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REPORT OF THE SCIENTIFIC AND TECHNICAL ADVISORY PANEL SELECTIVE REVIEW OF 'DYNAMIC FARMER-BASED APPROACH TO THE CONSERVATION OF AFRICAN PLANT GENETIC RESOURCE'

ADDIS ABABA, ETHIOPIA
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(Prepared by the Scientific and Technical Advisory Panel)

Report of The STAP Selective Review of "Dynamic Farmer-Based Approach to the Conservation of African Plant Genetic Resource"

Addis Ababa, Ethiopia
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Prepared by
The Scientific and Technical Advisory Panel (STAP)
Of the Global Environment Facility (GEF)

STAP Secretariat
United Nations Environment Programme

PREFACE

It is a pleasure to present the final report of the STAP Selective Review of the GEF Project *"A Dynamic Farmer-Based Approach to the Conservation of Ethiopian Plant Genetic Resources"* to you. The selective review was undertaken as an integral part of the preparation for an Operational Programme on Agrobiodiversity.

The STAP Selective Review team that visited the project sites would like to thank the staff of the project and of UNDP (in Addis Ababa and in New York) for their assistance in undertaking the review.

This report was prepared by Dr. Christine Padoch, Dr. Aberra Debelo and myself.

Madhav Gadgil
STAP Chairman

EXECUTIVE SUMMARY

The STAP Selective Review of the GEF project *"A Dynamic Farmer-Based Approach to the Conservation of Ethiopian Plan Genetic Resources"* was undertaken at the request of the GEF Secretariat and the Implementing Agencies, as an integral part of the GEF preparation for an Operational Programme on Agrobiodiversity. The conclusions of the review have been considered in the preparation of the paper on elements to be included into the an Operational Programme on Agrobiodiversity.

In situ programmes are important to ensure continued evolution and diversification of the genetic material in response to changing selection pressures such as emergence of new species and resistant strains of pests and diseases. It is also important to involve farmers who have been and continue to be the creators and conservators of this important biodiversity, in any conservation efforts. We feel that it is appropriate that Ethiopians have taken the lead in initiating such an endeavour since the country offers exceptionally high levels of agricultural biodiversity as well as heterogeneity of environmental regimes, the consequently of selection pressures. Our selective review team greatly appreciates and commends this effort.

Being a pioneering effort, this programme naturally has a number of rather particular foci. The most important of these is on ensuring maintenance of crop genetic diversity on the farms of a cadre of conservator farmers and on supporting farmer efforts at on-farm maintenance of local varieties through preservation of seed of a multiplicity of such varieties in community gene banks. We concur that this is a good way to begin the programme. However, it would now be desirable to initiate attempts to refine and broaden this focus, so that this significant initiative can help us develop an understanding of a number of other relevant issues, strengthen the sustainability of this programme, and facilitate its replication. Our review and this report concentrate upon a number of scientific and technical areas where we believe some changes or additional activities may enhance the results of this project.

1. BACKGROUND

Ethiopia's rich crop genetic resources have been widely recognized as globally important and in many cases threatened. The country's scientific institutions have been working over the last several decades to better conserve and utilize these resources. An important step in these efforts was the establishment in 1976 of the Plant Genetic Resource Center/Ethiopia now named the Institute of Biodiversity Conservation and Research (IBCR). The UNDP/GEF supported project *'A Dynamic Farmer Based Approach to the Conservation of Ethiopian Plant Genetic Resources'* (ETH/9e/631), is being carried out largely by the researchers and technicians of the IBCR. The project is a major component of an effort in Ethiopia and elsewhere to complement more traditional *ex-situ* approaches to conserving plant genetic resources with *in-situ*, field-based, farmer-focused conservation.

The project, which builds upon several earlier efforts, was initiated in 1994. It aims to benefit local farmers as well as local and global plant genetic conservation communities, using complex, multi-faceted, and integrated strategies of institutional strengthening, research, and training to achieve these ends. The project is acknowledged widely to be an important attempt to meaningfully involve local communities in the conservation of their crops, their knowledge, and other agrobiodiversity assets.

The purpose of the independent technical review undertaken by the Scientific and Technical Advisory Panel (STAP) of the Global Environmental Facility (GEF) is broadly to assess the scientific and technical soundness of the project. The review focused primarily on the specific issues raised in the Terms of Reference (see Appendix 1). The STAP reviewers also hope that the results of the review will help this project and any future agrobiodiversity projects in Ethiopia better achieve their goals, as well as contribute to the development of a new operational program in agrobiodiversity by the GEF.

The STAP selective review team to Ethiopia included Prof. Madhav Gadgil (Plant Ecologist) and Dr. Christine Padoch (Anthropologist), both members of the STAP, and Dr. Aberra Debelb (Plant Breeder) as a national consultant.

2. REVIEW OF TECHNICAL ASPECTS OF THE PROJECT

Among the major objectives of the project is to enhance the capacity of the IBCR and collaborating institutions for planning and implementation of effective *in-situ* conservation programmes; research is a significant component of the effort. The research that such a task demands is necessarily complex and often multi- or interdisciplinary. The project envisioned an ambitious agenda of research to understand long-term social and biological processes that affect biodiversity loss and conservation, to effectively assess conservation threats and opportunities, and to monitor the success and needs of this and other projects.

The project succeeded in initiating a broad range of research initiatives oriented toward identification of conservation priorities and prospects. The leaders of the various project sites have the freedom to decide on research needs. The team wishes to acknowledge the importance and quality of much of the research that has been done by the scientists of the IBCR and collaborating institutions, as well as the attempt to span a broad range of topics. We believe, however, that some important gaps remain in both the subjects that have been addressed in the ongoing research and in the way that research has been planned and carried out. Among these

are gaps that fall generally into the areas of: ecological and plant genetic issues, local knowledge and farmers' practices, agricultural policies, farmers' rights and benefit sharing, market and non-market incentives.

3. TOPICS AND EMPHASIS

3.1 Ecological and plant genetic issues

(i) The project could benefit from a stronger ecological perspective. Ultimately the rich diversity of farmers' varieties of Ethiopia owes its origin to the tremendous heterogeneity of the country's environmental regimes. The project has made excellent beginnings at documenting this environmental heterogeneity through its ecogeographic surveys. This could be taken further by careful application of the analysis of crop genetic diversity into constituent components such as α - diversity (packing of varieties in one locality), β - diversity (turnover of varieties along environmental gradients), μ - diversity (mosaic distribution of diversity within a landscape). Such an ecological analysis could be complemented by an analysis of how farmers view environmental heterogeneity and crop genetic diversity; in particular how crop variety names are distributed over geographical gradients.

(ii) The project has as yet devoted relatively little attention to the broader study of resources in landscapes where local crop varieties are planted and conserved, including wild relatives of crop plants as well as to other biotic resources –managed and unmanaged -- e.g., wetland pastures, "living fences", etc.

(iii) The project has made an important beginning in characterising farmers' varieties in terms of agromorphological as well as biochemical characters. This opens up a large and important area for research comparing farmers' varieties with breeders' varieties in relation to how distinctive, uniform and stable the former are. A good understanding of these issues has significant implications in several different contexts. There are, for instance, implications for conservation planning concerning numbers and spatial dispersion of the populations of farmers' varieties to be maintained so as to secure the conservation of the maximal levels of diversity on a long term basis for a given level of investment. The project may benefit by networking with specialists in the area of population genetics and biometry to explore this issue in greater depth.

(iv) Very few activities are targeted towards research leading to the conservation of medicinal plants as part of the smallholders' heritage. During our field visit, the team encountered some medicinal plants at the backyard of farmers. At Harbu the site team leader mentioned a small botanical garden with medicinal plants on the site. And in other sites such gardens are being planned. Patterns of resource allocation by smallholder farmers with particular emphasis on medicinal plants deserve to be better studied. The new GEF-funded project *"Ethiopia: Conservation and Sustainable Use of Medicinal Plants"* will undertake work only in the Bale Mountains region. Further investigation in this area should be done in cooperation with the above-named new project and with social scientists by collaborating either with the Ethiopian Agricultural Research Organization (EARO) or with Addis Ababa University (AAU).

(v) It would also be appropriate to try to reconstruct ecological and resource use histories in terms of changes in the landscape, in agricultural and animal husbandry practices and in the mix of crops and their varieties under cultivation. Farmers would recollect the changes, at least over the most recent period of ten to twenty, years quite accurately, and such oral histories would be of value in assessing the extent and rate of genetic erosion. Coupled to an understanding of what motivates farmers and other agents to behave the way they do, this would clarify the forces driving genetic erosion and point to a broader range of effective ways of countering them. A particularly important focus would be on how significant ecological and social events of the past have affected (or not affected) the diversity of crop genetic resources, as well as other forms of resource management practices.

3.2 Local knowledge and farmers' practices

The project has made a good beginning of documenting and putting to use farmers' knowledge and techniques. Farmers necessarily take a holistic view of the system; their livelihoods are affected by integral outcomes. They also have considerable experience with the behaviour of the system at least over recent history and therefore have an appreciation of consequences of relatively rare events, such as heavy frosts. All of this knowledge is rather local and may reflect the lack of scientists' access to a more global understanding buttressed by access to modern, highly sophisticated technologies. Nevertheless, scientists tend to take more sectoral perspectives based on their own specialized training. They also lack the detailed knowledge of local ecosystems and their histories.

(i) Farmers, herders, fishers, herbal medicine men and women have important knowledge and insights that complement the areas of competence of scientifically trained experts. This project could greatly profit from more detailed and careful documentation of farmers' knowledge and technologies in ways that could promote its use side-by-side with scientific knowledge and technologies. Thus farmers have an understanding of how the traditional varieties perform under different soil and rainfall regimes; they have effective and very specific techniques of selecting seeds and of storing seeds in ways that resist rodent depredation. This project should lead the way in profitably recording and deploying this knowledge.

(ii) The project envisioned a major ethnobotanical research component to understand and analyze patterns of farmer's knowledge in selection, utilization and maintenance of Ethiopian crop genetic resources. Current research termed "ethnobotanical," including the research done in collaboration with the Biology Department of Addis Ababa University, is largely confined to collection and characterization of barley and sorghum in Northern Shewa and North Central parts of the country. Although considerable results have been achieved on this area, much more could be done in other areas of ethnobotany, especially those having to do with local knowledge of cultivation systems and their area and seasonal variations and other technologies.

(iii) Another important area that merits closer research is an inquiry into locally-developed ways of conserving farmers' crop varieties, including the social and market networks through which such varieties are acquired, disseminated and reacquired following crop failures (as well as the social and ecological factors that might inhibit exchange). While the project has chosen to use community gene banks as its focus and its preferred

method of assuring landrace conservation, pre-existing methods of assuring seed availability must be understood so that these can be enhanced rather than threatened by project activities. During the team's brief visit to project sites, we heard several accounts of how landraces are saved or recouped in times of stress. The project should be highly commended for its philosophy of building upon rather than replacing local patterns. Additional multi-disciplinary study is, however, indicated if this philosophy is to be effectively put into practice.

3.3 Agricultural Policies, Farmers' Rights, and Benefit Sharing

The main objective of the Government of Ethiopia's agricultural policy is to ensure food security at the household level through increased production. Because of the dependency of the economy on subsistence agriculture, the government implemented the Agricultural Development-Led Industrialization (ADLI) development strategy. The strategy concentrates on increasing production by using improved agricultural technologies such as improved seeds, breeds, fertilizer, and overall crop and animal management practices, increasing production of raw materials for the local agro-based industries, and increasing production of export agricultural commodities. Although some yields obtained using these practices are impressive, under certain conditions the yield of improved varieties is not better than that of landraces. This situation has forced regional agricultural development offices to re-evaluate production packages and repackage them by including local farmers varieties to suit their local conditions.

(i) The seeming contradiction between augmenting productivity and maintenance of diversity must be resolved, for long-term enhancement of productivity does indeed need the base of diversity, especially to combat emergence of newer strains of pests and diseases. The project would therefore greatly benefit from a careful policy analysis focussing on these themes, including an examination of the specific areas and situations where diversity is essential and those where it is less important. Such a focussed analysis would also be of much value to the development of the emerging Operational Program.

(ii) Currently the Federal government of Ethiopia is following a policy of encouraging a free market economy, thus the price of any commodity is governed by demand and supply. Following this policy, the government has liberalized the market and many state-owned firms are being privatized and the rest are being restructured to fit into the free market economy. What this means for continued production of landraces is not yet known. In any case, detailed study should be undertaken to investigate how the pricing policy and marketing will affect the sustainable production of landraces, enabling policy makers can take appropriate measures.

(iii) An understanding of the extent of distinctiveness, uniformity and stability of farmers' varieties is relevant to developing a system of their registration in a manner analogous to registration of breeders' varieties. Improved varieties are evaluated and released by the National Variety Release Committee (NVRC) provided that a variety fulfils pre-set criteria such as distinctness, uniformity, trueness to type and higher yield or other qualities, among others. So far, little has been done to formally recognize farmers' varieties or landraces. The development of such a system has great relevance for the formulation of benefit sharing arrangements in the *sui generis* system of protected plant

varieties in Ethiopia, as well as in other countries. Ethiopia is now in the process of developing the national *sui-generis* system. To include farmers' varieties would obviously require some modification of the standard system of registering of breeders' varieties. The investigations coming out of this project could contribute much toward formulating such legislation.

3.4 Market and Non-Market Incentives

(i) This is one of the few areas in which the project has failed to make progress toward its goals. Farmers' varieties could potentially be favoured through the emergence of and access to markets willing to pay a premium for products derived from farmers' varieties. Small-scale domestic market surveys that have been done so far, however, indicate that there are no price differences between grains produced from landraces or from high-yielding improved varieties. Research into the extent to which it is feasible to develop specialized markets for Ethiopia's endangered crop varieties requires careful investigation. Access to such information would be best achieved by searching out and forming ties with researchers and others specializing in these areas. To date IBCR has not taken any tangible steps to address this seemingly difficult task because of lack of expertise. The project originally envisioned hiring an appropriate consultant to conduct such studies.

(ii) In the absence of market incentives, it may be necessary for the society to agree to pay some service charges to farmers willing to maintain farmers' varieties in cultivation. The current project in fact takes this approach. However the level of compensation offered is fixed rather arbitrarily without the help of any careful economic analysis of the issues. Again, it would add considerable value to the project if it involved competent economists in analysing the question of the nature and extent of incentives that may be paid to conservator farmers.

(iii) One project initiative in the area of non-market incentives has been the seed fairs that have been held in one of the sites of Ejere in Eastern Showa. In order to motivate farmers and communities, a more substantial system of awards and social recognition may have substantial results. Results of such incentive programs in other countries and regions should be investigated.

(iv) It is also essential to appreciate the behaviour of other actors who are important in trade in agricultural products, such as local, national, and foreign traders and consumers. For instance, the project needs to ask: when are consumers willing to pay higher prices for produce of genetically diversified, organic agriculture? Again, access to such information would probably be best achieved by incorporating social scientists and economists into several phases of the project's activities (see comments above).

4. TEAMS AND METHODS

The challenge of a complex undertaking such as this project is reflected, not only in the multiplicity of scientific issues that need to be addressed, but there is also a variety of research methods that should be employed if data and understanding appropriate to the complex task at hand are to be generated.

The team acknowledged the admirable efforts that have been made by personnel at the project sites that we surveyed. Most notable is the apparent excellent rapport and spirit of cooperation that exist among project scientists, technicians and the expert conservator-farmers who are a focus of the project. The team also took note of the difficult travel and living conditions under which much of work is accomplished. The review team focused its attention on assessing the adequacy of the research and monitoring methods that are now used and how these might be modified to strengthen the project scientifically. The team felt that some consideration might be given to the following aspects of research team design and methods.

(i) The project attempts to understand the behaviour of farmers and their motivations by applying limited questionnaires, by working closely with selected exceptional conservator-farmers, and by setting up village-based Crop Conservation Associations. While these methods have yielded much interesting data, it would be useful to broaden these efforts in order to gain a greater appreciation of the heterogeneity of farming communities and to understand how and why different farmers maintain or change their use of traditional landraces and other agricultural biodiversity. Appreciating the differences between individuals and households in terms of resources, labor, knowledge, gender and age distribution, and agricultural decision-making is necessary in order to understand which farmers -- and under what conditions -- accept and maintain improved varieties in place of farmer's varieties. Paying more attention to appropriate sampling and selection of key informants would doubtless lead to more useful insights into how resource use may be changing. Rather than merely boking at central tendencies, the range of resource-use related behaviours, and the behaviour of exceptional farmers and households should be given more attention.

(ii) Anthropologists, ethnobotanists, and others have considerable experience of recording indigenous knowledge, including locally-developed methods of dealing with environmental stress as well as abundance, through participatory methodologies involving long-term stays with their subjects. This project could gain much by involving some Master or Ph.D. students who would stay with farmers' families and participate in their activities thereby assimilating their knowledge and techniques as well as gaining an appreciation of the economic factors that influence behavior through a full annual cycle.

(iii) The project could be generally greatly strengthened by building effective interdisciplinary networks involving social scientists -- including anthropologists, sociologists, and economists -- as well as natural scientists such as population geneticists and biometricians. Among the important gains that the building of truly multidisciplinary teams would bring is better access to recent scientific literature and information from the broad range of disciplines that inform the *in-situ* conservation field. Obviously not all these specialists need to be actually employed by IBRC; many of them could become part of the project through working at other research institutes or University departments.

(iv) Improved gender balance in hiring on all levels might also be given more emphasis in the project. More women researchers, for instance might give the project far better access to the expertise of women farmers, an area now relatively neglected by the project.

5. SCIENTIFIC AND RESEARCH CAPACITY BUILDING

One of the primary strategies of this project, as stipulated in the project document, is to strengthen the scientific and technical capacity of Ethiopian institutions, especially the IBCR, through capacity building at various levels.

(i) The project has contributed to building research capacity by offering a diverse array of training opportunities. As Table 2 (Appendix 3) indicates considerable progress has been made. The review team would, however, like to point out that the scientists that have been sent to further their academic training have all pursued academic programs in a rather narrow spectrum of agronomy or botany. The benefits of added expertise in a broader spectrum of scientific disciplines, including the social sciences and ecology, might be considered when future training opportunities are contemplated.

(ii) In addition to the students mentioned in Table 2, three postgraduate students from Addis Ababa University working on research relevant to the project objectives have been sponsored by the project. The project has also contributed to the capacity building of the National Herbarium of the Addis Ababa University by way of procuring vehicles, computers to facilitate research activities and develop databases, etc. Again, a broader spectrum of collaborating scientists and partner institutions should help build more effectively scientific capacity for future conservation efforts.

(iii) Improved gender balance in training might also be given more emphasis in the project (see comments in discussion of research methods above) as it might extend the research capacity needed by this project and other activities.

(iv) Formal training of technicians and development agents has been done by the IBCR and the National Herbarium. During the field visit farmers indicated to the team that the training they received contributed to their expertise in conserving their genetic resources. However, the team was not able to observe such training, nor did we receive any written curriculum used in such training. The review team would have liked to have examined such a curriculum to assess whether training sessions indeed allow for an effective use of farmers' knowledge and whether they avoid traditional top-down farmer-training models.

6. INTEGRATION OF RESEARCH COMPONENTS WITH OTHER PROJECT ACTIVITIES AND OUTSIDE THE PROJECT

(i) Much very valuable research has been done by the project. At various points in our review it was suggested, however, that the paucity of in-depth social, economic, and ecological studies on the factors leading to genetic erosion, differentiation, or conservation is limiting the utility of much of the research done for the project. More effective collaboration with other scientific and technical institutions to complement the work at IBCR is indispensable because of a general shortage of trained manpower in this area.

(ii) In order for agrobiodiversity research to succeed in helping smallholders, the further enhancement of the genetic resources without sacrificing diversity is crucial. This

activity can best be performed in collaboration with a variety of scientists and technicians, including (but not confined to) plant breeders from EARO, marketing researchers at AAU, and management of *in-situ* conservation with regional bureaux of agriculture for the respective sites.

(iii) Breeders have been using local landraces to develop improved varieties of number of crops such as sorghum, durum wheat, barley, riger seed, tef (*Eragrostis tef*) and others, through collaboration with the IBCR in *ex-situ* conservation and utilization. However cooperation in *in-situ* conservation is still minimal. Improving such collaboration would doubtless increase the consciousness level of all stakeholders concerning the importance of genetic resources, thereby encouraging sustainable utilization. Every attempt should be made to implement genuinely "participatory breeding programs" by including farmers and their knowledge throughout the process.

(iv) Of the twelve community gene banks constructed, only two were visited by the review team because of time constraints. The project team is aware that CGB are not representative of the farmers' traditional ways of storing their seeds. Those are constructed either above ground from locally available materials or in underground pits. The CGB are also larger in size and made of materials different than those used locally, making them expensive for the farmers to duplicate. We believe that research on local technologies could again help improve this central activity of the project. Building upon local methods of seed storage may also provide an opportunity for project technicians and researchers to learn more about local techniques as well as for farmers to become more actively involved with the project, boosting interest and participation.

(v) The team does acknowledge that, apart from seed storage, the CGB can have other important functions, i.e. as meeting places for the community (although we did not observe that they actually served this function) and as visible symbols of the project and its involvement in the communities.

(vi) Agrobiodiversity research in general and particularly *in- situ* conservation is a break away from the traditional way of conserving plant genetic resources. As a new concept, it is still struggling to enter into a system of production as well as research. There is an encouraging trend of increased appreciation on the part of stakeholders at various levels of society, from farmers to government officials, around the project, that given time, with sustained resource and effort, it may be possible to expand and duplicate in other parts of the country. In order for this to happen, enhancement programs of landraces without sacrificing diversity should develop side by side with conservation activities so that farmers can benefit from their efforts.

Lastly, the project marks an important early step in understanding, organizing, and promoting systems of sustainable use of biodiversity that are flexible and participatory. The project team deserves to be commended on the excellent progress and the major contributions to science and conservation that they have made in this pioneering attempt. Our comments above are an attempt to aid in this major endeavor. We believe that this project has contributed lessons that will be invaluable for the projects that will follow. Perhaps the most important message that emerges from this review is two-fold: we must seek to foster effective collaboration among scientists from different disciplines and institutions, and we must attempt to couple the strengths of science with the knowledge and insights of farmers and other practitioners.

Annex I

STAP Selective Review of "A Dynamic Farmer-Based Approach to the Conservation of African Plan Genetic Resources"

Terms of Reference

1. How has the project built upon and strengthened local practices and institutions that have maintained agrobiodiversity, including traditional seed storage and distribution;

2. Has agrobiodiversity research been carried out in a manner that resulted in accurate identification of priorities and opportunities for conservation?

3. Has the project successfully built up scientific and research capacity in the IBCR and other relevant institutions in areas most important to agrobiodiversity conservation?

4. How successfully have the research components been carried out and integrated with other project activities?

5. What understanding has the project generated as to the extent of variability within and between different land races? Has it helped evolve a better system of recognition and documentation of land races? What understanding has it generated that is relevant to understanding contribution of land races to development of breeders' varieties?

6. How have changing conditions, including abrupt changes in political, economic, demographic, etc. spheres affected the project and how were past patterns taken into account?

7. To what extent did the pricing and agricultural policy affect the success of the project?

8. Have programs for market and non-market incentives been based on sound understanding of past experiences as well as present opportunities and constraints?

9. Have project conservation efforts identified and integrated priorities in conservation of smallholder patterns of resource management with focus on particular wild and domesticated crop genetic resources?

10. How has project influenced the state of agrobiodiversity in areas in Ethiopia outside of project sites, including the "modern" agricultural sector"?

11. What aspects of the Ethiopian project lend themselves to replication in other countries?

12. How can the lessons – positive and negative – contribute to the preparation of the new OP and agrobiodiversity projects in the GEF?