Seed multiplication by resource-limited farmers

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FOREWORD

Effective seed systems constitute dynamic repositories of Plant Genetic Resources for Food and Agriculture (PGRFA). They are a *sine qua non* for agricultural development and food security of the world. In spite of rapid advances made in the past decades regarding the formal seed sector, the informal seed sector, as largely represented by farmer-saved seeds and on-farm seed multiplication, has seen very little change. Small-scale or resource-limited farmers, who make up nearly 80 percent of farming populations in developing countries, rely on the informal sector for their seed needs, particularly of subsistence crops. There is therefore the need to introduce effective interventions aimed at ensuring that the informal sector is able to provide resource-limited farmers with the seed security that they require to achieve food security.

The relevance and need to strengthen seed systems are fully acknowledged in The Global Plan of Action for the Sustainable Conservation and Use of Plant Genetic Resources for Food and Agriculture (the *Global Plan of Action*). Specific recommendations are contained in priority activity area 13 "Promoting seed production and distribution", in priority activity area 3 "Assisting farmers in disaster situations to restore agricultural systems", and priority activity area 2 "Supporting on-farm management and improvement of plant genetic resources for food and agriculture".

It is in light of the foregoing that FAO, through its Seed and Plant Genetics Resources Service (AGPS), initiated a series of expert consultations, workshops and conferences to generate ideas, develop methodologies and facilitate initiatives aimed at strengthening on-farm seed multiplication (the informal seed system), thereby addressing the seed security needs of smallholder farmers. Just as in sub-Saharan Africa, the informal seed system of the Latin American Region receives inadequate attention by policy-makers and is not accorded the importance it deserves in the agricultural production system. The fact that Latin America also is faced with most of the inequities in the informal seed sector and, particularly, constraints in the conduct and effectiveness of on-farm seed multiplication, was amply borne out during the one-day Round Table organized in Santa Cruz de la Sierra, Bolivia by FAO, with the collaboration of the Pan American Seed Congress. In line with the recommendations of the Round Table, FAO, with funding from the FAO/Netherlands Partnership Programme (FNPP), organized the Latin American Workshop on Seed Multiplication by Resource-limited farmers.

The specific aims of the workshop were: to identify the major constraints facing on-farm seed production, to identify the groups of limited resource farmers to be targeted and to propose solutions for increasing the availability of good quality seed to small holder farmers.

It is the hope of FAO that these proceedings will serve as a good record of the Workshop and be a guide towards the development of interventions by Latin American governments, as well as national and international institutions and agencies that may desire to assist further in this topic.

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Special thanks are addressed to all those who assisted in the implementation of the workshop by providing information and advice during the workshop itself and during preparatory missions to Venezuela, Bolivia and Brazil conducted by Mr. Claudio Bragantini, FAO Consultant. FAO also wishes to recognize the invaluable inputs of the National Organizing Committee and the workshop working group facilitators who assisted FAO staff in the running of the workshop.

The organization of the workshop was coordinated by Claudio Bragantini, in collaboration with Leslie Lipper, FAO economist from the Agricultural Sector in Economic Development Service and two international consultants: Gustavo Blanco, of Uruguay, and Victorio Giusti, of Argentina.

These Proceedings were edited by Michael Larinde, FAO Seed Technologist.

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ACRONYMS

AGPS	Seed and Plant Genetic Resources Service, FAO, Rome
ANIFODA	Asociación Nicaragüense de Formuladores y Distribuidores de Agroquímicos (Nicaraguan Association of Formulators and Distributors of Agrochemicals)
APROSECH	*El Chore* Seed Producers Association, Bolivia
ASCAR	Associação Sulina de Crédito e Assistência Rural, Brasil (Southern Association for Credit and Rural Assistance)
BAGSA	Bolsa Agropecuaria, Nicaragua (Agriculture and Livestock Fund)
CENARGEN	Centro Nacional de Recursos Genéticos e Biotecnologia /Embrapa (Genetic Resources and Biotechnology)
CIAT	International Center for Tropical Agriculture, Colombia
COSUDE	Cooperación Técnica Suiza (Swiss Technical Cooperation)
DGDT	General Division of Territorial Delegations, Nicaragua
EMATER	State Company of Technical Assistance and Rural Extension, Brazil
ESAE	Agricultural Sector in Economic Development Service, FAO, Rome
ESREG	Escritorio Regional (Regional Office of IBAMA, the Brazilian Institute for Environment and Renewable Natural Resources)
FNPP	FAO/Netherlands Partnership Programme
FODA	Forestry Information and Liaison Unit, FAO, Rome
GNP	Gross national product
HCS	Hararghe Catholic Secretariat, Ethiopia
IDR	Instituto de Desarrollo Rural, Nicaragua (Institute of Rural Development)
IICA	Inter-American Institute for Cooperation on Agriculture, Costa Rica
INTA, Chile	Instituto de Nutrición y Tecnología de los Alimentos (Institute of Nutrition and Food Technology)
INTA, Nicaragua	Instituto Nicaragüense de Tecnología Agrícola (Nicaraguan Institute of Agricultural Technology)
LSSS	Local Seed Supply Systems
MAGFOR	Ministry of Agriculture and Forestry, Nicaragua
MHCP	Ministerio de Hacienda y Crédito Publico, Nicaragua (Ministry of Treasury and Public Credit)
MST	Movimento dos Trabalhadores Sem Terra, Brasil (Brazilian Landless Workers' Movement)
OEA	Organization of American States
PASA	Programa de Apoyo al Sector Agrícola, Bolivia (Support Programme to the Agricultural Sector)
PNLL	Pound per Pound National Seed Programme, Nicaragua
PRONAF	Programa Nacional de Agricultura Familiar , Brazil (National Family-Farm Programme)
PROSEMPA	Seed Potato Project, Bolivia (Proyecto nacional de semilla de papa)
SADC	Southern African Development Community
STA	Seed Technical Assistance
TCP	Technical Cooperation Programme
UPOV	Union for the Protection of New Varieties of Plants
USAID	US Agency for International Development
WB	World Bank

I. WORKSHOP ORGANIZATION

1.1 Introduction

One major step towards achieving food security in developing countries is to improve their ability to achieve seed security. While seed supply channels of commercial agriculture are usually operational even during emergencies, the seed system of subsistence crops, although resilient, is often fragile and unable to fulfill seed needs. This situation is prevalent in many Latin American countries, particularly in those with many resource-limited farmers.

In view of the above, FAO supported several regional meetings to discuss this important issue. In 1993 in Swaziland, FAO organized a Regional Workshop on On-Farm Seed Production for the Southern African Development Community (SADC) countries. In 1997 in Lesotho, FAO organized the Regional Technical Meeting on the Promotion of a Regional Network for On-farm Seed Production and Seed Security in SADC countries. More recently, in 2002, in conjunction with the Pan American Seed Congress, FAO promoted the organization of a Round Table in Santa Cruz de la Sierra, Bolivia, where representatives of several Latin American countries presented their strategies to increase seed production of subsistence crops. During this one-day Round Table a more comprehensive discussion of the issue was recommended to identify the major constraints for the development of on-farm seed production, to identify groups of resource-limited farmers to be targeted, and to propose solutions for increasing the availability of good quality seed, which is important to smallholders' farming systems.

As a follow up to the recommendation of the Santa Cruz Round Table meeting, the Latin American Workshop on Seed Multiplication by Resource-limited farmers was organized in Goiania, Brazil with the financial assistance of FAO.

1.2 Outline of official arrangements

1.2.1 Preparatory missions

Claudio Bragantini, FAO seed specialist, undertook preparatory missions to Venezuela, Bolivia and Brazil to hold discussions with government officials on ways to improve the efficiency and the sustainability of the "informal" seed sector. Consultations on this issue led to the decision to hold a workshop in Brazil to be organized by the Fundação Dalmo Giacometti and Brazilian Agricultural Research Corporation (Embrapa). The Rice and Bean Research Center of Embrapa in Goiania, Brazil was selected to host the Workshop due to its special commitment to beans and rice, the two most important staple food crops of Brazil and most Latin American countries. During the visits, the formation of the National Organizing Committee (NOC) was discussed and a list was prepared of potential Latin American countries to be involved in the meeting. The NOC invited experts from Argentina, Uruguay, Bolivia, Mexico, Colombia, Nicaragua, Cuba and Brazil to participate in the Workshop.

1.2.2 International Director

Claudio Bragantini, FAO seed specialist, acted as International Director for the Workshop.

1.2.3 National Organizing Committee (NOC)

The NOC represented a broad spectrum of stakeholders, which included the following personnel of Embrapa: National Director, Pedro Antonio Arraes Pereira, the Technical Director, Beatriz da Silveira Pereira, the Committee President, Tarcisio Cobucci, Abilio Pacheco, Dino Magalhães Soares, Geovando Vieira Pereira, Leonardo Cunha Melo, Marina Biava, Murilo Lobo Junior, Roselene de Queiroz Chaves and Valacia Lemes da Silva Lobo. In addition, NOC was complemented by three working group facilitators, Joaquim de Carvalho Gomide, Luiz Cezar Gandolfi and Arthur Eduardo A. de Toledo. During the Workshop, FAO staff were assisted at the national level by the NCO.

1.2.4 Consultants and lecturers

FAO provided the services of Gustavo Blanco, an international seed legislation specialist from Uruguay, and Leslie Lipper, an economist from FAO Headquarters. Victorio Giusti, an agricultural engineer from Argentina, was also one of the Workshop lecturers. These contributors greatly assisted with Workshop implementation and enhanced the discussions and debates with their timely interventions.

1.2.5 Technical arrangements

The main objective of the Workshop was to discuss on-farm seed production of subsistence crops grown in Latin America. Workshop facilities, meeting rooms for discussion groups and plenary sessions, audio-visual aids, and secretarial services were made available.

1.2.6 Administrative arrangements

Most of the participants arrived in Goiania, Brazil before or on 7 April 2003. (See list of participants in Appendix I.) In order to minimize transportation problems, all the participants were accommodated in the Plaza Inn Executive Hotel, which also provided conference and meeting rooms for the workshop.

The opening ceremony was chaired by Clayton Campagnola, the President of Embrapa, who represented the Brazilian Minister of Agriculture, while Pedro Arraes Pereira, Director of Embrapa's Research Center gave the closing speech. The events of the opening ceremony was covered by the local and regional mass media.

1.3 Workshop implementation methodology

In order to provide background knowledge, the first part of the Workshop consisted of two days dedicated to presentations of background papers and the experiences of Latin American countries in dealing with seed production and supply of subsistence crops.

The second part of Workshop used a participatory approach and stimulating creativity through a brainstorming technique, to analyze the situation and provide suggestions for their remedy. The methodology was divided into four phases:

Phase 1. *Individual*. In plenary each participant presented the constraints he or she considered most important to the development of effective on-farm seed multiplication systems. A total of 122 constraints were identified through this process. Following the same methodology, in the next exercise, participants identified motivating factors that are immediately available and could facilitate the development of local seed systems. The participants identified 54 of such positive factors.

Phase 2. *Harmonization of factors*. The previously identified factors were grouped by affinities and similarities.

Phase 3. *Prioritization*. Participants ranked the constraints and the motivating factors by importance as detailed in Chapter 2.

Phase 4. *Searching for solutions*. As outlined in Chapter 3, five working groups were formed and each group discussed and proposed possible recommendations to one of the most important constraints, and the possible ways to best take advantage of the identified motivating factors.

1.4 The Workshop Programme

International and national participants arrived on Sunday, 6 April, 2003. The Workshop Programme proceeded as follows:

TIME	ACTIVITY / PRESENTATIONS
DAY 1:	**Monday, 7 April 2003**
8:00	**Registration**
8:30	**Opening ceremony**: Pedro Antonio Arraes Pereira, Director of Embrapa Research Centre **Welcome address** **Presentation of Workshop officers and lecturers** **Outline of Workshop objectives and introduction of participants**
9:30	**Presentation**: *The importance of community-based production for the sustainability of smallholders* by Clayton Campagnola, President of Embrapa, representing the Minister of Agriculture
10:30	COFFEE BREAK
10:45	**Presentation**: *Informal seed systems: definitions, perceptions, concepts and prejudices,* by Claudio Bragantini, FAO seed technology consultant
11:45	**DISCUSSIONS**
13:00	LUNCH BREAK
14:00	**Presentation**: *An economic approach to assessing seed systems,* by Leslie Lipper, FAO Economist
15:00	**DISCUSSIONS**
15:30	COFFEE BREAK
15:45	**Presentation**: *Seed production and conservation in rural settlements,* by Ciro Correa, representative of the Organization of Landless People in Brazil (MST)
16:45	**DISCUSSIONS**
17:45	**CONCLUSIONS**
DAY 2:	**Tuesday, 8 April 2003**
	Seed production and conservation by smallholders: Case studies in Central America
8:00	**Presentation**: *The Cuban programme for seed production of subsistence crops,* by Miguel Socorro Quesada, Rice Research Institute, Ministry of Agriculture, Cuba
9:00	**Presentation**: *Experiences, successes and new perspectives of the Pound per Pound seed distribution programme in Nicaragua,* by Luis Mejía Selva, Ministry of Agriculture and Forestry of Nicaragua
10:00	COFFEE BREAK
10:15	**DISCUSSIONS**
	Seed production and conservation by smallholders: Case studies in the Andean Region
11:00	**Presentation**: *The Seed Technical Assistance (STA) project for seed production with smallholders in Bolivia,* by Jorge Rosales King, Director of Regional Seed Office, Santa Cruz de la Sierra, Bolivia
12:00	LUNCH BREAK
	Seed production and conservation with smallholders: Case studies in the Conesul Region
14:00	**Presentation**: *A practical and participatory proposal for seed production with smallholders,* by Victorio Giusti, post-harvest expert, Consultant
15:00	**Presentation**: *Harmonization of seed policies, rules and regulations: its potential effects on small-scale seed production,* by Gustavo Blanco, seed legislation expert from Uruguay
16:00	**DISCUSSIONS**
16:30	COFFEE BREAK

16:45	**Presentation**: *Technology transfer to smallholders: Embrapa´s maize and bean seed distribution campaign*, by José Hamilton Ramalho, Embrapa, Maize and Sorghum Research Center
17:45	**DISCUSSIONS**
18:15	**CONCLUSIONS**
DAY 3:	**Wednesday, 9 April 2003**
8:00	**Presentation**: *The Krahô Indians and Embrapa: an example of partnership for maize germplasm conservation,* by Terezinha A. B. Dias
9:00	**DISCUSSIONS**
9:30	**Formation of Working Groups**
10:00	**Working Groups meetings**
12:15	LUNCH BREAK
14:00	**Working Group meetings**
DAY 4:	**Thursday, 10 April 2003**
9:00	**Working Groups meetings**
12:15	LUNCH BREAK
14:00	**Working Groups meetings**
DAY 5:	**Friday, 11 April 2003**
8:30	**Workshop synthesis**
10:00	**DISCUSSIONS OF THE ACTION PLAN**
11:30	COFFEE BREAK
11:45	**Official closing**
13:30	LUNCH
	Preparation of Workshop report and proceedings

II. RANKING OF CONSTRAINTS AND MOTIVATING FACTORS IN STRENGTHENING LOCAL SEED SYSTEMS IN LATIN AMERICA

2.1 Ranking the identified constraints

The identified constraints were ranked as follows (in order of importance):

1. Inadequacy and low impact of public policies in promoting appropriate research, technology transfer, credit, commercialization and infrastructure focused on the generation, transfer, production and use of quality seed by resource limited farmers, including the development of appropriate farming equipment.
2. Institutional policies that do not prioritize the integration, coordination and strengthening of governmental institutions involved in research and extension, consequently contributing to the gap between them and potential beneficiaries.
3. Lack of strategy in the application of participatory methodologies that take into account the social, cultural and regional characteristics and experience of the small-scale farmers.
4. Difficulties for agricultural researchers in understanding and identifying the demands of small-scale farmers.
5. Enormous diversity of culture, climate and soil in small-scale farmer communities requiring differentiated strategies.
6. Lack of strategy in valorizing and identifying market niches, and adding value to seeds produced on-farm.
7. Low levels of literacy and professional capacity of small-scale farmers.
8. Inadequacy of small-scale farmers to comply with legal requirements for seed production and commercialization (seed laws).
9. Improved varieties with low availability and/or poor adaptability to local interest.
10. Low level of cooperation in the development and organization of small-scale farmers.
11. Exclusive reliance of small-scale farmers on their own seed for planting due to lack of alternatives - resulting from a lack of an effective demand and the uncertainty of profit for potential investor in the "informal" seed sector.
12. Conflict of interest among actors of formal and informal systems regarding production and use of seeds.
13. The inefficiency of health and education programmes in rural areas contributing to rural exodus and lower life expectancy of the communities.
14. Potential cultural resistance to the introduction of improved varieties and other innovations.
15. The focus of the current agricultural model on entrepreneurial agriculture.
16. Lack of information on the evolution of transgenics.
17. Lack of social, economic and environmental impact studies of seed use.
18. Difficulties related to the access of the informal seed supply system to channels for commercialization and marketing information and to the product quality requirements available to the formal seed supply system.
19. Lack of awareness and use of agricultural aptitude studies by small-scale farmers.
20. Difficulties in producing seeds under intense attack of insects and diseases.
21. Lack of support to infrastructure and the testing of new varieties.
22. Discrimination against small-scale farmers.
23. The lack of prioritization of seed multiplication activities.

2.2 Ranking the identified motivating factors

The identified motivating factors were ranked below in order of importance.

1. Many readily available technologies and production resources (land, hand labour, etc.) for seed production by small-scale farmers.

2. Current political sensibility to the need to integrate the formal and informal sectors with a view of improving the agricultural activities of small-scale farmers.
3. Biodiversity, breeding programmes and facilities for germplasm conservation, and interest in promoting the use of local varieties.
4. Positive experiences with participatory research and development programmes using local germplasm.
5. Public and private organizations involved in teaching, research and extension, strategically distributed and with highly qualified human resources (e.g. Brazil).
6. An official national seed system with laws and regulations that facilitate the development of on-farm seed production (e.g. Brazil).
7. Recognition of the importance of family agriculture by the society in general and by members of the scientific community.
8. Society's growing interest in better quality food through organic agricultural systems.
9. Technical and financial support from international organizations for seed production by small-scale farmers.
10. Encouragement from community organizations to promote the feeling of ownership and self-reliance of small-scale farmer seed producers.
11. The high cost of improved seed and the demand from specific marketing niches, which both stimulate community-based seed production activities and improve competitiveness.
12. Availability of infrastructure and equipment for seed production.
13. Circulation of communication in formal and informal channels sensible to the needs of smallholders.
14. Programmes for credit, health and technical assistance for rural communities.

III. WORKING GROUP PRESENTATIONS AND RECOMMENDATIONS

3.1 Groups: constraints and motivating factors

Each of the five working groups worked separately with one major constraint and one major motivating factor, and presented the related recommendations for discussion in plenary session.

3.1.1 Group 1:

A. Constraint: Inadequate and/or low impact of public policies for promoting research, technology transfer, credit, commercialization and infrastructure focused on the generation, transfer, production and use of quality seed by the resource-limited farmer, including the development of farming equipment appropriate for small-scale farmers.

Recommendations:

1. Create a national programme with specific financial resources for improving production and access to quality seed by resource-limited farmers and other rural communities.
2. Recover and conserve traditional and local varieties, and varieties that were introduced through participatory methodologies.
3. Providing technical assistance and training to local seed multipliers.
4. Make a credit line available to small seed producers for appropriate inputs, equipment and infrastructure.
5. Provide training to local seed producers for their initiation in the production chain and in marketing to ensure that produced seed will reach the market.
6. Create funds to stimulate research and technology transfer at the regional level that are specific for on-farm seed production.

Motivating factor: Public and private organizations with highly qualified human resources involved in teaching, research and extension, strategically distributed in Brazil.

Recommendations:

1. Stimulate the creation and/or development of cooperative projects that can take better advantage of available human resources, particularly at the regional level.
2. Promote training for research and extension teams to work with different ethnic groups of diverse backgrounds.

3.1.2 Group 2:

A. Constraint: Institutional policies do not prioritize the integration, coordination and strengthening of governmental institutions involved in research and extension, thus maintaining the gap between them and potential beneficiaries.

H. Vasconcelos remarked that his working group agreed that the best way to promote the integration of efforts in breaking the barriers to on-farm seed production is to create a "minimal agenda", where each institution involved is committed to some key activities.

Recommendations:

1. Each public and private organization needs to create an *institutional agenda; s*mall-scale farmer groups need to be present during the design of action plans and the role of each actor should be well established.
2. An assessment of small-scale farmer communities is needed before developing on-farm seed programme. This assessment will establish the main framework towards which subsequent actions will be oriented.
3. A participatory project should be prepared with common objectives and in agreement with community interests.

4. On-farm seed programmes require special adjustments according to the political and social organization of each Latin American country or region.

B. Motivating factor: Positive experiences with participatory research and development programmes using local germplasm.

Recommendations:

1. Create an "information system" for identifying, cataloguing in logical order and circulating positive experiences with on-farm seed production. The system would serve as a landmark for future seed programme that valorize local knowledge.
2. Seek political support for these positive experiences.
3. Replicate the identified positive experiences.
4. Seek recognition of the importance of these positive experiences by the society and the scientific community.
5. Explore necessary funds and human resources to carry out the above recommendations.

3.1.3 Group 3:

A. Constraint: A lack of strategy in applying participatory methodologies that take into account the regional, social and cultural characteristics and experiences of small-scale farmer communities.

Recommendations:

1. Organize meetings with universities, extension services, research institutions, local and regional administrations, community associations and NGOs to integrate efforts.
2. Promote brainstorming meetings with the above organizations for each target region, with the following objectives:
    - Creating awareness about the problems and prioritizing them in order of importance.
    - Find out the causes and prioritize them.
    - Propose solutions for the prioritized problems.
    - Develop an Action Plan.

Motivating factor: Biodiversity, breeding programmes and facilities for germplasm conservation and the promotion of local varieties.

Recommendations:

1. Encourage the use of local varieties in breeding programmes.
2. Stimulate native germplasm collection.
3. Build capacity in germplasm collection and characterizing available local varieties in local communities.

Discussion:

C. Bragantini*: Do we need to improve or conserve the local varieties?*
C. Camargo*: We are talking about the improvement of seed quality, not genetic improvement.*
E. Vieira*: We could also think about the genetic improvement of local materials, if necessary.*
L. Lipper*: I agree that we should improve both the seed and genetic qualities.*
V. Giusti*: I also agree that traditional or local seeds need to be improved in both ways.*
F. Caporal*: We need to take into account that small-scale farmers need to be more competitive. That's why I also agree that varieties need to be improved in both ways.*
M. Wetzel*: Local materials are usually the basis for many breeding programmes.*

3.1.4 Group 4:

Constraint: Researchers encounter difficulties in understanding and identifying the demands of small-scale farmers due to the lack of community involvement in programme design.

Recommendations:

1. Develop diagnostic study tools to identify constraints in the integration of research institutions and communities of small-scale farmers.
2. Based on the diagnosed constraints, establish strategies that integrate actors *in the correct identification of small-scale farmers' demands.*
3. Internalize the methodologies for participatory actions in research and development for the identified demands.

B. Motivating factor: Current political sensibility to the need to integrate informal and formal sectors, with a view to improving agricultural activities of small-scale farmers.

Recommendations:

1. Prepare and present to potential donors multi-institutional seed projects that improve the socio-economic conditions of smallholders.
2. Evaluate and promote the socio-economic impacts of successful projects.

3.1.5 Group 5:

A. Constraint: There is an enormous diversity of cultural, climatic and soil conditions among small-scale farmer communities that requires differentiated strategies.

Recommendations:

1. Prepare diagnostic studies through multi-disciplinary teams of experts using the participatory methodology that considers smallholders' cultural, social and economic diversity.
2. Take into consideration all the social and agronomic information already available to complement the diagnostic studies.
3. Provide continuing support to obtain different solutions to specific problems.

B. Motivating factor: Many readily available technologies and production resources (land, hand labour, etc.) available for seed production with small-scale farmers.

Recommendations:

1. Look for mechanisms to integrate complementary efforts that would optimize current production factors.
2. Utilize the motivating factor to complement the search for resources to develop on-farm seed programmes.
3. Use the results obtained from the diagnostic study of agricultural systems to develop participatory project proposals.
4. Organize and make available all the technical information on small-scale seed production through the Internet and other means of communication.

3.2 Summary of recommendations

In general, the high-level representatives of national institutions recommended that small-scale farmers of the region should have access to good quality seeds in order to guarantee them a sustainable and continuous supply system. In particular, it was recommended that:

1. Latin American countries should have national programmes to promote on-farm seed multiplication for subsistence crops by local communities. These programmes are expected to coordinate all field activities and promote the establishment and/or development of multi-institutional cooperative projects that would:
    - Promote the recovery and preservation of traditional and local varieties, and preserve biodiversity and local knowledge;
    - Provide technical assistance and training to local seed multipliers, from production to marketing;
    - Make available micro-credit lines for seed multiplication;

- Provide funds for research and technology transfer to small-scale farmers;
- Offer the available technologies and local production resources (land, hand labour, etc.) to complement the search for external financial support.

2. Any intervention related to on-farm seed multiplication should be preceded by a well-planned economic assessment of local seed systems and their impacts on the farm level. These assessments would require:
   - Training of research and extension teams to work with local farmer groups of different ethnic origins;
   - The use of participatory methodology taking into account socio-cultural, regional and economic diversity and farmers' previous experiences;
   - A multidisciplinary team composed of universities, extension services, research institutions, local and regional public services, community associations and NGOs.

3. On-farm seed production activities should be diffused through an information system network that would identify, organize and make such activities available to Latin American countries, using the modern means of communication (Internet, CD-Roms, etc.). Efforts to make local seed systems better known would result in:
   - increased political support for on-farm seed multiplication activities;
   - more available human and financial resources for local seed production;
   - greater recognition of the importance of local seed systems by the scientific community and society as a whole.

There was a consensus among Workshop participants that on-farm seed programme priorities may vary among Latin American countries, hence the requirement for special adjustments according to each country's political and social organization.

IV. TECHNICAL PRESENTATIONS AND DISCUSSIONS

4.1 Formal and informal seed systems: Definitions, perceptions, concepts and prejudices

C. Bragantini

4.1.1. Introduction

Since the origins of agriculture, self-sufficiency in seeds has been achieved through the selection and preservation of a part of the harvest for planting in the next season. The evolution of this system started with the exchange of seeds among neighbouring farmers and grain dealers. Since then, some but not all seeds supply systems greatly evolved. While seeds supply systems of cash crops are in constant development, those of subsistence crops, so important for food security, have been slowly evolving and are in constant crises.

There are currently traditional and commercial seed systems in all countries. The informal or traditional seed system supplies seed for subsistence agriculture, while the formal or commercial seed system is the main source of seeds for cash crops.

4.1.2 Description of seed systems

4.1.2.1 Formal seed systems

The formal seed production schemes use organized channels under the supervision and quality control system provided by public or private institutions, in accordance with special rules and regulations. This system is able to meet the demands of modern agriculture and complies with the seed industry's requirements. The formal seed system is market-oriented and characterized by a continuous varietal replacement as a mechanism of technology transfer and as a market strategy. Seeds of most cash and horticultural crops, particularly hybrids, are supplied by the formal seed system. More recently, since agrochemical multinationals have started to dominate the seed market, the formal seed system has been undergoing a tremendous transformation with the advent of transgenic seeds.

4.1.2.2 Informal seed systems

Informal, or on-farm seed systems, vary among countries, regions and crops. They rely on seed-saving practices, that is, keeping part of the harvest for planting in the next season. The system usually plants local varieties of seed kept from the previous year's harvest or obtained from neighbours and/or the local market. This is the predominant system for food crops in subsistence agriculture. It is estimated that in developing countries, the informal seed system is responsible for more than 80 percent of the total area planted with subsistence crops. It is a very resilient system, which is very active even without the support of public or private institutions. On-farm seed systems are essential for improving food security for developing countries. They will likely continue to be the main source of seed for subsistence crops in the world. Since this system is not market-oriented, seeds are usually produced for consumption. Some surpluses can be bartered with neighbours or sold to local grain dealers.

Until the beginning of the 1980s, the informal seed systems were usually ignored by governmental authorities, which were more interested in developing the commercial seed system and the seed industry. Recently, the informal seed system has been receiving special attention and support from NGOs and other agricultural development agencies around the world, but it is still underused as a tool for improving food security.

Formal seed supply systems, then, are designed for commercial agriculture, and use improved varieties developed for a market that responds to the application of new technologies. These varieties are constantly being replaced by new, more competitive ones. The informal seed supply system, on the other hand, responds to the needs of small-scale farmers involved in subsistence agriculture.

While the main goal of the formal seed system is profit, something very hard to attain with subsistence agriculture, the informal seed systems aims at the self-supply of seed, considered an important alternative for improving food security.

4.1.3 Converging and diverging issues related to seed systems

4.1.3.1 The term "informal"

Throughout Latin America the term "informal" connotes illegality when related to seed systems. The reason for this is that "informal" is used to describe grain producers of some cash crops who sell part of their harvest as seed without being legally accredited as seed producers. This is a common practice in most countries. In the United States, it is known as "brown bag" seed because they are conditioned, packed in paper bags and commercialized like regular seed, but due to their illegality, they are without any identification of the seed producer. In Latin American countries they are also known as "pirate seeds".

Unlike Latin America, other regions of the world use the term "informal" to identify on-farm or traditional seed systems. This informal system is still used as a major source of planting material for subsistence crops. It is important to point out that on-farm seed production, unlike "pirate seed", is not in an unfair competition with the formal seed system, because they deal with different crops and have different objectives.

4.1.3.2. Seed quality

There is a misperception that all seed from the informal system is low quality, while all seed from the formal system is high quality. In fact, both high and low quality seed can be found in any seed production system. From another perspective, one cannot assume that all seed bartered or even sold by small-scale farmers through the informal system is invariably of good quality just because of the mutual trust between the supplier and the consumer, and therefore no quality control is required. Similarly, seed from the formal system cannot be assumed to be high quality just because it is labelled and fancily packed.

Another controversial issue relates to varietal purity in the two systems. It is a very important quality attribute for the formal system because it provides the uniformity in plant maturation, in product quality and in market appearance that is required for mechanical harvest. This quality attribute is often seen differently in the informal system. For instance, in some African countries small-scale farmers usually intentionally mix early and late maturing bean varieties in order to guarantee some harvest, especially if the rain season is not favourable. This is only possible because beans are hand-harvested.

Another controversial issue relates to the characteristics of varieties. Most modern varieties developed for the formal system are aimed at increasing yields. Plant growth and architecture are adapted for concentrating on grain production, consequently less emphasis are placed on leaves and straw. These characteristics do not always satisfy small-scale farmers because they need to feed some animals on their property. However, seed quality attributes such as physical purity and germination capacity are equally important for both systems.

4.1.3.3 Informal seed systems and the preservation of genetic resources

It is well known that commercial agriculture concentrates on large-scale production of a few high performance varieties, consequently, there is a narrowing of the genetic base. The formal seed system serves commercial agriculture by using the continuing release of new cultivars as a marketing strategy. However, its vulnerability is high because all of these cultivars often have the same genetic base.

There is currently a growing global awareness that traditional seed systems play a very important role in maintaining genetic resources through the multiplication of local landraces.

4.1.3.4 Narrowing the gap between the formal and informal systems

There is an unquestionable need to develop mechanisms to ensure the supply of quality seed of subsistence crops to small-scale farmers. The strategies utilized to reach this objective have been varied. Some attempts were made in the past to motivate the seed industry to produce and market seeds of subsistence crops for small-scale farmers. Success was not always evident because this seed market's size and dispersion do not always allow for a margin for profitability. In addition, the varieties available in the formal system are often not what small-scale farmers want. Other attempts included organizing small-scale farmer groups into small seed enterprises to supply seed to this market. Although there are some small-scale farmers already established as seed producers in their communities, the mechanisms to promote this activity still need to be developed. Another perception of informal seed supply systems is based on the principle that since they have existed since the beginning of agriculture, alternatives should be sought to promote on-farm seed multiplication without trying to make a business out of it. Along these lines, rural fairs for exchanging local landraces have been very successful, not only in providing planting materials, but also in conserving local germplasm.

Any alternative to developing local seed systems obviously requires specific strategies. This Workshop should shed some light on establishing procedures that accommodate Latin American conditions.

4.1.3.5. Limitations and opportunities for the informal seed system

There are some specific limitations to the development of local seed systems. There may be some economic limitations with horticultural crops, for instance, since the cost of producing these seeds in small scale is usually not cost-effective. Hybrid seed production requires isolating seed production fields and is therefore unsuitable for small-scale farmer communities. Another limitation relates to the need for investment in infrastructure such as seed conditioning machinery, tractors and implements. There are, however, seed market niches that can be occupied by organized groups of small-scale farmers. These opportunities are usually neglected by the formal system because the market is not large enough to attract large-scale farmers or because they require hand labour. These market niches need to be identified and suitable conditions developed in order that groups of small-scale farmers may explore them.

4.1.3.6 The modern formal system and the primitive informal system

The success of the "Green Revolution" in increasing global food production has relied heavily on developing countries' capacity to develop their formal seed production systems. At the same time, the local seed production schemes were considered primitive and less important, not only by local authorities, but also by the technical and scientific community. This misconception retarded the development of a closer linkage between the two seed systems, which became widened. While the formal seed system received financial, technical and other support from government, and developed fast, the informal system either remained unaltered or collapsed in eventual crisis due to climatic or social disturbances.

With the present urge to increase food security in developing countries, there is a favourable environment for the development of local seed production systems to reach seed security for subsistence crops. In some African countries, this is being supported by NGOs and other development agencies. It is expected NGOs and Latin American governments will now concentrate efforts on the development of informal seed systems.

4.1.3.7 Discussion

J. Rosales: Regarding terminology, in Bolivia the term "informal" immediately connotes illegality and should therefore be avoided. With respect to the possible conflict of interests between the promotion of modern varieties and on-farm germplasm conservation, there are some organizations with external funds in Bolivia, which, under the umbrella of germplasm conservation, deprive small-

scale farmers from using more productive varieties. They cause these farmer groups to continually obtain poor yields.

C. Bragantini: I have the feeling that the term "informal" will probably have to be replaced with one or more terms that would better describe this important seed system in Latin America. The terminology is also important because it can create barriers within the legislation. The Brazilian seed law is presently being revised and the term "Creole seed" (seed of local varieties) is being introduced to provide resource-limited farmers with access to credit in order to plant this type of seed.

N. Francelino: I would like to add that the new Brazilian Seed Law recognizes farmer groups, such as "family agriculture", "rural settlements" and "Indian farming groups", and seed production activities in these communities. In addition, it states that traditional and local varieties are not required to follow the same rules (varietal description and varietal testing, etc) as are modern varieties. I also agree that the term "informal" should be avoided because of its proximity to illegality.

G. Blanco: Many years ago, when the Seed Unit of the International Center for Tropical Agriculture (CIAT) in Colombia was working on the development of other types of seed systems in Latin America, the term "non-conventional" was used in many papers to describe seed systems that were different from the "formal" or "conventional" systems. I find this very satisfactory and propose its use. I would also like to suggest the addition of one of these papers in the proceedings of this Workshop, as an extra source of information.

I would like to comment that, in my opinion, the introduction of modern varieties in small-scale farmer communities should be the farmer's choice and we cannot keep them poor just for the sake of germplasm conservation. Genetic variability does not provide a direct advantage to the resource-limited farmer, so he or she should be compensated if there is an interest in involving him or her in the conservation of genetic resources.

V. Fukuda: In your presentation you did not mention vegetative propagated crops such as cassava. Are we supposed to discuss this during the Workshop?

C. Bragantini: Of course, particularly because cassava is a typical small-scale farmer crop. In addition, cassava multiplication requires extra care to avoid the dissemination of diseases.

V. Fukuda: By the way, I have a very interesting paper describing small-scale farmers' multiplication of disease-free cassava plantlets produced *in vitro*. I believe it would be interesting to add a copy of this paper to the Workshop proceedings as an additional source of information.

T. Dias: Years ago, the Centro Nacional de Recursos Genéticos e Biotecnologia (CENARGEN) Embrapa was involved in restarting the multiplication of some special maize germplasm lost by Indian communities and being conserved in the germplasm bank. This is a true example of the importance of on-farm germplasm conservation through seed multiplication activities.

C. Bragantini: Just a reminder that this Workshop is to address seed multiplication problems of Indian communities and other minority groups such as farmers' groups formed by ex-slaves.

V. Giusti: Returning to the problem of terminology, I think the most appropriate term for replacing "informal system" is "traditional system".

E. Vieira: I have been recently involved with germplasm collection in several regions of Brazil and notice how important and how rich the genetic variability can be in some regions. My concern is related to the potential loss of genetic variability if local germplasm is replaced by commercial varieties.

C. Bragantini: This is probably one of the most important challenges we face - to increase yields of subsistence agriculture through the introduction of more productive varieties and, at the same time, to promote on-farm maintenance of genetic variability. I am sure that a serious project dealing with this issue would have no problem in finding financial support.

H. Vasconcelos: The solution to this problem could be through the development of market niches for traditional varieties. I had a chance to work with small-scale farmer groups that were interested in maize varieties that could produce some special type of straws and leaves to be used in artisan work. In this specific case, higher yields were not the most important attribute to an introduced variety.

S. Linhares: I would like to mention that the new Brazilian Seed Law indeed recognizes "local", "traditional" and local varieties in addition to the commercial cultivars and no restriction whatsoever can be imposed on these seed types.
C. Bragantini: This change in the Brazilian legislation is a big step forward and I am sure that other Latin American countries could use this new approach as a model when updating their own seed legislation.
K. Petan: Just a comment: the Ministry of Agrarian Development always supported the multiplication of local varieties through the organization of seed fairs, through the Programa Nacional de Agricultura Familiar [National Family-farm Programme] (PRONAF).
N. Francelino: I realized that there were many attempts to address this problem, but the information on these experiences with on-farm seed multiplication are scattered. It would be very useful to have it organized, either through publications on a CD-ROM or an Internet site.

4.2 An economic approach to assessing seed systems

L. Lipper

4.2.1 Introduction

In June 2001, FAO initiated a project to develop and test a methodology for conducting an economic assessment of seed systems and their impacts on farm level benefits and crop genetic diversity. The project is funded by the FAO/Netherlands Partnership Programme (FNPP) under its Access, Exchange and Sustainable Utilization of Agricultural Biodiversity component. The programme of work involves collaboration between the FAO Agricultural Sector in Economic Development Service (ESAE) and FAO Seed and Plant Genetic Resources Service (AGPS) in providing information and tools to improving the capabilities of FAO and member countries to facilitate farmers' access, exchange and sustainable utilization of plant genetic resources for food and agriculture. A key area to work on is the provision of information on the economics of seed system supply and demand, and how it affects farmer welfare and the conservation of crop genetic resources. This presentation focuses on the motivation, strategy, methods and preliminary outcomes of one FNPP-supported project over the last two years on the economic analysis of seed systems aimed at meeting this objective.

4.2.2 Motivation

Seed systems are comprised of a set of dynamic interactions between seed supply and demand, resulting in farm-level utilization of seeds and thus plant genetic resources. The seed system is essentially the economic and social mechanism by which farmers' demands for seeds and the various traits they provide are met by various possible sources of supply.

The primary research issues addressed by this project are:

- the degree to which this mechanism functions effectively, that is, the extent to which farmers' demands are met by supply;
- the way in which this mechanism affects farm-level outcomes, specifically household welfare and the conservation of plant genetic resources.

A key means for improving incomes and reducing food insecurity of small agricultural producers throughout the developing world is increasing agricultural productivity. Productivity is increased by improving farmers' access to crop genetic resources that are appropriate for their production and consumption conditions. For these producers, the primary means of access to crop genetic resources is through informal sector transactions, which include farmer-to-farmer exchanges, purchases from local markets or traders, and seed-saving from farmers' own production. In order to improve our capability of intervening in seed systems to improve farmers' access to plant genetic resources and the seeds that embody them, we need to know more about the incentives and constraints farmers currently face in accessing plant genetic resources. We need better information on the nature and determinants of farmers' demands for crop genetic resources, as well as the effectiveness of various supply mechanisms in meeting this demand. We also need to better understand how access to crop genetic resources translates into farm-level benefits or costs in terms of production and consumption. With this information we can design better policies and programmes aimed at improving the welfare of small producers and reducing food insecurity.

Promoting the *in situ* conservation of crop genetic resources is another important policy objective that must be taken into consideration in designing interventions in seed systems. At present, most of the world's *in situ* conservation of crop genetic materials occurs on the fields of small and low-income agricultural producers in developing countries. The *in situ* conservation of crop genetic resources involves the preservation of a process of genetic material evolution, driven by interactions between genes, the environment and humans in an agricultural production setting. In addition, *in situ* conservation preserves farmers' knowledge on the identification, use and value of the genetic

resource. This form of conservation has become increasingly recognized as an important aspect of biodiversity conservation, which is explicitly included under international agreements for the conservation of biodiversity, such as the Convention on Biological Diversity and the International Treaty on Plant Genetic Resources. Understanding how seed systems affect the tradeoffs farmers face in selecting and utilizing crop genetic resources is therefore essential in designing interventions that generate both improved farmer welfare and the conservation of crop genetic resources.

4.2.3 Strategy

The strategy adopted by the FNPP programme is to use a case study approach for developing a methodology for measuring seed systems and their impact on farmer welfare and crop genetic diversity. Ethiopia was selected for the case study site because it is a country where improving seed system management is a critical aspect of improving farm-level productivity and meeting its national food security objectives. Ethiopia is also a primary or secondary center of origin for several crops, including sorghum, wheat, barley and coffee.

The case study was built on an impact assessment of a seed system intervention implemented by the NGO Hararghe Catholic Secretariat (HCS) in a drought-prone region of eastern Ethiopia. HCS has implemented a seed system project over the past seven years, which involves selecting and cleaning local landraces of wheat and sorghum for multiplication and distribution to seed-insecure households. HCS also supplied improved varieties of wheat and haricot beans to participating farmers in some areas. Seeds were provided under a credit arrangement, which required repayment in the form of seed with a 15 percent interest charge.

The strategy adopted by the FNPP project was to use the HCS intervention as one means of defining a seed system, and to conduct detailed surveys at the plot, household and community level on socio-economic and agro-ecological conditions, seed supply, demand and utilization patterns, and agro-morphological characteristics of crop varieties. Communities sampled for the study were divided into participants and non-participants in the HCS project. The household sample was divided into three groups: (i) those who were participants in the HCS project, (ii) those who were not participants but who resided in communities where HCS had intervened; (iii) and those who were not participants and who resided in non-participant communities. The sample was designed to limit the degree of variation arising from agro-ecological factors in order to better isolate the impacts of the project.

In the HCS project area there are three major agro-ecological regions – lowlands, midlands and uplands. They mainly differ in elevation, and thus rainfall and cropping patterns. The sample was limited to midlands and uplands areas where sorghum, wheat and haricot beans are the primary crops. The non-project participant households (e.g. the control group) were selected to match the characteristics of HCS project participants to the greatest extent possible. A total of 720 households were surveyed in 30 peasant associations (equivalent to a municipality).

4.2.4 Methods

The method used for this project was the development and implementation of five different surveys on various aspects of seed systems, all interlinked by location. The household, community and market surveys were used for collecting information on seed supply and demand, and impacts of seed systems on farmer welfare. The agro-morphological and community focus group surveys were used to collect information for measuring crop genetic diversity.

For each of the selected Peasant Associations a survey was carried out on the community characteristics, infrastructure, marketing facilities and sources of seed supply. A key informant from the community, usually a government official, provided the information source. In addition, a group of households was surveyed within each of the selected Peasant Associations. In the non-participant communities 15 households were surveyed; in the participant community, 15 participating households and 15 non-participant households were surveyed. A total of 360 participant households were surveyed - 180 non-participants in participant communities and 180 non-participants in non-participant communities.

The household survey was conducted in two rounds: the first in August 2002 after the planting of the main crop of the year, and the second in February 2003 after the harvest. The household survey collected information on family structure and labour availability, agricultural and non-agricultural assets, crop and variety identification by plot, farm production (input and output) by plot, off-farm income sources, finance and access to credit, vulnerability, and coping strategies for disasters. In addition, the household survey covered detailed information on the farmers' seed demand and supply for wheat and sorghum crops. For these crops, information was collected on specific varieties. Questions covered where varieties are obtained, how often they are renewed, how much they cost to obtain and why they are preferred. Farmers were also asked to name varieties that they had planted in the past or would like to have.

The market survey involved the weekly collection of data over a two-month period (at planting time) from local markets where seed and grain were sold. The markets were usually located within the sample Peasant Associations, although some larger markets were outside. Data was collected on the prices and quantity of seed and grain sold by variety.

The agro-morphological and community focus group surveys were designed in cooperation with the International Plant Genetic Resources Institute (IPGRI). The main objective of the agro-morphological survey was to determine the characteristics of varieties that are consistently identified by farmers, in order to be able to link variety names and traits. The survey required characterization of 30 plants per plot in farmers' fields, listing all traits of a given variety. The community focus groups were another means of validating variety names. The main objective of the survey was to analyse the content of variety names, and the extent to which they are consistent across and within communities.

The data collected was entered into a computerized database and analyses were initiated. Statistical methods are used to identify relationships between variables, such as spatial econometrics, analysis of variance and principal components analysis.

Data will be used to define seed systems in various ways, to examine how well they function and their impacts at the farm level. We will begin by defining seed systems by the cost of obtaining seed, using our data on prices paid, value of in-kind exchanges and value of time and travel costs in obtaining seed to derive a cost of obtaining seed for each particular variety. We will analyse the variability in seed costs – if it varies mostly between communities or if there also significant variation within a community. We then plan to examine why some people face higher costs than others – if this is related to social networks, locations and/or income groups. The surveyed farmers will then be divided into groups based on the amount they pay to obtain seed of a particular variety; this information will be used to define the seed system of each household. Differences between farmer productivity, income and food security, as well as utilization patterns of plant genetic resources between these different groups will then be analysed.

In addition to using the cost of obtaining seed as one measure of a seed system, we plan to develop others that are not variety-specific, but crop-specific. One crop-specific measure is whether a household participated in the HCS programme or not. In participating in HCS, we assume a household is in a different seed system than are non-participants. We will then analyse the differences in farm benefits (productivity, consumption, income) and in farm conservation of crop genetic resources. Other measures of seed systems to be developed will be based on primary seed source and social networks.

4.2.5 Initial results

At this point we have only preliminary descriptive results from our study. A selected sample of the descriptive statistics on seed supply and demand is summarized in this section. Figure 1 shows ample variation in the sorghum varieties planted by farmers. Almost all sorghum varieties grown in the area are landrace varieties. Some improved varieties of sorghum have been developed but are not widely grown.

Figure 1 Sorghum variety distribution by household in 2001 planting season
Percentage of households planting

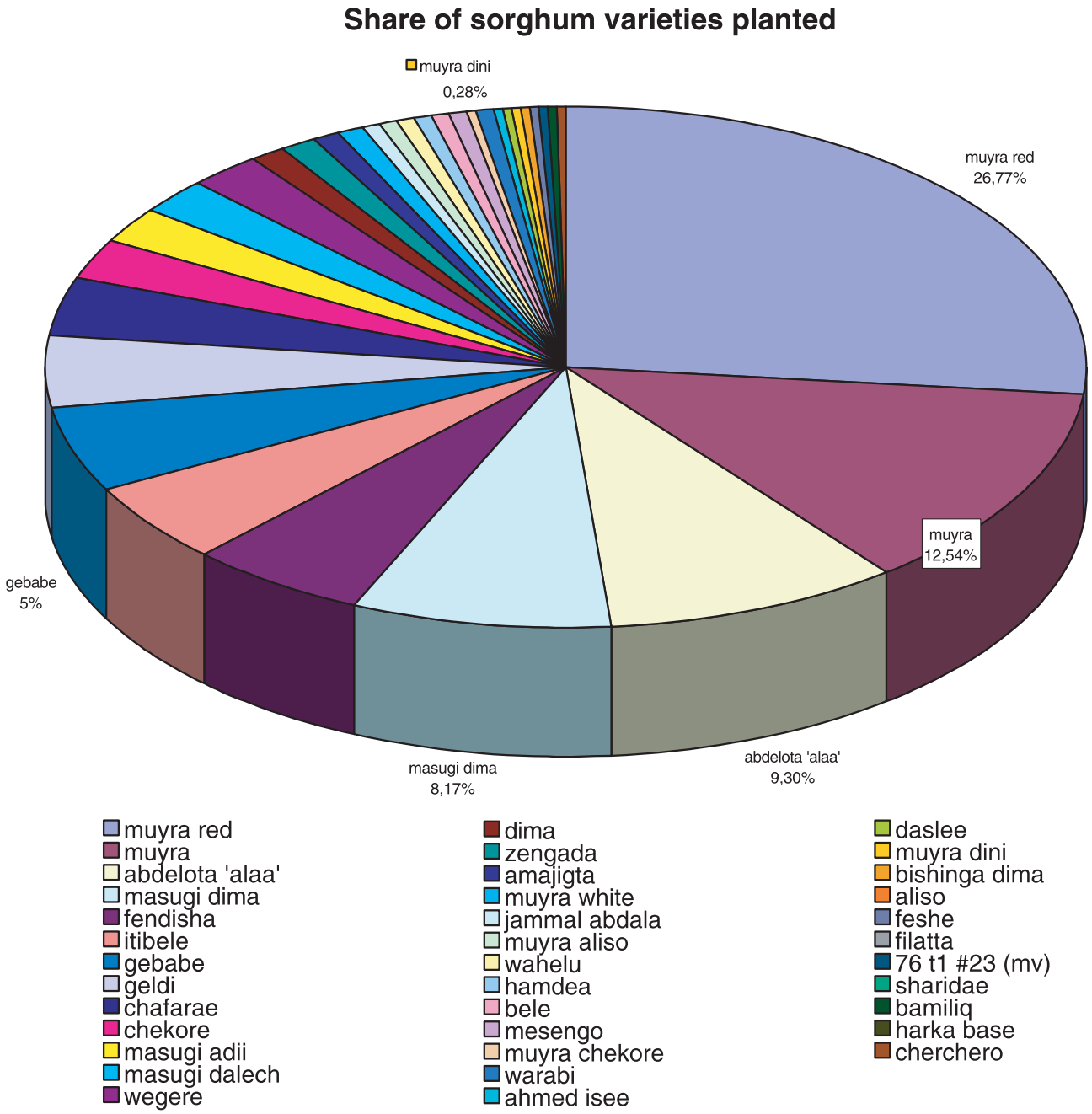


Table 1: Results from community focus group survey on descriptors for sorghum varieties

Varieties/ Descriptors	Stalk height	Grain Colour	Market value	Food quality	Grain yield	Grain size	Maturity	Tiller count
1. Chefere	Short	Red/ White	Best	Sweet	High	Small	Late	High
2. Muyra (Red)	Tall	Red/ White	Medium	Poor	Medium	Bold	Medium	Poor
3. Zengada	Tall	Red	Less	Bitter	Low	Small	Early	High
4. Fendisha dima gebabe	Short	Red/ White	Best	Sweet	Medium	Medium	Late	High
5. Fendisha adi gebabe	Short	Red/ White	Less	Sweet	Medium	Medium	Late	High
6. Chukura	Tall	Brown	Less	Sweet	Low	Medium	Early	Medium
7. Jengatelil	Tall	Yellow	Less	Bitter	High	Bold	Late	Poor
8. Dasle	Tall	White	Best	Sweet	High	Bold	Early	Medium

Table 1 shows some results from the community focus group survey where groups of farmers assigned values to varieties of several characteristics. It is interesting to note that the most commonly grown sorghum variety, muyra red, has only medium market quality and poor food quality, while the much lesser grown variety, daslee, is very high in market and food quality. The question then becomes, why isn't the latter being grown more? Figure 2 gives some insight into the answer.

Figure 2 Difficulty in obtaining sorghum varieties
Reported by sample farmers: Ethiopia seed study

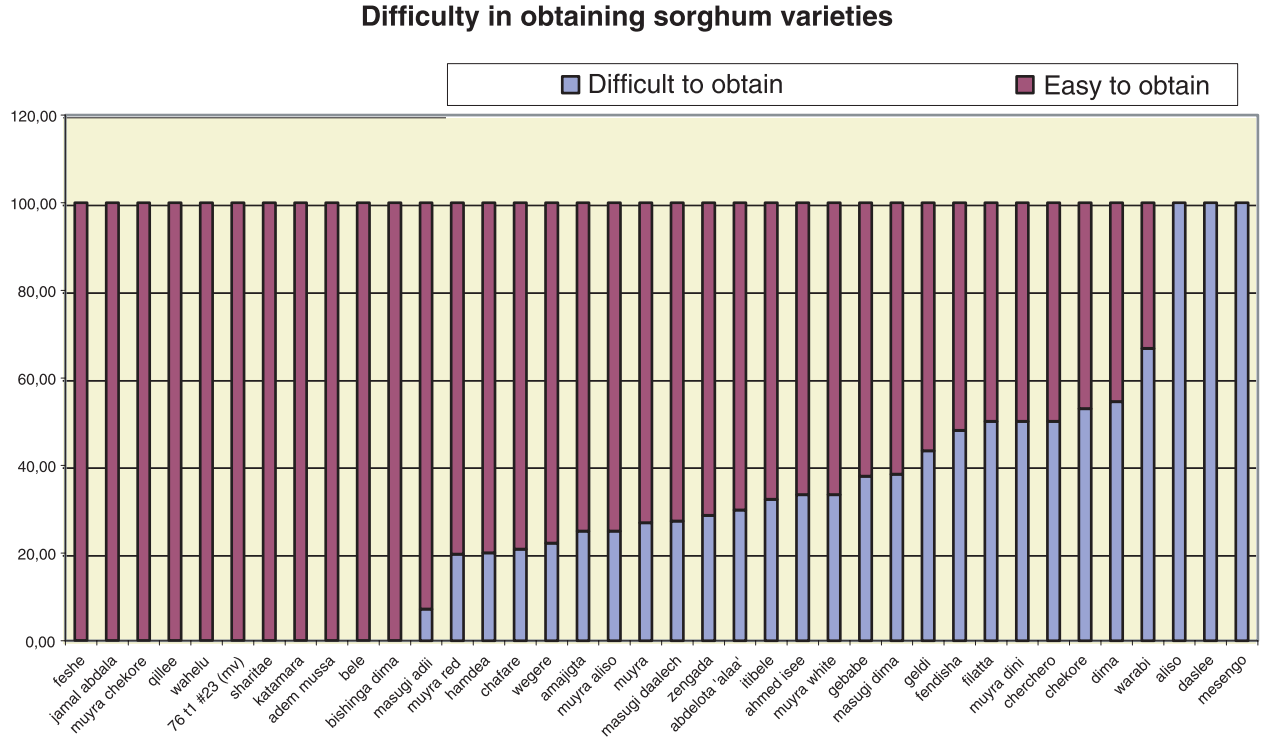
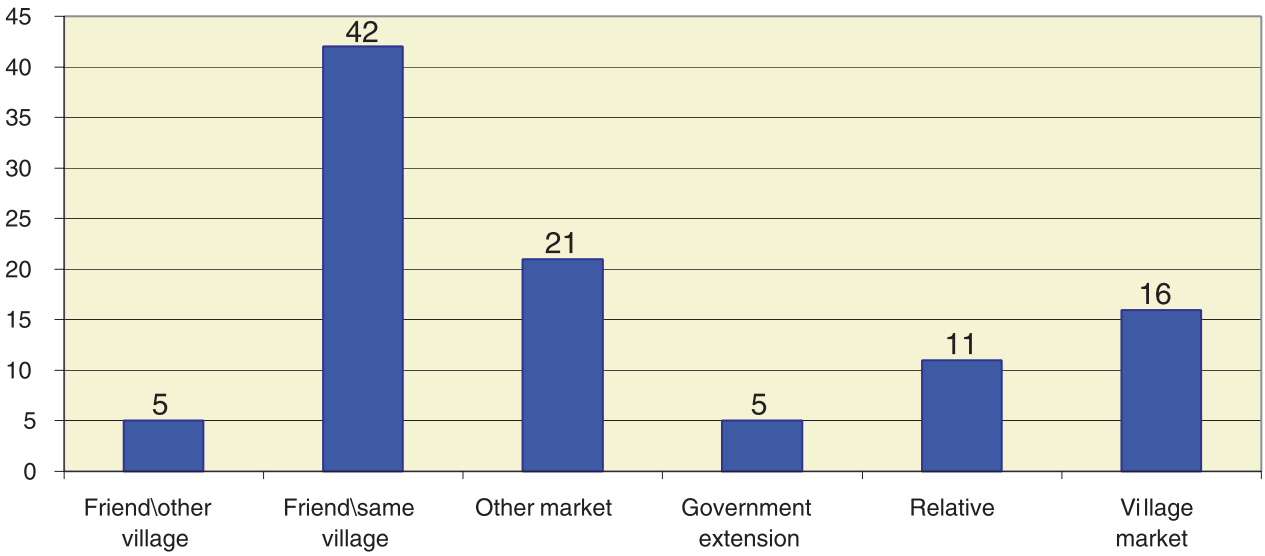


Figure 2, derived from data from the household survey, shows that according to the surveyed farmers, muyra red is a much easier variety to obtain than daslee. All of the farmers (100 percent) who have planted or are planting daslee report that it is a difficult variety to obtain.

Figure 3: Sources of sorghum seeds
Reported by sample farmers: Ethiopia seed study



In order to understand why daslee is a more difficult variety to obtain than muyra red, we need to look at the sources of these varieties. Figure 3 shows the overall percentage breakdown of the source of sorghum seeds from the households surveyed. More detailed analysis of sources by varieties will be conducted by the project in the future.

Figure 4: Wheat variety distribution by househol in 2001 planting season
Percentage of households planting

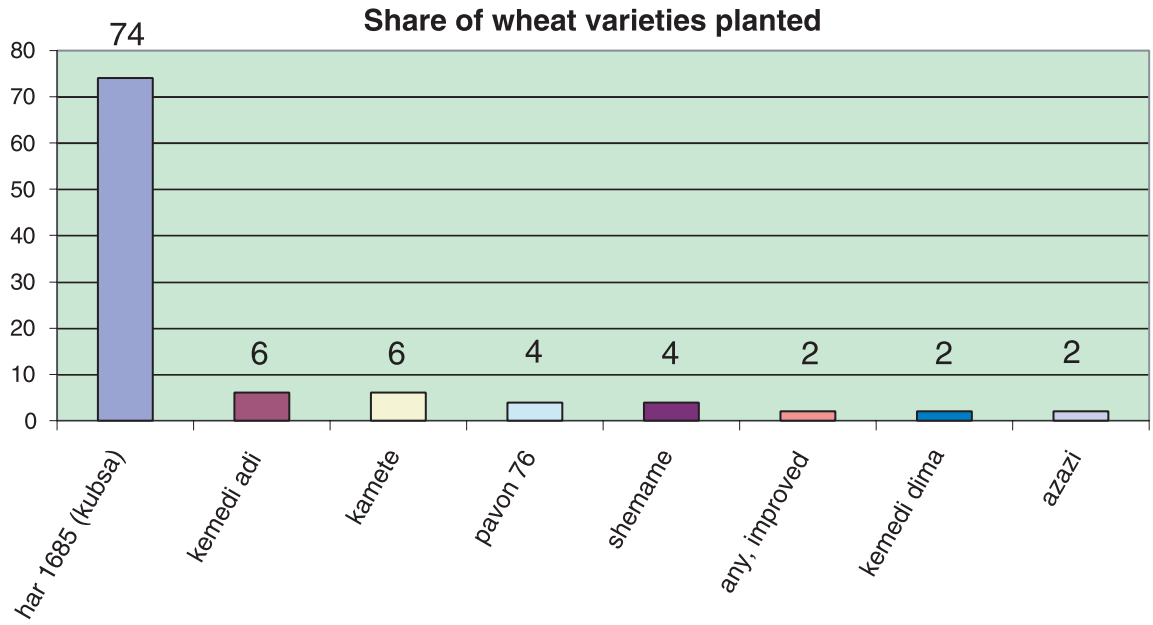


Figure 4 shows the percentage share of households that reported planting specific wheat varieties. As shown, there is a significantly lower number of varieties planted compared with sorghum. Most of the wheat-planting households used a modern variety (HAR 1685), in contrast to sorghum growers who used mostly landraces. Our data also indicates that a much higher percentage of seeds purchased for

wheat than for sorghum. It suggests that the seed system for wheat is quite different than that for sorghum, although this difference at the household level has yet to be analysed.

4.2.6 Discussion

C. Bragantini: Based on your experience in Ethiopia and Brazil, do you think that the methodology developed for Ethiopia would work for the target groups in Latin America?
L. Lipper: Based on the experience we gained in Ethiopia, we could now make this diagnosis for Latin American groups much better and faster. Of course, the methodology will always need some adaptation to local conditions.
V. Giusti: In Latin America, formal and informal seed systems are evident. Is this true for Ethiopia?
L. Lipper: The formal system in Ethiopia is not well developed and the seed produced through the informal system represents almost all the seed produced in the country.
J. N. Francelino: It seems to me that a good way to integrate small-scale farmers in the market is to first identify the local materials available and then look for market niches for these products. Partnership with NGOs through networking is very important.
L. Lipper: NGOs are very important in the network, but keep in mind that it is not always easy to establish partnerships between them and public institutions. They can be very resistant to this type of networking.
T. Dias: The diagnosis is also very important in identifying cultural barriers. For instance, when I first started working with the Krahô Indians, I learned that they believe that youngsters should not work with groundnuts because it could interfere with their fertility. I found your methodology very interesting but would like to have more detailed information.
L. Lipper: I have all the details here with me and I can discuss it with you later.
S. Teixeira: I believe that interviewing 720 farmers for this study is a little exaggerated. It could be done with many less interviews.
L. Lipper: We wanted to understand the relationships between productivity and germplasm conservation, and we needed to have a large sample to capture heterogeneity within and among the various groups.
K. Pettan: Seed certification and any other kind of quality control do not seem to be adapted to family agriculture because they are not market-driven. Family agriculture seeks self-consumption.
V. Fukuda: What is your opinion on the researchers' needs to leave their laboratories to go to interact with the small-scale farmers communities?
L. Lipper: There are still many communication problems between researchers and small-scale farmers' communities. I would like to mention that FAO is deeply interested in establishing its role in both technical and political scenarios.

4.3 Speech on sustainable development

Ciro Correa

4.3.1 Historical background

We are now facing the third of three phases of the rural reality in Brazil's history that has led the country to monoculture exports, poor management of environmental resources, poor work conditions, and domination by large property owners.

Phase 1 – *The Plantation model*. This model relied heavily on manual labour. Two good examples are the ancient coffee and sugarcane plantations in Brazil.

Phase 2 – *The Industrial model*. The Green Revolution was environmentally and economically unsustainable, socially unfair and culturally inappropriate. Agriculture aimed at exporting agricultural products, producing cheap food to keep salaries low, producing raw material for industry, releasing manual labourers to cities, and using industrialized products like seeds, chemical fertilizers, equipment and pesticides. All of this generated an unprecedented, enormous socio-environmental crisis. During the 1980s this model became exhausted and brought agriculture into crisis.

Phase 3 – *The North American model*. During the 1990s the new economic model started in Brazil and subordinated the economy as a whole to foreign capital. Agriculture became totally subservient to the logic and the integration of agrarian, industrial, commercial and financial capital. The search for profit greatly aggravated problems of land tenure, means of production and the production itself, creating a total subordination of agriculture to the industry. The State, totally subjected to this model, altered the following social relations with the rural environment:

- The control of agricultural market by large multinationals. The State left the control of food supply and prices to the market, which is now being controlled by a small number of large corporations. These corporations are now establishing the price of agricultural products at national and international levels. Examples include Bung, Cargill and Monsanto.
- Promotion of agricultural production for export through large-scale farmers with investments in infrastructure for transport of produce and the opening of new agricultural frontiers.
- Changes in agro-industries, which are sold to multinationals, concentration and monopolization; selectivity of integrated farmers, changes in the technological standards of production.
- Dismantling of the agricultural public sector: rural credit, technical assistance, CONAB (National Food Supply Company), research and insurance, etc;
- A new technological package in progress - biotechnology. The international financial capital of three different sectors that were historically separated (pharmacological, agro-chemical and food supply) is now being merged into one single company.

4.3.2 Consequences of the current agricultural model

This current model is transforming agriculture into a factory assembly line, with production being turned into an industrial process. Since the model concentrates power and profits, family agriculture has become totally unviable and any policy that tries to promote it becomes only compensatory, simply delaying its failure. These are the consequences:

a) *Land concentration*. From 1985 to 1995 almost one million rural properties with less than 100 ha disappeared, while rural properties with more than 2 000 ha increased from 19 000 to 27 000. These large rural properties now control 127 to 177 million ha. In addition, land utilization does not represent the interests of the society as a whole and even less the interests of workers; it represents the interests of payment balance, neglecting economic progress and people's wellbeing. Our best lands are planted with monocultures of soybeans, citrus, coffee, sugarcane and cotton, while food production has stagnated. From the 350 million ha of farmer-owned agricultural land, only 40 million ha are being cultivated. If the agrarian legislation were effectively applied, there would be 120 million ha available for agrarian

reform. This concentration of land ownership in the hands of a few is causing an enormous rural exodus. In the last 40 years, more than 40 million people left rural areas in Brazil, and more than 500 000 migrated to Paraguay, Bolivia and Argentina.

b) *Concentration of capital and profits*. Out of almost 5 million agricultural properties only 600 000 are presently able to survive within the current agricultural model. Rural properties with less than 50 ha in the southern region of Brazil have monthly incomes of less than one minimum salary, with very rare exceptions.

c) *Reduction of agricultural employment*. More than two million people that used to live on their agricultural salary have lost their jobs in the last eight years. Around 50 percent of these rural workers earn up to US$ 30/month, 64 percent of their work being informal, without labour contracts. The indicators of development such as electricity, home appliances, literacy levels, availability of medical doctors and per capita income resemble those in the poorest regions in the world.

d) *Increase in agricultural imports* such as wheat, rice and beans that are the staple crops that used to be produced locally by small-scale farmers.

The adoption of this model is under way globally, but at a different pace in Chile, Indonesia, Mexico, Europe and the United States. All these countries face similar problems as in Brazil.

4.3.3 The popular project for agriculture

The only way to challenge the current agricultural model is through a national project that would reconstruct Brazil's political and economical geography, and guarantee political, economical, social and cultural democracy:

- *Democratization of assess to land*. Wide, massive and rapid agrarian reform should be developed, promoting the return to rural areas and the resettlement of farmers in their land. The maximum size of rural property and small-scale farmers' credit lines should be established.
- *Public policies*. Public policies must lay the foundations for development, with subsidized credit as a form of redistributed income. This should avoid small properties from becoming poor, making available public technical assistance, education, infrastructure and housing, roads, energy and communication.
- *Promote cooperation*. Cooperation should be developed in many different ways not only as the driving force for production, but also as a personal and social value. Such values would avoid the degradation of human relationships caused by the current stimuli to individualism and competition.
- *Technological model*. A technological model should be developed to promote the basis of sustainable development, free from agro-industrial monopolies.
- *Agro-industry*. Small and medium-size agro-industry in all provinces should be implemented. These small businesses would aggregate profits, avoid the exploitation of farmers, stimulate cooperation, and decentralize economic development, generating youth employment.

4.3.4 The Vía Campesina Proposal

The principles of this Proposal are:

- *Biodiversity*. Biodiversity cannot be privatized. Patenting of living organisms have to be combated. Biodiversity should be available to and controlled by the people.
- *Seeds are the patrimony of people*. Seeds have been collected, improved and multiplied by rural and traditional populations for more than 10,000 years and should be kept as the patrimony of people. They do not belong to any multinational company.
- *Agriculture should not be part of the World Trade Organization (WTO)* . We propose that the WTO should not legislate on agriculture. Agriculture is beyond the laws of the free market

because food production is a basic condition in building citizenship. We defend the food sovereignty of people as a right in all countries, allowing them to produce food autonomously.

4.3.5 Seed production in rural settlements

Seed production in rural settlements is a tool for challenging the current neo-liberal model of agriculture and is the first step for the construction of a new agricultural model based on agro-ecology. Seed production is not limited to building farmer's autonomy in seed, but belongs to a much broader context, requiring reflection on values and strategies for farmer's resistance to the current model, including:

- *Cooperation*. We develop a politic awareness that cooperation is fundamental for the strengthening of agrarian reform and small rural properties. Cooperation will lead us to build something new.
- *Solidarity*. We promote harmonious human relations, emphasizing that we are all equal.
- *Cultural return.* We promote the return of rural cultural practices as part of people's culture. Seeds have always been selected, improved, multiplied and exchanged among rural families.
- *Technological model*. We promote the debate and the search for autonomy from external inputs, minimizing the impact in the environment and avoiding the drainage of family profits.
- *Gender relations*. We promote the valorization of men, women, children and elderly people and their participation inside the family as a whole.

4.3.6 Discussion

C. Bragantini: You mentioned the creation of Bionatur, a horticultural seed production company within the Landless Rural Workers' Movement (MST). It seems to me that this seed company complies with all normative requirements and is therefore part of the "formal" system. Could you explain how the seeds from Bionatur are made available to farmers in rural settlements (sale, barter and donation, etc.)?

C. Correa: Bionatur started small, with 12 farmers who became seed producers. Presently, seeds are distributed through seed fairs and direct sale in 23 states of Brazil. Sometimes the negotiation of seeds does not include payment in cash.

N. Francelino: Bionatur is surely under the formal system because it complies with all the requirements.

C. Bragantini: How does MST deal with the supply of seeds in new rural settlements?

C. Correa: The agrarian reform in Brazil does not support new settlements; farmers plant the seeds they buy. In the first season after settlement MST is concerned with how to improve food security. The ideal situation for MST would be for each farmer to produce his or her own seed.

C. Bragantini: Why doesn't Bionatur diversify and produce seeds of major subsistence crops such as rice, beans and maize?

C. Correa: We are thinking of producing maize seeds next year.

N. Francelino: Who is presently in charge of the certification of the Bionatur organic seed?

C. Correa: The organization that is supervising our organic seed production. Ecovida does not have the credentials for this activity so we foresee problems in the future. However, we are planning to question the current legislation on organic materials because we understand that it is another means of making a monopoly of this activity.

C. Bragantini: Since seeds are not offered for sale in the open market, I cannot understand why MST wants to have the organic seal.

C. Correa: Because legislation will probably force us to remove the term "agro-ecological" from our seed bags.

A. Didonet: In your opinion, what are the research priorities of the rural settlements?

C. Correa: There is a need to build the foundation of technical knowledge as a whole, but I would also mention ecological soil management, insect control and recuperation of degraded soils. In reality, so far governments have only served entrepreneurial agriculture. This situation needs to be changed.

V. SEED PRODUCTION AND CONSERVATION BY SMALLHOLDERS; CASE STUDIES IN CENTRAL AMERICA

5.1 The Cuban project of seed production with small and medium-scale farmers

Miguel Socorro Quesada

5.1.1 Introduction

Seed production in Cuba is organized to comply with technical requirements that ensure the quality that the market needs. In Cuba, as well as other countries, seed production is done through pre-established schemes by parastatal companies and cooperatives.

Recent changes in production arrangements have strengthened new forms of production (individual producers, contract growers and land users) and led to the need for alternative schemes for seed production. Local producers usually plant their own seed because it is available at the right moment and helps keep production costs low with the grain quality they like. In order to reach this objective some farmers separate part of their production area and keep it for seed. This procedure is not correct, however, because it does not meet the required quality standards that are usually met with more sophisticated procedures like drying, conditioning, storage, and the evaluation of physical, physiological and sanitary quality standards.

In this context, the United Nations Development Programme (UNDP) was requested to find financial support that would comply with the following objectives:

- To establish a seed production system for small and medium-size properties (known in Cuba as "Popular Production").
- To develop a training programme for seed producers under the above conditions.

FAO contributed to project implementation, supporting all training activities and requisite consultancies.

5.1.2 Materials and methods

In 1999 several communities were selected in four provinces in the eastern region of Cuba for project installation, taking into consideration the food insecurity of this region due to El Niño and the intense dry spell that followed as a consequence. In addition, this zone had seed supply problems because of its poor links with research institutions located in the capital and in the neighbouring Province of Havana.

Several agricultural production institutions actively participated in each community with more experienced producers in the following crops:

- **Rice** (*Oriza sativa*), a basic component of the Cuban diet.
- **Beans** (*Phaseolus vulgaris*), a basic and important food for the Cuban diet, like rice.
- **Maize** (*Zea maíz*), traditionally cultivated for human consumption and animal feed.
- **Sunflower** (*Helianthus annuus*), a source of cooking oil for human consumption.

In Cuba, there are four classes of seed:

- original or genetic
- basic
- registered
- certified.

The Project supported the production of genetic and basic seed through the research institutions and research stations in the region, while registered and certified seeds were produced in provincial farms and by growers in their own land or in cooperatives, supported by project resources.

In Cuba, all classes of seed produced pass through a rigorous quality control programme done by the State that controls varietal purity, off-type plants, noxious weeds, presence of pests and diseases and germination capacity. The total volume of sunflower, rice, beans and maize seed produced by the Project between 1999 and 2001 are shown in Table 2.

Table 2: Volume (metric tonnes) of seed produced in four Cuban provinces in 1999 and 2001

Province	Crop/class	Basic		Registered		Certified	
		1999	2001	1999	2001	1999	2001
Las Tunas	Sunflower	0	0.7	0	7.9	0	0.40
	Rice	0	0	0	5.7	0	36.10
Granma	Rice	0	2.3	0	25.5	0	625.50
Holguín	Beans	0	3.95	0	46.9	0	26.15
	Maize	0	2.6	0	50.1	0	10.27
Guantánamo	Maize	0	0	0	0	0	136.70

The project objectives aimed at showing farmers the value of good quality seed and implemented a large training programme for many farmers with courses and field days.

5.1.3 Main results

The main results were:

- increase in availability of seeds;
- increase in yields;
- increase in quality seed use;
- better seed prices;
- increase of available jobs;
- use of available land for food production.

In 1999, before the start of the Project, no seed of any class was produced because there was no official seed produced under the local system.

Another important achievement was related to seed commerce. Producers and small-scale farmers that were once isolated now sell their seed to seed companies that process and commercialize seeds identified by class, providing some control of generations and then improving genetic purity.

The good seed price policy contributed to the promotion of seed production and commercialization by these participatory farmers.

Another successful programme that strengthened the informal seed production was the distribution of a varietal collection of some crops such as rice, promoting the use and improvement of local varieties by local farmers. In plant-breeding experiences, farmers have better-adapted materials and a much wider genetic diversity; they *test, select and distribute* seeds, which speeds up the adoption by neighbouring farmers.

5.1.4 Conclusions

As in the formal seed system, seeds are produced through local production of food crops and may be labelled into classes. The training programme for seed producers has been vital in meeting the proposed objectives.

5.2 Experiences, success and new perspectives of the "Pound per Pound" National Seed Distribution Programme in Nicaragua (PNLL)

Luis Mejía

5.2.1 Summary

In 2002, through the Nicaraguan Ministry of Agriculture and Forestry (MAGFOR), the Government of Nicaragua started the Pound per Pound National Seed Programme (PNLL) with the main objective of promoting the use of certified seed by small- and medium-scale farmers.

The programme distributes seeds through a coupon system, giving priority to crops like maize, beans, sorghum and rice, implemented by provincial field units, which furnishes one coupon per farmer per crop. In addition to the distribution through coupons, seeds are also directly transferred and exchanged with traditional grain, providing farmers with higher yield varieties.

During the first year the programme invested 3 000 000 dollars, reaching 91 558 farmers and covering an area of 127 745 mzs[1] in 120 municipalities. During the next growing season, 98 843 small-scale farmers received 59 917 quintals (qqs)[2] of certified seeds for planting 137 015 mzs, which represents around 14.5 percent of the total area planted in the country.

The programme is financed by several donors, including the World Bank, US Agency for International Development (USAID), FAO and the Government of Nicaragua, with private sector participation through the coupon distribution services, NGOs, local governments, commercial companies and public sector technical assistance.

5.2.2 General objective

Promote the development of a seed market through increasing seed demand and establishing the seed supply chain.

5.2.3 Specific objectives

Specific objectives include:

- massive distribution of certified seed (hybrids and improved varieties) through a coupon system, distributed through the local supply chain;
- strengthening local seed distribution systems to ensure access to certified seed on time to farmers throughout Nicaragua;
- contributing to the improvement of concepts and the implementation of marketing systems for the development of economically sound and sustainable seed enterprises;
- promoting the certified seed trade through financial institutions and NGOs;
- ensuring that grain received as payment from beneficiaries are properly handled.

5.2.4 Programme implementation strategy

Historically, most farmers in Nicaragua involved in subsistence cropping use their own commercial grain as seed, which has a direct effect on their yield because no improved varieties are adopted. Exceptions are sorghum for industry and oleaginous crops.

Since the beginning of PNLL, a seed supply system through coupons or vouchers enabled the set-up of a system strategy.

MAGFOR is the National Coordinator of PNLL, represented by the General Division of Territorial Delegations in each department and a technical team. MAGFOR determines the total area to be accomplished each planting season by department, crop, and the total number of beneficiaries, and has prepared a manual indicating the procedures in seed delivery.

[1] 1 ha = 1.42 manzanas (mzs)
[2] 1 quintal = 46 kg

During the period 2002/2003, certified seed distribution through coupons campaign, 91 658 farmers in 120 locations were able to plant better hybrids and varieties that were available in the market, tested and approved as being adapted to the local conditions. Under this programme, each beneficiary was given enough certified seed to plant 1.5 mzs of maize, 1 mz of beans, 1 mz of rice and 2 mzs of sorghum or sesame seed, depending on the region in which beneficiaries are located.

The subsidy for the seed distribution is to phase out with time, from 100 percent of the cost in the 2002/2003 season, to 80 percent in the 2003/2004 season, to 40 percent in the 2004/2005 season.

Other strategic approaches for the medium term are:

- diffusion of information on new cultivars and how to find them.
- massive certified seed distribution campaigns to small and medium-scale farmers through the coupon system with the objective of disseminating new cultivars. These campaigns will be implemented through public and private extension services in order to ensure the correct utilization of these inputs.
- improvement of the capability to generate and transfer market information that will increase the efficiency of seed businesses.
- training and support of seed companies in the development and implementation of seed marketing plans, taking advantage of the present and future market potential.
- development of the administrative and entrepreneurial capacities of seed companies in order to improve their financial efficiency and sustainability.
- strengthening of seed distribution systems under a network that will improve access to high quality certified seed. Seed companies will be motivated to develop their own network to create a seed distribution network.
- training of extension workers whose opinions will influence the small- and medium-scale farmers in the use of quality seed of improved varieties and hybrids. Workers may come from the Nicaraguan Institute of Agricultural Technology (INTA), NGOs and/or other extension agencies, as well as other agents in charge of certified seed distribution.
- promotion of credit availability to acquire certified seed through NGOs and other financial institutions.

5.2.4.1 Coupon distribution and grain-bartering

The programme established a pound per pound barter system where farmers provide grain ready for planting and receive certified seed. Farmers therefore have the opportunity to access certified seed with a much higher quality and yield capacity.

For the main 2002/2003 planting season, PNLL subsidized all the costs of seed distributed. The barter is implemented by the executing agency selected in the region, which fills out forms with farmers' data and seed delivered.

The goals of this system aimed to: (i) clearly demonstrate to the beneficiaries the differences in cost between the seed and the grain; (ii) promote the habit of paying for the high quality input being co-financed; (iii) use the bartered grain to feed families stricken by natural disasters.

The MAGFOR administration hired a private company with nationwide coverage for coupon and seed distribution, and for handling the grain received during the 2002/2003 season. This company cooperated with all executing agencies of each department in sharing information and responsibility in control.

5.2.4.2 Coupons and seed distribution by agro-services

The local agro-services outlets shown in Table 3 promoted seed marketing, making new and more productive varieties available by using coupons identified by different colours, and delivering seeds at a prices established nationwide.

The coupon system identifies the beneficiary and all personal and technical information so that the seed market may be understood by small-scale farmers. Figure 5 shows a Seed Coupon System.

Figure 5: A schematic view of the seed coupon system

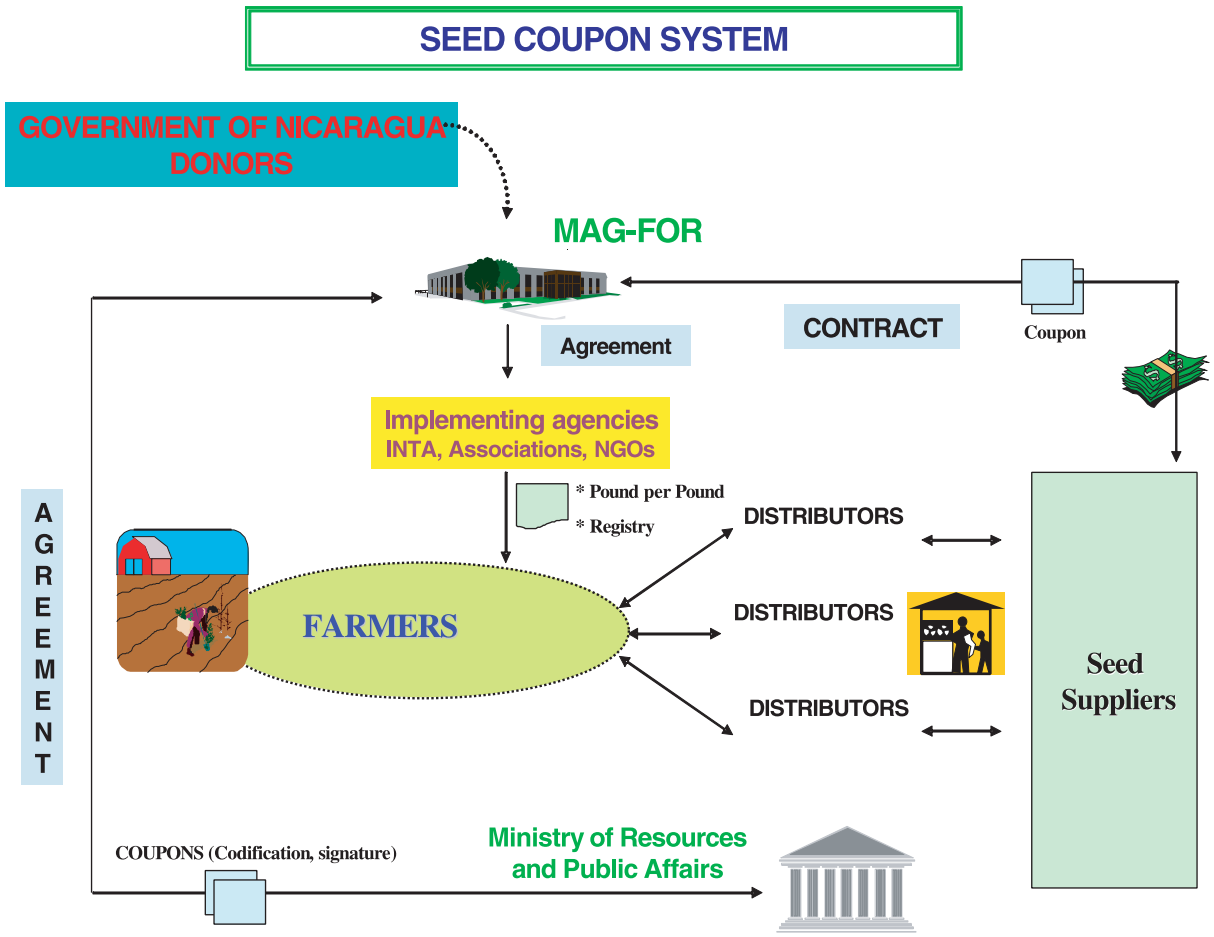


Table 3: Seed coupon programme: Participants' functions and responsibilities

SYSTEM ACTORS	FUNCTIONS/ RESPONSIBILITIES
DONORS WB, PL-480, USAID, FAO, IDR	- Define the financial share base of prioritized departments of donors
MAGFOR	- Define policies and norms - Administer funds - Produce and check coupons - Coordinate, supervise and evaluate Programme implementation - Inform other cooperating agencies

MHCP	- Codify and legalize coupons - Verify the authenticity of coupons - Comply with all conditions imposed by the agreement with MAGFOR.
ANIFODA / SEED PRODUCTION COMPANIES, LOCAL AGRO-SERVICES	- Ensure availability of seed through the network of suppliers at the local level. - Comply with all conditions imposed by the agreement with MAGFOR.
IMPLEMENTING AGENCIES INTA, NGOs, ASSOCIATIONS	- Deliver coupons to beneficiaries and formalize the seed delivery. - Receive the grains bartered with certified seeds. - Provide technical assistance to beneficiaries. - Comply with all conditions imposed by the agreement with MAGFOR.
COMMERCIAL COMPANIES/ BAGSA	- Receive the grains bartered with certified seeds. - Process, store and commercialize the production. - Promote seed saving practices / improve commercialization.
LOCAL AUTHORITIES	- Promote the Programme at the local level. - Participate in the integration of prioritized communities.
FARMERS	- Use delivered seeds satisfactorily. - Provide information on their production.

5.2.5 Profile of beneficiaries and programme focus and coverage

In Nicaragua, the production of food crops, particularly white maize and red beans, are in hands of around 150 000 small and medium-scale farmers who plant in an average 1 to 5 mzs[3]. There are three planting seasons in the country: "primera", "postrera" and "apante" (first, second and third crop seasons, respectively).

The programme selected farmers with the maximum area of 5 mzs in order to prioritize farmers whose main agricultural activity is food crops (maize, beans, white sorghum and rice), and who produce under rainfed conditions.

During the Programme's first production season there was an expectation of a worsening of the "El Niño" phenomenon, forcing the Programme to locate hybrid maize production in less risky zones, the maize varieties and beans in zones of intermediate risk, and white sorghum in zones of low rainfall pattern.

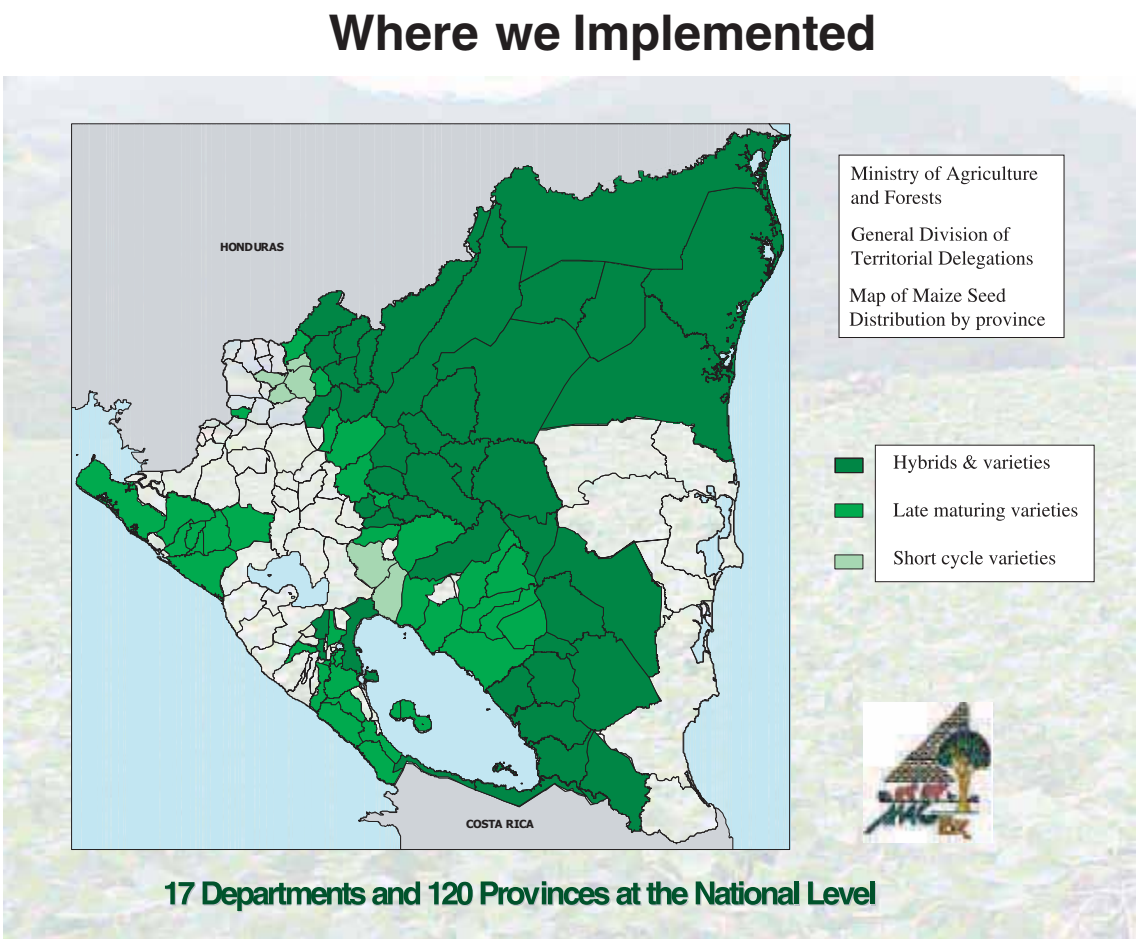
The Programme's scope was nationwide in 120 municipalities in 15 departments and 2 special regions in the Atlantic, covering the entire political divisions in the country. Special attention was given to three zones with a majority of small and medium-scale farmers, which are more exposed to dry spells and where some kind of technical assistance is available.

It is important to note that province selection criteria used the agro-climatic zone studies, adjusted according to the priorities of the executing agencies.

[3] 1 manzana (mz) = 0.7 ha

MAP OF NICARAGUA AND THE AREA COVERED BY THE PROGRAMME

THE MAIZE PROGRAMME



The map shows hybrid maize and varieties distribution following technical recommendations. Similar maps were developed for beans, white sorghum and rice.

5.2.6 Results and perspectives of the PNLL Programme

The first planting season of the PNLL programme provided the expected number of beneficiaries with certified seed, and included the participation of all partner institutions from the Government, the private sector and NGOs. As shown in Table 4, a total of 51 944 qqs of certified seed of targeted crops were distributed to plant 127 246 mzs in 120 Nicaraguan municipalities in 2003/2004. Overall, 91 658 farmers, representing 46 percent of the total in the country, were assisted at a total cost of a little more than US$ 3 million. In addition, the following results were obtained during the period under review:

- 12 seed supply companies were integrated.
- 120 implementing agencies participated.
- 640 agro-services were available in the provinces.
- Technical assistance was provided by 376 extension agents in the country.

Ministry of Agriculture and Forestry (MAGFOR)
General Division of Territorial Delegations

Table 4: Comparing PNLL crops in 2002/2003 season with 2003/2004 season

CROPS	Producers	Manzanas	Quintals	Amount (US$)	Producers	Manzanas	Quintals	Amount (US$)	Percentage % (mzs)
Hybrid maize	27,608	41,413	12,423	1,090,794	29,010	43,315	13,055	1,028,835	105.1%
Maize variety	27,043	40,565	13,521	553,403	22,333	33,500	11,167	419,086	82.6%
Red bean	25,501	25,501	20,401	1,187,814	20,000	20,000	16,000	848,448	98.0%
Black bean	-	-	-	-	5,000	5,000	4,000	192,000	
Rice	2,745	2,745	2,745	79,510	10,000	10,000	12,195	341,210	364.3%
White sorghum	6,761	13,522	2,704	114,735	7,500	15,000	3,000	96,216	110.9%
Sesame	2,000	4,000	200	15,798	5,000	10,000	500	45,000	250.0%
Total	91,658	127,746	51,994	3,042,056	98,843	137,015	59,917	2,970,795	107.3%

Figure 6: Participants in the PNLL Programme

The major factors that led to the programme's success were the clear establishment of stakeholders' roles that ensured the timely distribution of certified seed and the set-up of marketing channels providing a solid base for the development of economically sound and sustainable seed enterprises. In all these efforts, the provincial governments consider the beneficiaries to be central to the programme.

5.2.7 Conclusions

The President of Nicaragua, Enrique Bolaños Geyer, in his first speech to the Nation, emphasized the importance of the PNLL programme and its contribution to the improved quality of life for poor farmers in the provinces. He stated that the increase in food production improved the food security of farmers' families.

It is estimated that use of certified seed has increased from 10 to 35 percent since the advent of the PNLL programme. The largest impact was found with maize, reaching a record of production in the first crop season of about 7.0 million qqs.

The Government has announced that the PNLL programme will continue until 2006.