

GIVE US THE TOOLS

SCIENCE
AND
TECHNOLOGY
FOR DEVELOPMENT



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CONTENTS

Preface	1
Introduction	3

PART ONE — The Organization

1. How it Began	9
2. How it Works	23

PART TWO — The Projects

3. Science Technology and Society	35
4. Making Industry Competitive	49
5. The Andean Example	67
6. Basis for a Blue Revolution?	79
7. An African Family Affair	91
8. Protein from Pig Waste	105
9. Helping Young Scientists	113
10. Defence Against Famine	123
11. A Model of Rural Development	133
12. Advice on the Factory Floor	147
13. Making Information Accessible	161

PART THREE — An Assessment

14. The Role of Research in Solving Problems of the Developing Countries: A Third World View	177
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APPENDIX 1 — The IDRC Act	189
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CHAPTER TEN

DEFENCE AGAINST FAMINE

BRHANE GEBREKIDAN

Ethiopia is believed to be the home of sorghum, a staple food crop not only for Ethiopians but for hundreds of millions who live in the semi-arid tropics. When sorghum crops fail, famine follows in Ethiopia. Addis Ababa University's agricultural faculty has for many years been carrying out research aimed at improving sorghum, and in 1972 the IDRC granted it \$195,300 to continue this work. In 1974 a further \$560,000 grant was approved.



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THE LIVES AND WELL-BEING of millions of rural Ethiopians traditionally have been intertwined with the status of the sorghum crop. A year of good sorghum harvest is often a year of prosperity, but if the sorghum crop fails, food supply is scarce and famines become commonplace.

Ethiopia, in fact, is probably the original home of sorghum and is the source of many wild and cultivated forms adapted to a wide range of growing conditions. Consequently Ethiopia is a valuable reservoir of diverse genetic material for sorghum breeders throughout the world.

Sorghum is the dominant crop in parts of the country where drought and moisture shortage are the norm. In most of these areas, the traditional sorghums, though requiring a long growing season, give reasonable harvests in years of good rainfall. But they fail to produce any grain if the rains are inadequate. The recent droughts that have dominated these zones, along with most of Sahelian Africa, have caused the failure of the sorghum crop and resulted in massive famines and deaths. These painful experiences have forced the rural people in these areas to look for ways of stabilizing crop production. Realizing such a need, the Ethiopian Sorghum Improvement Project (ESIP) was created with financial support from the IDRC. It has tried to introduce early-maturing varieties along with recommended production packages. This has been done by holding field days near the project sites, carrying out demonstrations in selected farmer's fields, and through the Extension and Project Implementation Department (EPID), the Settlement Authority, and State Farms. Farmers in such areas are now becoming more aware of the potential of early-maturing and drought-avoiding sorghums adapted to the environment, pest and disease situation of the area. The demand for such sorghums is increasing in these areas.

However, a positive influence on food production depends on a multi-disciplinary approach. And since the ESIP has not been in operation

long enough to coordinate all disciplines and agencies influencing sorghum production in Ethiopia, and because varietal development is long-term by its very nature, the project's direct influence on sorghum production in Ethiopia has so far been modest. Even this modest influence cannot be quantified because of the absence of reliable crop production statistics. For similar reasons, it is difficult to predict the future impact of ESIP on Ethiopian sorghum production. However, the outstandingly successful breeding program that has been established shows promise of making a major contribution to the country's food supplies. The project's main contribution to food production has been supplying improved varieties and recommending optimum packages of production including seeds, fertilizers and cultural practices. The varieties that have been developed or introduced by the project and are being grown in different parts of the country in varying amounts are Gambella 1107, Dedessa 1057, Kobomash 76, Serena, Alemaya 70, and Awash 1050.

Two of these high-yielding cultivars, Alemaya 70 and Awash 1050, substantially outyield farmers' cultivars in high and intermediate altitude zones respectively. In the low rainfall areas these new varieties can give up to approximately 5.0 tons/ha and in the high rainfall areas they produce up to 8.0 tons/ha on small experimental plots. Average on-farm yield of the farmers' cultivars is about 1 ton/ha.

For lowland areas, suitable maturing varieties are almost absent. Kobomash 76 has been released due to a crisis situation resulting from the drought: it has performed well in other parts of the world but has not been tested extensively under Ethiopian conditions. In 1976 it has yielded 3.5 tons/ha under experimental conditions.

A number of trials have been carried out to define packages of agronomic packages for growing the new sorghum cultivars in the various regions of the country.

An important part of the research program has been to determine the major diseases and pests of sorghum in Ethiopia along with the most commonly found weeds, and to develop methods for their control. Surveys have shown that weed control is important since competition from weeds can reduce yields by at least 25 percent. Tests conducted on the major broad-leaf weeds indicate that atrazine-based herbicides are the most effective form of control. A major unsolved problem is the development of a control for the parasite witchweed, striga. It is believed that if the weed can be effectively controlled, a major hurdle will be overcome in increasing Ethiopian sorghum output. A limited striga control program is currently being undertaken in the project.

The surveys have also identified 12 major sorghum diseases and 13 types of pests, which have been classified into general, highland or lowland specific, and/or high rainfall-low rainfall specific. This classification allows researchers to estimate the frequency of occurrence of the various pests and diseases by region, and to concentrate their control efforts in those areas.

One of the objectives of ESIP has been the collection of Ethiopian sorghums. As of the 1977 crop season there was a collection of Ethiopian sorghum varieties numbering over 5,700. This collection has been made freely available to other cooperating national programs and to ICRISAT. The varietal development program has concentrated on pure line selection, the pedigree method and hybridization.

For pure line selection, ESIP has been gathering between 500 to 1,000 new Ethiopian sorghums every year and growing them out for evaluation purposes. The pedigree method is the crossing program involving Ethiopian and exotic varieties. In total there are 137 parents involved in 11 major combination blocks. A hybrid program started in 1977, and is based on 10 male sterile lines and 163 pollinators. Combinations were made in the off season nursery and 1,630 different F_1 hybrids were planted for yield trials in 1977.

GOVERNMENT AND NATIONAL DEVELOPMENT POLICIES

ESIP has become an excellent example of effective cooperation between the Addis Ababa University (AAU) and the Institute of Agricultural Research (IAR). The two institutions, along with IDRC, have different vital contributions that make the effective functioning of ESIP possible.

AAU and IAR have agreed to give all national responsibility for improvement of the sorghum crop to ESIP. Almost all research stations and other government organizations interested in sorghum receive seeds, guidance, and consultancy from the project. The project has now become the national reference centre for almost all aspects of Ethiopian sorghum improvement and production. Though ESIP attends to such references with pleasure, we find that this unlimited role is demanding increasingly more time of our very limited professional staff.

In the National Crop Improvement Committee (NCIC) framework, ESIP is the coordinator for all national sorghum trials and nurseries. This responsibility entails organizing and planning trials, packaging and distributing seeds, providing instructions and data sheets for the trials, providing consultancy and advice on sorghum, assembling data from all cooperators, analyzing and interpreting the data, and submitting reports on work done on the crop during the year to the NCIC annual meetings. In addition to these functions, ESIP is nationally responsible for breeding, germ plasm collection and introduction, and agronomic and crop protection trials on sorghum. ESIP often calls ad hoc technical meetings of cooperators and appropriate crop protection and soils specialists to review the national work on sorghum. Visits by these experts to various stations handling sorghum trials are also arranged by ESIP. The project is considered significant in the NCIC framework not only as an effective crop-specific project but also as a model that appears



Searching for a better grain in Ethiopia, the home of sorghum.

to positively influence modes of operation and crop improvement approaches in the other nationally important field crops.

The Ethiopian Seed Corporation (ESC), which has been recently established, depends entirely on ESIP as a source of breeder and foundation sorghum seed for all ecological zones of the country. ESIP played a prominent catalytic role in the establishment of the ESC, and sorghum is one of the top priority crops for seed production by ESC.

Another important agency with a strong interest in the activities of ESIP is the Ethiopian government's Relief and Rehabilitation Commission (RRC). Since the RRC's chief geographical areas of activity are major sorghum producing zones, the crop is often of highest priority for the commis-

sion. The commission is very keen to popularize ESIP's new sorghum cultivars, which can stabilize crop production in the drought- and famine-prone areas of the country. In one such difficult crop production area, Kobo, the seed multiplication farm of the Kobo-Alamata Regional Agricultural Development Project of the RRC, is entirely dependent on ESIP as a source of breeder and foundation seed, as well as technical information on sorghum seed production.

Realizing the menace of *quelea* birds (also known as weaverbirds) to sorghum production, the Ministry of Agriculture and Settlement has recently established a *Quelea* Control Project. The activities of this project and that of ESIP have become mutually supportive. Indirectly, ESIP played a catalytic role in the establishment of the *Quelea* Project.

ESIP plays significant roles in the government's policy formulations not only in sorghum research but also in production. On the production side, we find ESIP's linkages are directly with State Farms, the Settlement Authority, and the various Regional Agricultural Development Units. To each of these, ESIP provides technical consultancy and advice, seed and production recommendations.

In general, ESIP's impact on government and national development policies, particularly as related to sorghum, is multifaceted: sometimes it assumes a catalytic role, at other times it gets involved in policy formulations, and sometimes it acts as consultant and advisor. Whatever the role may be in national sorghum research, extension, production, and development policies, ESIP is a unit that is seldom ignored.

THE SCIENTIFIC COMMUNITY

The impact of ESIP on the Ethiopian scientific community is significant: it is often a major participant in professional dialogues. And the comprehensive sorghum improvement activity of the project is often referred to as a model crop improvement program by the scientific community, which indicates its high regard for it.

ESIP continues to play a major catalytic role in encouraging and stimulating other Ethiopian scientists to be more involved in sorghum-related investigations such as pathology, entomology, nutrition, *quelea* and *striga* control. ESIP is also the major force cultivating team spirit among Ethiopian workers interested in sorghum.

ESIP is an active member of both the Ethiopian Seed Corporation Technical Advisory Committee and Ethiopian Plant Genetic Resources Centre Advisory Council. In both, the project's services and contributions are vital, and its positive influences in such groups are well appreciated by the scientific community. The project, in fact, played an active role in establishing both these important organizations. Significant contributions continue to be made by ESIP to both, not only in ideas but through its collections of in-

valuable germ plasm. As mentioned earlier, all basic and foundation seeds of improved sorghum cultivars are provided by ESIP to the ESC. ESIP has contributed a total of 5,000 accessions of Ethiopian sorghum germ plasm to the Ethiopian Genetic Resources Centre. Scientific interactions on these and related items in which ESIP is a leading participant, go on continuously.

ESIP also adds continuously to the scientific knowledge of Ethiopian sorghums through the literature. The ESIP annual reports are important references in most national agricultural experiment stations and educational institutions. Our annual workshops and field days serve as important scientific forums of interaction on Ethiopian sorghum improvement. The regular annual NCIC reports provide us with a good opportunity to address the whole sector of the Ethiopian scientific community that focuses on crops. The results of these interactions often give us new insights into Ethiopia's sorghum improvement efforts. In addition, ESIP reaches the scientific community on specific topics in national, regional, and international scientific publications. On the whole, ESIP's contributions and presence are well felt by the Ethiopian scientific community.

OTHER CONTRIBUTIONS

One way in which ESIP has had a considerable impact on the Ethiopian scene is by developing a high quality, viable and comprehensive sorghum improvement program using entirely local staff. The program has now matured enough for it to pay attention to most of the needs of the major sorghum ecological zones of the country. This strength and development has come about mainly because of ESIP's emphasis on training local staff. Within ESIP, we now have an adequate supply of fully-trained technical assistants who can carry out almost all skilled jobs related to sorghum improvement in both field and laboratory. Our training efforts have been useful also to other national organizations such as the Ethiopian Seed Corporation, the National Development Campaign, EPID and the Regional Agricultural Development Projects. ESIP staff have major roles in the teaching and curriculum development activities of the Ethiopian Colleges of Agriculture. ESIP's strong, comprehensive sorghum improvement program and the well-developed Ethiopian network of sorghum stations have been among the major reasons for the establishment of a graduate studies program in plant sciences in this country. ESIP's total contribution to the country's trained agricultural manpower, at both high and intermediate levels, has been significant.

ESIP is now considered a very important unit in a worldwide network of sorghum improvement centres. Ethiopian sorghum germ plasm, collected, evaluated, and distributed by ESIP, is considered invaluable and is well known in most international, regional, and national sorghum improvement programs.

NON-TECHNICAL PROBLEMS

There have been two general types of problems encountered by ESIP — technical and non-technical. The technical problems have been dealt with in ESIP's Progress Report No. 5, 1977. I will deal with the main non-technical problems.

The lack of a seed production establishment of any sort in the country has been the main factor limiting the spread of improved varieties to farmers. The recent establishment of the Ethiopian Seed Corporation is expected to alleviate this problem. Sorghum is one of the priority crops for the Corporation and ESIP is supplying the breeder and foundation seeds.

Another important problem has been — and continues to be — the lack of effective linkage between the crop improvement program and the national extension service. ESIP continues to feel that it must have a strong outreach program as an integral part of its activities.

The third important problem is the impossibility or difficulty of obtaining suitable research equipment and supplies from local or foreign sources through local agents. This problem often exists even if money for the purchase of this material is available.

ADVANTAGES AND DIFFICULTIES OF COOPERATION WITH IDRC

ESIP's feelings about the advantages and difficulties associated with cooperating with IDRC have been honestly expressed in our Project Annual Reports.

We consider the disadvantages of cooperation with IDRC on the whole to be minor. However, for the sake of completeness and looking at the issue from all angles, one point will be mentioned here.

Even though we fully appreciate the importance of periodic technical and financial reports, the centre's requirement that these reports be submitted on a specific date sometimes makes it very difficult to submit technical reports that are meaningful. Our technical reports naturally depend on the data we collect from a given growing season. Often, we are asked to submit a technical report even before harvests have been completed.

The major aspect we continue to appreciate and admire is the IDRC's total belief and confidence in a project that is completely staffed by local personnel. This is unlike most aid-giving foreign agencies, which invariably attach strings and insist that their own nationals must be posted to projects they are financing.

The minimum of bureaucracy involved in our dealings with the IDRC makes our project operations efficient and less time-consuming. The prompt and efficient responses to ESIP enquiries from IDRC offices is another quality of the Centre we value highly.

ESIP's semi-autonomous status, which has been made possible by the mutual agreement between IDRC, AAU, and IAR, has been one of the most favourable reasons for the project's smooth and efficient operations. We cannot overemphasize the importance of adequate financial support for the effective operation of a project such as ESIP. We feel that one of the most important advantages of cooperating with IDRC has been the good financial support we have received from the Centre.

Inasmuch as we are located in an area where current scientific literature on sorghum virtually does not exist, the services of the IDRC library in providing ESIP with regular computer printouts of published topics on sorghum, and the associated photocopy supply of selected papers are invaluable to our project. Thanks to this service we are kept up-to-date on scientific developments on sorghum even though we have no library of any sort within everyday reach. This service keeps our scientific morale constantly high and makes us feel we are not left out and are communicating with the world-wide scientific community that works with sorghum.

The periodic personal visits of IDRC staff and the sincere interest of the Centre in the project are much appreciated by ESIP. Such visits give us constant encouragement to strive to do better and contribute a great deal to strengthening the ties between the Centre and this project.