. They could not use it for the next season. CIKS made an intervention in this area also and succeeded to bring back at least 50 indigenous vegetable varieties which are cultivated in the home gardens of these women. These women cultivate the vegetables organically and the Centre provides training for the same. It has also trained women to produce good quality seeds. Every family involved this programme produces at least Rs. 300/- worth vegetables. This adds to the nutritional security of the family. In addition to cultivating vegetables in these gardens women are also encouraged to cultivate herbs which can be used in curing common ailments. They are provided training in organic cultivation of herbs and also the know how of preparing some of the medicines for self help. This is a 100% women based programme.

Trainings, Outreach Programmes and Production of Educational Material

The Centre provides constant training to the network of farmers in organic cultivation

of indigenous varieties. They are also trained to prepare plant based biopesticides on their own. Farmers are also trained in various composting techniques. This helps them to become self sufficient as far as farm inputs are concerned and also saves them a lot of money. Outreach programmes are also conducted regularly to increase awareness in other sections of the village community. Essays and oratorical competitions are held in schools. CIKS also has produced a number of publications in the form of books, posters and films on organic agriculture and biodiversity conservation.

Organic Farmers *Sangams*

After nearly 10 years into this programme CIKS has come up with certain models for the maintenance and sustainability of the effort. Currently, it has nearly 3000 farmers spread in nearly 125 villages who conserve these varieties organically. There are more than 800 households which maintain integrated organic home gardens. In every village, CIKS is in the process of forming organic farmers *sangams* or groups. So far it has established 37 organic farmers *sangams*. These *sangams* have members who come together for a common cause of organic farming and indigenous seed conservation. The *sangam* members pay a monthly subscription which is maintained in a bank account. Elected office bearers take care of and give directions to the working of the *sangams*. The *sangams* maintain the village community seed bank. Storage structures for the seed bank are initially provided through the programmes with a beneficiary contribution and later it is maintained by the *sangam*. The borrowing and returning is controlled by the *sangam*. *Sangams* may also be provided with certain agricultural implements like sprayers, tarpaulin sheets for drying grains and so on which is hired out for a nominal rate. Some *sangams* also run biopesticide units as an income generating activity. The basic know how and the infrastructure is provided by the Centre.

Conclusion

Starting from a handful of five indigenous rice varieties CIKS biodiverse organic farming programme has enlarged into a major effort. Currently, the Centre has more than 130 rice varieties being conserved organically and more than 50 varieties of vegetables providing nutritional security to households. It hopes to expand this effort to the entire state and probably to the entire country.

Source : Based on the information provided by Dr.K.Vijayalakshmi of the organisation.

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CHARACTERISTICS OF INDIGENOUS VARIETIES

Thanga samba

The earhead of this variety is very long. Since this variety of rice is extremely fine and long it is used for the preparation of special dishes like *pulav*. It is suitable for the South Indian meal.

Neelan samba

A highly suitable variety for areas which are prone to water logging. It is best suited for cultivation in the vicinity of lakes. Resistant to brown plant hopper and earhead bug. It increases the milk yield in lactating mothers and hence suitable for them. Since the straw is very long it is used as roofing material.

Kurangu samba

The earheads are very long. There are up to 267 grains in one earhead. It grows in areas prone to water logging as well as dry areas. Highly resistant to pests and diseases.

Seeraga samba

Since the rice of this variety resembles the shape of a spice *seeragam* it has got the name Seeraga Samba. The rice is extremely fine and aromatic, hence it is used for making *biriyani*. Though the yield is very low, since it is aromatic, it fetches the highest price amongst all indigenous paddy varieties of Tamil Nadu.

Samba mosanam

This variety is also called Puzudikal, Eri nel and Maduvu muzangi. It is suitable for growing in the vicinity of lakes. It is said that people travelled by boats and harvested the Samba Mosanam in the lakes. The variety is good for preparing *aval*. (flattened rice), *idly* and *dosa*.

Kullakar

This variety is highly suitable for preparing *idly* and *dosa*. It is also used in the preparation of porridge. Since it is a short duration variety it can be grown in all the three seasons. Highly resistant to pest and disease. The straw is preferred as roofing material.

Thooyamallee

The rice of this variety is highly suitable for the South Indian meal. It is also used for making special dishes like *biriyani*. During the flowering stage, the earheads look like flowers. In Tamil *thooyamallee* means pure jasmine. Since the rice of this variety is white in colour like the jasmine it is known by this name. Highly resistant to pests and diseases. Since this is a fine variety it fetches a good price.

Kuzhiyadichan

Kuzhiyadichan is highly suitable for making dishes such as *idly* and *dosa*. Suitable for saline soil and land which has good drainage facility. Highly drought resistant. Highly resistant to pests and diseases. It is also called Kulikulichan. It is ideal for lactating mothers, since it increases the milk flow.

Kallimadaiyan

The rice of this variety is highly suitable for making a South Indian snack called *murukku*. The Manapparai *murukku* became very popular since it was prepared with this variety of rice. It is also suitable for the South Indian meal. Highly resistant to pests and diseases.

Pitchavari

The rice of this variety is highly suitable for making a special dish called *pittu*. It is used for treatment of diarrhoea in cattle. It also increases appetite in cattle. Highly resistant to pests and diseases. It is suitable for cultivation in areas prone to water logging as well as drought prone areas.

CIKS - CASE STUDIES

1. INDIGENOUS RICE FOR FILARIASIS CONTROL

Filariasis is a disease spread by mosquitoes. Even modern medicines do not have a complete cure for this disease. But, people believe that this disease could be cured by Siddha medicine. Murugadasan from the village Thiruppurambiam 5 kms from Kumbakonam says that filariasis can be cured by using the indigenous rice variety called **Karungkuruvai.**

According to him, the Karungkuruvai paddy is boiled with cactus milk (*thirugukallipal*), cow's milk and honey and made into a *lehyam* confection. This *lehyam* is stored in a mud pot. People who are afflicted with filariasis should have it for five days continuously and after an interval of three days, again for five days. During the intake of this medicine, ghee, milk, cereals and fried salt should be added to the diet. The method for preparing the *lehyam* using karungkuruvai also finds a reference in the ancient tamil text **Pulippani Vagadam 500.** Ramu of the same village had already undergone this treatment 15 years back and has been cured.

Karungkuruvai

Karungkuruvai is an indigenous paddy variety. This can be cultivated during the Kuruvai (June 1 - August 31) and Navarai (December 15 - March 14) crop seasons. The crop grows well on clayey, coarse and sandy clay soils. Normally, the crop grows to a height of 95.56 cm. The age of the crop is 120 – 125 days. Normally, 55 grains can be obtained from an ear head.

This paddy variety was originally cultivated near Kollidam but currently they do not have this variety. CIKS from its collection has given seeds of Karungkuruvai to a farmer Gunasekaran of this area for cultivation in 20 cents of land.

Source : Murugadasan, 2/34-D, South St., Thirupurambiam–612303.

Compilation : Subhashini Sridhar, Ashokkumar, CIKS, Sirkazhi.

2. KAPPAKAR FOR FOOD SECURITY

Kappakar paddy variety is usually cultivated in clayey soil as a dry sown crop during the Samba (July – January) season. The duration of this crop is 5 months. More than 30 farmers have been conserving seeds of this variety in Thiruvanaikovil village of Thirukazhukundram block for more than three generations. When we interviewed the farmers as to why they conserved this variety, they reported the following –

"Every year we cultivate Kappakar variety as a dry sown crop in about 50 acres. This variety can tolerate drought. It can also withstand floods. The incidence of pest attack is quite low. Altogether, the cost of cultivation is very low. Hence we cultivate this variety every year.

During the Samba season (August – January) of this year (2002), our villagers had sown Kappakar as a dry crop in about 50 acres of land. Some farmers had sown a high yielding variety called White Ponni as a dry sown crop. Since there was no rain for 2 months subsequent to sowing, the crops withered. As soon as it rained, the Kappakar crop recovered and turned green. On the other hand, the Ponni crop did not recover. The average yield is about 16 – 18 bags per acre.

The rice of this variety is ideal for making idli and dosa. It also tastes good if the cooked rice is left overnight and then consumed. The hay of this paddy variety is also a good fodder for the cows.

Source : S. Varadharajan, Sankar, Krishnan, Manickam, Thiruvanaikovil, Ozhalur (P.O.), Thirukazhukundram block, Kancheepuram district.

Note : We had personally visited the fields of these farmers. It was quite surprising to note that Kappakar paddy variety remained green even in extreme drought conditions.

3. SAMBA MOSANAM PADDY VARIETY – IDEAL FOR WATERLOGGED FIELDS

Ranganathan who is a farmer belonging to Mangalam village of Tirukazhukundram block of Kancheepuram district has 2 acres of land adjoining a lake. Out of these two acres, half an acre of land remains submerged in water during the monsoon season. This resulted in crop loss when high yielding paddy varieties were cultivated. So, Mr. Ranganathan cultivated Samba Mosanam variety of paddy during the last July – November season by direct sowing.

Since there was heavy rain last year, the water level in the lake was higher than usual. There was about 4 ½ feet of water stagnation in about half an acre of his land. The stalks of Samba Mosanam paddy variety remained unaffected and withstood the waterlogged conditions. However, the stalks of high yielding paddy varieties like Ponni cultivated by the neighbouring farmers were bent and remained submerged in water. This caused germination of the grains resulting in crop loss.

In waterlogged conditions, wherever Samba Mosanam was cultivated, there was no loss in yield. This has motivated the neighbouring farmers to cultivate this variety during the next season.

Special Features of this Variety

1. This variety is also called Puzhudikal, Eri nel and Maduvu muzhungi in Tamil. It is suitable for cultivation in the vicinity of lakes. It is said that people travelled by boats and harvested the Samba Mosanam in the lakes.

2. This variety is good for preparing *aval* (flattened rice), idly and dosa.

INDIGENOUS PADDY CULTIVATION - EXPERIENCES OF A FARMER, GOMATHINAYAGAM

Kitchili Samba is a traditional rice variety popular for its use in the South Indian meal and also for making a special dish biriyani. Gomathinayagam of Vivasaya Seva Sangam, Puliyangudi, Tirunelveli Dist. obtained seeds of this variety from CIKS and cultivated it during the Samba season of the year 2000. He raised the seedling for 1 acre using 40 kgs of seeds. The seedlings were transplanted on the 30th day. He used 40 loads of farmyard manure while preparing the main field. Before transplantation he irrigated the main field with dilute slurry. On the 25th day after transplantation he irrigated the field with cowdung solution. On the 30th day a litre of cow's urine diluted in 10 litres of water was sprayed. On the 40th day he sprayed *panchakavya* using a power sprayer. Only one weeding was done.

Preparation of *Panchagavya*

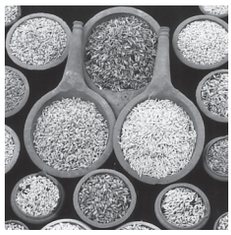
For preparing *panchagavya* Gomathinayagam took 5 litres of slurry, 3 litres of cow's urine, 2 litres of cow's milk, 2 litres of curd prepared from cow's milk and 1 litre of ghee. All these were put in a wide mouthed vessel and left in a shady place. The solution was mixed by hand everyday in the morning and evening. The *panchagavya* is ready on the ninth day and can be used for the next 30 days. Since ghee does not dissolve easily he used a power sprayer. Three litres of *panchagavya* were diluted with 100 litres of water and sprayed. After spraying *panchagavya* on the 40th day after transplantation he irrigated the field. One hundred and thirty days after transplantation the crop was ready for harvest. He got an yield of 1400 kg.

According to Gomathinayagam, this variety was easy to cultivate and tasty to eat. It was extremely good for preparing pongal and pepper rice. Gomathy Nayagam mentions that the yield could be increased over a period of time by increasing the soil fertility gradually. He plans to distribute seeds of this variety to others in his area. He suggests that to preserve the soil quality and the environment it is better to cultivate such varieties organically.

Indigenous Knowledge and Biodiversity for Sustainable Endogenous Development

Integrated Development Through Environmental Awakening

Integrated Development through Environmental Awakening (IDEA) is a non-government research and development organization working in the tribal belts of Andhra Pradesh, Orissa and Chhattisgarh. IDEA and its target group – the tribals of the area – feel strongly that, for a comprehensive sustainable development of human society, man and his environment should be harmoniously knit with a chain of local indigenous/traditional socio-economic, cultural and ecological links. Therefore, the prime concern of IDEA is to promote sustainable endogenous development on socially acceptable, culturally ethical, economically viable and ecologically sound lines. IDEA has its headquarters at Vishakapatnam in Andhra Pradesh.



Village level seed banks engage in on- farm seed conservation, and quality seed production. Annual seed melas are conducted to collect traditional seeds from farmers and to distribute them to other farmers for the multiplication of traditional crop varieties.

Thrust

The most important project of IDEA is to halt the degradation of the indigenous knowledge and worldviews of the tribal people and to conserve biodiversity. These, IDEA firmly believes, when integrated with modern knowledge and institutions, will give rise to an alternative development. As a first step IDEA is documenting, conserving and reviving indigenous agro-ecological, health and nutritional practices of different tribal communities in Andhra Pradesh, Orissa and Chhattisgarh, with the help of the tribals themselves. The main focus of this initiative is on rural agro-ecological, socio-economic and herbal health aspects.

IDEA started its programme initially with 14 villages in Andhra Pradesh in 1985 and now covers over 500 tribal villages through its action and research programmes.

In Orissa, a few years earlier, farmers had taken up the cultivation of cash crops replacing all their traditional crops, in the mistaken belief that cash crops would be more profitable than the traditional ones.

Village Level Seed Conservation Programme

In the 1990s the tribal communities in the Andhra - Orissa border faced severe food shortages. This was especially true in the Koraput district of Orissa where a few years earlier, farmers had taken up the cultivation of cash crops like soya and others replacing all their traditional crops, in the mistaken belief that cash crops would be more profitable than the traditional ones. But, in reality, the reverse happened. The yield from soya declined and gradually became nonexistent. Since the seeds of the soya bean could be used only once, farmers had to buy new seeds every year. The area also had ecological and watershed problems. All this led to the exodus of thousands of farmers from the area in search of food. At this juncture, IDEA intervened and helped the tribals take up a watershed development programme and reintroduce all their traditional crops. The returns came within two years. The tribals began getting food from agriculture. Soya bean has disappeared from the area and the traditional varieties are back. This experience spurred IDEA and the communities to start a village level seed conservation programme called KOTTA DAAN (seed bank). Gradually, a traditional seed research, conservation and development programme called BION (seed) was started at the institutional and village levels with the help of NORAD and ETC-COMPAS. There are two seed banks (bion) in IDEA's Research and Conservation Centre which are managed by the traditional institutional functionaries, women, young farmers and IDEA's research staff. The village based seed banks are managed by women development groups and farmers.

Village level seed banks engage in on- farm seed conservation and quality seed production. Annual seed *melas* are conducted to collect traditional seeds from farmers and to distribute them to other farmers living both nearby and at far away places, for the multiplication of traditional crop varieties.

IDEA became interested in this work because of its firm conviction that traditional seeds are the agricultural genetic resources of the tribal communities, which are vital for them to get subsistence returns in their own agro climatic conditions. Erosion of these traditional seeds cause severe food security problems to the tribals at the micro level and it could also lead to the specific gene pool becoming extinct, which would affect food security at the macro level.

Area of Conservation

IDEA works in the Vishakapatnam, East Godavari,and Khammam districts of Andhra Pradesh and in the Koraput, Rayaguda, Kalahandi, Bolangir, Nuapada and Gajapathi districts of Orissa. In all they work in 202 villages where tribals carry out direct cultivation and in 74 villages where there are traditional seed multiplication programmes. IDEA carries out this work both in its own plots at the research centre and also in the villages with the farmers. On the whole 10,000 farmers are engaged in direct cultivation helped by about 150 traditional institutional functionaries and senior farmers. There are about 50 village volunteers in the seed conservation programme.

IDEA's seed conservation programme is in the 2 states, in 9 districts and 13 blocks/ mandals. In 202 villages the local farmers are in charge. In 74 IDEA villages and farmers work together. Its main focus is on paddy, millets, and vegetables, oilseeds, spices and commercial crops.

The special characters of some varieties conserved by IDEA are: short duration varieties of paddy, long duration red gram varieties with high disease resistance and nutritional value and scented rice.

Participatory Varietal Selection

Participatory varietal selection is carried out through PRA exercises and also by conducting seed testing in traditional ways. Participatory plant breeding of rare varieties of crops is carried out with the active participation of the community and researchers. On- farm trials are conducted by farmers before varieties of traditional seeds brought from other areas are introduced. IDEA and the farmers also conduct experiments on traditional seeds at its research centre

Achievements

Helped by these initiatives, the tribals have restored more than 250 varieties of traditional seeds and strengthened their sustainable agriculture practices with the integration of their indigenous knowledge and worldviews related to agriculture. They have almost solved their food security problems and have even started grain banks to act as a buffer during the community's lean periods. IDEA also supports farmers in conducting multiplication programmes of some selected rare varieties of traditional seeds.

Training

IDEA conducts training programmes, trainers' training programmes and organizes farmers' *sangams*. In the farmers' *sangams*, the community leaders and senior farmers help to conduct on- farm experiments, seed multiplication activities and maintain seed banks. Special newsletters have been published on documentation of traditional seed varieties. IDEA interacts with other NGOs like CIKS, Chennai and Green Foundation, Bangalore, for exchange of information and for sharing experiences. IDEA can also help others by providing consultancy and exchange of selected seed varieties and saplings. It can help farmers in selling their organic produce, help in conducting field demonstrations, exhibitions, seminars, field days, farmers' fesivals, and so on. It can also help in building legal awareness and in insuring against crop loss.

Women farmers display some traditional seed varieties conserved by them.

Education

To educate the farmers, IDEA has Farmers' Research Centres, and Dormitory Education Programmes at the village level.

The entire intervention is community based where the target groups are all tribals. IDEA works with both men and women farmers.

Alternate Income Generation

As an alternative method of income generation for farmers, IDEA has helped the people to make botanical pesticides, distributed bamboo sprayers, and revived the use of traditional seed storage baskets made using specific tree species.

Publication

IDEA brings out newsletters on the traditional seeds of the various tribal communities and training manuals on seed conservation and weed management.

Overcoming Constraints

IDEA faced some constraints initially, but the farmers' realization and the failure of the hybrids were a major motivation for them to bring back the traditional seeds. IDEA has also conducted several motivational training programmes for farmers to revert to traditional organic cultivation practices.

Source: Based on the information provided by Mr.Gowtham Shankar of the organization.

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BALI PAROB – THE SOIL TESTING FESTIVAL

As the mountain lands of the Eastern Ghats have a rich variety of soils, a farmer's land may well comprise two or three different kinds of soil. The festival of Bali Parob, in November, is the traditional soil-testing festival of the tribals when they test the soil for fertility and its suitability for certain crops. Disaris of communities gather on a suitable day and the farmers come to them with baskets of different kinds of soil from their fields in which different seeds have been sown.

After a ceremonial offering to the Bali Devata or soil deity, the baskets are left to germinate. These are then observed for 12 days, which is approximately the time taken for germination. At the end of this period, depending on the quality of germination in the baskets, farmers are advised on which crops they should grow.

If germination is unsatisfactory, it is an indication of depleted soil and they are asked to wait for the soil to regenerate, or to grow alternate crops that may require soil with lesser nutrients. If, however, a farmer finds that he cannot grow any crops, the community steps in to help him with his food requirements.

The revival of this festival is extremely important, because followed in its strictest sense, it minimizes the risk involved in planting crops, investing time and effort in tending the fields and then finding that the crop has failed because the soil was incapable of sustaining the crop.

IDEA has succeeded to a great extent in taking this festival beyond the symbolic festivities and encouraged farmers to actually use it in their agricultural practices.

Source :

An Idea that Works - Documentation of good practices of NGO support, IDEA

Seeds of Freedom

Navdanya

Navdanya means nine seeds. These nine seeds represent India's collective source of food security, connoting a diverse ecological balance at every level - from the ecology of the earth to the ecology of our bodies. It is a movement born of a vision in which every species has a future, every farm is free of toxins and every person is free of hunger.

Over the last decade, Navdanya has worked with local communities and organizations to establish 20 seed banks in seven states, serving over 10,000 farmers.

Navdanya is a Delhi based NGO. Since 1987 it has been saving seeds, promoting chemical free organic agriculture, creating awareness on genetic engineering, defending people's knowledge from biopiracy, and defending people's food rights and food sovereignty in the face of globalization. The erosion of biodiversity and the social and ecological impact of monoculture on forestry and agriculture provided the impetus to Navdanya's action.

The Impact of the Green Revolution

The disappearance of indigenous crops was caused by the Green Revolution cash crops. By the time farmers realized that native crops were better in the long run, these crops had ceased to exist. So Navdanya pioneered a movement to save native seeds, which in turn, helped to preserve the indigenous knowledge and culture of Indian agriculture.

Navdanya and Conservation

Navdanya works mostly with small and indigenous farmers.

It strongly believes that placing the farmer at the centre of conservation gives him/her control of the political, economic and ecological aspects of agriculture. For the seed keepers, the choice to maintain crop diversity in the face of popular monoculture, has become a political statement about who controls their lives.

Navdanya initially helps the local groups and communities to take up seed conservation activities. Once the locals become capable of coping, Navdanya withdraws.

Four types of farmers participate in Navdanya's conservation programme. First are the *beej rakshaks,* who have continued to use and conserve diverse seeds on their own. These are usually small or marginal farmers in remote or marginal areas where the monoculture of the Green Revolution has not yet reached mainly due to the inability of these farmers to afford costly techniques and the unadaptability of the land to these techniques.

Many of these farmers are women and it is compulsory for them to use traditional seeds because that alone ensures their survival. These women do not have the luxury of experimenting with the new seeds and risk crop failure. The traditional farming methods using native seeds is linked closely to the environmental constraints of the area. This is the only way that the farmers can feed and shelter their families.

The second type is made up of those farmers who have shifted from traditional farming and have suffered as a consequence. So, they are keen to reintroduce diversity in their fields and attain the status of being *beej rakshaks.* Reverting back to traditional agriculture ensures the livelihood security that is in-built in the use of traditional seeds.

Then come the *beej utpadaks* - the community seed producers. These farmers keep their land aside for the multiplication of the conserved seeds. They may

need to be compensated monetarily until seed exchanges/sales or barter can meet their requirements. There is another kind of *beej rakshak* involved in Navdanya's conservation model as well. These are the farmers who continue to conserve indigenous plant varieties for future generations despite economic or cultural difficulties. These farmers may not get any immediate monetary benefit; hence the community or public interest groups may have to compensate them.

Over the last decade, Navdanya has worked with local communities and organizations to establish 20 seed banks in seven states, serving over 10,000 farmers. It has succeeded in conserving more than 1500 varieties of rice, hundreds of millets, pulses, oilseeds, and vegetables. It has worked with many other NGOs.

Navdanya sees itself as the catalyst in seed conservation creating an ever widening circle of awareness at many levels from the micro to the macro. To do this, Navdanya initially helps the local groups and communities to take up seed conservation activities. Once the locals become capable of coping, Navdanya withdraws.

Bija Yatras

In March 1999, Navdanya launched the Bija Satyagraha Movement with over 2500 groups. The objective of this movement was to defend farmers' rights and seed freedom in the face of biopiracy and seed monopolies. This is a grassroots campaign on patent issues; an assertion of people's rights to biodiversity; a determination not to cooperate with IPR systems that make seed saving and seed conservation a crime. Navdanya's Bija Yatras (Seed Marches) have created awareness through seed fairs, seed exchange programmes and initiation of new community seed banks.

Organic Farming

Navdanya has been in the forefront of the organic revolution. It believes that to cultivate organically is to survive with dignity. Organic cultivation also liberates agriculture from chemicals and genetically modified crops . The NGO's pioneering research on the hazards of chemical farming; the high cost of industrial agriculture and the risks of genetic engineering have led to a paradigm shift.

Navdanya has been a leader in the movement for biosafety and against dangerous

genetically modified organisms in agriculture at both the national and the international level. For this, the NGO has worked in citizens'movements and governments. It has proved, that contrary to popular assumption, ecological agriculture is highly productive and the only lasting solution to hunger and poverty.

Model Farm

In Navdanya's Biodiversity Conservation and Organic Farm in Doon Valley, eucalyptus monoculture has been replaced by more than 650 varieties of plants including 250 rice varieties, 30 wheat varieties, and numerous species of medicinal plants. This farm has become a model of biodiversity.

Training and Marketing

Over the past decade, Navdanya has trained thousands of farmers through workshops and training camps in chemical agriculture and created awareness amongst lay people through fairs, festivals and rallies.

To support organic farming, the NGO has started to market organic products directly. To help in this endeavour, it has opened Delhi's first organic outlet.

Achievements

Navdanya has consistently been in the forefront of the fight for farmers' rights and livelihood. Its perseverance has paid off now with the nation and the people becoming more aware of the hazards of globalization and the forsaking of age-old indigenous agriculture. The NGO has conserved innumerable varieties of rice, wheat, pulses, millet and vegetables at various places. It has encouraged small and marginalized farmers to become self sufficient and independent. It has triumphantly shown in practice that organic agriculture is very profitable and the only means for the Indian farmer to have food and shelter.

Source: Based on the material available on the organisation's web site.

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From Food Security to Food Sovereignty

Deccan Development Society

The Deccan Development Society (DDS) is a grassroots organization in the Medak district of Andhra Pradesh. It is present in about 75 villages where it works with women's sangams (voluntary village level association of the poor women). The members -5000 women – belong to the poorest strata in the society and are mostly Dalits. The headquarters of the NGO is in Begumpet, Hyderabad. DDS was started 20 years ago. It was started with a vision of consolidating the village groups into vibrant organs of primary local governance and federate them into a strong pressure lobby for women, the poor and Dalits.

The DDS is present in about 75 villages where it works with women sangams (voluntary village level association of the poor women).

The *sangams* of DDS

The autonomy of local communities is the driving force of DDS. The fundamental principle of access and control ensures this autonomy, which has become much more important in a globalizing world with shrinking national boundaries and disappearing national sovereignties. Therefore, DDS felt the necessity of women *sangams* who have since worked for many autonomies – over food production, over seeds, over natural resources and for an autonomous market and media.

The *sangams* of DDS work towards ensuring seed sovereignty by practicing permaculture, establishing ecoinsurance and production of biomass to enhance soil fertility.

Four steps towards food security

To ensure food security for the poor and the dalits the organisation has taken four major steps. As a first and important step, household food security is ensured (eco employment) where Dalits work to upgrade their farms. This entails efforts like bunding, trenching, top soil addition and so on. Production in these lands (about 1000 acres), has improved. Lands which hardly grew 20-30 kg of sorghum per acre today grow about 100-120 kgs. This has ensured food grain security for households.

The second step is food security for the dispossessed community, where *sangam* women collectively cultivate large chunks of land that they lease from owners who cannot cultivate them. On an average each *sangam* woman who was a member of her *sangam's* land lease group worked on the leased land for 4-5 days a season and in return earned enough food crop to last her family for one month which was an additional food grain security for her family. This amounted to an addition of about 60-80 kgs per capita availability.

The third step is the alternative public distribution system - PDS - (the community grain fund) which ensures the food security of the entire village. This programme aims at rejuvenating the poor lands in all the DDS villages and growing enough grain to maintain a PDS managed by the community. This prototype of DDS is a new model for all the rainfed degraded lands in the country. The programme was supported by the Ministry of Rural Development, Government of India. About 3000 women in 50 villages have increased the productivity of over 3500 acres of fallow or highly marginal lands to grow more than a million kilograms of sorghum – which translates into roughly 1000 extra meals per participating family per year. These 50 village community grain funds help to tide over the food problems of the poorest and the destitute in the community during the lean period of food shortage every year.

Critical control over germplasm (community gene- fund) is the fourth and final step. Through this, the women have reestablished their control over the most vital link in the food chain – seeds. Now, instead of begging for seeds, these women can

In the process of growing mainly food crops, women have regained control of family farming economic processes.

give others seeds. The community gene-fund programme has tried to restore to the rural women in general, and Dalit women in particular, the important control over seeds. This programme emphasizes biodiversity in agriculture and recovery of traditional landraces.

The women of DDS have retrieved over 80 landraces (crop varieties) which had been obliterated by 'modern' agriculture through this programme. By doing so, they have taken over their community's germplasm knowledge. This control is very important and is a vital step in their struggle for food sovereignty. The women of DDS have also established village level community gene- banks in 60 villages. This is a remarkable achievement which was accomplished by growing diverse crops in their poor lands.

Advantages

These programmes have many advantages, both visible and invisible. Many people have started approaching the *sangam* women for seeds. This process has helped people move away from the organised, externally controlled market and helps a self reliant seed economy. The bottom line is that no member of DDS *sangams* needs to suffer from hunger as her access to food has increased at least four times. And, during lean periods, she can depend on the support provided by the programme.

In the process of growing mainly food crops, women have regained control of family farming economic processes. They have got back to the centre of decision making. Agricultural processes have become internalized. Seed control returning to women means the reestablishment of their intellectual leadership in the community.

From the position of being poor women they are now managers of germplasm for the community. Viewed from a simple economic angle the farms which earned hardly Rs.300/- a season have started earning Rs. 2,500/- now.

Over and above these, the DDS *sangams* have worked towards control over natural resources where they regenerate land from forests, plant trees in degraded village common areas, and have created in many villages medicinal commons where different species of medicinal plants are grown. The Dalit women have also been active in watershed development. In short, they have improved their natural resources considerably.

DDS *sangams* set up their own market in 1999, through which the *sangam* members buy and sell their agricultural produce. They have formed the Zaheerbad Consumers' Action Group in order to popularize the advantages of ecologically produced food to urban populations.

Dissemination of Information

Despite being illiterate, the Dalit women have produced successful videos to hold dialogues with their *sangams* and to inform the world of their achievements. *The Sangam Shot* that they produced has made waves throughout the world. They have also established a community FM radio facility.

Education

DDS perceives education holistically. It has a school system starting with *balwadies* (preschool), to the *Pache Saale* (Green School) where working children of the 10-16 age group (with an emphasis on girls) are taught subjects that are relevant to their life style. It also has workshops for adult women and night school for children who cannot attend school during the day.

Farm Science Centre

The Krishi Vigyan Kendra (The Farm Science Centre of DDS) preaches sustainability in agriculture, that is organic, environment friendly and based as much

as possible on local knowledge systems. Local knowledge in areas like health care and agriculture is deemed very important by DDS.

Outreach

DDS encourages the participation of its members in social issues. Its Ananda Nilayam (Safe Home) is a haven for victims of violence. It has also taken part in many campaigns to popularize biodiversity. Its Mobile Diversity Festivals (*jatharas)* are highly respected in the South Asian region. From 1998, these festivals have dialogued with over 1,50,000 farmers on ecological agriculture, control over seeds and organic markets. These *jatharas* have also become important spiritual and religious events, reminding the people of their past culture and tradition.

Campaigns

DDS has also led a number of major campaigns on organic farming and ecological agriculture, against foreign intervention in Indian agriculture and supporting the farmers' right to their lives. It has also had many workshops on these and other related subjects. The NGO has contact with many organizations, both national and international, and has won a number of awards. It is the regional resource agency of the Government of India and since 1990 has networked with over 500 NGOs, civic groups and academic institutions in Andhra Pradesh to work on environmental issues. It has conducted many research studies related to biodiversity in agriculture.

Source: Based on the material available from the organisation's website.

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Center Based And Community Based Seedbanking - Returning Diverse Genetic Resources to Farmers

Community-Based Native Seeds Research Centre

Community-Based Native Seeds Research Centre, Inc (CONSERVE) was established in 1992 as a project of Southeast Asia Regional Institute for Community Education (SEARICE), a regional non-governmental organization (NGO) active in issues involving farmers, indigenous peoples, urban poor with concerns such as appropriate technology, community health, land issues and other people-centered development work.

CONSERVE is committed to work in partnership with farmers in the collection, conservation, research, development and utilization of plant genetic resources for sustainable agricultural development.

CONSERVE was instituted as a non-stock, non-profit organization with the Securities and Exchange Commission (SEC) of the Republic of Philippines in December 1993. It envisions an empowered farmers' sector, utilizing sustainable agriculture for food security, peace and prosperity. Bringing its flagship programme on Community Plant Genetic Resources (CPGR) conservation and development, it is committed to work in partnership with farmers in the collection, conservation, research, development and utilization of plant genetic resources for sustainable agricultural development.

Its central farm and office is located at Poblacion, Pres, Roxas, Cotabato and is working with poor farmers and indigenous peoples in Arakan Valley Complex (AVC) composed of five municipalities and is expanding to at one of the nearby municipalities-the Kabacan in the Northern part of Cotabato, island of Mindanao.

Apart from its CPGR program, CONSERVE also works on giving some education and training, as strategy to enhance the farmer-partners skills in attaining food security, farmers empowerment and prosperity.

CONSERVE's Objectives

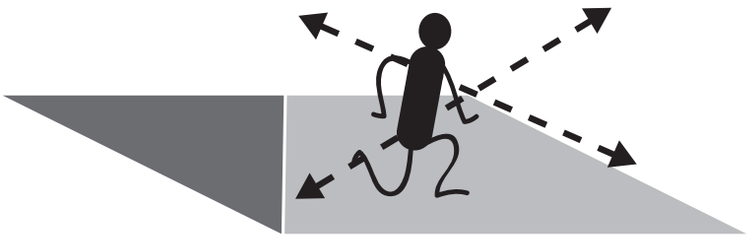
The aim of CONSERVE is to bring farmers back into the centre of agricultural research – a place they lost when research was institutionalized. It wants to return diverse genetic resources to the farmers. By using these genetic materials farmers are assured of valuable plant genetic resources allowing local landraces to evolve in the changing environment. CONSERVE works with farmers to systematically collect, conserve, undertake research, develop and utilize plant genetic resources for sustainable agricultural development. The establishment of centre –based and community-based seed banks is one of the strategies employed by the organization in this quest.

Centre Based Seed Banking

The first step in this effort is collection. Collecting expeditions, donations and seed exchange are methods used to collect plant genetic resources. Collecting is the most exciting activity of a conservation project. To collect the materials, a contact person from the area is first identified. This person's main job is to establish trust and rapport between the collecting team and the locals. The person is also the local guide. A detailed map of the target area, marking relevant features is drawn up. Local officials, community leaders and existing organizations in the area are contacted. At this stage, the following important materials are got ready – bags for collecting (backpack), envelopes, net bags and cloth bags, record forms to be filled in while collecting, pens, tags, scissors, knife, medicines and other personal items.

Pre-collecting paves the way to the real collection activities. In this stage, the team visits and explores the area a month or so before the harvest of the target crops. This helps the locals and the farmers themselves understand the organization's objectives. It is important that farmers willingly donate their genetic materials. In this period, farmers with diverse genetic materials are listed along with the dates in which these crops are to be harvested.

Proper sampling methods are employed to get a good representation of the variety to be collected. This is ideally done by two collectors walking diagonal to each other. While walking two panicles per plant from 50 plants is sampled per collector.



The direction of the collector while collecting samples in the field

Sampling at the borders of the field is avoided because of higher risk of pest and disease infestation. Collectors then place the bunch of panicles gently in the neg bags and put tags inside and outside indicating the variety name and collector's name. If samples are collected from the storage houses of farmers, a 500 gram sample is collected at random to represent the population. These collectors have to be very thorough and methodical and should get the samples that are the most unique and distinct - this is for favourable breeding stocks and further selection.

At this stage a thorough documentation (in forms provided by the agency) is very important. Photographs, with the permission of the farmers are taken.

Registration

The seeds coming into the seed bank are registered. CONSERVE uses a number of criteria to identify the seeds easily like collector's name, number, variety name, crops and so on. Upon receipt of the collected seed materials, the following important activities take place. First, the seeds are tested for contamination and for pest or disease infestation. The seeds should be dry, if they are not, they are dried carefully since the reduction of moisture in a seed is important for better longevity. Air drying is much more efficacious and safe than sun drying, which destroys the embryo of the seed.

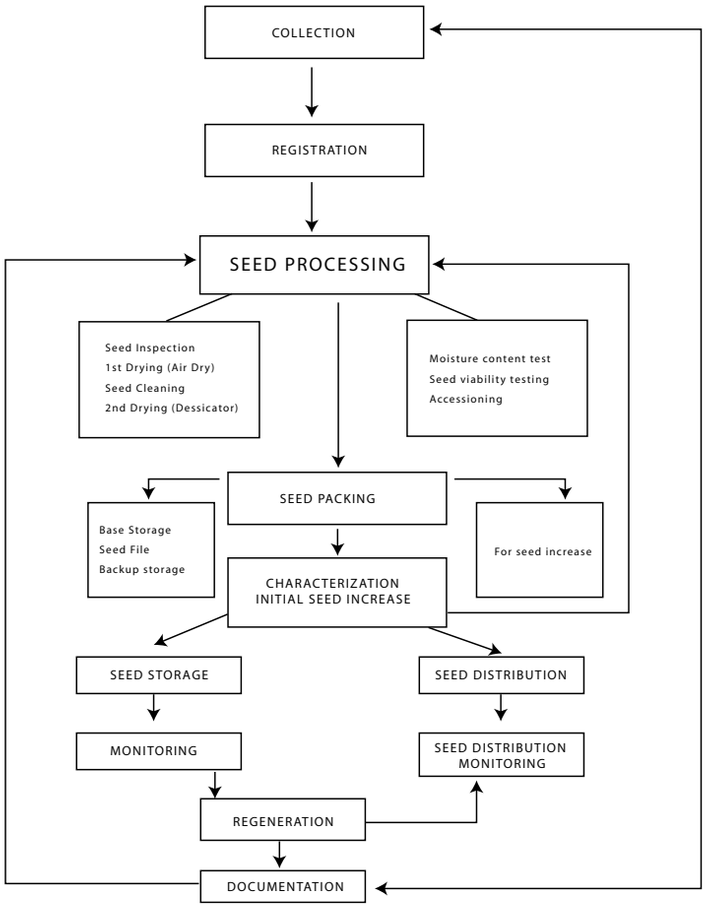
Next, the dried/dry seeds are hand threshed to avoid breaking of the endosperm. After the drying and threshing the seeds are cleaned by winnowing. Infected seeds and shriveled, cracked or immature seeds, weed seeds and other debris are removed. Hundred seeds are removed and put in an envelope to be tested for viability . The cleaned seeds are again dried till they reach the required moisture content of 6 – 8%. Next, the moisture content of the seed is tested either with a seed tester or by biting. Viability testing is done to ensure that seeds that are to be stored are worth the effort. Seeds with a germination percentage of 50% and more are given a permanent accession number after the seed increase. A seed file is then formed. This is the reference collection of seeds which is used to identify the accession for regeneration, characterization and other conservation activities in the later seasons. It is created during the second drying. The selected seeds, that is, those that have met the agency's criteria, are packed in paper bags with proper accession numbers, variety name and date of storage. Silica gel is used to maintain the moisture content.

Base and Active Collection

Then the seeds are packed and stored in the base collection and the active collection. The first is for future generation activities and the latter for distribution and characterization. The base collection is maintained in a seed bank as a reserve for seed distribution to farmers. The active collection storage is for on-farm research conservation and development efforts.

Characterization

Characterization is an activity of knowing and evaluating the morpho-agronomic traits of a plant in terms of qualitative and quantitative characters. CONSERVE is interested only in important morpho-agronomic characters useful for farmers. Farmers and curators help in the characterization. CONSERVE uses an indigenous method of characterization.



Flowchart of centre based seedbanking - collection to storage

Initial Seed Increase

Next comes the important step of initial seed increase. The supply of water, soil fertility, safety from rats, insects and diseases are some important details to be considered while the site is selected. Seeds need their own agro-eco systems to flourish. Upland rice varieties need an upland eco-system, while lowland rice needs an irrigated eco-system. The land is ploughed and harrowed thrice to pulverize the soil and organic fertilizers like animal manure and other compost available in the market are applied 15 days before planting. Great and different details are to be adhered to while planting lowland and upland rice – seed preparation, layout and planting.

Monitoring

Then comes monitoring to prevent pest infestation and weeds. Daily monitoring is necessary when some rice accessions begin to mature. The harvest is done at the correct time when the grains are mature. The ideal time for harvesting is when the field is dry and not early in the morning or late in the afternoon. This is for ensuring the best quality of seeds, which are then collected dried, threshed, cleaned and stored.

Seed Distribution

The next stage is seed distribution. This is to increase plant genetic diversity in the fields, ensure availability of plant genetic materials for production, provide new materials for further selection and parent materials for rice breeding. For a successful on-farm conservation project, seed distribution of the collected plant materials is a key factor. The seeds distributed come from the active collection, which has to be replenished seasonally.

The area of seed distribution is identified – like where there is pronounced erosion of rice genetic resources. Sixty varieties of rice, each weighing 200 to 500 grams is the ideal number of varieties to be distributed per cluster of 30 to 40 households. Linkages with farmers' organizations, farmers' cooperatives, and church based organizations themselves engaged in sustainable agriculture are important in monitoring. The background, objectives and activities of the project should be disseminated to the farmers/farmers' organizations, to help them interact with the conserving organizations. Seeds are then distributed to the farmers two weeks to one month before the planting seasons. The quantity of the seeds distributed depends on the farmers' ability and capacity to grow them.

The farmers' fields are visited at least thrice within the cropping period for on-farm monitoring – during planting, at the vegetative state and at the maturity or harvesting season. Rice is gathered based on the data on farmers' observation of the morpho-agronomic characteristics of different varieties. After two or three cropping, the seed flow and the storage system is also monitored. Back-up storage

is necessary to ensure the security of the base collections and to complement the on-farm conservation efforts. The consent of the farmers and seed donors is important at this stage.

Regeneration

Regeneration is the multiplication of the original seeds from the stored collection when seed viability falls below 85 or 90%.

Black Box

CONSERVE stores its back-up collection under a black box agreement with the Philippine Rice Research Institute (PhilRice) at Maligaya, Munoz, Neuva Ecija. The storage temperature is 2.5 degrees Centigrade with 40 – 50 % relative humidity. This storage condition can ensure the viability of seeds for 20-30 years.

The black box agreement protects farmers' rights over the stored germplasm by giving them sole access to the stored seeds. The black box has a combination lock with a code which are known only to the farmers and a few selected members of CONSERVE.

CONSERVE undertook this project to preserve some seed varieties that weretraditionally discarded by farmers. In the gene-bank the materials will remain viable till they are needed. This material is meant only for the farming community. It is important to document every activity. The following information is necessary: passport data (collection data), viability data, regeneration data, characterization data, base storage data, seed file data, and seed distribution data. The data gathering forms are designed in such a way that the same design can be used in encoding the information on a database.

Community Based Seed Banking

CONSERVE established a community seed bank at the Arakan Valley Complex because only 52 remaining local varieties and three landraces were utilized in this vast area. Escalating armed rebellion in the area was responsible for the disappearance of many varieties.

In 1995 CONSERVE distributed upland river varieties that it had collected and saved to the indigenous farmers of the area. Many meetings were held between CONSERVE and the local tribal groups. CONSERVE established a community managed conservation of germplasm in the area.

First they selected the site based on genetic erosion and farmers' interest to maintain and manage different rice varieties. Two communities were selected for the project-Lake Sagan of Barangay Meocan, Arakan, Cotabato and White Kulaman, Arakan, Cotabato. The area is mountainous and undulating. Deforestation for timber had made this province poor and it was only partly rehabilitated by the displaced indigenous communities who had some land for cultivation with limited varieties saved from previous cultivation. A community seed bank was established to bring back the diversity that they had lost.

Following their own agenda of establishing linkages and contact, project orientation, seed distribution, CONSERVE ensured that the community was fully involved in the planning and the planting (done mostly by women, while men focused on land preparation, layout weeding and harvest). During the harvest, women selected the healthy and vigorous plants when they were 85-90% mature for the next cropping season. CONSERVE and the farmers undertook post harvest activities. Monitoring was done within the two cropping periods from the first distribution of seeds to the harvest. It used the indigenous storage system which is highly suited to local conditions.

Community Plan for Plant Genetic Resources (PGR) Conservation

The farmers themselves used the following methods for PGR conservation. First, a seed production farm of one hectare was established to sustain the seed supply to all farmer members of the community. This was owned communally and served as a living back up in case of pest infestation. This was also a source of seeds to farmers desiring plant diversity in a larger area. Harvested seeds were placed in the community seed storage.

Every farmer of the community was given 3-4 kg rice seeds for one planting season. It was the farmer's responsibility to increase the seeds. If planting material was not enough the farmer would ask the community seed production. Indigenous storage

systems were used for storing the seeds.

Elders and the indigenous people selected the varieties needed, the important criteria being resistance to pests and diseases, good eating quality and the days to mature. When the seeds were dried and cleaned, steps were taken to prolong seed viability. Seeds kept in the community's seed storage are meant for drought and other crisis in the community. This is the guarantee that seeds will be available for consumption. Normally seeds are not sold as the people believe that grains come from Heaven and that a good harvest is a sign of blessing.

Indigenous Storage Systems

It is also important for individual families to have their own storage of seeds, apart from the community seed bank. There are many methods of indigenous storage that the community practices. After drying, seeds are kept in bamboo poles covered with coconut husk, rice straw or any variety of leaves that can repel pests. These poles are kept in the cooking area so that the smoke drives away insects. Seeds are also stored in clean bottles after they are dried. Ash or charcoal is placed inside the bottle to absorb moisture. Baskets made of woven palm leaves are also used . Seeds harvested from the communal farms are stored in a community store house which is built on stilts to prevent animals from destroying the seeds. Cotton bags are used for bulk storage. These methods that CONSERVE advocates have been used by farmers and indigenous people for a long time as they are cost –effective. They have many advantages and some disadvantages as well.

Seeds are the common heritage of mankind and adopting the seed bank idea gives them access to lost genetic materials. Seeds also have medicinal and cultural value. Some of the seeds have specific uses: thanksgiving (*kandoli* and *panubad*), wedding and birth ceremonies etc. Seeds with a good aroma and taste can be selectively propagated and stored in the seed banks. They can be grown organically without using chemical fertilizers. Area specific varieties can be propagated and disappearing varieties resuscitated.

Source: The book published by CONSERVE

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Saving Seeds in the Himalayan Foothills

Beej Bachao Andolan

The Beej Bachao Andolan (BBA) is set in the village of Jardhargaon in the picturesque Himalayan foothills. The village is in the district of Tehri Garhwal. Agriculture and cattle rearing and collecting forest produce are the main occupations of the village. The Andolan was started by a local villager, Vijay Jardhari, who had taken part in the Chipko Movement of the 1970s and 1980s.

Beej bachao means save the seeds. The objective of BBA is to save indigenous seeds from the onslaught of hybrid varieties in the Garhwal Himalayas.

Beej bachao means save the seeds. The objective of BBA is to save indigenous seeds from the onslaught of hybrid varieties in the Garhwal Himalayas. The realization that modern techniques yield only short term benefits, caused the formation of BBA whose main aim is the revival of biodiversity in the area.

The Activities of BBA

Beej Bachao Andolan is a movement to save indigenous seeds from the onslaught of new hybrid varieties, in the Garhwal Himalayas. The movement is successfully conserving *in situ* several hundred folk varieties, 40 different crops, including cereals such as red wheat, oats, rices, *mandua,* amaranthus, buckwheat, corn; millets like *jhingora* and *koni*, beans and pulses like various *rajma* (kidney bean) varieties, *urad, kulat, bhatt, chana, masoor* and *tor*; oilseeds like mustard varieties, sesame seed and tilphara, medicinal varieties of turmeric and ginger, *arbi* and red chillies, vegetables such as cucumbers, bitter gourd, a sweet bitter gourd, ridge gourd, bottle gourd, *jimikand, kadoo*, radish, fenugreek, garlic,

The movement is successfully conserving in situ several hundred folk varieties and 40 different crops.

tomatoes, peas, potatoes and coriander.

Gene Banks

Using women committees as part of the state-level Mahila Samakhya programme, BBA is spreading the idea of community level or farmer level gene banks in several villages in the area. It noticed that women farmers were receptive to the idea of growing indigenous varieties, while men favoured the technologies of the Green Revolution because they are more profitable in the short term.

Other Movements in the Area

The Van Suraksha Samiti (VSS) was started to save the forests of the area. Forests are a major source of sustenance to the villagers and VSS was formed to stop indiscriminate felling of trees. Another institution involved in protecting the forests is the Mahila Mangal Dal (MMD or the women's committee) which was started in 1987. Along with saving the forests, these organizations also oversee the cutting of grass and water management to ensure that the maximum good reaches the maximum people.

Source : Based on the information provided by Mr.Ashish Kothari of Kalpavriksh.

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"BARAH ANAAJ"-TWELVE FOOD GRAINS: TRADITIONAL MIXED FARMING SYSTEM

Two Year Rotation and Mixed Cropping System:

Mixed cropping of the twelve food grains is done prior to the Kharif season. In different regions, these seeds are sown from mid-May to mid-June and harvested from mid-September to mid-October. These fields are left fallow after that. The fields are prepared again at the end of March. Farmyard manure is applied. Paddy and Barnyard Millet are sown.... harvested by September end. In Rabi season, Wheat, Barley and Masur Dal is grown and harvested by April end. Again in the third year, twelve grains mixed cropping is done.

The twelve food grains mixed system

Ragi (Finger millet) is the main crop of this system. Amaranth, Rajma (Kidney beans), Lobia, Horse Gram, Math (traditional soya), Buck wheat, Sesame, Mangjeer (tilhan - an oil seed), Makka, Green Gram, Black Gram, local gram varieties etc. are sown together. In some regions, more than twelve and less than twelve grains are grown too. This method is foolish in the opinion of agricultural scientists. But, since this system has been developed based on the knowledge and experience of the local people and got accepted from generation to generation, it cannot be unscientific.

Nutritional value of this system

Bread (roti) prepared from ragi flour gives enough energy for a day of heavy work. Calcium, iron and iodine are found in rich quantities in ragi. Ragi grain extract has medicinal properties for animals. Ragi malt and extract can be consumed.

Amaranth can be used to make bread (roti). The seeds are roasted to prepare laddoos (sweet balls) and other delicacies during the fasting and festival period. It is rich in fibre and protein. Buck wheat, like amaranth, is also consumed during the fasting period. Therefore, these crops are also important economically. Traditionally, these

crops were bartered for salt. But, now they have good demand in the plains too. Both amaranth and buck wheat can be used as greens.

Amaranth, maize and sorghum plants are tall. Kidney beans climb on these tall plants. These crops do not compete with each other and are good companion crops. On the field bunds and on the rocky part of the farm, lobia, black gram, local gram, horse gram, green gram and traditional soya are grown. These are consumed as dal and also many different delicacies can be prepared using them. One who consumes horse gram will never suffer from stones and kidney stones disease. Even if one gets this problem, consuming boiled horse gram water for one month will cure the disease without having to resort to surgical operation. As the story goes, in the olden times, horse gram, instead of dynamite, was used to break large stones. People used to heat large rocks and pour boiling horse gram water on it and the rock would break into pieces.

Traditional soya is considered the best among the dals. It can be roasted like gram and consumed. It is very delicious. Its flour is given to lactating cows to increase milk production. All these provide cereals, pulses, oil seeds and all the nutritional requirement of the farmers.

The crops of 'Barah Anaaj' system makes the inseparable relation between farming and livestock that much stronger. The crops give valuable straw and husk for animal consumption. As the local saying goes, "The husk of pulses is as important for animals as the son-in-law is important and respected in the in-laws' place". The system fulfils the nutritional requirement of humans, animals and the soil.

Pest and disease resistance

It is important to note that in this system there is no problem of pest and diseases. Even if it exists, only one or two crops in the mixture are affected. Because of the rich biodiversity, rest of the crops are unaffected. Even in the case of heavy wind or storm, only one or two crops are affected in the mixture.

Drought resistance

In the 'Barah Anaaj' system, ragi, pulses and oil seeds not only have the ability to resist pest and diseases, they also show resistance against drought. During the sowing period, the fields are very dry and there is dust in the air. After one ploughing, ragi is sown and it only needs one shower for the seeds to germinate. Ragi is so hardy that it will survive even an extreme drought. Again after a light rain and sunny period, inter-cultivation is done with the help of bullock and local implements attached to it. The women organize correct weeding and biodiversity in the fields.

Source : Excerpts from "Barah Anaaj" – Twelve Food grains: Traditional Mixed Farming System , LEISA INDIA, September 200, Vol.2, No.3.

Biodiversity for Food Security

The Academy Of Development Science

The Academy of Development Science (ADS), an NGO working in rural Maharashtra, is a pioneer in the field of on-farm seed conservation in India. ADS is a registered Society and Charitable Trust and its campus is situated near Kashele village in the Karjat Tribal Block of Raigad district. It has been working on rural development issues in Karjat and Murbad talukas of Raigad and Thane districts since 1979. ADS has worked successfully in the areas of seed conservation and grain banks, thereby rendering signal service to agricultural biodiversity. Its target group is farmers from over 200 villages in these districts. All the inhabitants of this area are Adivasis (Tribals).

When ADS started its work in the Karjat and Murbad talukas of Raigad and Thane districts a vibrant, age-old method of cultivation and seed storage had been replaced by dependence on narrow scientific methods of farming where the farmers were losers in the long run.

The Target Group

ADS works with the tribal communities of the area. These are the most vulnerable communities facing food shortages for 3 to 4 months in a year. Historically, hunting/gathering and subsistence farming were the main sources of the tribals' livelihood. But deforestation, caused by a number of reasons, gradually denied these resources to the tribals - the original inhabitants of the area who have lived there since historical times and who had always relied on these forest produce to further their food security.

With hunting/gathering thus adversely affected, the tribals have to depend more on subsistence farming, but yields from this are low and cannot meet the food needs of the

family for the whole year. This periodic cycle of food shortages, is the 'lean period' for tribal families, a period of starvation and hardship for the entire family. And, here again, as usual, women and children are the ones most affected.

The Menace of Moneylenders

This shortage of food has another evil consequence. The tribals are forced to borrow money in order to survive. This brings the moneylenders, the *sahukars* into the area. These men not only charge exorbitant interest rates, they also indulge in other forms of exploitation including rape, bonded labour, work on demand, forced removal from work sites and more. Very often, the tribals are forced to work in the moneylender's fields during important seasons like sowing and harvesting, leaving their own fields untended. A vicious circle of want and deprivation, sometimes lasting several generations, is thus propagated.

The Context

It is in this background that ADS started work in 1987 –'88. Its main thrust is against poverty of the local indigenous people - the tribals. ADS is a people oriented science and technology organization concerned primarily with problems faced by village communities, particularly tribals, landless and small and marginal farmers.

ADS is committed to rural work based on an appreciation of the many positive features of rural life and society. It aims to revitalize rural economy even while strengthening the ecological base. It draws inspiration from the rich and diverse indigenous cultures and knowledge systems.

The vanishing diversity in traditional rice varieties and the absolute dependence of farmers on high yielding varieties (HYVs) first aroused the concern of ADS. India is and has been a centre of diversity for rice. Thousands of indigenous cultivars growing in different parts of the country are a witness to this fact. This invaluable genetic resource has been safeguarded by farmers over centuries. But now, this diversity in traditional rice varieties is seriously threatened as hundreds of indigenous cultivars have been discarded in favour of 'improved' varieties making the farmers absolutely dependent on HYVs brought in by the Green Revolution.

The Reasons for ADS' Intervention

When ADS started its work in the Karjat and Murbad talukas of Raigad and Thane districts a vibrant, age-old method of cultivation and seed storage had been replaced by dependence on narrow scientific methods of farming where the farmers were losers in the long run. Concerned by this unequal situation, ADS started its seed conservation initiative. The immediate cause was that many farmers expressed a desire to revert back to the cultivation of indigenous varieties. But by this time, seeds of most indigenous varieties were simply not available. So there was a pressing need to provide these seeds for the farmers to go back to the old methods of cultivation. This was not just for rice, but also for millets, pulses, oilseeds, tubers/rhizomes and some vegetables also. There was also the need to emphasize the importance of promoting ecological agricultural practices to the farmers in the tribal regions.

The Operation

ADS began its project by visiting farmers in the four districts of Konkan: Thane, Raigud, Ratnagiri and Sindhudurg. These seed collection towns, where farmers were supplied with different varieties of indigenous seeds by seed conservers on request, helped ADS understand a great deal about individual cultivars and cultivation practices in different areas. The ADS team visited the towns in the rice harvesting season. They would stop in various villages and ask the farmers about the 'old' varieties that were cultivated earlier. They would, often, be given a list of 10 – 15 varieties. Next, the team would ask the farmers if the seeds of these varieties were still available. They found that the majority of the farmers had abandoned the old varieties some time ago. But some, luckily, would give them some strange looking varieties. Very often, the team had to walk a few kilometers to collect a single variety of plant, and often, it also turned out to be futile, because, on reaching the farm, they found that the farmer had abandoned the variety. This slow, patient and meticulous work laid the foundation of its seed conservation programme, the first step in its spread of ecological biodiversity in the area.

The ADS seed conservation initiative has been inspired and guided by the late Dr. R.H. Richharia. From the 20 varieties collected in the first year, ADS now has more

than 500 indigenous cultivars from the Konkan region. Traditional varieties of rice, millets, pulses, oilseeds, tubers / rhizomes and vegetables constitute the collection. These seeds are maintained in the ADS field gene bank and seed banks. Each variety is characterized based on morphological and agronomic parameters.

A tribal farmer with panicles

Currently, ADS works mainly with farmers in the field. It maintains a small gene bank at its headquarters. The seed conservation initiative is no longer a separate or isolated project, but an integral part of their work on land rights, grain banks, and agriculture for food sovereignty.

Grain Banks

A significant development from the seed conservation initiative is the setting up of the ADS grain banks. Pursuing its goal for an alternative life-style, ADS began working with the local communities to promote a Village Grain Bank model. These are village level institutions which ensure availability of food grains to members during the lean period.

Starting first with four grain banks in 1987, ADS has established over 160 grain banks in the five villages of Raigad and Thane districts, mostly in tribal areas. These tribal grain banks are the modified versions of existing grain banks, made suitable for tribal villages. This initiative has proved very successful and has been taken up all over Maharashtra.

Grain banks work in simple ways. Following certain simple rules, any village can set up a grain bank. The village *Panch* Committee made up of villagers, puts in a formal request to ADS for a loan of grain to individual members. The members

themselves decide the quantity and type of food grain. ADS provides an interest free grain loan to the village grain banks in April-May. Then, the *Panch* Committee distributes it to the farmers. Members repay the capital amount borrowed from the grain bank with an additional 25 % grains. The village grain bank thus repays the capital to ADS in four years. From the fifth year the village grain bank is self sufficient and the additional 25 % paid by members is put in the corpus. The grain collected at the harvest season is stored in the grain banks in a traditional storage bin called the *kanaga ,* for which the members contribute money and labour. Villages also contribute money and/or labour for everything

Grain banks have succeeded in alleviating the food shortage of tribals during the lean period. In the process, ADS has demonstrated the ability of poor communities to actively participate in efforts to address the issues of hunger and indebtedness. Other grain banks normally are controlled by a few important people of the area and their aim is mostly to collect and store. ADS allows farmers easy access to its grain banks because it feels the need to conserve rice varieties at the community level.

Hundred percent recovery of the grain loan and contribution in cash/ kind from each member are an important part of the strategy to instil a sense of ownership and accountability among the members.

Gavki Vikas Samiti

Grain banks are interlinked into cluster level organizations that merge to become the Gavki Vikas Samiti (GVS). GVS has a Coordination Committee consisting of fifteen members. Of these, thirteen members are from village *Panch* Committees and two are from ADS. GVS meets two times in a year to assess the status of the programme and to sort out problems, if any. It is responsible for the implementation of the grain bank programme. The Coordination Committee has representation of women and other marginalized groups and it meets once every three months.

The most important point to note is that people's participation and management are the key aspects of the grain banks' programme. The programme has successfully

reached out to the poor by ensuring that grain is available at the village level during times of need. There is a village cash fund made from selling surplus grain. This money is used by the tribal village both for community (agriculture, health, etc.) and individual (marriage, repairs in the house, etc.) needs. This has eliminated moneylenders from the area. This freedom from moneylenders has enabled farmers to negotiate better wages. It has improved the bargaining power of the people, including non-members.

Even landless farmers engaged in share-cropping can borrow from the grain banks. These banks prevent grain price fluctuations. The surplus grain generated is a major asset. As it is a people's organization, it builds a feeling of oneness and solidarity in the village by encouraging everyone, including women, to participate in discussions and decisions.

Forest conservation is another important aspect of the grain banks' work. The Grain Bank Programme has gone beyond food security issues and has begun to address the development and poverty concerns of tribal communities. ADS has thus justified its anti poverty thrust by encouraging this community based food security system.

Outreach Programmes

ADS organizes training programmes for others, raises support for developing ecological agriculture and participates in research studies on ecological agriculture. The other areas of interest are the promotion of traditional medicine and primary health care which seeks to balance traditional or folk medicine with allopathic medicine at the village level. ADS tries to generate meaningful employment like food conservation, canning, and other village/forest based occupations to prevent mass migration of the local youth to cities. Awareness building, negotiating land rights for the tribals, capacity building, watershed development, empowering women, encouraging suitable horticulture, are some of its other areas of work.

Funding

Misereor, Germany, helped finance ADS' grain bank initiative. Intermon-Oxfam, Spain and a joint Ministry of Rural Development – UNDP programme (Community Based Pro Poor Initiatives) have helped further in consolidating the programme and in networking.

Education

The Academy has established a formal school where apart from conventional subjects children are taught skills like bamboo work, nursery/grafting techniques, etc. The aim is to give enough opportunities and freedom to the children to learn and develop their own interests and also to generate in them an understanding and love of nature.

Source : Based on the information provided by Mr.Rajeev Khedkar of the organization.

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Documenting and Increasing Diversity in the Home Gardens of Karnataka

Malnadu Home Garden And Seed Exchange Collective

The Malnadu Kai Thota (Home garden) collective is a small decentralized collective based in Karkolli Village, Hulekal P.O., Sirsi, Karnataka. It is an unregistered collective in which individuals and several organizations are involved. It began in the summer of 2001.

The organization is informal with an overall coordinator and a contact person for each seed group at the village level. It is a voluntary organization, and as such, it has no staff or organizational structure. It continues to be a modest effort to document and increase the diversity of species grown in the home gardens of Uttara Kannada district, Karnataka. In the hilly regions and the eastern plains of Karavalli, the Malnadu Home Garden and Seed Exchange Collective helps in home gardening and seed exchange.

In the hilly regions and the eastern plains of Karavalli, the Malnadu Home Garden and Seed Exchange Collective helps in home gardening and seed exchange.

The Background

The desire to make available the wide variety of semi-wild and cultivated plant species of the region motivated this effort. The area had seen the rise and sharp fall in the prices of *Areca*, the region's predominant cash crop. In this context, addressing issues of food security and individual health became critical. The underlying themes of this home garden programme are: diversity, health, nutrition and awareness of the dangers posed by hybrid seeds, toxic pesticides and synthetic fertilizers.

The Beginnings

The collective began its activities in May 2001 with a seed display at the National Biodiversity Strategy and Action Plan (NBSAP) *Biodiversity Mela* in Sirsi town. Subsequently, a documentation of the garden species was done with the participation of women from Neernalli, Mathighatta, Yellapur and school children from Nilkunda. About 120 vegetable and 60 flower varieties have been recorded so far. The vegetables are varieties of amaranth, spinach, cucumber, squashes, lady's finger (okra), brinjal, starchy tubers, beans and chillies. Trees which are an intrinsic part of the home garden were also recorded.

The collective maintains a small seed collection for the exchange network. It has also received donated seeds from several agencies and individuals. Good quality, healthy, organic, open pollinated seeds are the essence of this effort.

Melas and Seed Festivals

The collective conducts several melas and seed festivals. Women from Yellapur village participated in a seed festival in April 2002. The collective also had a display at the biodiversity festival in Kumta in May 2002. Work with two groups of home and market gardeners (mostly *Hallaki Vokkal* women) began on the coast in June 2002. In June 2004, another seed festival attracted 100 women from villages around Sirsi.

Method

The Collective farms on 9.25 acres of forest farm (that belongs to Ms Sunitha Rao of the organization). The total acreage of the members' lands has not been computed so far. The work is carried out in these lands, home gardens and in fields in about 12 villages of Sirsi taluka.

One of the main objectives of this group is to ensure the maximum participation of women. About 100 women belong to it – women farmers and housewives. Protection of seeds, seed exchange, cultural heritage and life pattern of the people is the main thrust of the organization.

There has been no detailed documentation of the special characters of the seeds conserved, though it has been noted, for example, that the okra does not become fibrous even on maturing.

The organization has not set up any seed banks yet. The arrangement is more informal, with people exchanging their seeds at get togethers.

Organic Farming

The cultivation in all the farms is organic. The sustainable agricultural practices followed are organic farming, use of FarmYard Manure (FYM) and compost as fertilizer instead of chemical fertilizers and the use of ash, cow urine (1:100 water), *Vitex negundo* as pest remedies instead of synthetic pesticides. Traditional seed varieties are sown, mulching is done, bunds/trenches are built and percolation pits are dug. A local breed of cattle - Malnadu gidda is raised.

Outreach

The Collective organizes seed *melas,* bio-diversity festivals, training programmes and skill share and seed exchange get togethers. Their work is carried out in home gardens through trials and personal experiments. The effort is local community based where the community members participate in every aspect of the programme. It is hoped that it will get stronger over the years. Women form the majority of the collective.

Women from several villages gather to exchange seeds and discuss home garden issues.

As a footnote, in five villages around Ellapure, 50 women (Marats, Siddi, Avyaka), formed a think tank to discuss various seed exchange and emphasis was given to self reliance. The women realized that *desi* varieties could be grown naturally and that, aided by other groups, they could cultivate to become independent.

In May 2002, the Centre for Seed Exchange initiated a meeting where the adverse effects of chemical fertilizers and pesticides and the use of old seeds were discussed. This group is trying to develop a model home garden in a half acre farm in Karkoli, 15 kilometres from Sirsi. Here, local farmers are taught methods of growing vegetables, flowers and also how to save seeds that are on the verge of extinction.

The Collective gets a feedback on how the seeds have fared, on their productivity and diseases and so on, it does not monitor. It follows many traditional practices, a list of which is being compiled. The seed collection and preservation is being documented. The alternative methods of income generation that the Collective has taught the farmers are sale of dried seeds, wild banana, cocum juice, cocum candy, herbal hair oil, ecotourism and home stay.

Outreach

The Collective can arrange training programmes for farmers in the neighbouring areas, provide consultancy and can lend its small documentation centre. It can supply seeds and saplings, conduct field demos, exhibitions, field days, farmers' fairs, and so on. In the area of legal awareness, it needs to develop its own strengths.

Future Plans

Future plans include the creation of a model garden, a seed wealth centre for common and rare seeds and a nursery of indigenous forest species. The viability of seeds from outside the region will be tested here for home cultivation. Additionally, the seed wealth center will provide a space for meetings and skill sharing workshop.

Apart from cultivated species, they will also identify locally endangered, semi-wild vegetables such as the popular *maad hagalkai* – a variety of bitter gourd. The

method of cultivating these increasingly rare varieties and the importance of forest conservation for sustained food supply will also be promoted.

Initial interest is encouraging, but many skills need honing. The Malnadu Home Garden and Seed Exchange Collective is an individual but significant effort. Their motto can be summed up as:

Promote home gardens around your house and in your neighbourhood. Give and take seeds.

Remember:

Some small seeds have the strength to keep you and your family fed.

A handful of seeds can feed people.

Our future lies in the protection of the life pattern of people around us.

Source: Based on the information provided by Ms.Sunita Rao of the organisation and a brochure provided by Ms.Rao.

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Agro-diversity for Poverty Reduction and Sustainable Development

Green Foundation

The Green Foundation (GF) is a Bangalore based NGO. GF began its work in 1992 with a few women farmers and a handful of seeds. The Foundation's vision is to conserve agrodiversity, for poverty reduction and for sustainable development of the small and marginal farmers of the semi-arid regions of South India. The Foundation has been working towards protecting, conserving, promoting, and reviving genetic and cultural diversities in the rural communities – who are fully involved in these programmes.

Green Foundation works with women who have land but cannot cultivate it due to extreme poverty. They are involved in community farming with inputs to facilitate the seed bulking.

Area of Work

GF's interest in conservation began when it realized that a number of indigenous seeds were on the verge of extinction. It works in the Thally block, which includes 100 villages in Tamil Nadu and the Kanakapura taluka of rural Karnataka. One of its network projects has spread across nine agro-eco regions of 14 districts in Karnataka. It works directly with more than 2000 farmers. More than 5000 farmers have benefited through its programmes. Currently, the activity is spread in about 150 villages.

Work of GF is carried out mainly on the farmers' fields - mostly small and marginal farmers. GF has a conservation centre at Thally where it maintains a gene-bank. Various experiments are conducted here to improve the yield of

crops. GF focuses on conserving paddy, millets and indigenous vegetables.

Seed Collection and Multiplication

The Green Foundation has developed several steps to set up community seed banks. The community is involved in every step of the formation of seed banks. Informal discussions are held with the farmers and the community to revive the lost local varieties. Once the community expresses its interest, a formal meeting is held to conduct seed mapping which shows the local varieties that flourished in the area before the Green Revolution. The community identifies the pre-hybrid varieties that were grown in the area. The farmers in all the project villages are involved in the mapping. The identified seeds are collected and stored in seed banks for further multiplication.

Seed banks are established to provide the farming communities with local varieties of seeds, both vegetables and food grains. These seed banks are managed by the local self help groups. They ensure that farming communities have an informal seed supply system and reduces their dependency on the market for their seed supply. The seed banks collect, distribute and multiply the local varieties of seeds in an organized manner.

A Seed Management Committee (SMC), which is a federation of community seed banks (CSBs) has been established. This committee will take over the management of the seed banks once GF withdraws from the area. The managing committee of SMC meets regularly.

Seed Melas

Seed melas are the high point of the year long activities that follow the agricultural seasons. These seed melas provide on opportunity for farmers to select the varieties, interact with other farmers with similar interests and exchange seeds. Through these seed melas conducted every year, the number of farmers who conserve the traditional varieties increases. The activity also spreads to other villages. The focus on organizing the farmers around the issue of seeds is to improve the seed supply

system and strengthen the role of farmers as conservers and producers. There has been a consistent increase in the varieties that have been conserved by the farmers.

On farm Conservation

In selecting a site for on farm conservation GF follows the following criteria. It should be in an area

- Where dry land subsistence farming is practiced
- Where the context of socio-economic and cultural diversity is relevant
- Where landraces are under the threat of genetic erosion
- Rich in farmer's knowledge and skills in seed selection and conservation
- Which is accessible
- Which has access to a market
- Where intra specific diversity still exists

On farm conservation sharply focuses on widening the status of biodiversity and conserving land races by value addition to local crop diversity.

Community Farming with Women

Women who have land but cannot cultivate it due to extreme poverty are involved in community farming with inputs to facilitate the seed bulking. The harvested grains are shared amongst the women who participate in the community farming, with a share given to the foundation for further distribution.

Crop Improvement through Participatory Varietal Selection (PVS)

The modern approach to plant breeding has become centralized with a rapid increase in land under modern varieties, thus eliminating the farmers' varieties. As a result, now it is a universal phenomenon to see monocultures of a few varieties. As an important step towards seed conservation and creating a stable system of community seed supply, a participatory breeding program has been initiated to involve the farmers in the varietal selection process.

Under its research programme, the crops selected for PVS are finger millet, paddy, sorghum and navane. In the participatory plant breeding programme, two varieties of finger millet, and two varieties of dry land paddy were selected. Other experiments conducted are nutritional experiments, seed treatment experiments, seed storage experiments, demonstration, and integrated pest management experiments.

Documenting and Promoting Rituals

Farmers and communities have evolved a unique way of relating rituals to agriculture. The rituals not only signify the celebration of life but they also bring the community together. GF has/is documenting several agricultural rituals and is also promoting the same in the community in which its works.

GF has documented a number of traditional and cultural practices. One of them is the Raashi Pooje performed after harvest. The community expresses its gratitude and respect to the cosmos for the grain harvest. Nature is worshipped during this ritual where all the members of the village are invited to participate. Now, with GF's intervention, the villages celebrate this festival collectively, which was done individually before. Thippe Pooje - offering to the manure heap, is another ritual practiced in these villages. The communities collect all the organic waste, crop residues, green leaves, cow dung and other farm waste to make a heap. This heap is called the thippe. This manure is crucial to agriculture and so the community worship the heap of manure. This puja is performed once in six months. Maddina Madike - herbal medicines stored in earthen pots used in the village for common treatments is also worshipped. In Honneru Pooje, offerings are made to the agricultural implements. In Negila Pooje, offerings are made to the plough for a good harvest and in Koorige Pooje to the drill.

Community Involvement

GF encourages and promotes organic farming. It promotes several traditional and sustainable agricultural practices, some of which it has revived with the farmers' participation. Some sustainable agricultural practices like traditional and standardized seed storage systems, germination tests, preparing different types of composts

– vermicompost, basket compost, green manure, preparing growth promoters and biopesticides have also been promoted by GF. The foundation believes in involving the communities at all levels. By doing so, the communities are helped to acquire the required skills to manage the groups. Self help groups are formed and the NGO conducts training programmes periodically on the subjects necessary to run these seed banks/self help groups.

Training and Publications

The Foundation trains farmers and can provide information to other organizations to facilitate the setting up of seed banks. It can also train other organizations in sustainable agricultural practices. In the last decade, GF has brought out a number of publications on various aspects of seeds and on traditional and sustainable agricultural practices.

Monitoring

It has devised a method to monitor crops systematically. Separate cards are maintained for each crop variety. The monitoring begins at the germination stage. The plants are monitored for drought resistance, pest and disease resistance right from the pre-germination, seedling, vegetative and harvesting stages. The growth and yield parameters are also recorded. Farmers do the visual observation. Seed yatras are conducted to help farmers exchange seeds.

Income Generation

GF has initiated various income generating activities, mostly involving women, as a step towards poverty alleviation. The seed bank members are involved in these activities. Some of them have been trained in bio-pesticide preparation. The organization promotes value added products. These are sold through sanghas and federations. GF promotes the marketing of organic products.

Constraints

The constraints faced by GF are typical. Initially the farmers were skeptical about the performance of local seeds. They thought that the yield from these would be low as compared to the hybrid varieties that they were growing with the extensive use of fertilizers, chemicals and pesticides. GF had to initially convince the farmers about the efficacy of traditional seeds. To prove their point, it asked the farmers to grow the traditional seeds in small plots of land in the beginning. Slowly the farmers became convinced and organic agriculture began spreading in the region.

Outreach

GF works with all sections of society regardless of caste. It can provide some varieties of seeds for those who want to conserve, multiply and propagate. It encourages the exchange and sale of seeds to a small degree. GF helps in creating market linkages to produce and sell biodiversity based value added products. It conducts seminars and workshops on issues of biodiversity conservation, farmers' rights, exhibitions on organic products, etc. It organizes field days and has conducted workshops on IPR and Farmers' Rights.

Source : Based on the information provided by Dr. Nadagouda of the organization.

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CHARACTERISTICS OF SOME INDIGENOUS FINGER MILLET VARIETIES

1. Chendoo Hoovu Ragi

Season :	Kharif
Duration:	3.5 Months
Significant Feature:	A Wetland variety. It is water intensive and is resistant to pest and disease attack.
Yield:	Good
Description:	Earheads are compact and closed and are hence identified with mari gold flowers. Has moderate fodder yield.

2. Beli Ragi

Season :	Kharif / Summer
Duration:	4 Months
Significant Feature:	Good yielding variety
Yield :	Good
Description :	It provides good quality of fodder and grain suited to both wet and dryland. Earheads are long and white in colour. Good tillering variety.

3. Tidalu

Season :	Kharif / Summer
Duration:	4 Months
Significant Feature:	Suited to both dry and wet land
Yield:	Good
Description:	Short duration variety with medium height and good yield. It has good pest and disease resistance. Earheads are small and compact.

4. Madayyana Giri Ragi

Season :	Kharif
Duration:	3 Months
Significant Feature:	Grows tall, food quality is good
Yield:	Moderate
Description:	This is an old and rare variety of old Mysore region. Ear heads are violet, open and long. It is the best suited variety for rainfed dry lands. Vulnerable to neck and finger blast disease.

5. Uganda Ragi (3624)

Season :	Kharif
Duration:	4.5 Months
Significant Feature:	Good resistance to neck and finger blast disease
Yield:	Good
Description :	Variety suited to areas receiving less rain fall. It has com pact and medium sized attractive violet earheads. Good resistance to drought. This variety contains less quantity of husk.

6. Gidda Ragi

Season :	Kharif
Duration :	4.5 Months
Significant Feature :	Good resistance to drought and pests
Yield :	Good
Description :	Except for the size of the earhead which is small, it can be compared to kari kaddi ragi.

7. Kari Bunduga

Season :	Kharif
Duration :	4 Months
Significant Feature :	Good yielding variety
Yield :	Good
Description :	Attractive violet colour earheads are close and compact. It has a black colour ring at the leaves and stem joints. Good in fodder and grain yield.

8. Iyyana Ragi

Season :	Kharif
Duration :	5 Months
Significant Feature :	Highly drought resistant
Yield :	Moderate
Description :	Famous in old Mysore area, but is gradually being eroded, suited to rainfed dry lands. Grows tall and provides good quality and quantity of fodder. Earheads are open and long. Vulnerable to neck blast.

CASE STUDIES

MS. HOMBALAMMA- A DRIVING FORCE IN THE AGRO-BIODIVERSITY PROMOTIONAL EFFORTS

Alappanadoddi village is an undulating, dryland region located on the Karnataka –Tamil Nadu border. It lies on the periphery of the Bellalam forests located at a distance of approximately 15 kms from Thally. Hombalamma a 50 year old, woman farmer hails from this remote village. She would have been an unknown entity, but for GF discovering her. Women like Hombalamma are at cross roads struggling to maintain their culture, biodiversity and identity. It is in this context, that GF is committed to making conservation a movement that can take root in the backdrop of the culture and knowledge that is simmering on a dying fire.

Although she is a small woman farmer, with no male head in her family she has taken the role of ensuring food supply to her family. She not only manages the household chores, but is also actively engaged in manual work on her five acre farm.

When GF discovered her, she was on the verge of converting her land to hybrid cultivation, but with inputs from the Foundation she shifted her interests to indigenous varieties. Observing her interest in indigenous varieties, GF enhanced her knowledge in seed conservation.

The major crops being conserved on her farmland are traditional ragi varieties such as the Mandya orissa and Pichakaddi ragi, dryland paddy, groundnut varieties and a wide range of vegetables such as tomatoes and beans. She has distributed many varieties to farmers in the surrounding villages. Ambukai (an indigenous groundnut variety) is being conserved and multiplied by her on a large scale. This variety, according to her, prevents attacks by wild boars and crows and has a wide spread growth at different points in contrast to the improved groundnut varieties.

Hombalamma has made effective use of her 5 acre plot. The undulating land

has different crops grown at different levels depending on the availability of water and soil conditions, without wasting even a foot of land space. Millet varieties are grown on eroded patches while finger millet is conserved on plane lying areas. She practices mixed cropping. Though she lives in extreme dry conditions and has to walk 2 km for water, it has not curbed her enthusiasm in cultivating vegetables and crops.

Hombalammma, though an illiterate, has built up capacity to attend seminars and workshops where she speaks about seed conservation. She creates awareness about indigenous varieties, and the negative impact of using chemical pesticides and fertilizers.

She has formed self help groups with other women farmers, and has initiated a seed bank in her village for better seed access to farmers of the surrounding villages. With enhanced knowledge in seed conservation she has conserved about 5 varieties of finger millets and about 25 varieties of vegetables and has distributed seeds to farmers in the nearby villages. She is a model to many other farmers. She is a recipient of the 'Shirsti Sanman' Award, in recognition of her enthusiasm for conservation and her innovative ideas in agriculture.

She has undoubtedly been a key figure in GFs diversity promotional efforts for the past five years. By virtue of her contributions in this field the women's group have honoured her as 'Beeja Mathe' (Seed Mother) during the annual seed mela at Thally.

COMMUNITY FARMING IN BETTAHALLI

Bettahalli is a tiny village situated in Kanakapura taluka in rural Karnataka. There are 30 households in this small village - all of which belong to the dalit community. They are all landless and eke out a living by working as agricultural labourers. The rich and big farmers from the neighboring villages were exploiting them. Most of them were working as bonded labourers with landlords.

The people of Bettahalli have now decided jointly to take up community farming on a small piece of land avoiding the use of chemicals and fertilizers.

GF initiated its project interventions in this village. In the beginning, the community was hesitant to talk to the staff members of GF. After a concerted effort, the community gained some confidence to interact with the GF staff. The village elders and heads were contacted and appraised of GF objectives of working in the village. Through Gram Sabhas, a SHG was formed involving women initially. The agro-biodiversity conservation and the seed bank activities have motivated the men in the village also to form their own self-help group.

Both these women and men groups- Shree Dhareyasiri Women Sangha & Shree Vinayaka Raitha Sangha - participate in the development activities in the village. They are now expanding their activities into a new area, to which other communities are hesitant to venture into. They have now decided jointly to take up community farming on a small piece of land avoiding the use of chemicals and fertilizers. Their objective is to revive traditional varieties of food grains and vegetable crops. According to them this will reduce the dependency of the farmers in the market for seeds to a great extent. They have planned to produce seeds on a large scale. They are keen to become a model to the neighbouring villages on organic farming and to spread values of traditional varieties. This will also generate additional income for their SHGs. To make this vision a reality, they have taken 3 acres of land on lease for a period of 3 years with funds borrowed from the Federation of SHGs at one per cent interest. In this land the groups have sown five varieties of ragi viz., pichhakaddi ragi, bilimundagada ragi, ragalli/shivalli ragi, Hasiru kaddi ragi and dodda ragi. They also cultivate toor dal, niger, sesame, kombu akki, bili navane, kempu navane, raja, koralu, jowar and castor. These groups are committed to conserve traditional varieties of seeds.

An Initiative Of The Bangladesh Peasants For Better Living

Nayakrishi Andolan

This is a movement of farmers growing from the grass-roots. Its objectives are to ensure that the living environment is free from toxic and unwanted chemicals; to promote the conservation and regeneration of seeds in order to protect and enhance biodiversity and genetic resources; to resist dispossession and centralization of natural resources through centralized structures such as seed banks and/or gene banks (which exclude farmers from having access to the common property of the community); to search for alternative methods and institutions for the conservation of biodiversity and genetic resourced on-farm through structures controlled by the community/village; to ensure food security and nutrition; to search for agricultural practices that can conserve other life forms, mainly endangered species; and to become culturally aware of the intricate role played by all those species of nature that are not the object of immediate human needs.

The Nayakrishi, or the new way to relate productivity with nature, is essentially a movement of the farmers of Bangladesh to produce healthy food, a healthy environment and a happy life.

The Nayakrishi, or the new way to relate productivity with nature, is essentially a movement of the farmers of Bangladesh to produce healthy food, a healthy environment and a happy life. In its simplest form, it is ananda, a happy way to relate with nature and enjoy life.

The Nayakrishi Andolan started in response to the overwhelming promotion and practice of chemical agriculture in Bangladesh and the erosion of community power in the face of encroaching and centralizing forces beyond the control of the peasantry. It is the practical response of

farmers against the destruction of the environment and the consequent loss of their livelihood. There was deep sense of discontent and insecurity among the rural communities of Bangladesh caused by a variety of socio-economic, political and other reasons. The Nayakrishi Andolan is the expression of that discontent and is an exercise in productive and positive engagement with the dynamic realities of life to regenerate visions and practical means for and new and happy community.

In the work of the Nayakrishi Andolan, UBINIG (Policy research for Development Alternative), a research and policy advocacy organization, plays a vital role as a source of information, and as an interpreter into popular language of the available knowledge and other discourses. It helps farmers test new ideas in practical ways, to see if they are capable of responding to the crisis of their daily struggle. The traditional 'wisdom' of the farmers is given more weightage then 'science'. That is, they aim at a critically appropriating both 'science' and 'knowledge'.

Source : Compilation from the Proceedings of a workshop 'Using Diversity – Enhancing and Maintaining Genetic Resources On-Farm' held in New Delhi in June 1995 .

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PART TWO

SELECTED READINGS

Biodiversity conservation programme of RASTA

Danesh Kumar

Wyanad District is located in the northern part of the state of Kerala on the borders of Karnataka and Tamil Nadu. It is located on the western ghats at 1000 m height from the sea level and receives an annual rainfall of 3,000 mm. It is located on the hilly terrains criss crossed by numerous streams and valleys.

The homestead farm of Wyanad is a unique ecosystem. Normally the farm starts from the valley going up into the hills. The valleys or the flood plains (vayal) support the family with food for subsistence. The land between the hills and the valleys is known as kara-vayal. This land is used for paddy cultivation during the monsoon and for vegetable cultivation during the rest of the year. The land above this is the Hills (kara), where plantation crops like coffee and pepper are cultivated. These are interspersed with crops which add to the family food basket.

Influenced by market-oriented agricultural options, the farmers resorted to high external inputs, like fertilizers and pesticides which disturbed the economy and ecology of the area. The cultivation of paddy was given up which in turn had serious impact on cattle population. Farmers soon fell into debt traps and the overall social relationships got seriously affected.

In this scenario, RASTA started working with the affected families by mobilizing them to collectively attempt preservation of local varieties through PTD processes. RASTA's primary concern was promoting food security while preserving the local varieties. As part of a PTD experiment with the farmers, a package of ecofriendly practices evolved which included the use of soil amendments, compost and biofertilisers. Farmers are supported with necessary inputs from RASTA. Some farmers cultivated the traditional varieties of paddy, like vellian. Women took special

interest in saving the traditional seeds and tubers. The farmers have experienced better yields while investing less on external inputs.

RASTA has successfully spread the awareness on the need for conservation among the community members through 450 SHGs and has initiated the following activities: restoring green hedges, protecting river banks, organising seed melas and maintaining seed nurseries.

Green Hedges: Once a treasure house, the green hedges were the last frontiers of vanishing species of plants and herbs. Hedges provide shelter to the birds during the hot afternoons and get enriched by their droppings. The bird droppings are the source for varieties of seeds. Hedges also trap the seeds blown by winds and to some extent the seeds of other plants. As hedges do not come under the purview of agricultural operations, their diversity is almost intact. During the monsoon months, varieties of mushrooms are seen growing from the litter under the hedges. Nitrogen fixing shrubs/trees are being planted on these hedges. They provide some fodder in the summer and green manure. The women are encouraged to plant and protect the live hedges.

River Banks: The constant dredging of the riverbeds has not only lowered the beds but also damaged the river banks. Ground cover has been provided by planting screw pine, reed and bamboo. The ground vegetation started growing profusely. The protective vegetation cover filters the seeds and sediments brought by monsoon floods. Thus, creating a favourable environment for increase in variety and diversity of avian families, and also increasing the growth of aquatic plants under its shelter.

Seed Melas: The melas are organised in RASTA's working areas either just before or around harvesting of the main monsoon crop. Though started with scepticism, now it is an event of great interest and gaiety. The entry to the mela is with seeds. An elderly person — usually a woman, conducts the ceremony. A traditional kuttuvalka is lit, and the seeds are exhibited in floral beds and variety of colourful leaves. Each person explains the quality and the benefits of the variety. The

seed varieties are exchanged. Some seeds are distributed among the interested onlookers, on the condition that they will return them to some other persons in the forthcoming year. The seed varieties which are in high demand are the traditional varieties which are almost lost in urbanised areas.

Seed Nurseries: With limited quantity of seeds available and the demand growing, the seeds are raised in a long tunnel green house. The seedlings are raised by two methods; one is on the raised beds and the other is in small bags. The first method is for plants which are transplanted varieties, and the second method is for directly sown varieties. The seedlings are hardened before distribution among interested farmers. By these methods, they are able to harvest the produce much earlier than others and get a better price.

Women and children play an important role in promoting food security for the family. Varieties of tubers, yams, dioscorea, vines gherkin, winged bean, traditional varieties and cucurbits are grown. In the monsoon months, vines have good vegetative growth. Their leaves are used as greens. By the end of the monsoon, they start yielding fruits. The young leaves of yams are also used as greens. Some varieties need a dash of tamarind to reduce the oxalate found in them, otherwise it will produce rashes on the bodies. At the fall of the year, the tubers supplement their food basket.

The modest attempt by RASTA has found acceptance. More groups of people are coming forward and are supporting the conservation attempts. Instead of trying the ex-situ measures, farmers collect some of the seeds at the appropriate time, leave some at the site and keep some for distribution. Some seeds are planted at home, particularly near the live hedges and around the river banks. The efforts have not only helped in promoting food security and conservation but also ensuring some savings from their scarce income. The farmers are happy that their produce is pesticide free and are influencing others to grow these crops in the same way to improve their health and reduce their dependencies on the market.

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Tribals show the way for conserving indigenous crop varieties

Jagadish Pradhan

Dumeri is a small village in Kalahandi district, with a population of about thirty households, most of whom are Kandha and God tribals. The village has about 200 acres of cultivable land. But, most of them are up and medium lands. Rice cultivating area is only about 80 acres. All the farmers belong to small and marginal category.

Agni Dei, a mother of three children, lost her husband at the age of 32. Since then she has been struggling hard to rear the children and to sustain herself. Agni Dei has about one acre of medium land and a small plot of 0.12 acre in her backyard for growing vegetables. She has only one bullock. She brings another young and untrained bullock from a nearby village on banka system, in which she keeps the bullock for about six months. During this period, she trains it and feeds it on behalf of the bullock owner.

In her one acre of land Agni Dei grows the following crops, the approximate harvest of which is mentioned within the brackets: Maize (about 50 to 60 kgs, food for one month), Kudo (60 to 70 kgs), Ragi (about 40 kgs), Kushla (about 24 kgs), Horse gram (40 kgs), Black gram (20 to 24 kgs), Sesam (24 to 28 kgs) and Mustard (40 to 60 kgs).

All the crops are grown only for her family's consumption excepting Mustard and Sesam which is sold in the market. In the vegetable plot, she grows vegetables like spinach, beans, tomato, chilly, brinjal, pumpkin, yam, sweet potato etc., but all these crops are also grown under rain fed condition. Agni Dei herself has kept seeds of five different varieties of beans. Her land is not suitable for growing any rice. So

she collects her rice requirement by working as a labourer in others field and takes the wages in kind.

It was startling to know that in this small village even today there are thirty three varieties of rice seeds cultivated, out of which only four were introduced by Government Departments. The list of all the thirty three varieties harvested this year is given in Box 1.

Box 1 : List of rice varieties cultivated in Dumeri

Up land varieties :
Setka (Sarian), Luchei, Karni, Baudia, Luchei, Kusma, Chinamal, Sakra, Gelei Bhata Burei, Nadiakura, Para, Kaliasuru

Medium/Low land varieties :
Budamanji, Jhili, Kalikhujee, Sapuri, Ghitkani, Baeda Hundar, Kankri, Magura, Bhudei, Lal Gaendi, Kuresal, Hiram, Lal Luchei, Mal Patri, Mugdi, Mahipal

Govt. Introduced Varieties :
Dharitri, Parijat, Lalat, Moti and Swarna

Conclusion

People have their strong reasons for practicing crop diversity. It is not that Government Extension Officers have not reached these villages or the tribals have not got exposure to modern agricultural practices, for which the monoculture has not yet penetrated to those areas. It is high time that people who are genuinely interested on the issue of bio-diversity need to spend time with the farmers and tribals in remote villages and understand from them, the reason for which they prefer to practice the diversified crop pattern as well as conserve the indigenous seeds. May be from them we shall be able to find solutions for most of our problems.

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Home gardens: a cultural responsibility

Emily Oakley

Home gardens are reservoirs of agrobiodiversity in rural communities worldwide and in many cultures it is women who maintain them. This everyday task is an important household activity and ensures that families get a nourishing diet suited to their tastes and cultural traditions. Women preserve agrobiodiversity through high-density plantings of underutilized species and their home gardens are often "experimental stations" for adopting indigenous and non-domesticated varieties. This rich diversity is important not only for household food security and economic stability, but also for the health of the agroecological system. Many studies from Asia, Africa, and Latin America conclude that women's home gardens "provide early-maturing varieties that carry families over the hungry season till the main crops mature, contain reserve resources of plant genetic materials should the main crops fail and function as conservation sites for special or preferred varieties and as testing grounds for new varieties".

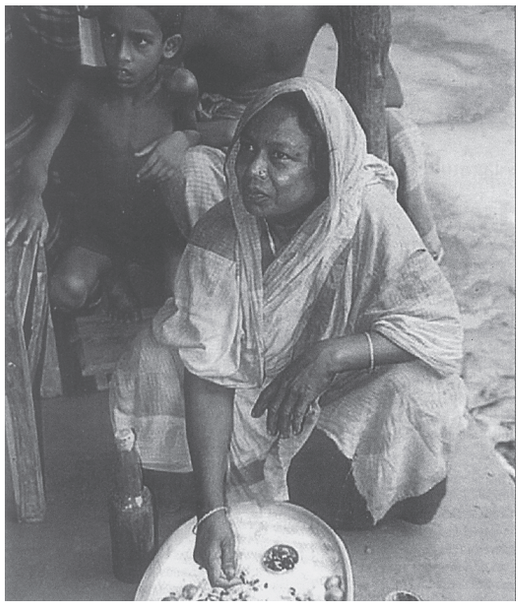
Cultural legacy

Home gardens are a prominent feature of rural Bangladesh and are found in almost all village households. They are worked and managed exclusively by women. They are located within the walls of the family compound and function as fresh pantries from which women can harvest produce for the daily meal. Women have strong preferences for using traditional local varieties instead of modern high yielding commercial varieties in their home gardens. They consider local varieties to be uniquely adapted to local agroecological conditions, and feel that they represent a significant cultural legacy. By saving seed from home gardens and exchanging it with their neighbours, friends, and relatives they are able to maintain a considerable amount of agrobiodiversity.

In 2002, a study carried out in two villages in Bangladesh looked at the best way to promote the cultivation and conservation of species found in home gardens. Previous studies had concluded that women in Bangladesh prefer local varieties because they cook quickly and are an important source of vitamins. They also have a strong preference for the native varieties of fruit trees they manage in their gardens.

Women's role

The villages studied - Bishnapur and Baushid - lie in the flood plain of West-Central Bangladesh approximately two hours from the capital Dhaka. Although Bishnapur is less remote and more independent agriculturally than Baushid, both villages have the same level of home garden production.



The study, which tried to find out how women's preferences and the choices they made in their home gardens influenced the cultivation of various crops, surveyed 75 adult women. Their average age was 35 years and most had little formal education. Nearly all the women who participated in the study were economically vulnerable and their families suffered regularly from periods of food shortages.

Home gardens in Bangladesh are often overlooked as serious sources of food. In fact, they provide successful examples of how locally adapted varieties support food security and have an important economic, dietary, cultural, and agroecological function. They also play a role in the financial security of rural households and help reduce dependence on vegetables and fruits from the local market. Women harvest from gardens to supplement their rice supply. Over half the women interviewed also reported marketing garden produce when there was a seasonal surplus in order to increase their household income. Several of the women specialized in selling local varieties of fruit and vegetable seed to earn extra cash.

High-density diversity

Home gardens in Bishnapur and Baushid contain a high concentration of crop and varietal diversity in remarkably small areas. Gardens are made on any ground

available near the house, and often are no bigger than a few square meters. Some 60% of the women said their home gardens were less than 50 m2 in size, but even so they were growing an average of 16 different crops and an astonishing number of fruit, vegetable and spice species.

Women reported that they sowed a large number of crops per plot in order to minimize risk and maximize overall yield. In total, 25 different fruit crops, 29 vegetable crops and 12 spice crops were cultivated in the two villages. Indigenous squashes, gourds and greens were the most commonly grown vegetables, and local varieties of mangos, jackfruit and papaya as well as guava, banana and grapefruit were popular in all house-holds.

The crops grown required comparatively little room and roofs and fences were used as trellises to maximize vertical and horizontal space. Short-stature, annual vegetables occupy the lowest level, followed by shrub-like bi-annuals, such as taro. Bamboo frames support climbing vines such as squash, gourds and beans and mixed fruit trees formed the top layer of the garden. The local varieties used by women gardeners have been selected for their ability to thrive under this type of intensive cultivation system. Although gardens were planted on marginal lands such as courtyards, the local varieties were highly productive, required few external inputs and were able to survive the floods that regularly affect Bangladesh.

Women in Bishnapur and Baushid had a very sophisticated understanding of their agricultural systems and precise criteria for determining the varieties they use. When asked to list the most desirable characteristics of local home garden crops their answers revealed not only a complex decision-making process but also the multiple uses for which they manage the different varieties. Because their needs are subsistence rather than commercially oriented, women emphasize taste, agroecological adaptation, culinary uses, and nutritional value. However, they also considered yield to be important and felt that local varieties performed well under home garden conditions.

Women liked local vegetable varieties because they mean something to them and are part of their culture and food traditions. Local varieties of gourds, for example, had a long growing season, could grow on rooftops, cook quickly and had fruit and leaves that were useful for a variety of purposes.

Women also preferred local varieties in home gardens because they were better adapted to local climate, soil and disease conditions and could be grown without

the fertilizers and pesticides needed for commercial varieties. In both Bishnapur and Baushid there were hardly any households that used pesticides in their home gardens and only 17% used chemical fertilizers. Women found that local varieties responded well to organic pest control measures, such as ashes, jute seed powder, and fermented rice water and thrived on organic fertilizers such as cow dung, compost, ashes and courtyard sweepings.

It is often said that the reason why there are few high yielding varieties in home gardens is that women have not yet experimented with them. However, in Bishnapur and Baushid this was not the case. Seed for high yielding varieties was readily available yet women still preferred to rely on their local seed networks. In both villages, only 10% of women said they used one or more high yielding variety in their home gardens, although several women said they had tried them. The reasons for not continuing to grow them included not liking the taste or texture of the fruits and vegetables they produced; poor cooking qualities; the length of time and fuel they needed to cook and, in some cases, a very short growing season meant the crop could not be harvested gradually in accordance with household need.

Women's authority

Women are responsible for all the tasks associated with developing and maintaining the family's home garden, including land preparation, weeding, harvesting and saving seed. Their work in the home garden is seen as an extension of their domestic duties and is integrated into their daily routine. One woman in Bishnapur village described her work in her home garden like this:

"I decide what to plant in the home garden. I decide what vegetables have grown well last year and I plant those. I go to the home garden and see if there are good soil conditions for planting seeds. I pick the fruits for harvesting. I manage the fruits for ripeness, checking the progress of each fruit every day to make sure I don't miss any. When we plant seeds I need to make sure the plants are coming up. I take care of seedlings. I pick and cook fruits and vegetables. If plants die, I replace them. I weed to give more space for the plants. I prepare the ground, air the soil and make sure it is well drained. When the soil is dry I plant seeds again."

Women of all educational levels, ages, and incomes cultivate home gardens. The art of home gardening has been passed down from generation to generation through oral tradition, observation and hands-on experience. At every stage of their lives women are involved in some aspect of home gardening and the fact that women are secluded in the home, in accordance with the traditions of Bangladesh, means

they cooperate on home gardening tasks. This encourages, the flow of information on crop selection, planting methods and processing. In addition, young women obtain local varieties of seeds by inheriting them from their mothers or mothers-in-law. New brides often bring horticultural seeds from their home villages when they marry thus furthering the diffusion of varieties. The high rate of seed sharing within communities and among neighbouring villages further promotes crop genetic diversity.

Women maintain diversity

Although increased cultivation of high yielding varieties of rice in Bangladesh has led to an overall decrease in traditional field crops, such as local rice varieties, oilseeds, pulses and millets. Home gardens continue to be sanctuaries of agrobiodiversity. In both Bishnapur and Baushid women expressed a commitment to preserving local varieties and regarded them as part of their cultural tradition and responsibility. Local varieties were an important part of the everyday diet and provided the special ingredients necessary for the dishes served at festivals. As one woman from Baushid put it "If I stop growing local vegetable varieties who will carry on the tradition?"

Lessons for practitioners

In answer to the question - How can women's preferences for local varieties be used to help promote their continued cultivation - it can be suggested that NGOs encourage informal learning networks through which older women can pass on knowledge about the cultivation of these varieties and that they promote the training of young women in seed management for local, garden crops. NGOs could also start educational campaigns to encourage the use of local varieties and in this way strengthen the understanding that high yielding varieties are not the only option.

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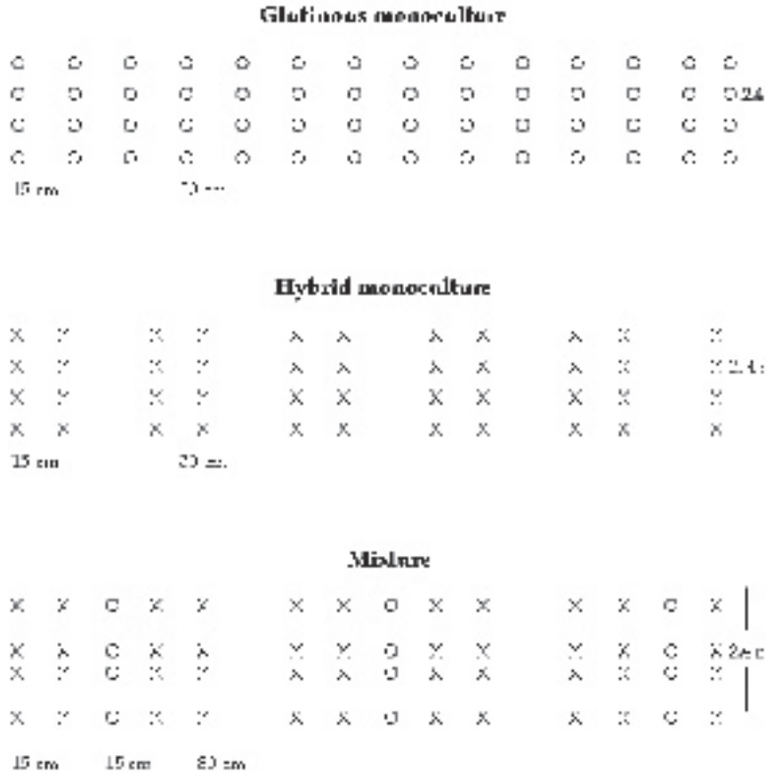
Genetic Diversity And Disease Control In Rice

A.V.Balasubramanian

Recently, there has been a remarkable demonstration of the role of genetic diversity in disease control of rice. In a major experimental effort that was carried out beginning from the year 1998 (the work is still in progress) experiments in China have shown that

By intercropping resistant modern rice varieties with susceptible traditional rice varieties, the incidence of Rice blast can be decreased significantly - in fact, to the point that no floral spray of fungicide was used after the first year. The same experiment also showed that there is an 89% increase in the yield of rice. We are summing up below the salient features of this experiment reported in the Science journal - NATURE.

The experiments were carried out in the Yunnan province of China during the years 1998 - 1999. It was an collaborative effort involving the plant protection department and Agricultural Universities in the Yunnan province at China, International Rice Research Institute at Philippines and Botanists in the Oregon State University of USA. In the Yunnan province of China, farmers have been traditionally preserving Glutinous or "sticky" rice varieties which are used for confections and other speciality dishes. These have a higher market value than other rice types but they have lower yields. They are also highly susceptible to blast disease, caused by the fungus *Pyricularia oryzae*. Non-Glutinous hybrid varieties are less susceptible to rice blasts. Experiments were based on a farmer's practice of dispersing single row of glutinous rice between groups of four rows of hybrid rice. The layout of rice is explained in the diagram on the following page.



In the first year of the experiment, mixed plots were set up involving two different traditional rice varieties which are susceptible, namely - Huangkeneo and Zinuo. Two hybrid rice varieties were used for intercropping namely Shanyou 63 and Shanyou 22. Four different mixtures were planted in 812 hectares of area in five townships in the Shiping county of Yunnan province. This provided excellent blast control when varieties were mixed. Hence, only one Floral fungicide spray was applied. In the second year, the study was expanded to 3,342 hectares of rice fields. This time five townships in the adjacent county of Jianshui were also included. The results were quite spectacular. The diversification had a substantial impact of rice blast severity. In the first year of experiment, the panicle blast severity in the susceptible variety averaged 20% in the monocultures but was reduced to 1% when dispersed within mixed population. Panicle blast severities of hybrid varieties which averaged 1.21 % in monocultures was reduced to varying degrees in mixed plots. Results from 1999 were very similar to 1998 season. Disease susceptible rice varieties planted in mixtures with resistant varieties had 89% greater yield and blast was 94% less severe than when they were grown in monocultures. The experiment was so successful that fungicidal sprays were no longer applied by the end of the two year programme.

It is interesting to see that the experiments are currently being continued and in the third year - they are being expanded to 40,000 hectares !! These experiments, we believe, have great significance in the Indian context. India also has a great varietal diversity of not only rice but also a vast number of other crops. Harvesting is by and large still carried out manually with a sickle and hence separate harvests of intercropped mixed varieties is feasible and possible. The results of the above experiments have drawn great attention and offer enormous possibilities in terms of the use of varietal and species diversity in sustainable agriculture.

Based on the paper - "Genetic Diversity and Disease Control in Rice" Youyong Zhu et.al NATURE Volume 406, 7th August 2000 pp. 718-722.
January 2001

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Women in biodiversity conservation

Judith Daniel

Biodiversity is an indication of varied biological wealth. This wealth provides communities with food, medicine, raw material for housing and a wide range of goods and services and genetic resources for agriculture, medicine and industry. However, habitat alteration and destruction, pollution, improper land husbandry, erroneous agricultural practices, erosion of traditional knowledge about managing biological resources, lack of community initiatives and a lack of appropriate local legislation have destroyed the biological resources in our eco-systems.

Biological resource conservation is necessary to ensure human survival and well-being. The local/indigenous communities had knowledge systems and a culture that conserved life forms and the physical environment. Such knowledge systems and culture have got eroded due to external influences. There still exists a rich, latent pool of indigenous knowledge within local communities, which has to be tapped for the recovery of ecosystems. Though indigenous knowledge has great potential for such a recovery, it should be augmented with modern conservation management techniques. This is necessary because the nature of current human activities and its effect on ecosystems is different and on a larger scale as compared to the times when indigenous knowledge systems were developed. It is thus obvious that biological resources of the village community can be managed successfully, only if appropriate ecological management systems are developed by the local people themselves.

IIRD has been involved in environmental restoration and biodiversity conservation for the past decade in a backward part of Marathwada region in Paithan taluka in Aurangabad district of Maharashtra. An integrated approach to rural development and environmental restoration has been adopted to promote multi-functional land

use. Community based bio-diversity conservation programmes are being carried out in 45 villages of the taluka through an interactive and participative learning process. IIRD in association with the women's groups builds community awareness on environmental issues. Consequently, the communities have undertaken ecological restoration programmes in their villages.

Women's Involvement

An important aspect of these community-managed eco-development initiatives is the involvement and leadership of grassroots women. Besides being the providers of life, women also nourish and sustain life. Traditionally it was the woman, who played an important role in conserving life forms. This has been increasingly ignored due to gender inequalities and now it is the woman who bears the brunt of environmental degradation and her declining access to biological resources around her village. Therefore, in these community managed systems, the capacity of women to nurture life is brought to the fore and rejuvenated.

Organic Agriculture and Biodiversity Conservation

As part of agro-biodiversity conservation, the community was educated about the adverse effects of chemical fertilisers, toxic pesticides and herbicides, hybrid seeds and mono cropping, on health and the environment and the potential for environmentally sound development through the management of locally available resources. Agriculture with minimal use of external inputs was shown as an alternative to destructive chemical agriculture.

Mostly, the downtrodden women were encouraged to take up organic farming on their marginal lands and related eco-development activities like tree planting, nursery cultivation and micro-watershed programmes. Over the years, about 1240 acres of farmland has been brought under eco-friendly farming practiced by the women farmers. Though this is just a small part of the vast areas still under conventional agriculture, they are confident that a progressive transformation of the remaining area is also possible. These women farmers use indigenous and traditional seeds to grow crops like wheat, pulses, cotton, millets, vegetables and fruits. Indigenous herbs are conserved through kitchen gardens and hedgerows for their medicinal and pest repellent values, respectively.

Moreover, these organic farmers have taken the prime responsibility to revive depleting indigenous livestock and poultry for soil fertility management and animal traction. The women's groups through their savings and credit management programmes provide various forms of financial assistance to enable the trained farmers to raise native livestock. Native breeds of cattle such as Red Kandhari and Devani have been successfully introduced. The low-income farmers were enabled to venture into sheep and goat husbandry, as a result of which, native breeds such as Jamunapuri, Osmanabadi, Sirohi and Beetal have been introduced. Backyard poultry was also encouraged among landless women who were supplied with native poultry eggs and chicks for hatching and raising.

Environment Councils and Pariyavaran Sevikas

In order to strengthen community initiatives for environmental enrichment, women's Pariyavaran Samitis (environment councils) have been formed in the villages. These Samitis capacitate their Pariyavaran Sevikas (environment animators) through an intensive three-year training programme on biodiversity conservation issues, in IIRD. The Sevikas, capable of field documentation and community research on bio-diversity conservation issues, have become effective resource persons for their communities.

Role of the Pariyavaran Sevikas

The trained Pariyavaran Sevikas along with the Samitis and women's groups evolve and implement ecological recovery plans in participation with the community and adapted to their village conditions. They have multiple responsibilities.

- Conducting and documenting village-wise surveys of existing practices, traditional uses of biological resources, extinct and threatened indigenous species of flora and fauna, eco-problems and development issues.

- Maintaining village-level community registers containing comprehensive physical and biological data - of soil, water, air, climate, flora and fauna, to enable the community to understand the wealth, as well as depletion of their resources. Community ecological recovery and conservation plans are prepared based on these records.

- Conducting community extension and demonstration programmes on identification, selection and traditional preservation techniques of local seeds, to counter the increasing threat to farmers' ownership of seeds, arising from the promotion of patented seeds and hybrid mono-culture varieties. In addition, they

maintain village seed registers and manage seed exchange programmes between organic farmers, the community and farmers of neighbouring villages, initiated to meet the challenge of seed scarcity.

- Instilling values and positive attitudes among the young for eco-conservation, which is crucial for the long-term sustainability of community initiatives, through environmental education programmes in primary schools.

- Promoting income generation activities to sustain the environment restoration programmes.

- Organising and conducting weekly Pariyavaran Samiti meetings and monthly village workshops on eco-development and biodiversity conservation to review activities, discuss emerging issues with the community and formulate appropriate village-level action plans.

Income generation

To sustain a variety of the eco-management and biodiversity conservation activities, the Sevikas promote ecologically sound income generating activities for these eco-management groups. Some of the on-going activities are listed below.

- Seed banks for native crops have been formed in two nodal villages, Tondoli and Karkin.

- Plant orphanages for threatened plant/tree species are being promoted.

- A market system replete with standards and local certification of organic produce of these women farmers was formed. An urban outlet for organic products, has created a consumer support system for these women and their sustainable land use activities.

- The women have set up waste recycling centres producing compost, vermicompost, etc. This provides employment for them, and valuable manure for the organic farmers.

- Breeding centres for local varieties of livestock and poultry are being managed successfully by women.

Conclusion

The conservation efforts of these Samitis continue under varying ecological constraints, on farms as well as on community lands, using in-situ and ex-situ techniques. Ecological management models have been developed for different eco-systems such as — adjoining denuded forest areas, cropland, adjoining shorelines of water bodies, hill slopes and flat terrain. These models are used in our training programmes.

Our experience indicates that women-headed community based biodiversity conservation programmes are effective and successful. Capacity building of local Pariyavaran Sevikas has ensured the continuance of community-based conservation activities. The involvement of women is narrowing down gender inequalities, and enabling them to re-establish their traditional role of environment managers and conservators. This is leading to the rise in position, strength and income levels of women.

Though inroads have been made in evolving conservation management technologies through grassroot groups with women's leadership, there is much more to be done in this sphere. Major constraints like the eco-cidal policies of the government, extensive promotion of conventional chemical fertilisers, pesticides and conventional agricultural practices and lack of healthy market systems to foster biodiversity conservation, have to be resolved through vigorous lobbying and promotion of sustainable community based development activities.

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Protecting diversity in rice: Rapid clonal multiplication of rice seed

1. GENERAL INFORMATION

I . 1 Title of practice or experience

Protecting diversity in rice: Rapid clonal multiplication of rice seed

I .2 Category of practice/experience and brief description

Rice is the most important foodgrain crop of Asia. It is also the most threatened by germplasm loss. Thousands of rice varieties and cultivars have been forever lost to humankind in the wake of the uncritical and rushed introduction of a few short-stemmed (dwarf) hybrid varieties over the last three decades. The spread of the few hybrid varieties, largely from the International Rice Research Institute (IRRI), has also resulted in an alarming situation of genetic uniformity in rice paddies all over Asia.

One rice scientist who saw the emerging threat to biodiversity was the late Dr. R.H. Richharia. He set out to provide a remarkable solution to conserving endangered rice cultivars: a seed multiplication technique that is not only effective but is so simple it can be easily acquired by rice farmers. The technique of rapid clonal multiplication of rice seed enables any farmer to effectively proliferate even a single seed of rice into thousands within the space of a single season. The technique is particularly useful for rapid multiplication of endangered varieties of which only a few seeds may be available. The method will work even if one has a single healthy grain of rice. Using the method, groups and communities working with traditional varieties can multiply these for propagation at no extra expense and without having

to rely upon centralised research institutes.

1.3 Name of person or institution responsible for the practice or experience

The late Dr. R.H. Richharia

Kaluram Khandu Bhagat

Academy of Development Science

Indian Society for Rural Gene Banks

1.4 Name and position of key or relevant persons or officials involved

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2. THE PROBLEM OR SITUATION BEING ADDRESSED BY THE PRACTICE/INNOVATIVE EXPERIENCE

In many of the rice fields of Asia, from the Philippines to India, farmers are expressing a desire to replace the modern varieties of rice with the varieties they were planting a few decades ago. This conversion has not come about overnight: farmers have gradually (and sometimes even grudgingly) discovered that the so-called "high-yielding" varieties (HYVs) introduced by IRRI and a few national institutes of research as well are seriously plagued with chronic genetic and environmental problems for which no long-term remedy exists.

These chronic problems include the susceptibility of these modern varieties to an entire range of unexpected pests and viruses which often devastate entire areas, leaving the farmer with neither food nor income and sometimes in debt. No sustainable, long-term measure for dealing with these problems of plant disease and insect attack is available except routine advice from scientists and companies to farmers to continue spraying ever more toxic mixtures on paddies.

The general confidence that rice scientists may be able to solve these problems seems to have been drastically eroded over the past decade.

Many of the modern varieties have also reached a productivity plateau: they require more and more fertiliser merely to maintain their present output levels. Productivity is also going down simply because the soil has been mined of all its trace elements and has little left over to feed new plants. The "high-yielding" dwarf varieties are also known sometimes as "high-response" varieties in view of their enormous appetite for chemical fertilisers. And fertilizer prices are going up everywhere in the South, as they are based on imported feed stock in most cases.

The scenario is hardly a desirable one.

There is an additional aspect: it is now acknowledged that the modern varieties cannot survive any longer without the infusion of genes from the older varieties and from wild relatives. Most of the modern varieties have, in fact, survived on the genetic crutches provided by the traditional varieties and their more resistant genes.

However, as more and more "successful" modern varieties are propagated, more of the traditional varieties go out of use and become extinct. If this continues

to happen, the future of the modern varieties themselves, on which millions of farmers have been made dependent, would be profoundly at stake.

One of the solutions for the conservation of rice germplasm has been the setting up of centralised gene banks in which indigenous or traditional rice varieties and cultivars are maintained under special conditions.

However, the reported survival rate of seed maintained in such refrigerated gene banks is hardly impressive. For this reason, concerned scientists have proposed that rice germplasm should also be maintained *in situ,* in the fields of farmers.

As farmers seek more and more traditional varieties, however, they are bound to encounter problems of seed scarcity. This is because the established rice research institutes are not geared towards addressing this aspect of the problem, that is, towards the multiplication of traditional seed or even towards supplying farmers with the seed from their gene banks. In some areas, only a few seeds of a particular variety may be available. The variety in question may have certain desirable traits which it might be useful to propagate among farmers. How does one rapidly multiply such seed without relying on expensive, privately run research institutes or, worse, seed multinationals?

It is in such circumstances that Dr. R.H. Richharia's technique of rapid clonal propagation of rice produces stunning results. The technique enables immediate salvage of those rice varieties of which there are very few seeds, or not even one single seed, available. Thus, it is a great tool available to farming communities and gene banks specialising in rice to enable them to rapidly increase their stock of endangered rice seeds.

Using the clonal propagation technology, one can easily generate from a single good seed, and that too within 10 months, up to 4,000 kg of pure, productive rice seeds of the same variety. With this quantity, 80-100 acres can be cultivated in the following season with the same variety. This makes expensive duplication of rice seed from central sources or laboratories entirely un-necessary and redundant.

Productivity of rice in India and Asia generally has stagnated with the introduction of new dwarf varieties via IRRI and other rice research centres: this is now acknowledged even by IRRI itself in its own publications and scientific papers.

The present methods of rice research at such institutes involve identification of rice cultivars with desirable characteristics, incorporation of desired genes, and

their multiplication in laboratories for distribution to farmers. The institutional drawback is that the focus remains on a few varieties. Once these are identified or selected, these are propagated at the expense of those being grown by farmers in their fields. The model of rice research therefore precludes the existence of an alternative system in which farmers themselves select good varieties from their own eco-region and then maintain, sell or otherwise exchange the seeds of such varieties among themselves. Dr. Richharia's clonal propagation technology was invented to circumvent this problem: it teaches farmers how to raise several kilograms of rice from a single seed and that too within a single season.

In fact, it enables an alternative rice research system to develop in which progressive farmers are able to multiply good seed for distribution to other farmers and to thus contribute towards the conservation and development of such varieties. At present, they play no such role since all research into rice and rice varieties is now effectively monopolised by rice scientists.

An additional feature of rice propagated by the vegetative method is that the yields from such rice plants have been confirmed to be much higher than the yields from seed to seed crops. This is an important consideration in adopting the technology on a large scale in the paddies of Asia.

3. DESCRIPTION OF THE PRACTICE/INNOVATIVE EXPERIENCE AND ITS MAIN FEATURES

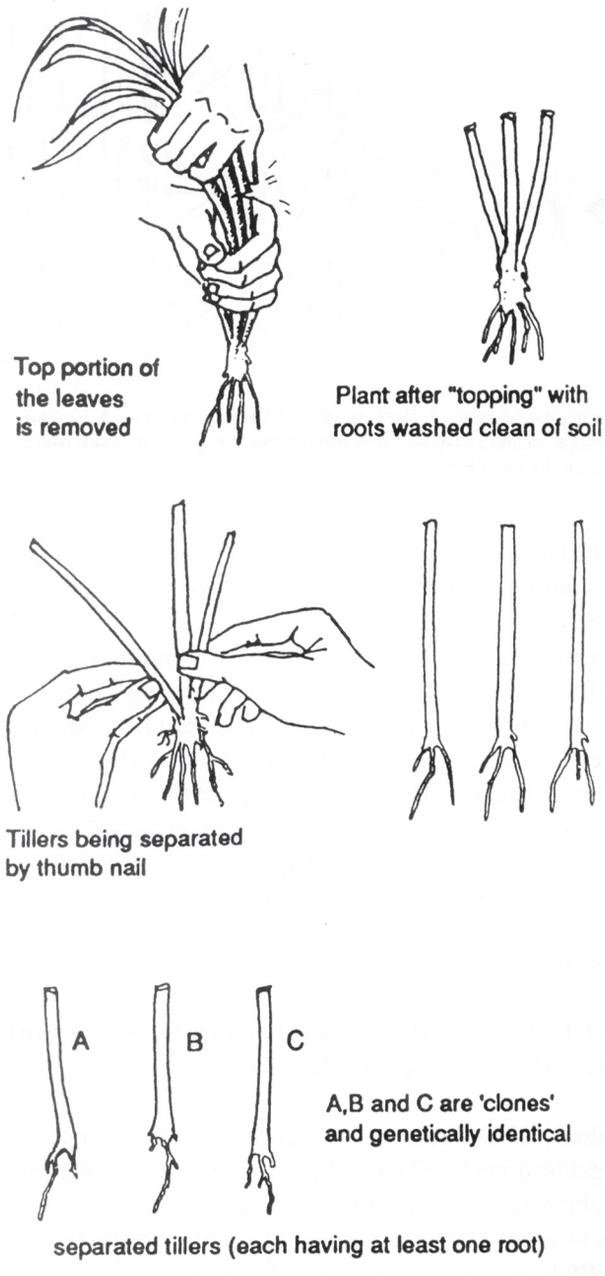
The technique of clonal propagation of rice depends, in the ultimate analysis, on the availability of at least one good seed of the variety that needs to be conserved or propagated. Despite several decades of the Green Revolution and of official dissemination and sponsorship of HYVs, several farmers continue to plant their older seeds and to harvest them.

Those wanting a choice of such indigenous seeds should tour their regions and collect a handful of the seeds of such varieties and catalogue their specific characteristics after a discussion with the farmers from whom they are taking them.

The available seed or seeds are grown in a mud pot or in a small nursery bed. The bed material must be prepared with good soil and manure. Approximately six to eight seeds should be planted in case one is using a mud pot. Larger quantities should be sown in nursery beds but thinly planted.

Water availability is important. Hence the seeds must be planted at the commencement

Diagram 1: Separation of Tillers



of the monsoon or, if water supply is available, during the month of February.

As the rice plant grows, it begins to throw out tillers within 10-12 days. After approximately 20 days, the tillers would be fairly strong and able to stand on their own. The plant is now carefully dug up, without damaging the roots.

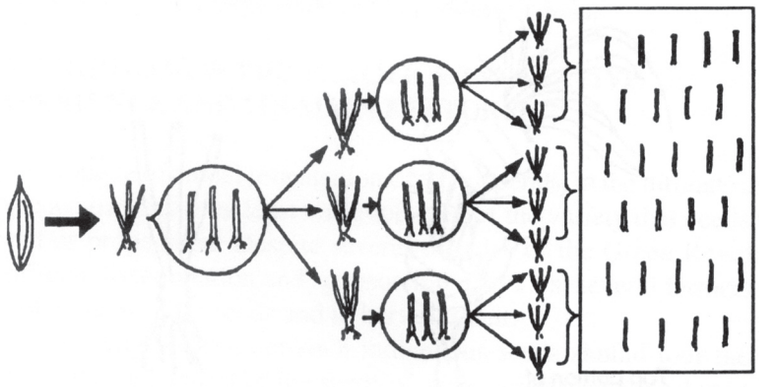
The top of the plant, that is, the tapering portion of the leaves, is now removed by hand or lopped off. The roots are then washed and the tillers separated from each other by using either a blade or the thumbnail. The arrangement of the tiller formation is linear, allowing for easy separation. Each of the tillers is a clone of the mother plant and will have all the genetic characteristics of the mother plant.

The separated tiller clones are now planted each by itself in a well-watered nursery bed.

After they are established, the individual tillers will in turn send out fresh tillers. Thereafter, the process of separation and planting of these tillers is repeated. Through this method, the plant population multiplies by leaps and bounds every 20 days.

This process can be repeated till an adequate population of plants has been created,

Diagram 2: Repeat the cloning



Note:
For simplicity, the number of tillers per plant has been taken as 3. However, in actual practice, cloning may be done when there are 2 or 4 or more tillers, depending on the situation.

after which the plants are allowed to reach the maximum vegetative growth stage when they are allowed to seed as normal.

There are two important aspects to clonal (or vegetative) propagation of rice to be noted.

The first is that clones can be generated from numerous sources and not just from seed. Dr. Richharia produced clones from all kinds of material. For instance, he experimented with tillers that sprouted from stubble left over in the fields after rice had been harvested. He also worked with rice that had been transplanted: immediately after the rice plants had been stabilised, he cloned them again, increasing the plant population by 40%.

The second aspect of clonal propagation is the impact on yields. Dr. Richharia and his research teams found that grain yields and straw from cloned plants were invariably and significantly higher than grain yields and straw from crops raised directly from seed.

4. DESCRIPTION OF THE INSTITUTION RESPONSIBLE AND ITS ORGANISATIONAL ASPECTS

The Academy of Development Science (ADS) is a registered non-governmental organisation (NGO) based in a tribal area near Karjat, Raigad District, Maharashtra State. Mr. Kaluram Khandu Bhagat from ADS conducted detailed trials on clonal propagation of rice varieties under the personal supervision of Dr. Richharia (while he was still alive).

The Academy of Development Science, as a people-oriented science and technology organisation, is primarily concerned with problems faced by village communities, particularly the tribals, the landless and small and marginal farmers.

Conservation of crop genetic resources is one of the thrust areas of ADS. Dr. Richharia initiated the conservation project at ADS in 1988 and was closely involved with the developments at each and every stage of the project. The project took concrete shape by 1994-95 and Dr. Richharia was extremely proud of the achievements. He passed away in 1996. Dr. Richharia continues to be a source of inspiration for the ADS Conservation project.

As part of this programme, ADS is looking at ways and means to restore the genetic diversity of rice in the Konkan region. It has established a community genebank

of rice cultivars for this region and it is actively involved in seed multiplication and distribution. The genebank has a collection of over 350 traditional rice varieties from the Konkan region. ADS is also exploring possibilities of improving the performance of traditional cultivars through application of technologies like clonal propagation and hybridisation. In hybridisation, the focus is on exploiting the hybrid vigour of plants by crossing different eco-types of the same genotype.

ADS also organises a number of training/awareness programmes for NGOs and farmers.

The Indian Society for Rural Gene Banks (ISRGB), which is an autonomous entity within ADS, is involved in promoting and setting up decentralised gene banks in rural areas.

5. PROBLEMS OR OBSTACLES ENCOUNTERED AND HOW THEY WERE OVERCOME

The impact of using the clonal propagation technique on paddy cultivation was far more impressive when Dr. Richharia was heading the rice research set-up in India than it is now. Today, the use of the technique has been restricted to a few areas and that too within the non-official sector. This is largely due to the fact that the modern system of rice research is fairly centralised and has no capacity to patronise or endorse an alternative, decentralized system of research and development.

Rice research stations admit that the technique invented by Dr. Richharia can be profitably used to enhance seed production from a single healthy seed without any extra cost and without dependency on expensive equipment.

However, rice scientists are wary of the technique because it might render their work, now intimately connected with the use of chemicals and genetic manipulation, redundant in the long run.

In fact, as the technique demonstrates, rice research need no longer remain a monopoly in the hands of a few rice scientists working in agricultural rice stations. It can become a farm-to-farm experiment conducted by thousands of farmers in their own fields working with their own indigenous varieties. This could herald a potential revolution in rice production even as it enables conservation of rice varieties on a qualitatively superior footing than hitherto.

Besides conventional rice scientists and rice research institutes, other obstacles in the way of widespread dissemination of the clonal propagation technique include the seed and fertiliser corporations. Dr. Richharia insisted throughout his life that several indigenous HYVs of rice could be used as the basis for a new rice revolution based on clonal (or vegetative) propagation. He proved that such propagation techniques actually enabled production to increase dramatically without any additional inputs in the form of fertiliser. The method of clonal propagation actually liberated the farmer from seed companies or seed research centres. This has been extremely difficult for the rice research community, which has a vested interest in its own perpetuation, to accept with equanimity and grace.

6. EFFECTS OF THE PRACTICE/INNOVATIVE EXPERIENCE

During the time when he was Director of India's premier rice research institute based in Cuttack, Orissa, Dr. Richharia worked extensively with farmers to disseminate the clonal method of propagating rice. In certain circumstances, his research workers even learned to distribute rice clones (tillers) in place of seeds. Once certain indigenous, high-yielding seeds were identified, the research teams were able to rapidly disseminate clones of such varieties among farmers in the state.

Clonal propagation was eventually taken up in several states of India, including Bihar, Andhra Pradesh, Mysore, Kerala and West Bengal.

7. SUITABILITY AND POSSIBILITY FOR UPSCALING

Upscaling is possible, as the technique can be applied in small nurseries or in large farms with equal ease, provided labour is available.

However, it must be remembered that the technique is limited to production and multiplication of rice seed only due to the peculiar perennating nature of the rice plant or its unique ability to multiply its tillers indefinitely. The technique therefore cannot be used on other cereal crops.

8. SIGNIFICANCE FOR (AND IMPACT ON) POLICY-MAKING

Government policies of rice breeding are capital-intensive and equipment dependent and eventually face the problem of how to transfer such techniques to the farmers. At present, only the results of plant breeding, that is, seeds, are distributed to

farmers, with the important skills of seed multiplication and breeding retained by the rice scientists.

Dr. Richharia's techniques enable every rice farmer to become a rice scientist and to use his field as a fertile laboratory for maintaining rice germplasm and as a decentralised source of production of those seeds that have desired characteristics.

In addition, the technique is absolutely free and labour-intensive. It does not require heavy capital investments, machinery nor buildings. If governments find such systems desirable, it would be easy to adopt them for wide-spread use. Rice scientists, in that case, could apply themselves to more productive research.

9. POSSIBILITY AND SCOPE OF TRANSFERRING TO OTHER COMMUNITIES OR COUNTRIES

The clonal propagation technique is simple and can be easily applied in all those areas where the problems with rice cultivation discussed above are faced. The technique is not location-specific but rice-specific.

10. OTHER COMMENTS

A simple manual on the rapid clonal multiplication of rice seed, prepared under the direction of Dr. Richharia and published by the Other India Press, is available. The manual explains step by step what must be done in carrying out the multiplication process. It is accompanied by appropriate illustrations. But the best detailed work on clonal propagation is Dr. Richharia's standard text: Rice *in Abundance for All Times Through Rice Clones*. This book has been published by the Sri Aurobindo Rice Research Centre, Aurobindo Ashram, Pondicherry 605 002, India.

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Variety choice and seed supply by smallholders

Anita R. Linnemann and Jan S. Siemonsma

Ever since new varieties of food crops have been introduced in developing countries, at least some farmers have started to use them. However, smallholders who choose to use these new genetic materials generally do not replace them after a few years when they have lost their varietal purity. Instead, the farmers select and save seed from their own fields and exchange seeds locally. It has been estimated that at least 80% of the planted seeds of the main food crops grown in developing counties is produced by the farmers themselves (Delouche, 1982).

Differing criteria

Plant breeders develop varieties according to a number of criteria, primarily yield potential but also response to fertiliser, resistance to pests and diseases, length of growth cycle, dietary value of the product etc. These varieties are generally appreciated by market-oriented, larger-scale farmers growing the crop in a pure stand and under relatively good growing conditions. Subsistence-oriented farmers require varieties with a good yield which is reliable and stable, also during bad years. For this purpose, they commonly use a mixture of varieties. They choose varieties adapted to specific characteristics of their farming system, such as intercropping, staggered harvesting and seasonal availability of labour. They also attach importance to taste and cooking qualities and to by-products that can be used, e.g., as forage or building materials.

Producing and selecting seed

Different farmers produce and select their seed in different ways. Most farmers select seed after harvest. Others make their choice before harvest, walking through the fields and marking the plants they will use for next year's crop. Some farmers grow seed plants for the next season in a separate plot at some distance from the

main crop. They may give extra attention to this plot, for example, by applying manure, discarding off-types and keeping the plot free of weeds and pests. The farmers do not necessarily select for a uniform type of seed. They may choose seed so as to maintain a certain variation in earliness, shape, colour and taste of product.

Need for seed purchases

In general, farmers save enough seed to resow at least twice. However, in drought-prone areas, they often run out of seed and have to depend on seed from other sources. They also have to buy those seeds which they cannot store adequately, e.g., groundnut and soybean which soon deteriorate and lose their germinative power when stored at ambient temperatures in monsoon climates. Some crops, particularly certain vegetables, do not produce seed in certain environments. Farmers who want to grow these crops have to buy seeds produced in favourable regions. Farmers may also buy seeds if they are convinced that the new genetic material meets their needs better than the seed they produce themselves. However, most farmers prefer their own varieties because these are adapted to their farming system.

Farmer-based seed supply

In view of the diversity in the wishes and requirements of small-scale farmers with regard to crop characteristics, there is a need to strengthen farmer-based seed supply at the community level. First of all, researchers must acquire a thorough knowledge of the existing varieties and the existing techniques of seed production, selection and storage. Then, by conducting on-station trials as well as on-farm trials in close collaboration with the farmers, improvements could be tried out such as in seed selection in the field and in the treatment and storage of seed, and appropriate new genetic material could be incorporated into the farming system.

Case study: soybean seed supply

Since Indonesia has achieved self-sufficiency in rice, the Government has started to promote the growing of other food crops, particularly soybean. The main soybean-growing province is East Java, where 37% of the national crop is grown. The extension service recommends the use of a new soybean variety with a 100-seed weight of 10 g. However, most farmers in East Java still use local soybean varieties, which they generally call "local 29". This refers to the variety No.29 with small, green-yellow seeds (100-seed weight 5-8 g) which was introduced from Taiwan to Indonesia in 1924. Variety No.29 was maintained at Indonesian research institutes but was not multiplied and distributed by Government services after its initial introduction at the farm level. Sixty years of intensive cultivation and selection by Indonesian farm-

ers have led to the development of a large number of local varieties which differ in terms of time to reach maturity and yield levels.

Maintaining seed supply

About 70% of the soybean production in East Java comes from dry-season cropping on wetland: one crop from April to June following a rice crop, and another from July to October, following either soybean or rice. The other 30% of soybean production comes from wet-season cropping on dryland between December and February (Soegito and Siemonsma, 1985). The farmers have difficulties in storing soybean seeds so as to maintain its viability for more than about six weeks. To obtain good germination and establishment of soybean after a rice crop, they need access to fresh seed. To achieve this, they developed a system called JABAL "Jalinan Arus Benih Antar Lapang", which literally means "seed flow between fields". Certain villages have specialised in soybean growing on dryland during the wet season. Yields are lower than those of dry-season soybean, but farmers can get a 50% higher price for their wet-season crop, for it provides the seeds for the main soybean crops in the dry season.

Local varieties compare well

Trials at MARIF (Malang Research Institute for Food Crops) revealed that some farmers' varieties of soybean compare well with those recommended by international institutes and the Indonesian Government (Siemonsma and Soegito, 1985). In on-farm trials the most promising farmers' selections were then compared with varieties developed by Asian research institutes as well as with the stock of the original variety No.29 maintained by Indonesian research institutes. The selected local varieties performed as well as the new varieties during the main cropping season (the dry season) and generally outyielded them during the wet season. As the seed flow from dryland to wetland and back again is indispensable for sustaining soybean cultivation in East Java, varieties must yield well in both seasons. It was noteworthy that the selected local varieties also outyielded the original variety No.29 from which the farmers had derived them. The results of the on-farm yield trials demonstrated that many locally developed varieties are well adapted to the local environmental conditions and farming systems. Large-scale introduction of a few varieties could cause the rapid loss of a valuable source of genetic diversity, especially since soybean seed soon loses its viability when stored under farmers' conditions.

What does this mean for research?

Soybean improvement programmes should start with testing local planting materials. It is not sufficient to compare introduced varieties with just one or two local

controls, as this does not do justice to the diversity found in farmers' varieties. Instead, researchers should use fresh, healthy planting materials carefully chosen to reflect local diversity and potential, and should evaluate these materials according to the farmers' selection criteria. Progress may be slower than relying on easily available seed from international institutes but will be more secure in the long term.

Source : "Variety Choice and Seed Supply by Small Holders" by Anita R. Linnemann and Jan S. Siemonsma

Empowering Farmers for Rural Development: The Masipag Experience

Charito P. Medina

Problems for farmers in the Philippines created by the Green Revolution have led to the emergence of organizations seeking alternative solutions. Highly successful amongst these is the Farmer-Scientist Partnership for Development (MASIPAG), started in 1985 as a response to growing concerns by farmers over their dependent situation. The phenomenal growth of MASIPAG is due to its commitment to improving the quality of life of resource poor farmers through supporting their participation and empowerment in the development process. Farmers adapt or develop their own technologies and maintain access and control of production resources such as seeds, technology and land.

The response: Farmer-Scientist Partnership

In a series of symposia that culminated in a national conference on rice in 1985, farmers complained that the Green Revolution had not made their lives any better - quite the reverse. Born out of need, the Farmer-Scientist Partnership for Development (MASIPAG) was organized. The ultimate goal is to improve the quality of life of resource poor farmers and empower them through:

- participatory planning and development,
- effective and efficient utilization of locally available resources and farmer-developed/adapted technologies, and
- access and control of production resources: seeds, technology, and land.

There are three stakeholder sectors in the partnership:

- farmers to become active partners in development,
- scientists to provide technical support, and
- non-governmental organizations (NGOs) to facilitate organizing and coordination.

This development approach has five strategies:

- *farmer-scientist partnership* to combine the theories and technical knowledge of the scientists to that of the experience and practical knowledge of the farmers,
- *bottom-up approach* to prioritize community needs, problems and aspirations,
- *farmer-led research and training* through the farmer-managed trial farms cum training center,
- *farmer-to-farmer* mode of technology transfer
- *advocacy* for sustainable/organic agriculture, genuine agrarian reform and other issues affecting farmers.

The farmers decided to start with the traditional varieties because they do not require much capital input and are ecologically adapted to diverse agro-ecological conditions. The traditional rice varieties could also be improved later. To join MASIPAG, farmers simply have to signify their intention. Aspiring partner members either need to have an existing organization or have to start one. Support is available from several sources. There may be a Community Organiser or Peoples' Organisation (PO) in the area to give advice on organizing a local group. Roving technicians from MASIPAG or partner NGOs will also be available to help.

Initially, an orientation workshop about local and global trends in agriculture as well as alternatives like sustainable organic agriculture is conducted by farmer trainers from the nearest PO, or technical staff from either the regional office or from the national secretariat. Then the farmers must establish a trial farm where they plant 50 to 100 traditional varieties and MASIPAG rice 'selections'.

MASIPAG uses the term selection for seed that cannot technically be called a variety because it does not meet the criteria for purity and uniformity. Use of these seeds is intentional to maintain more genetic variability, giving wider possibilities to match selections to environmental conditions. The farmers observe the characteristics of the different varieties and selections to assess them for suitability to the local environmental conditions and pest resistance. The top ten performing locally adapted varieties are then chosen for planting. Some farmers also do further verification trials in their farm by planting the top 10 to 15 varieties before they finally select two to five. Farmers are given between a hundred grams to one kilogram of seed per variety so that initially the farmer must re-learn the important skill of mass-producing seed.
An important spin-off from the community level organizing is that the mosaic ef-

fect of the different neighbouring varieties creates a barrier to pests and diseases because of the differential resistance between varieties. The trial farm involves no cost to the farmers except for the collective work required for its maintenance. By planting several varieties on their farms, farmers also benefit from the different rates of plant maturity. Harvest is spread over a longer period allowing the farmer to spread out the work, rather than having to hire in costly outside labor.

Scaling up

The positive personal experiences of farmers and a common cultural and language context, led to the rapid farmer-to-farmer spread of the MASIPAG concept and technology (both material and knowledge). The farmer-to-farmer diffusion has been made more effective through the organizing efforts of farmers and peoples' organizations. Initiated with five Peoples'/Farmers' Organizations (PO/FO) in 1985, by 1999 MASIPAG had grown to 484 farmers' organizations and a total membership of 20,864 farmers. That same year 62 per cent of the members planted MASIPAG rice varieties on 17,165 hectares of cultivated land. Today, land area has increased along with membership, which now includes 46 NGO partners (from an initial three) and 24 academic scientists.

Empowering the farmers

MASIPAG was fairly successful at employing the bottom-up approach through POs. The POs became a vehicle for consolidating and coordinating farmers' collective interest and knowledge, while the local leaders were the facilitators of such technological developments. Through their organizations, they were able to articulate, process and implement development approaches and solutions appropriate to specific situations. Sustainability of this development work was also enhanced by local Pos, which remain highly effective at spreading the concept at the local level through workshops and training, depending on a minimum of resources. The scientists in the end, simply provided technical backstopping and the NGOs assisted in organizational strengthening and networking.

- *Access and control of seeds:* Perhaps one major and concrete realization of empowerment by farmers is control of the seeds by themselves. The diverse variety of seeds maintained and readily available to them through their trial farms is indeed making the farmers very proud.

- *Development and control of technology:* An integral component of farmers' empowerment is their ability to develop, improve and modify technology. Since MASIPAG farmers were also trained to do actual

plant breeding and management, as well as evaluation and selection of plant cultivars, they can now develop seeds based on their resources, priorities or perceived needs.

- *Advocacy:* Land tenure is a problem area in many countries in the South. It has many ramifications that are not favorable to farmers. With this realization, MASIPAG farmers also participate in the advocacy of genuine agrarian reform.

MASIPAG has joined local and international campaigns on opposing genetically modified organisms and patenting of life forms.

Farmer-managed trial farms

Every PO who wants to become a MASIPAG partner must be willing to establish and maintain a trial farm. Currently, there are 230 farmer-managed trial farms throughout the country (see box above). Farmer-led research is done with the trial farm as their laboratory. About 50 to 100 MASIPAG rice selections are usually provided. These are planted side by side and the farmers are taught to observe, measure and monitor certain agronomic characteristics. Locally adapted varieties are then selected. Breeding is mostly done on the central back-up station, but also takes place on the trial farms or by individual farmers. The trial farm also serves as a seed bank for *in-situ* conservation of genetic resources.

There are multiplier effects of the trial farms. For example, just before harvesting, field days are organized where non-member farmers and local government officials are invited to evaluate the performance of the varieties. Thus, the trial farms provide an advocacy tool to lobby local government officials and to convince other farmers of the effectiveness. Farmer-managed trial farms are important for creative organizing. Inactive members of POs usually become active upon knowing the concrete benefits. Non-member farmers often volunteer to become members of the PO so that they can access the seeds and technology or else organize their own farmer organization.

Results and impacts

- *Economic*: The yields of MASIPAG bred rice and some selected traditional varieties are in most cases higher or similar, as those of HYVs.

- *Health:* MASIPAG farmers practice alternative pest management where

the focus is on maintaining ecological balance in the farm. This has allowed the return of diverse food sources, contributing to better nutrition of the farming family.

- *Diversity and environment:* The recovery and maintenance of 668 traditional rice varieties contributes to the conservation of the main staple food. Improvement of these varieties through a modified bulk selection breeding strategy has produced 539 MASIPAG selections. All of these are maintained in the central back-up farm, the main source of seeds distributed to trial farms throughout the country.

Social equity and cultural sensitivity

Through MASIPAG, farmers are not only articulating their needs but are now addressing and solving their own problems. They are developing technologies to improve production of their staple food and emphasizing low cost production systems. Volunteer farmer-trainers are now teaching other farmers. Through their local POs, farmers can now also negotiate with local government to address farmers' concerns.

Challenges in the future

The greatest threat to this Farmer-Scientist partnership initiative is the second wave of Green Revolution, the 'Gene Revolution', and its transcendent issues of patenting life forms and processes. MASIPAG farmers are becoming more resolute in advocating what they have started as their only alternative. They contend that MASIPAG was their alternative to the green revolution and it will still be their alternative to the gene revolution. For as long as the seeds are in their hands, they have the capability to develop and improve technologies, and for as long as they remain organized, they are insulated from the damaging effects of the new technology. The farmers will determine their own history.

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Source : Excerpts from Medina, C.P.(2002), "Empowering farmers for rural development: the MASIPAG experience". Biotechnology and Development Monitor, No. 49, p. 15-18.

Seed selection and biodiversity maintenance by women farmers

Yiching Song and Gigi Manicad

The International Center for Wheat and Maize Improvement (CIMMYT) started a maize-breeding programme at the end of the 1970s in south-west China where 25 million poor farmers in remote upland areas depend on the crop for their staple food. China which was the first country in the world to plant significant areas of genetically modified crops, has followed a modern technology-oriented approach and has relied mainly on its public seed system to ensure national food security. Researchers are becoming more aware of the role of farmers' seed systems and their knowledge of crop development and biodiversity conservation. Some 30% of Chinese food production can be attributed to the development and promotion of improved planting materials, especially hybrid wheat, rice and maize (Lin 1998, Fan and Pardey 1997)

Feminisation of Agriculture

The feminisation of agriculture is an important phenomenon in China. Women constitute more than 80% of the agricultural work force because of the volume of male out- migration (Song 1998). As a result, women who had fewer access to resources and services are overburdened with agricultural activities that give little or no profit.

The CIMMYT Collaborative Maize Breeding Programme in southwestern China set out to collect information on areas with limited natural resources. The study assessed the impact of modern varieties and analyzed the capabilities of public research and farmers' knowledge in dealing with food security, poverty alleviation and agro-biodiversity conservation issues at different levels.

Impact of CIMMYT material

The impact study revealed that CIMMYT genetic material had a significant effect both in hybrid development and in direct use. This had been achieved through the formal seed system and farmers' informal systems:

• Public breeding efforts have led to the adoption of CIMMYT-related hybrids but yield increments have been of limited benefit for resource-poor farmers in marginal rain-fed areas

• CIMMYT's maize germplasm has had a considerable impact on household food security and poverty alleviation through the informal system which has assured the wide distribution of CIMMYT's improved populations.

Tuxpeño 1

Tuxpeño 1 (local name Mexican 1) is an improved population that was developed by CIMMYT from a landrace that originated from Tuxpau, Mexico. *Tuxpeño 1* was introduced in Southwest China in 1978 and rapidly disseminated through southwest China, mainly through farmers' seed exchange systems. *Tuxpeno 1* became particularly popular due to its broad adaptability, stability and good stress tolerance, especially lodging resistance in the remote mountainous areas. Meanwhile, due to the poor quality of government supplied hybrid seed, *Tuxpeño 1* has increasingly been adopted by farmers in relatively favourable areas. However, since maize is an out-breeding crop, *Tuxpeño 1* has, in the absence of an improvement effort from formal breeding, degenerated greatly by out-crossing, resulting in decrease of yield, increase in plant height and loss of stress resistance characteristics. Since the farmers did not get any support from the government, they themselves took efforts to regenerate *Tuxpeño 1*.

Case study was conducted in Wenteng which is typical of the relatively better-off communities found in the valleys and flat areas, where farmers are educated and better integrated into the market economy.

Wenteng

Wenteng farmers who used to cultivate hybrid maize have recently shifted to improved Open Pollinated Varieties due to limited options offered by hybrid varieties and decreasing quality of government-supplied hybrid seed. Due to the lack of institutional support and the popularity of *Tuxpeño 1*, women in Wenteng village have been organizing themselves to maintain and improve *Tuxpeño 1* since the 1980s. An innovative woman had initiated this activity by trying to maintain *Tuxpeño 1* after it

had been adopted. The crop development methods used by the women include spatial separation through the use of plots at different locations, temporal isolation and seed selection. These methods are critical for population maintenance.The women mainly select according to mass selection both in the field and after harvesting.

The three steps in seed selection are:

- First to select the best plants in the middle of the field: phenotypes with big ears and other desired agronomic traits.
- Second, select the best ears (based on cob size, length and number of seed rows) and
- Third the best grains are chosen from the middle part of the cob according to kernel size, shape, quality, and colour.

The women farmers claimed that these techniques have been passed on for generations and they use similar techniques for the maintenance and improvement of landraces. They also added that some of their selection knowledge and skills were gained by their parents or by themselves from the so-called 'bare-footed scientists'. As a result, the varietal quality, in terms of preferred agronomic traits and yield of *Tuxpeño 1* in Wenteng village has been maintained and improved in such a way that it is better adapted to local conditions. Most villagers now consider it to be a local rather than an exotic variety. It is not surprising that the improved *Tuxpeño 1* has spread rapidly to neighbouring areas through farmers' informal seed exchange systems. Today, Wenteng is a source for quality *Tuxpeño 1* seeds over a large area.

Source : Summary and excerpts from "Seed Selection and Biodiversity Maintenance by Women Farmers" by Yiching Song and Gigi Manicad.
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PART THREE
RESOURCES

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Arumugasamy, S., M. Jayashankar, K. Subramanian, S. Subhashini and K.Vijayalakshmi. 2001. Indigenous Rice Varieties-1. Centre for Indian Knowledge Systems, Chennai. pp.74.
This book provides detailed information on 34 indigenous rice varieties. For each variety the cultivation details, agronomical features, characteristics of the ear head and grains, yield of grain and straw are given. It also provides information on certain special features of the variety such as pest resistance, drought tolerance, medicinal properties etc.

Genetic Resource, Ecology, Energy and Nutrition Foundation.1998. On-farm Conservation of Seeds Diversity-A Guide to Conserving Agricultural Diversity. GREEN Foundation, Bangalore. pp. 50.
Seed conservation is an art and science that is enhanced by interaction with and observation of nature. This source book aims at educating a lay person on the question of "how" to conserve diversity in agriculture.

Genetic Resource, Ecology, Energy and Nutrition Foundation. Beeja Samrakshru (Seed Savers). GREEN Foundation, Bangalore. pp. 38.
A compilation of seed savers involved in on-farm conservation. It is a compilation of seed savers who have been conserving various crop varieties like fingermillet, paddy, pulses, other minor millets and vegetables in the border area between Tamil Nadu and Karnataka. The book describes about the varieties and its special features.

Genetic Resource, Ecology, Energy and Nutrition Foundation. Beejada Butti (Kannada). GREEN Foundation, Bangalore. pp. 64.
This book is a compilation and varietal description of indigenous seed varieties.

Genetic Resource, Ecology, Energy and Nutrition Foundation. 2003. Investing in Indigenous Knowledge. GREEN Foundation, Bangalore. pp. 90.
Green Foundation's interaction with the farmers on developing mechanisms for

organic ways of producing and protecting seeds have been captured. The book is towards retrieving the farmers' knowledge to reiterate the fact that there is science that is indisputable in farmer's knowledge. The richness of the information that is being shared to the rest of the community is no doubt invaluable and the right to access it vests with the farmers alone.

Genetic Resource, Ecology, Energy and Nutrition Foundation. 2004. Seed Quest-A journey through space and time. GREEN Foundation, Bangalore. pp. 110

Celebrating the journey of seed conservation across different agro-climatic zones and go back in time to revive the historical evolution of the seeds of diversity.

Integrated Development Through Environmental Awakening (IDEA). 2003. An Idea That Works - Documentation of good practices of NGO support. IDEA, Vishakapatnam. pp. 75.

It speaks about the ecological, economic, social and cultural richness of the Eastern Ghats. IDEA shares its experience and efforts towards endogenous development and biodiversity conservation involving active community participation.

Jayashankar, M., S. Arumugasamy, H. Saraswathy and K.Vijayalakshmi. 2002. Indigenous Rice Varieties-2. Centre for Indian Knowledge Systems, Chennai. pp. 100

This book provides detailed information on 47 indigenous rice varieties. For each variety the cultivation details, agronomical features, characteristics of the earhead and the grains and yield of grain and straw are given. It also provides information on certain special features of the variety such as pest resistance, drought tolerance, medicinal properties etc.

Krishi Prayoga Pariwara . 2004. Kadiru (Kannada). KPP, Karnataka. pp. 39.

It is a documentation of traditional paddy varieties of Sagara Taluk, Shimoga district, Karnataka. The book has information on 60 traditional varieties of paddy that is still grown in Sagara taluka. Varietal name, duration, height of the variety,

size of paddy, colour of paddy and rice, on which soil and topography the variety is grown, special characters of variety, pest and disease resistance characteristics, type of cultivation, season, major purpose of cultivation, villages growing the variety, yield, rice recovery percentage per quintal of paddy and name & address of farmer growing the variety is given in the book. The book also lists the reasons for the absence of large scale cultivation of traditional varieties in the taluk.

Panigrahi, K.M. 1999. Festivals of Biodiversity. Navdanya, New Delhi. pp. 82
The book gives us a detailed description of the Indian agriculture based thirteen festivals like sowing seeds, rain welcoming festival and pre-harvesting festivals, which are celebrated in the twelve months of the year.

Ramprasad, V. 1997. Seeds of the Future. GREEN Foundation, Bangalore. pp. 75
This is an experimental learning & documentation by GREEN Team. An outcome of tremendous efforts to save, multiply & conserve the lost agricultural diversity of the rainfed dry lands & tank irrigated areas of South India.

Ramprasad, V. 2002. Hidden Harvests. GREEN Foundation, Bangalore. pp. 96.
This publication captures a decade of Green Foundation's work on conservation of biodiversity and its multiple activities in other dimensions of sustainable agriculture.

Ramprasad, V. and S. Paulose. Biodiversity-the lifeline of sustainable agriculture. Indo-Swiss Participative Watershed Development Project, Karnataka. pp.40.
This booklet is about agro biodiversity. But, beyond this, it is also about farmers and their role in conserving and developing the various traditional crop varieties. It describes the findings of a study in three watershed areas in North Karnataka, India. The use of agro biodiversity in these areas is under pressure and generates concern about food security and environmental sustainability.

Shiva, V. 2000. Stolen Harvest. India Research Press, New Delhi. pp.146.

In this book, the author charts the impacts of globalized corporate agriculture on small farmers, the environment and the quality of the food we eat. With chapters on genetically engineered seed, patents on life and the debate on shrimp farming, this is an impassioned and inspiring book that will shape the debate about genetic engineering and commercial agriculture for years to come.

Shiva, V. Future of Our Seeds: Future of Our Farmers. Research Foundation for Science Technology and Ecology, New Delhi

The book highlights the agricultural biodiversity, Intellectual Property Rights, the TRIPs Agreement of WTO and the protection of Farmers' Rights.

Shiva, V. Betting on Biodiversity. Research Foundation for Science Technology and Ecology, New Delhi. pp. 57

The book discusses why genetic engineering will not feed the hungry or save the planet and how it will lead to destruction of on-farm biodiversity through use of broad – spectrum herbicides like Roundup.

Shiva, V. et al. 1993. Cultivating Diversity. Research Foundation for Science Technology and Ecology, Dehradun, India. pp. 130

Cultivating Diversity indicates a shift from monocultures and unidimensionality to diversity and multiplicity as a way of thought, a paradigm, which has to be encouraged if biodiversity has to be conserved. It entails viewing conservation as apart of production at the farmer's fields. Most importantly, it views the seed as a tool of the farmer, which cannot be modified without the farmer's consent. Farm level biodiversity cannot be conserved sustainably without the participation of consumers in supporting patterns and lifestyles. "Cultivating Diversity" analyses the politics of the seed and details the various farmer/ consumers, farmer/ scientist and most importantly, the farmer/ farmer linkages that are vital for sustainable agriculture.

Shiva, V. et al., 1995. The Seed Keepers. Research Foundation for Science Technology and Ecology, New Delhi. pp. 156

A testament of Seed Keepers involved in *in-situ* conservation and community register of their wealth of diversity and rejuvenating agricultural biodiversity.

Shiva, V. et al., 2002. Nature's Harvest - Rejuvenating Biodiversity. Navdanya, Uttaranchal, India. pp. 125.

The book gives information on the different food crops grown in the conservation farm in Doon Valley and the multipurpose fruits and flowers. It was published to celebrate the return of the diverse species to a devastated landscape and share the beauty and joy of ecological enrichment and rehabilitation.

Shiva,V. and R. H. Bari. Diversity: The Hindustan Way (Vol. I) . Navdanya / Research Foundation for Science Technology and Ecology, New Delhi.

The book deals with agro-biodiversity and traditional ecological farming systems of India. It is also an attempt to remember the ecological and sustainable basis of Indian agriculture.

Shiva, V., R.H. Bhari and A.H. Jafri. Corporate Hijack of Biodiversity. Navdanya, New Delhi.

The book shows how WTO–TRIPS rules promote hijack of people's biodiversity and knowledge. The false promise of genetically modified crops, the risks of bio-pollution and the changes in the biodiversity and related Intellectual Property Rights has also been dealt with.

Shiva,V., S. Bhutani, U. Prasad and A. Jafri. 1999. Biodiversity. Research Foundation for Science Technology and Ecology, New Delhi. pp. 42

The book discusses the threat to biodiversity and the need to conserve it. It also highlights on intellectual property rights and biopiracy and calls for living democracy to strengthen people's rights over biodiversity to defend local enemies.

CD-ROMS ON BIODIVERSITY

"The Seed Keepers"- A Multimedia Presentation. Centre for Indian Knowledge Systems (CIKS), Chennai.

The Seed keepers is a self-running multimedia presentation made with still photographs and complete with commentary and soundtrack. This 23 minutes presentation summarizes the effort of an eight-year project of CIKS on biodiversity conservation. This would be a starting point for organizations involved in biodiversity conservation work.

Community Seed Bank - as a way of managing Agro-biodiversity. Genetic Resource, Ecology, Energy and Nutrition Foundation , Bangalore.

This CD-Rom gives a glimpse of GREEN foundation's activities in conserving indigenous varieties, stabilizing Community seed Banks and the role of women in managing seed banks.

Cultivating seed Links. Genetic Resource, Ecology, Energy and Nutrition Foundation , Bangalore.

This is an interactive CD ROM on bio-diversity and its conservation.

WEB SITES OF RELATED INTEREST

www.biodiv.org
www.ciks.org
www.ddsindia.com
www.envirodebate.net
www.greenconserve.com
www.ideaind.org
www.ipgri.cgiar.com
www.navdanya.org
www.sristi.org
www.sgpindia.org
www.undp.org.in

THE SEED KEEPERS

Burn our land
burn our dreams
pour acid onto our songs
cover with saw dust
the blood of our massacred people
muffle with your technology
the screams of all that is free,
wild and indigenous.
Destroy

Destroy
our grass and soil
raze to the ground
every farm and every village
our ancestors had built
every tree, every home
every book, every law
and all the equity and harmony.

Flatten with your bombs
every valley; erase with your edicts
our past
our literature; our metaphor
Denude the forests
and the earth
till no insect,
no bird
no word
can find a place to hide.
Do that and more.
I do not fear your tyranny
I do not despair ever
for I guard one seed
a little live seed
That I shall safeguard
and plant again.

(Palestinian poem of unknown authorship)