

**USING MARKETS TO PROMOTE THE SUSTAINABLE UTILIZATION OF CROP
GENETIC RESOURCES.**

Workshop Report

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Table of Contents

I. Introduction	3
II. Concepts, Research Questions and Literature Reviews.....	4
1. Workshop opening.....	4
2. Project Objectives and Research Questions.....	4
3. Conceptual framework and behavioral model.....	5
4. State of the literature reviews.....	7
III. Summary of Discussions on Methodological Issues	7
1. Defining and measuring diversity along the seed supply chain.	7
i. Measuring diversity over time versus space.....	8
ii. Impacts on Migration versus Selection.....	9
2. Inter vs. Infra specific diversity	10
3. Incorporating policies into the analysis	11
4. Components of the Study	12
i. Policy Assessment	12
ii. Farmer focus groups.....	12
iii. Seed/Grain market value chain analysis.....	13
iv. Sample market survey	13
v. Sample household survey.....	13
vi. Choice Experiments	13
vii. Agro-morphological characterization	13
viii. Molecular analysis	13
5. Sample household survey: data and analysis	14
6. Sample market survey: analysis and data.....	16
IV. Country Case Study Working Group Reports	17
1. Kenya Working Group Report	17
2. India Working Group Report	19
V. Moving forward: Responsibilities, Timing and Funding.....	21
1. Funding	21
2. Tasks and Responsibilities	22
VI. Closing	24
 List of Participants	 24

I. Introduction

In 2004 ESA initiated a research program on agricultural markets and their relationship to farm level decisions on utilizing crop genetic resources. The program is motivated by the need of policy-makers in developing countries to respond to commitments made under the International Treaty on Plant Genetic Resources to promote the sustainable utilization of plant genetic resources. This research program is designed to support and inform strategies to meet this commitment. It rests on the premise that agricultural markets can significantly affect farm level access to seeds and the crop genetic resources they embody, and thus farm level decisions on utilization. The goal of the research is thus to assess how public policies affect the supply of crop genetic diversity in markets, and how variations in the supply affect farm level patterns of utilization. The research also proposes to analyze the relationship between utilization and two critical components that determine its sustainability: farm level well-being and *in situ* crop diversity.

The program builds upon considerable work that has already been done by FAO, CGIAR centers and others on seed systems, agricultural biodiversity and farmer livelihoods. Several CGIAR centers, including IPGRI, IFPRI, CIMMYT, CIP, CIAT and ICRISAT are partners in the program. In April 2004 an initiating workshop was held with representatives from each of these centers as well as FAO staff to establish a framework for designing and implementing the program. The report from that workshop is available at: <http://www.fao.org/docrep/meeting/009/ae408e.htm>. The key recommendations emerging from the 2004 workshop were to: 1) develop a formal conceptual framework for the research; 2) conduct a review of the CG center “grey” literature which could be relevant to the project; 3) review some institutional economics literature and assess the relevant economic literature on seed and agricultural commodity market characteristics; 4) identify key methodological issues; and 5) work on securing funding to support the study.

The main purpose of the 2005 workshop was to inform the research partners of the progress made on meeting the recommendations of the 2004 workshop, to develop the methodology further, and to move ahead with implementing the study. The 2005 workshop began with presentations and discussions on the key components of the conceptual framework and was followed by presentations outlining specific methodological problems. The group was then asked to work through a solution to the problems by preparing two actual case studies for India and Kenya. Presentations on the outcome of the literature reviews and the funding situation were also given. The workshop concluded with a session on how to move forward with the project, including a division of responsibilities among CG centers and FAO for various tasks.

This report is a summary of the presentations, discussions and agreements from the workshop. The following section summarizes the presentations on the conceptual framework, research questions and state of the literature reviews. Section II summarizes the discussions on the key methodological issues that need to be resolved. Section III describes the discussion on the missing components of the methodology as identified by the workshop participants and some details on its design and content. Section IV presents the results of the working groups on designing case studies for India and Kenya. Section V summarizes the discussion on responsibilities, timing and funding. Section VI summarizes the closing. In addition to the workshop report there are several supporting documents:

- 1) Powerpoints (not attached but will be available on the ESA website)
- 2) Conceptual frame (FAOMktSeedDivConc.doc) and supporting materials:
 - SM 1: Institutional economics literature review and database.
(SM1FAOLITSUMM.XLS)
 - SM 2: Economics of crop biological diversity literature review and database.
(SM2CGCENTERBIB.DOC & SM2KINGDATABSE.RTF)
 - SM 3: Measuring Crop Diversity along the Seed Supply Chain
(SM3MEASURINGDIV.DOC)
 - SM 4: Sampling frame: time series versus cross sectional.
(SM4TIMEVSCROSS.DOC)
 - SM 5: Sampling frame: defining a market zone.
(SM5MARKETZONES.DOC)

II. Concepts, Research Questions and Literature Reviews

1. Workshop opening

The workshop was opened by Prahbu Pingali, who outlined the relevance of this work on markets and agricultural biodiversity to other projects the ESA division is currently engaged in, and to the major findings of the recently released Millennium Ecosystem Assessment (MEA). One of the key findings of the MEA is that ecosystems have undergone an unprecedented level and rate of change over recent decades. These changes have generated considerable benefits to humanity, but also considerable costs which have not been fully accounted for, and with effects that are just now starting to be understood. Studies to assess the costs of changes in ecosystems and the services they provide to humans in relation to their benefits are critically needed, and the study that this workshop is focused on will be an important contribution to this area. Assessing the role of markets in stimulating changes in the plant genetic diversity in agricultural ecosystems and the impact on human well-being will provide insight on how to promote the sustainable utilization of plant genetic resources. Prabhu stressed the importance of designing this study to focus on areas that are, or will be, experiencing changes in agricultural production and marketing systems so as to capture a long-term and dynamic perspective on the potential impacts on agricultural biodiversity, agricultural production systems and human welfare.

2. Project Objectives and Research Questions

Leslie Lipper followed by reviewing the project objectives and main research questions the project addresses. (See powerpoint LIPPER) Two main objectives of the project were identified:

- **Provide guidance to the public sector on managing commodity and seed markets to promote the sustainable utilization of crop genetic resources**
- **Contribute to the knowledge base on markets and farm level access, utilization and conservation of CGR**

Providing practical guidance on how to implement the International Treaty on Plant Genetic Resources is the key driving force of the research project. Promoting sustainable utilization is a key objective of the treaty. Article 6.1 calls on contracting parties to develop and maintain

appropriate policy and legal measure to promote sustainable utilization and gives a number of examples including the following:

- Pursuing fair agricultural policies that promote...the development and maintenance of diverse farming systems
- Increasing the range of genetic diversity available to farmers
- Promoting the expanded use of local and locally adapted crops
- Supporting the wider use of diversity of varieties and species in on-farm management.

Agricultural markets are a mechanism by which these objectives can be met, but they can also work against them, depending on several factors. Our interest is in understanding when, and how, access to crop genetic resources (CGR) markets can promote sustainable utilization.

The project seeks to meet these objectives by trying to answer three main research questions:

- 1. How do we measure farmer access to crop genetic resources, especially in relation to crop genetic diversity, in local markets?**
- 2. How does access to CGR in markets affect farmer welfare and on-farm crop biodiversity?**
- 3. How do policies such as emergency seed relief, seed sector regulation, and market integration, affect farmer access to CGR in local markets?**

The research questions are based on some empirical findings and assumptions about the relationship between seed supply, diversity and farmer welfare. First, local markets have been found to be an important source of seeds and genetic resources to farmers, including low income farmers. Markets can be particularly important when traditional seed systems are stressed due to crises such as drought or war, but also in the process of economic development where traditional relationships may break down. Secondly, availability is a critical component of access, which means we need to look at the supply side as well as the demand side to understand farmer access to seeds and crop genetic resources. Diversity is an important measure of availability, which can include measures of the range and distribution of crop genetic resources on offer to farmers. Since diversity is an important component of availability, and availability an important component of access – the supply of diversity becomes an important determinant of farm level access to genetic resources. The access farmers have to seeds and genetic resources determines what they plant and thus the farm level of *in situ* diversity. It also has impacts on various measures of household well-being – including productivity, resilience and dietary patterns.

We can summarize these relationships as follows: **Diversity** is a measure of **availability**, **availability** is an important determinant of farm **access** and **access** determines farm **utilization** that impacts **welfare** and **diversity**.

3. Conceptual framework and behavioral model

Leigh Anderson presented highlights from the conceptual framework developed for the project. (See powerpoint ANDERSON) The goal is to understand how policies affect market access to CGR, and how farmer access to CGR in markets affects farmer welfare and on farm crop biological diversity (CBD). A schematic layout of the methodological challenges we face in the research project are shown in Figure 2.

Figure 2



The first methodological challenge (number 1 above) arises in defining and measuring diversity from policy to market to farm. This includes finding a measure that is consistently used along this chain, or understanding how we can translate from one measure to another. It also include conceptual issues of infra versus inter specific diversity. The second methodological challenge (2) is understanding how policies affect market access to CGR, and solving several technical problems that might allow us to attribute market variation to policy interventions. The third methodological issue (3) is how to measure welfare and CBD outcomes, and all the farm and individual characteristics that we believe might affect these outcomes. In particular, our desire to understand some behavioral and institutional factors that might drive seed sourcing decisions require some new instruments and possibility varied sampling strategies. Finally, the fourth methodological issue (4) is positing a behavioral model of how farmers make their seed sourcing choice, and what they choose to purchase, given a set of constraints and opportunities available in the market and elsewhere, and influenced by the set of policies we are examining.

The research design requires the development of a behavioral model in order to clarify our hypotheses, define the variables we need focus on and organize our thinking. The behavioral model typically consists of some household model that acknowledges the farmer is both a consumer and producer of crops. The farmer maximizes utility subject to a full income constraint determined by profit maximizing considerations, which include the usual production and technology constraints. Their demand for diversity is a derived demand for a set of production and consumption attributes.

We want to look at two related choices that the farmer makes:

1. where to acquire their seed;
2. what seed is acquired and in what proportion.

We propose adding the following to this basic model:

1. transaction costs derived from the set of existing institutions that shape the rules of exchange and the incentives faced by potential suppliers and demanders of CGR;
2. risk, fairness and other behavioral considerations that influence the choice of where to acquire seed;
3. important supply side considerations that reflect market power and pricing.

From our behavioral models for farmers (as consumers and suppliers) and traders and other suppliers, we predict some equilibrium exchange of traits under certain conditions of access to market CGR, and some level of on-farm welfare and CBD. When those conditions change, or in markets that have different access to CGR, we should expect a change, or difference, in our two outcomes.

Specifying a behavioral model that is rich enough to capture important changes in farmer decision making when policy or market access changes, but is simple enough to be tractable and for which data is available and can be econometrically estimated, is always a challenge. We discussed sacrificing some quantitative complexity by enriching certain parts of the analysis with qualitative data.

These issues are raised in the conceptual framework. All workshop participants received a draft of the conceptual framework, prior to the workshop. Some aspects can only be finalized as the project unfolds, specific sites and issues are identified and in conjunction with other methodological considerations.

4. State of the literature reviews

Two literature reviews were undertaken to support the project development. The first was a review of the mostly theoretical and academic literature on institutional economics that might relate to developing country seed markets. This includes articles on transaction costs, property rights, and markets.

The second review was of 30 years of CGIAR center work on seeds, seed systems, and databases that might form a basis for this project. The centers reviewed included CIMMYT, IFPRI, and IPGRI. Amanda King also raised the issue of inconsistent terminology used in the literature, and suggested that we need to agree on how we are going to use some important terms (see PPT - King). She presented definitions of some key terms used in the literature. These are referred to in the summary of discussions on inter-temporal measures of diversity (section III. 1. below) The plan is to complete a review of other centers involved with the project and then compile the two literature reviews into a single database accessible to project participants and eventually, the public. In the meantime a summary of the results is attached to this report.

III. Summary of Discussions on Methodological Issues

Six key methodological issues were focused on over the course of the workshop:

1. *Defining and measuring diversity along the seed supply chain*
2. *Inter vs. intra specific diversity*
3. *Incorporating policies into the analysis*
4. *Components of the Study*
5. *Sample household survey: analysis and data*
6. *Sample market survey: analysis and data*

1. Defining and measuring diversity along the seed supply chain.

Following a presentation by Toby Hodgkins on Measuring Crop Diversity along the Seed Supply Chain (see PPT - HODGKINS) a lengthy discussion was held on how to measure diversity. Everyone agreed that more than one measure would be necessary. As noted, diversity can be measured as variation in:

- species,
- crops,
- varieties,

- agromorphological traits
- genetic markers (e.g. microsatellites, AFLPs etc).

The discussion focused primarily on infra specific crop diversity measures. Issues of inter vs. infra specific crop diversity are taken up in the following section. The group agreed that the measures of infra specific genetic diversity which should be taken include:

- Production traits and consumption attributes (yield, resistance to various environmental stresses, taste, etc.) since we are studying the choices of farmers, and farmers tend to select and purchase planting material based on a set of desired attributes.
- Named varieties since this is a common, though not necessarily standardized, means of identification.
- Genetic composition at a molecular level to complement the measures based directly on human selection criteria.

It was noted that sustainable utilization involves both a public and a private dimension where the former includes agro-morphological and molecular aspects and the latter is linked to the farmer interest.

In each case, we are likely to want to develop diversity indices which describe:

Richness – numbers of types (e.g. crops, varieties, character states, genes)

Evenness – distribution of the different classes or the probability of finding a difference in the average comparison.

Distinctness – some measure of the range of variation found, or how different are any pair in a comparison.

One issue that has not yet been resolved is how to standardize any of these metrics among individuals who use them: among farmers, between farmers and traders, between traders and suppliers up stream, etc. Different farmers may refer to the same (genotypic or phenotypic) variety by different names, or different (genotypic or phenotypic) varieties by the same name. Traders may bundle valued attributes and traits, and named varieties, together. We expect that some sampling and a few grow outs of seed followed by genetic analysis will be required to establish some understanding of the correlation between diversity in the market and on farm, in migration patterns, and among our diversity measures.

i. Measuring diversity over time versus space

The importance of measuring diversity over both time and space was noted several times in the workshop. In her presentation Amanda King defined indicators which may be useful measures of inter-temporal diversity. These include:

Planting material replacement; replacement of planting materials with material of the same variety (genetic deterioration)

Partial exchange – replacement of some of the material with material of the same variety (as composition of seed lots that constitute a variety change over time, genetic composition undergoes shifts)

Partial exchange with varietal mixing – (cross-pollenization, criolloization)

Varietal change – when a farmer who is growing a variety stops planting it and starts planting another – often used in studies of adoption of modern varieties.

Seed replacement rate – # of times replace seed with material of same variety (Louette and Aguirre) (Heisey and Brennan – model of demand for replacement seed)

Seed transfer rate – the frequency with which farmers act as seed suppliers.

Varietal change is measured using the average and area-weighted average variety age

All agreed that a time series of data is desirable, but may not be possible with current funding. At a minimum, an extended period to collect even a single series of data may be necessary to understand market price and variety movements, seasonal change, trader behaviour, the role of expectations, and the farmers classification system. It was agreed that using focus groups at the beginning of the project and throughout would be useful for getting an idea of variety names and traits, social networks exchanges etc. and that this should be combined with an effort to ask questions about the past and use existing work and baselines where possible. Using a good history of seeds and varieties may allow us to capture some dynamics of the system, and molecular methods may allow us to do more on the history.

ii. Impacts on Migration versus Selection

The issue of diversity effects of farmer seed selection of own seed, versus migration (seed exchange) via the market, was discussed at some length. Since not all varieties enter into the market place, we need to understand the relationship between the production system and what is available in the market. It is very likely that in the market we will find fewer varieties than within the system. Therefore if we stick with the market measure of diversity we might end up following the path of some specific varieties and have an incorrect sense of community diversity. We expect the seed flows from migration to affect on farm diversity, but we do not necessarily understand how, especially what happens to meta-populations. Some traits matter for conservation issues, different ones are important for the seed system. Mauricio Bellon mentioned some interesting seed flow work at CIMMYT that may provide some tools for our study.

Toby concluded with some thoughts on the possible relationship between market characteristics and crop diversity, which appear below.

Markets and Crop Diversity – Possible effects of market structure on crop diversity?

Characteristic	Possible effect
1. Listed on p 5 of Conceptual framework	
Numbers of buyers	Increased numbers of buyers may increase migration with respect to on farm maintained diversity and may increase flows of new materials (varieties, traits, alleles). A larger number of buyers may be associated with reduced amounts of varietal and within variety diversity in an area (more farmers getting similar materials from markets).
Numbers of sellers	Increased numbers of sellers may increase amounts of diversity within the market. Most likely to result in increases in richness of varieties and possibly an increased evenness (less certain about this). One might expect to see a larger number of smaller populations.
Market share	If one (or a few) sellers dominate the market this might be expected to reduce diversity both in respect of richness and evenness. Population sizes might be larger.

Pricing	High prices might reduce the use of market seed by many farmers leading to reduced migration, increased unevenness over the farming system, more maintenance and exchange of on farm populations – hence more populations of smaller size.
2. Other features of interest	
Grain/Seed distinction	Not clear – possible effects on seed quality and hence selection
Seed relief activities	Likely to increase diversity (new varieties) but also may swamp and lead to disappearance of traditional varieties (i.e. a later reduction following reduced evenness)

Issues still to resolve:

- a) How to measure market impacts on migration and implications for market/household sampling strategy
- b) The degree/level to which we need molecular analysis, and what criteria we will adopt to decide this.

2. Inter vs. Infra specific diversity

In this research program we are trying to understand the impact of the availability in the seed supply system on farm level decisions about crop and variety utilization patterns. We could look at the diversity of varieties available for just one crop and try to trace its impact on farm level decisions, but we know that this will be an incomplete picture of what is happening because the farmer response could be to switch to another crop – e.g. farmers substitute between crops, as well as within varieties of a crop. If we want to understand farmers' responses to environmental shocks or regulatory changes we need to understand both. The problem is keeping the study and data collection to manageable limits, but at the same time capturing the key components of the system that drive farm level utilization patterns.

Richard Jones presented material from a study ICRISAT conducted in Kenya that illustrated the degree of substitution between and within crops. (See Powerpoint JONES) The introduction of new varieties for one crop can impact the varieties grown for other crops. Thus the studies will need to consider inter crop diversity and substitution among as well as within crops.

However, studies focusing solely on inter-crop diversity are not sufficient to meet our needs – we do need to consider infra crop diversity in order to meet the needs of providing policy guidance on sustainable utilization for the Treaty and the Global Plan of Action. This implies that the case studies must be designed so that they include consideration of farm level impacts on infra specific diversity, but an important potential driver of change in that measure of diversity will be changes in inter-specific diversity.

In terms of assessing market impacts on farm levels of diversity, we are most concerned where changes are occurring in infra crop diversity at the farm (and community) level, and where these changes are occurring for a crop with some significant or unique aspect of local diversity. One of the major data collection and analyses requirements of the study is related to the measurement of infra-specific diversity and we will limit this analysis to crops with a significant or unique level of local diversity.

However, since we do have substitution between crops, the intervention or policy that we may be focused on a crop that doesn't have significant local diversity, but which is likely to impact the utilization of the crop and varieties for which there is important local diversity.

The issue of how to deal with inter vs. intra crop diversity was a key factor in the discussion of the Kenya case study design and is reported in Section IV 1. below.

Issues still to resolve:

How do we define the full set of crops that should be considered in the study? Do we start with an assumption that farmers could potentially substitute among all crops and therefore we should collect basic market data on the seed (or grain that could be used as seed) available for all crops? Or should we define a set of possible substitutes based on production requirements as well as end uses? This is an issue that's more important when thinking about what data to collect in markets. At the farm level we will want to get some basic information on all crops grown. However we do need to define what needs to be collected on "substitute" crops at the market level.

3. Incorporating policies into the analysis

Incorporating a strong policy focus into the studies is a major concern of the project and the subject of a presentation by Leslie Lipper (see LIPPER2. PPT) The group had several discussions about whether to try and fix some policies of interest *a priori*, or to select markets and a sampling frame and see what could be said about policies *ex poste*. The advantage of the first option is that it makes the policy the primary intervention of interest and the markets would be chosen to try and appropriately control for policy effects (for example, one market where emergency seed relief operates and one where it does not).

The reality, however, is that it is difficult to find comparable markets that differ measurably in their policy exposure, such that different market characteristics could be attributed to a policy intervention. For example, national policies, though implemented differentially, in theory affect all markets. Local policies may affect market levels of diversity differently, but the policy itself is likely endogenous to that location. Finally, to select a sample based on policy impact makes it more difficult to control for agro-ecological zone and other factors we may want to hold constant.

We agreed as an alternative to have some specific policies in mind, choose a market area and markets for other considerations such as agro-ecological, do a policy analysis of local institutions and the exposure and implementation of the markets we are studying to different policies, and then see what we could say, and possibly measure and test, about policy impacts.

In terms of specific policies, some concern was raised about emergency seed relief (ESR), which is not market based by definition. It was pointed out, however, that ESR is known to have major impacts on markets and quite recently a move to make the intervention more market based is occurring in aid agencies. There was a little more discussion on the level of policy intervention. e.g. ESR is usually implemented locally whilst seed sector is regulated at national level and usually implemented at sub-national level. For all policies we will probably look at sub-national implementation. It was noted that the level of government intervention in markets can strongly affect marketing functioning and, for example in Mexico, the adoption rate of modern varieties.

The point was made that national and international policies such as privatization and market liberalization, may inadvertently have a major impact on the accessibility of crop genetic resources in the supply system. In cases where they are counter to diversity, there is the potential to develop countervailing policies to mitigate their impact.

Two questions were raised:

- How can targeted policies contribute to these higher level policies?
- Are the meso-level policy instruments related to risk missing (e.g. safety nets, credit etc)? We are assuming that risk is a motivation for maintaining diversity.

These points relate to the more general perspective of looking at where market chains are, or are not, functioning. Jon Hellin suggested that we look at market system, at market functioning and then at how certain policies affect both the market system and its functioning and try to identify bottlenecks.

4. Components of the Study

The project will be comprised of a number of distinct study components pieces to collect specific types of information or for participatory dialogue/interaction with farmers, traders and sellers in markets, public sector agents, policy makers and other relevant stakeholders.

The group agreed that both quantitative and qualitative analyses are needed to accomplish the objectives of the project, with strengths and weaknesses associated with each. The need for simplification to collect the quantitative data runs the risk of losing important complexity; too much emphasis on details runs the risk of losing the ability to generalize.

On the final day of the workshop, the group agreed upon a set of analyses that will comprise a standardized study methodology that will be implemented for all case studies. These are listed below in the order of which they are likely to be implemented.

i. Policy Assessment

Purpose: to identify public sector interventions that are most likely to impact three aspects of access to crop genetic resources in markets: the content and quantity of diversity, the information about diversity and the costs of obtaining and using diverse genetic resources. The study will also be used to identify the public sector interventions/policies which should be considered in the analysis.

ii. Farmer focus groups

Purpose: to help identify some basic parameters of the relationship between farmers, markets and diversity such as why farmers do or do not use markets for seeds, how they identify varieties, the values they attach to different varieties and some idea of how varieties are distributed in the local area. The focus groups will help to design the sample for the market and household survey, as well as specific questions.

iii. Seed/Grain market value chain analysis

Purpose: to understand the flow of grain, seeds and CGR in the seed system and the factors which are driving these flows. The analysis will include consideration of the content, quantity and pricing of seeds and information about CGR at different points in the supply chain. The analysis will consider flows into local markets from formal as well as informal sector.

iv. Sample market survey

Purpose – to measure the diversity of CGRs available in local markets, the information available about diverse resources in markets, and the costs of obtaining CGR. In addition, we want to collect information on market characteristics that affect the diversity, information and costs in the markets and identify how these are affected by the public sector interventions. Data from this survey will be used to develop measures of market diversity which can be used to explain household levels of diversity and welfare.

v. Sample household survey

Purpose: to assess the household level incentives to participate in markets for seeds in relation to other potential sources via seed flow analysis, to assess the values farmers associate with varieties attributes, and to understand their seed sourcing choices. Data from this survey will be used to provide a measure of household welfare and on farm diversity to relate to market levels of diversity, as well as household level demands for seeds and crop genetic resources.

vi. Choice Experiments

Purpose: to assess stated preferences of the household for seed sources and variety attributes, and their attitudes towards fairness and various aspects of risk that might affect their seed sourcing choices and selection of seed. Depending on the complexity of the experiments, these surveys may be conducted on a sub-sample of the sample households and only for some of the case studies.

vii. Agro-morphological characterization

Purpose: to provide a characterization of the attributes associated with named varieties at the market and household level for use in developing measures of diversity. This may be necessary only for some of the case studies.

viii. Molecular analysis

Purpose: to provide a molecular analysis of the genetic diversity present at the market and household level to be used in developing measures of diversity. The workshop participants agreed that considerable work is still needed to identify exactly how these components will be linked and to identify any gaps that may exist in the methodology. A final critical issue was raised about the need to design the study to allow for synthesis across the case studies and this is an area which considerable further work is needed.

5. Household sample survey: data and analysis

At the household level information will need to be collected on the interaction between the household and markets and the crop genetic resources obtained therein, as well as on measures of farm level well-being. One main method for collecting such information is through a household survey and the workshop included a session to discuss what should be collected in such a survey. The focus was more on the type of information that would be needed, as opposed to the analyses these data would be used for, although discussion of the latter did arise as well.

The household level survey will use both revealed and stated preference methods and a brief overview of these methods was presented by Melinda Smale. (see SMALE ppt). Melinda discussed how the implicit value of the attributes of either planting material or products can be derived through revealed preference approaches (hedonic models, with market or farmgate prices) or stated preference approaches (conjoint analysis or attribute-based choice experiments, with hypothetical situations). Each has pros and cons, and combining them is feasible and in many cases, desirable.

Several tools to value non-traded goods have been developed by economists and can be used in the study. We also want to use them to measure facets of the decision-making process to better understand how farmers make decisions when institutional incentives change. For example, they can help us to understand:

1. How poor people perceive risk and its impact on their participation in markets;
2. How peoples' perceptions of fairness affects market participation (i.e. price increases are accepted for certain reasons but not for others).
3. The heuristics or decision rules that people use in deciding where to get seeds and what seeds to get.

Mauricio Bellon presented a summary of a joint CIMMYT/FAO project on seed supply and diversity among maize growers from Chiapas, Mexico. This study piloted some of these techniques of behavioral economics into the household survey, and combined it with some of the institutional issues of seed sourcing and transaction costs (see BELLON ppt). Since this project was initiated in 2003 some results were already available for discussion at the workshop.

In addition to stated and revealed preference household surveys, Mauricio and his team conducted an ethnographic study in Oaxaca about the transaction costs farmers face to obtain seed in an informal system. The findings are useful to help design questions on transactions costs in seed exchanges. Mauricio reported that it seems the transaction costs questions were relatively easy to answer by farmers, but only for sources they actually use. There is no broad knowledge of different ones—no “comparative” shopping. Belonging to farmers' groups was important for obtaining improved seed. Some of the questions about farmer perceptions of risk were difficult to answer because of the idea of probabilities, and their hypothetical nature -- people could not separate out their own experiences from the general nature of the question. On fairness, they saw increases in the price of hybrids as unfair, but increases in price of landraces as fair.

An important issue that was raised in this session was the importance of having a standard terminology and understanding of these terms for concepts like landrace vs. improved

varieties. It will be very important to train the survey enumerators to ensure that there is a common understanding of what the terms mean, and help them identify various ways it can be elicited in an interview. Likewise, the importance of having well-trained enumerators was raised in the context of the market survey, where getting reliable data from sellers requires skill and time.

The household survey will need to include data that can be used to develop measures of household welfare that can be related to the accessibility of diverse crop genetic resources in the market. We need measures of welfare as a dependent variable in a statistical analysis where some measure(s) of diversity in the market would be the independent, or explanatory variable. In addition to data for constructing a measure of household welfare, we also need to collect information about several aspects of the households' social, human, natural and financial capital that may condition the relationship between market diversity and welfare. The discussion in the workshop focused primarily on measures of the outcome, or dependent variable.

Romina Cavatassi presented a distilled version of work she had prepared for the workshop on various ways in which household welfare had been measured in household surveys. (See power point CAVATASSI) Some of these surveys were designed to look at specific aspects of household welfare likely to be linked to agricultural diversity, including household dietary and nutrition levels, as well as resilience to production failures and other shocks. Several other means of measuring household welfare were also raised, including various measures of income, assets and expenditures.

The key issue in this discussion was thinking about the key aspects of household well-being that must be considered when analyzing the relationship between diversity in markets and household welfare. The need to keep things simple and short in terms of data collection must be balanced against the need to collect sufficient information to allow us to analyze this complex relationship.

We agreed to define a common set of welfare indicators across all the case studies but the way in which these would be measured would vary from place to place. For example, the group agreed that we should include an indicator of household dietary patterns in all surveys, although the specific way in which we'd measure it would be different in Kenya than India.

The group agreed that the following aspects of household welfare should be included on all surveys:

- 1) Agricultural productivity
- 2) Resilience to production shocks
- 3) Resilience to other shocks
- 4) Diet
- 5) Assets (agricultural and non agricultural)
- 6) Food security (some of which is covered in items above, but other measures could be included as well)
- 7) besides all basic required info on socio-demo, and land

Some discussion was held on the degree to which questions on household income and expenditures should be included. The key issue here is the amount of detail and time needed to collect a full set of information and also problems with the reliability of the data. It was

agreed that it would not be feasible or necessary to collect a full set of data on income and expenditures.

6. Sample market survey: analysis and data

The data collection and analysis for this project will focus around something defined as a village, or local market. However, the exchanges in a local market must be seen within the overall supply available to a farmer. The participants agreed that the full range of potential seed exchanges that farmers may engage in needs to be mapped and measured, which includes:

- 1) exchanges with neighbor, family, friend
- 2) exchanges in village/irregular markets
- 3) exchanges in a daily, formal market

We hope to define a market zone to better control for certain variables that have consistently been shown to affect market participation and attribute demand. By controlling for these variables we will be better able to attribute remaining variation to other variables of interest. In particular, we are hoping to control for agro-ecological zone and possibly stratify our sample by distance to market (measured by both physical distance [km] and degrees/ease of accessibility (road access, time to get there), though the market referred to in earlier studies is an urban/commercial center where certain services are available. Since we are interested in seed exchange in local village markets, it is not yet clear how we will interpret the distance to market findings for our study.

The idea is to complement the HH survey with a market survey and for this we need to specify what unit of analysis we are studying (i.e. size and type of market). We also have to have a level of market integration where a policy change can affect the level of accessibility of seeds and thus household outcomes. Our market should be exposed to policy and accessed by an enough large number of farmers (i.e. 250 of which we could sample) in order to see how it affects their welfare and on farm levels of diversity.

Some of the key issues raised in the discussion on markets and what we could and should measure include: the need to identify the actors in the market chain; traders and brokers are key to understanding what is going on; it's very difficult to get volumes but it is possible to get prices; the rules for exchanging seeds may be based more on moral obligations than on market rules.

We developed a list of market measures to consider:

1. access: prices/costs; *relatively easy to collect*
2. diversity; *we need to define what we mean by diversity;*
3. information *can be anything related to 1 and 2 above.*
4. identify number of buyers and sellers;
5. market prices
6. pricing and credit practices;
7. other common contractual arrangements;
8. price variability (*very much connected to fairness*);
9. relationships among the traders;
10. range of products;

11. location linkages (*trading rates, physical institutions etc*);
12. timing/regularity of operational reliability;
13. physical characteristics and infrastructure;
14. costs of entry/exit: bureaucracy, economies of scale and scope;
15. history and nature of public intervention.

IV. Country Case Study Working Group Reports

On the second day of the workshop the group was divided into two working groups who focused on the specifics of designing two case studies: one for India and one for Kenya. The working groups were asked to identify:

- Crops/varieties to focus on, and others to include;
- Region/province/markets;
- Policies/regulations to consider.

They were also asked to hypothesize how specific policies will affect market access to CGR, focusing on diversity and information, and how these changes would affect farmer outcomes of welfare and on-farm CBD.

The working groups were instructed to build the case study around 1-2 main crops which should meet the following criteria:

- A crop that has some type of locally important infra-specific diversity
- A crop whose seeds are traded in the market
- A crop that is important to food security
- A crop that has already been the focus of CGIAR studies.

In addition, the working groups were instructed to consider the following in characterizing the suggested case study sites:

- Agro-ecological zone
- Population and market density
- Main farming systems
- Variation in access to markets
- Policies and public sector interventions that may affect diversity in the market

1. Kenya Working Group Report

The Kenya group started with a proposal from ICRISAT to look at mixed cropping systems of maize sorghum, pigeon peas and millets in arid to semi-arid agricultural production zones located in Eastern Province. This is an area where hybrid maize has adoption has been very rapid, replacing more traditional crops such as sorghum and pigeon-pea. The traditional crops are still an important part of the farming system however, particularly in times of stress when the maize crop may fail. The government of Kenya has a policy of encouraging crop diversification in these areas to reduce vulnerability associated with too heavy reliance on maize.

The proposal is to look at the impact of emergency seed relief as well as the new Kenyan seed law on the diversity of supply of seed for several crops in local markets. The crops will include maize, as well as crops that can substitute for maize. Two of the possible substitute

crops are sorghum and pigeon pea, and the latter in particular has a significant degree of locally important infra-specific diversity. These crops were selected because sorghum is an important food security crop, and it is also the focus of relief seed trade. Pigeon peas are also an important food security crop and the area is considered a secondary center of diversity for the crop. Both crops are traded in markets and farmers do obtain seed from this source.

Several districts in Kenya's eastern province are chronic recipients of emergency seed relief. There is speculation that this is creating seed dependency and destroying local markets, but there is little empirical evidence of this, or how this affects farmer welfare and on-farm diversity. Kenya has been experimenting with new forms of market based emergency seed relief, including seed fair and voucher schemes. Comparison among these types of aid mechanisms will provide interesting insight into the impacts of seed relief on local markets.

Kenya has also just instituted a new seed law which imposes more stringent regulations on the development, distribution and exchange of seeds and varieties and thus will likely have some impact on market exchanges. The seed law was thus proposed as a second policy intervention we should consider in this case study.

Much of the discussion around this proposed case study was the weight that should be given to inter vs. infra specific diversity in the markets. Are we more concerned with diversification among crops, or among varieties for any specific crop? The group agreed that collecting information on the diversity of varieties available in markets for pigeon pea and sorghum and relating it to measures of on-farm infra-specific diversity would be an important part of the case study. However the interventions we are thinking of focusing on are not necessarily focused on changes in the supply of seeds and varieties for sorghum or pigeon peas – it may be that changes in what's being supplied for maize is more important to consider because farmers are substituting maize for sorghum and pigeon-peas and this is the main factor driving changes in diversity for the latter crops on farm. Thus we will need to consider the supply of seeds for other substitute crops – particularly maize – in local markets

The group also discussed the relative merits of an alternative case study on vegetables grown for domestic or export markets and in high potential agricultural zones, which was raised as a potential case study by IFAD in meetings between FAO and IFAD prior to the workshop. There is considerable local diversity in native vegetables, and there is also a rapid transformation of the production system to production for commercial outlets which would seem to indicate a potentially interesting case. However, within our working group considerable expertise and data has already been gained on sorghum and pigeon-pea production systems in the arid and semi-arid areas of Kenya, including a rich set of data on seed flows in markets for the crops. In addition, the policy focus on emergency seed relief is one that is immediately relevant to FAO, as the major UN agency involved in its distribution. Leslie also noted that ESA has another project starting up in Kenya, investigating the impact of commercialization and integration into vertical supply chains on smallholders, and there is the possibility of cross-over between the projects; integrating a component on the impact on commercialization on seed diversity in markets for vegetable producers. The group agreed that the case study focus for this project should be the sorghum and pigeonpea study in Eastern Kenya, with support for the idea of an integrated project on the impact of diversity in vegetable production systems under commercialization with the ESA project on this topic.

Summary of Kenya Working Group Report

	Crop #1	Crop #2	Crop #3
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	Pigeon Pea	Sorghum	Green Vegetable
Substantial diversity	Pigeon Pea	Fairly limited diversity in areas we are considering	Green vegetable
Evidence of genetic erosion	Yes as crop is being replaced with maize	Yes: replaced with maize	Not clear
Importance to food security	YES (subsistence and income)	YES (subsistence and income)	YES (famine food and income source)
Traded in Markets	YES	YES	Output market is strong; seed market weaker
Availability of improved varieties	Available		Available, but selection is weak and mostly from external sources.
Substitute crops	Maize	Maize	?
Agro-ecological zone	Arid- semiarid low potential	Arid-semiarid – low potential	High potential
Existing FAO/CG center work	ICRISAT	ICRISAT	IPGRI work on diversity
Policies to consider	Emergency Seed Relief New Kenyan Seed Law	Emergency Seed Relief New Kenyan Seed Law	

2. India Working Group Report

The table from India's working group is given below. In addition, we discussed some other pros and cons including that the diversity of pearl millet is very poorly structured; that sorghum markets are very different for rainy sorghum vs. post rainy sorghum (planting season is January for post rainy sorghum and July for rainy season sorghum); pigeon peas would be attractive to donors; rice is attractive in terms of policy and it's easier for identifying national partners; vegetables and their markets are also well-defined; sorghum and pigeon peas may be the crops of interest in Kenya.

In terms of markets, there are also non-full time traders, and some exchanges are very informal but in India are always monetized. Farmers obtain seed from commercial companies and various suppliers depending on how good or bad the season is.

Summary of India Working Group Report:

	Crop #1	Crop #2	Crop #3	Crop #4	Crop #5
Substantial diversity	RICE (primary) ORISSA, EASTERN AP	SORGHUM (sec) N. KARNATAKA	PEARL MILLET (sec) RAJASTAN	FINGER & MINOR MILLET (sec) combined with a major crop (sorghum)	PIGEON PEAS/GREEN GRAM/BLAK GRAM (sec) combined with a major crop
Evidence of genetic erosion	YES	Yes for the rainy season sorghum	YES	YES	YES
Importance to food security	YES	YES (Karnataka)	YES (Karnataka)	Only in marginal areas	YES (protein)
Traded in Markets	Mostly farmers to farmers	YES	to some degree	to some degree	
Availability of commercial varieties	HIGH (eastern AP) MEDIUM (for ORISSA)	MEDIUM TO HIGH (zero in post rainy season)	LOW to HIGH in the Eastern part of Rajasthan	VERY LOW	LOW but INCREASING (new varieties released by icar)
Reproduction type	self	Mixed/Self pollinating	outcrossing	self	self/ unsure ???
Substitute crops		Many for rainy season, for post-rainy season sorghum			

REGION

	ORISSA:	Karnataka	RAJASTAN
AGRO-ECOLOGICAL	high moisture AP: irrigated	arid-semiarid	Arid
EXISTING WORK	yes	yes	yes
CENTRE CAPACITY	Need to involve IRRI	ICRISAT	ICRISAT
LOCAL INSTITUTIONS	MS SWAMINATHAN Res. Found. Universities and	MS SWAMINATHAN Res. Found. Universities and	To be identified Universities and

	institutes	institutes	institutes
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POLICIES

LEGISLATION ON FARMERS RIGHTS - PV	allows the protection and registration of farmers varieties – Rice varieties in Orissa: outstanding example of this
SUPPLY CHAIN	Minor millet: recently considered healthy food – increasing differentiation of demand for varieties and for organic production
NEW SEED LAW	Certification and variety registration (pearl millet, maize, sorghum) May affect very small companies selling OPV.
EMERGENCY SEED	Occasionally in times of stress – more in Rajasthan for drought. In Orissa frequent floods and therefore emergency intervention (impact on market?)

V. Moving forward: Responsibilities, Timing and Funding

The final session of the workshop was dedicated to a discussion on tasks that needed to be done, funding and responsibilities among the various participants.

1. Funding

Leslie started with a brief reiteration of the funding situation. One of the principal funding sources for this project is the FAO Netherlands Partnership Program. (FNPP) The program includes 3 components: Agrobiodiversity, Food Security and Forestry. ESA (Leslie's Division in FAO) is submitting proposals to support this project under both the Agrobiodiversity and Food Security Components. The proposals include a budget of \$250,000 over a 3 year period to fund collection and analysis of market and household data and to fund some part of the CG center's senior scientist's time to work on methodology development. Under the FNPP funding mechanism, projects in only a limited group of countries will be funded. The selected countries vary between the components, with some overlap between them. These countries are:

Agrobiodiversity: Kenya, Mali & India

Food Security: Kenya, Mozambique & India

The country selection under the FNPP was a key factor in the selection of case studies sites for Kenya, Mali and India. Each country has a different group of participants within FAO involved, and the country groups vary in terms of the speed with which they are proceeding, and for which funding will be available, as well as the mix of FAO activities which will be undertaken. In all cases, funding under the FNPP will be enhanced by the degree to which projects link with other FAO proposed activities in the country under FNPP. For India and Kenya these are still being developed. The Mali FNPP working group is fairly advanced and activities are identified.

Under the Agrobiodiversity component of the FNPP, the process is being initiated in each country is being initiated through a stakeholder workshop. The Mali workshop is planned for

June, Kenya in July and India is not yet set. CG center partners involved in the country case studies will be asked to help prepare for the workshop and participate.

Aside from FNPP other funding sources are being sought for the project. At present these include IFAD (possibility for India and Mozambique) and FAO Norway Partnership funds (possibility for funding Mexico and methodology development) It is anticipated that other sources of funding will be sought as the project progresses.

2. Tasks and Responsibilities

During one session of the workshop the participants were asked to briefly summarize their expectations from participation in the project. These are briefly summarized below:

Leslie Lipper (FAO): Primary expectation is outputs that can be used to advise countries on how to implement the ITPGR. Expectation that the involved senior scientist from CG centers will take responsibility for data and analysis quality from country case studies. Expect that FAO will play the lead role in funding, but may require assistance from CGs and other partners. FAO will also facilitate the group coordination, methodology development and synthesis of the study.

Louise Sperling (CIAT): This study complements ongoing work at CIAT. The main question of interest for CIAT is do markets and the diversity (both MVs and landraces) provided in markets affect farmer welfare and how? This project could complement a new CIAT study is starting in Ethiopia which does involve questions of diversity and markets. Concerned that this project should be better integrated into NARs work and national policy procedures.

Melinda Smale (IFPRI/IPGRI): This study goes in the direction that IFPRI wants to go in the research program on diversity. At a recent meeting in IPGRI it was decided that markets and diversity would be one theme under the Diversity and Livelihoods Program and this project will provide both direct and indirect contributions to that theme.

Toby Hodgkins: (IPGRI): The IPGRI Diversity and Livelihoods program has 3 main concerns: 1) Under which conditions does diversity contribute to livelihoods and what form does it take? 2) What policies and institutions does it take to realize the contribution of diversity to livelihoods and 3) Dynamics of seed systems and scale dimensions. Understanding diversity in markets is thus essential to understand. In the past more emphasis was on the market – now the emphasis is on understanding the system and its dynamics.

Mauricio Bellon: (CIMMYT): For CIMMYT the links between markets and diversity are crucial – it brings a new dimension to the study of diversity and farmers. The hypothesis is that markets will reduce diversity – but this may be wrong. It is also important to be building this collaborative relationship between FAO and the CG centers and among the centers themselves.

Pablo Ezaguirre (IPGRI): A key issue of interest for IPGRI is understanding if markets deliver important traits to farmers; traits that are important to poor farmers and when traditional systems of seed exchange are breaking down. It is important to understand the market organization, performance and role of actors in the system.

Richard Jones (ICRISAT): ICRISAT has four major research themes, including crop improvement, relief and rehabilitation, crop-livestock and commercialization) and thus there is an interest in understanding markets as a means of delivering germplasm to farmers and how they can be linked to national programs.

In discussing the implementation of the study, it was agreed that each of the country case studies will have one CG center as the lead institution, and this institution will be contracted by FAO to take the overall responsibility for implementing the country case study. The country lead institution may contract with other CG centers for various parts of the work program, as well as with other country level partners. IFPRI will be the lead institution for the Mali study, ICRISAT for Kenya and CIMMYT for Mexico. The lead institution for the India study was not decided, but it was agreed that IPGRI, IFPRI or ICRISAT were all possibilities.

The group agreed that the development of the methodology should also be shared among the participants, with one person taking the lead but with everyone participating on all parts. It was also noted that the work would need to be done by the CG Center senior scientists that will be leading the country case studies, and they would need some support for their time commitment in working on the methodology. Support for this time commitment will be included in the country case study budgets as part of the study preparation. Connie proposed that the Wageningen contribution to the methodology development come later in the process, to identify any gaps and to help identify how to link the various pieces together. Rob noted that ODI would be under the same constraints as the CG centers in needing support for any significant time contribution, but expressed interest in remaining involved in the study.

The group agreed that the development of the methodology, identification of country case studies, and securing of funding should be finalized by the end of 2005. In January 2006, the group proposed a workshop to launch the fieldwork phase of the project, which would include key participants from each of the country case studies. This workshop would also be an important opportunity for the group to finalize and standardize the project methodology. A discussion was had on who should take the lead on various bits of the methodology. It was suggested that CIMMYT take the lead on the method for the seed supply chain analysis, IPGRI for the diversity measurement (with input from CIMMYT and ICRISAT) and focus groups, FAO on the market survey and IFPRI on the household survey and choice experiments.

The set of tasks and estimated time frame for their completion as agreed by the group is summarized in the following table.

Task	Estimated Time Frame
Case studies: identification of sites, crops, and policies	June 2005
Proposal Development	June 2005
Funding:	June 2005
Stakeholder consultations and identification of country level partners	December 2005

Seed and market policy framework analysis	December 2005
Methodology development:	
▪ Market and HH sample frame	December 2005
▪ HH survey instrument design and protocol	December 2005
▪ Market survey instrument design and protocol	December 2005
▪ Measuring diversity along the supply chain	December 2005
▪ Seed supply chain analysis	December 2005
▪ Farmer focus groups	December 2005
▪ Choice Experiments	December 2005
Workshop: all countries groups presenting their plans	January 2006
Initiation Field Work	2006

VI. Closing

The workshop was closed by Prabhu Pingali, who thanked everyone for their hard work over the three days of the workshop and reiterated the commitment on the part of ESA to support the project and move it forward as quickly as possible.

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