

TRANSFER OF POST HARVEST TECHNOLOGIES TO SMALL FARMERS*

INTRODUCTION

The post harvest system needs to be tailored to the needs of the people it serves. One of the key groups should be the small farmers. Identifying their problems is relatively simple. Understanding the reasons ^{for} these problems ~~are being resolved~~ and identifying workable ways to encourage farmers, technicians, private business and policy makers to start resolving them is more difficult. There is no simple "100 meter dash solution". The transfer of post harvest technologies is a process, not an event.

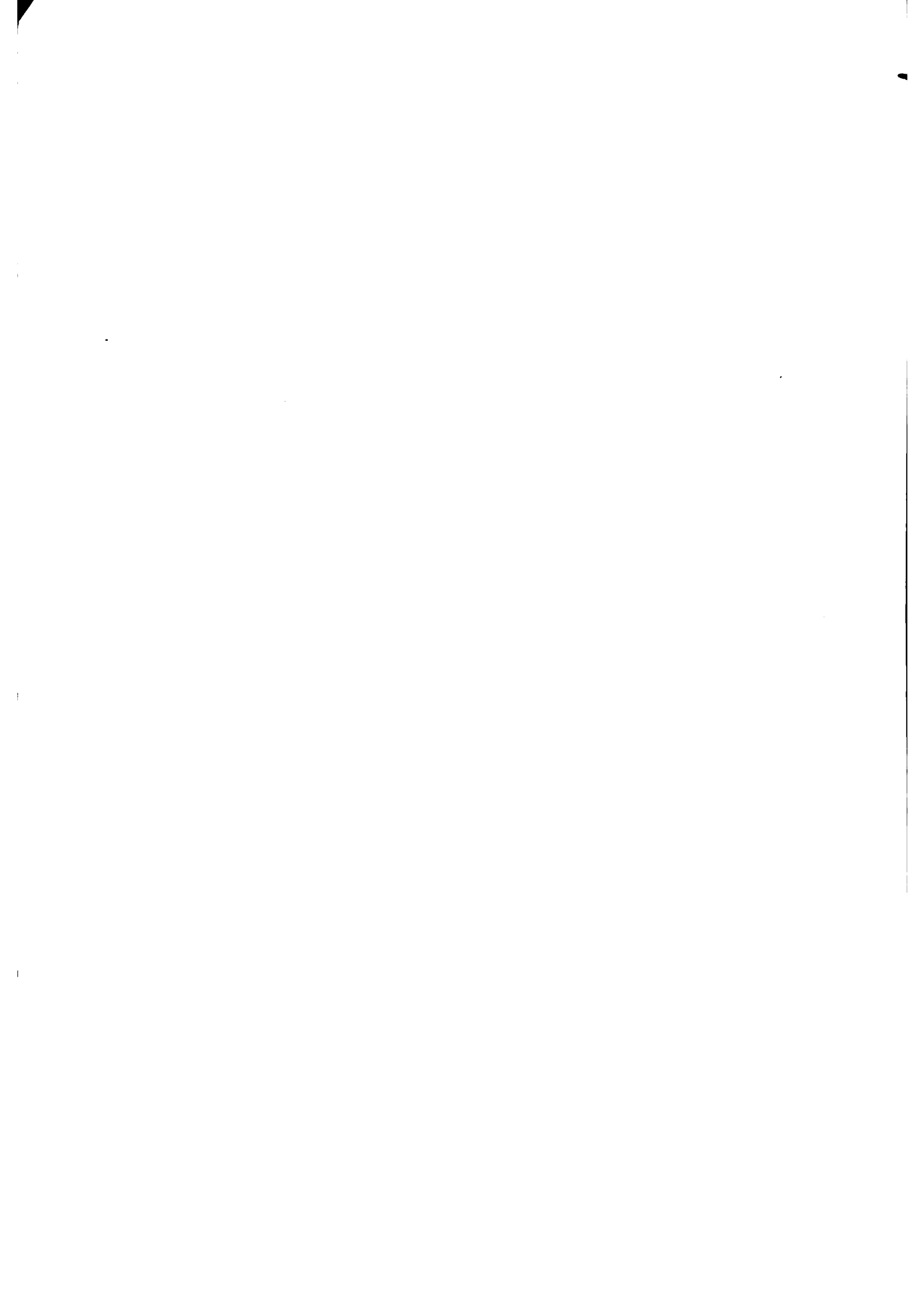
Professional development technicians and politicians are now paying increased attention to the problems of small farmers, realizing that a poverty environment only fosters malnutrition and weakens the entire social structure. Three main factors have reinforced the interest in programs to increase the small farmer's production and productivity thus giving him more purchasing power. These factors are:

- Most farms in Latin America and the Caribbean are operated as small holdings. ^{1/}
- Small farmers are major producers of food crops.
- Increasing evidence shows that small farmers can be as efficient per unit of capital investments as large units due to the intensity of labor inputs from the farm family. ^{2/}

* Post harvest food loss here is viewed as an integral part of the agricultural and food marketing system. According to the National Academy of Sciences Post harvest is the time after separation from the medium of immediate growth or production of the food. It ends when the food enters the process of preparation for final consumption.

^{1/} For example, according to an analysis made by the National Bank of Mexico, 52 per cent of the 2,816,000 farm units in Mexico are classified as subsistence farms.

^{2/} See Peter Dorner and Donald Kanel, "The Economic Case for Land Reform", AID Spring Review, June, 1970.



The area concerned in this paper is the transfer of post harvest technologies to small farmers as part of the total rural development effort, with attention being called specifically to some of the related major policy implications and issues involved. Whatever arrangements are made for promoting the study and dissemination of information and technologies, a further problem to be seriously considered is the mechanism and policies by which technology is transferred to the small farm level.

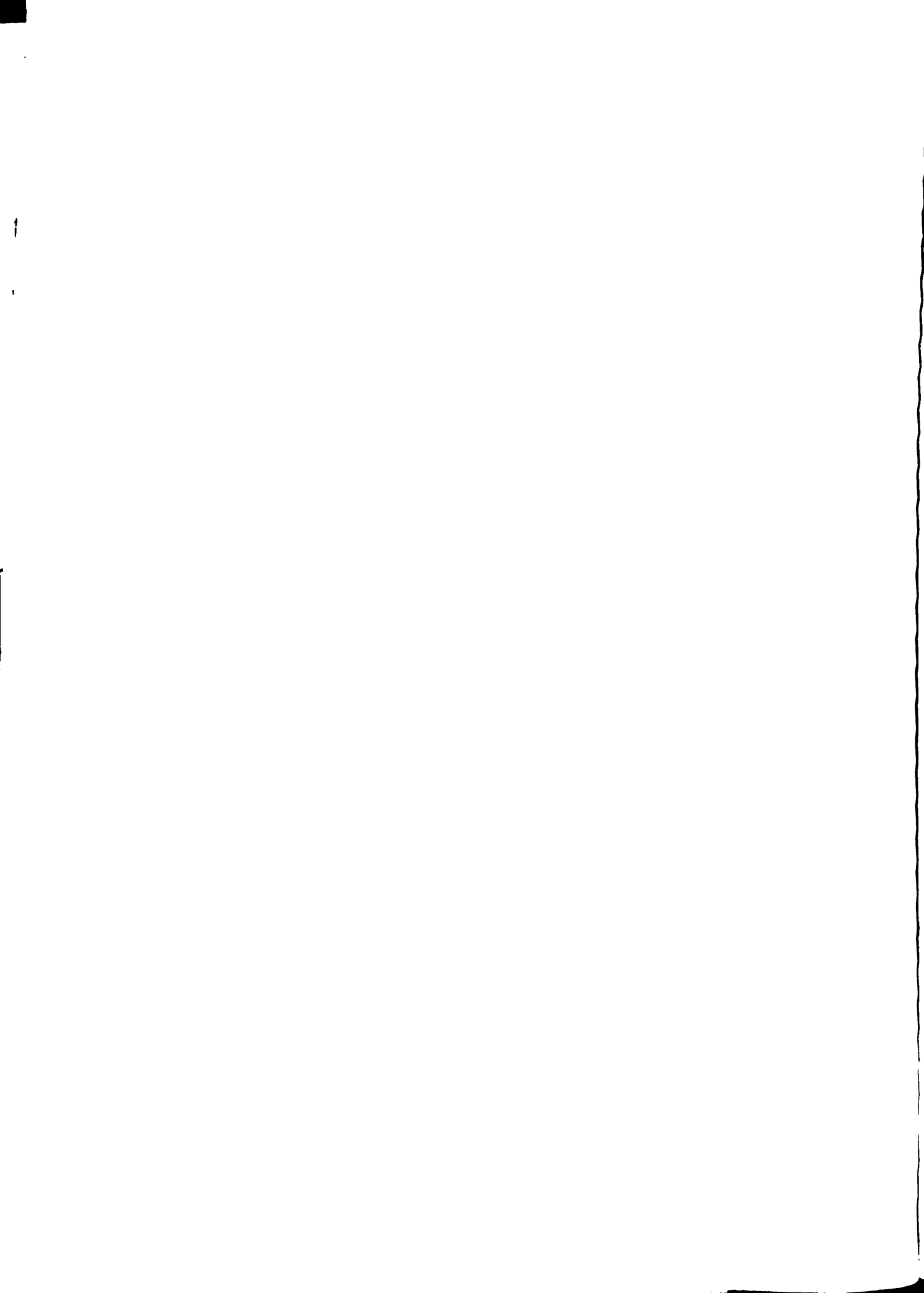
THE SMALL FARMER AND POST HARVEST FOOD TECHNOLOGIES

The small farmer is typically identified as one of two main subsectors within the rural sector. The other, the large commercial farmer, has dominant access to land, capital markets, technology, government support services and fiscal incentives. The channels of this commercial subsector tend to modernize by capital intensive programs such as agroindustry complexes, large wholesale markets, supermarkets seeking vertical integration and modern storage facilities.

The small farmer is characterized as having limited access to productive services, technical assistance, income streams and political influence in his society. The composite of these variables restricts the size of his farm and his ability to influence the resource allocation process of goods and services in both the product and factor market. Governmental support is needed to help him break out of this low income and productivity equilibrium level.

There are many complicated reasons for this duality in the rural sector, such as the type of technological production and marketing packages being produced and delivered to the small farmers and the existing imperfections in the land and capital markets.

The job of improving the welfare of the small farmer through transferring technologies to reduce post harvest losses is very difficult. The prevailing production and distribution practices need to be studied and evaluated in order to determine



from analysis of field situations what innovations might yield the best economic results for the farmer, and what are the alternatives and their cost-benefits.

Overall, the small farmer at the first instance, does not appear to be a likely candidate to adopt innovations, assuming they can be made available and are appropriate, for he simply cannot afford to risk losses in crop production.

For example, a poor farmer who has been persuaded by a well-intentioned government extension agent to buy a small insecticide sprayer or a small scale on-farm storage facility must be convinced that it will bring in significant increased benefits in the short run. For it breaks down or proves to be non-competitive with existing traditional methods he will have not only lost his capital investment but also much of his confidence in new technology and in the "wisdom" of the extension agent.

David Hopper points out that if new technologies do add greatly to yield and the yield can provide a profit beyond the enhanced cost of the new methods, and if the farmer has access to the appropriate production factors he needs in order to apply these methods effectively, then "aggressive" innovations will follow.^{3/}

Recent thinking has suggested that the low adoption rates result from the new technology being inappropriate for small farm situations. According to Zandstra, Swanberg and Zulberti, "it may be erroneous to seek only to maximize production per hectare, and to consider that other production factors exist in unlimited quantities, and at fixed prices. Such an approach assumes that economic, social, cultural, and political infrastructure can and will automatically

^{3/} Hopper, D. "The Development of Agriculture in Developing Countries", Scientific American, September 1976.

adjust to the requirements of the new technology. In practice this does not often occur".^{4/}

More recently, an alternative approach has gained some acceptance, namely that of adjusting production and distribution technology to the social and economic system currently encountered in rural areas.^{5/} This approach has emerged as a result of the recognition that modern production and distribution may unfortunately increase the disparity in welfare levels between the commercial and non-commercial farmers rather than close the gap.^{6/}

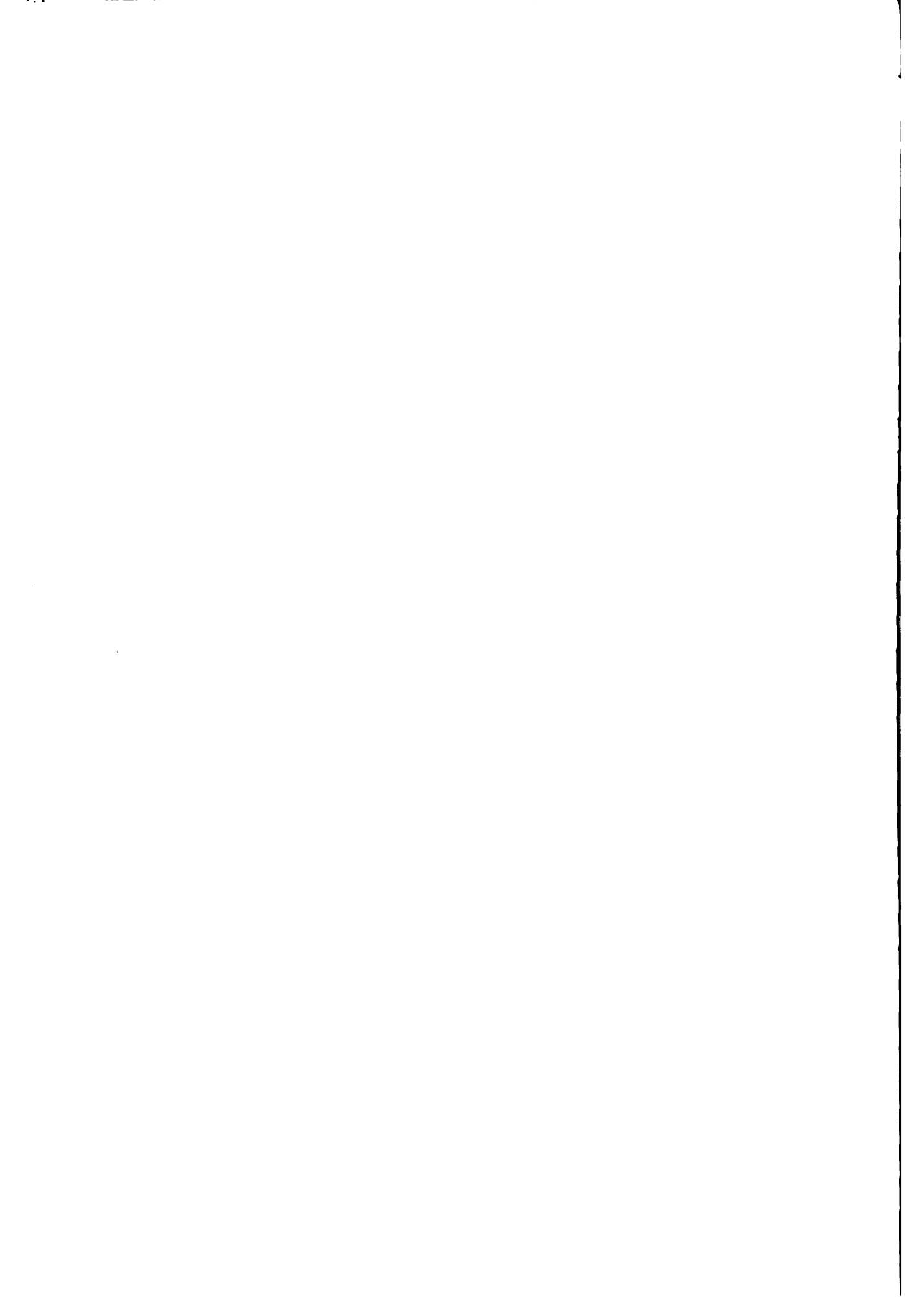
According to some experts, the labor intensive technology and performance of small units employing a combination of traditional and intermediate or appropriate technology generally compares favorably with large-scale units on the efficiency indicators, such as capital (outputs) yields per area of land.^{7/} Experience has shown that social or cultural acceptability is often a major factor in the success or failure of an innovation, but because it is so subjective and ill-defined there is a tendency to pursue the more "rational" criteria of engineering efficiency or economic viability.

^{4/} Zandstra, H. G., Swandberg, K. G. and Zulberti, C. A. Removing Constraints to Small Farm Production: The Caqueza Project, published by the International Development Research Center, Ottawa, Canada, 1976

^{5/} The following institutions are examples of this new approach towards low cost more labor intensive technology: ITDG (London), OECD (Paris), Brace Research (Quebec), VITA (Maryland), CENDES (Quito), CEMAT (Guatemala) and others in Ghana, India and U.S. and Europe.

^{6/} Araujo, J.E. Participative Technical Cooperation, paper prepared for the Conference on "New Approaches to Technical Assistance in Accelerating Agricultural Development", held in Munich, April 26-28, 1977

^{7/} Overseas Development Council/International Labor Organization. Employment, Growth and Basic Needs. 1977.



If new technology is to succeed it must be economically, technically and culturally "competitive" and possess an evolutionary capacity to keep on improving.^{8/}

Gittinger points out that "intangibles" related to better life for rural people such as income distribution are real and reflect true values.^{9/} However, they do not lend themselves well to evaluation, although an attempt is sometimes made. In many cases economic and financial analysis are viewed as an inappropriate tool to use for dealing with intangible effects.^{10/}

STRATEGY CONSTRAINTS AND ITS REASONS

The change embodied in post harvest technologies together with the accompanying institutional and complementary inputs, may have a number of significant effects on the economy, specific regions, and specially the farmer and consumer. Changing technology creates new possibilities for some agricultural products, makes others obsolete, effects markets, alters cost-price relationships, influences the amount and conditions of employment and makes new non-agricultural industries feasible.

Most recent efforts in post harvest methods tend towards off-farm technologies such as bulk storage operated by the government in support of purchasing and selling, stabilization and or reserve programs.^{11/} There appears to be a lack of attention for on-farm related post harvest technologies and the coordination and organization factors of the food system: Possibly because bulk storage methods are considered more effective in controlling losses and more efficient from an economic standpoint.

^{8/} OECD: Appropriate Technology: Problems and Promises, edited by Nicolas Jequier Paris, 1976.

^{9/} Gittinger, P. Economic Analysis of Agricultural Projects, 1977

^{10/} Ibid.

^{11/} Kansas State University. Status of Grain Storage in Developing Countries. Special Report N° 3. Revised July, 1975.

Some Latin American and Caribbean countries have made attempts to implement small farmer marketing and post harvest food loss program activities (i.e. Brazil, Colombia, Dominican Republic, Honduras, Costa Rica, Haiti, etc.) Recently a major seminar involving 14 Latin American and Caribbean countries was held by the Inter-American Institute of Agricultural Sciences (IICA) to discuss and analyze small farmer marketing strategies and related post harvest food losses.^{12/} Many of the post harvest food loss activities are "add on" to other agricultural integrated projects or food marketing improvement projects. According to one bibliography study on farm storage in developing countries, not much progress has been made between the early 1960's and the present as reflected in articles dealing with or calling for an improvement in on-farm storage methods.^{13/} Of particular importance is the need for economic research in this area. For example, improved drying and disinfestation methods at the farm level may be priority entry point in the post harvest system because the most important time to improve storage is at the beginning, for pest damage multiplies as the food passes through the food marketing system. Also, small farmers may have greater long-run potential than a completely integrated operation, especially in areas where there is significant land pressure. According to one major research report on Central America agribusiness management "as increasing concern is expressed at the political level regarding rural-income distribution problems, government credit and infrastructure may be heavily weighted towards such procurement practices", (referring to small farmers).^{14/}

^{12/} IICA, Seminario Latinoamericano sobre Estrategias de Comercialización para el Desarrollo Rural, San José, Costa Rica, 25-28 de abril, 1977.

^{13/} Buckley, B. Farm Storage in Developing Countries: A Partially Annotated Bibliography, Agricultural and Rural Development Sector, World Bank, 1975

^{14/} Goldberg, R. Agribusiness Management for Developing Countries - Latin America, 1974



ME MAJOR POLICY ISSUES

1. Political Commitment and Professional Understanding

Government policy makers and professional developers jointly need to have a commitment and understanding of the policy options and issues to be derived from a realistic and effective effort to increase food supplies. Both experience and research need to be adequately identified to assist the policy makers in appraising development implications of action programs. Otherwise, it is highly unlikely that the necessary political and institutional support will be obtained to assure the desired impact of post harvest food loss program on small farmers.

One key consideration is to recognize that the performance of the total food system can either enhance or limit the potential performance of the post harvest food subsystem. A great deal of effort and resources are presently being directed to engineering and technological problems. The socio-economic and cultural aspects and the coordination and organization activities are sometimes more important than the new "hardware" itself.

2. Resource Allocation

There exist resources within the countries and in international agencies, but how can they be brought to bear on this problem? There are many competing rural development programs and projects to affect the resource allocation process.

Most government institutions have tended to prefer direct forms of food marketing improvements, characterized by infrastructure build-up.

There has been a traditional physical facilities (off-farm) bias inherent in most development planning. Large investments have been made in these facilities by national and international agencies. One major research project concluded that "it is relatively easy to generate enthusiasm for a \$50 million project to build a network of public owned-storage facilities, but hardly anyone is interested in a \$2 million supervised credit and training program designed to improve managerial competence among marketing cooperatives and private intermediaries."^{15/}

3. Integrated Effort

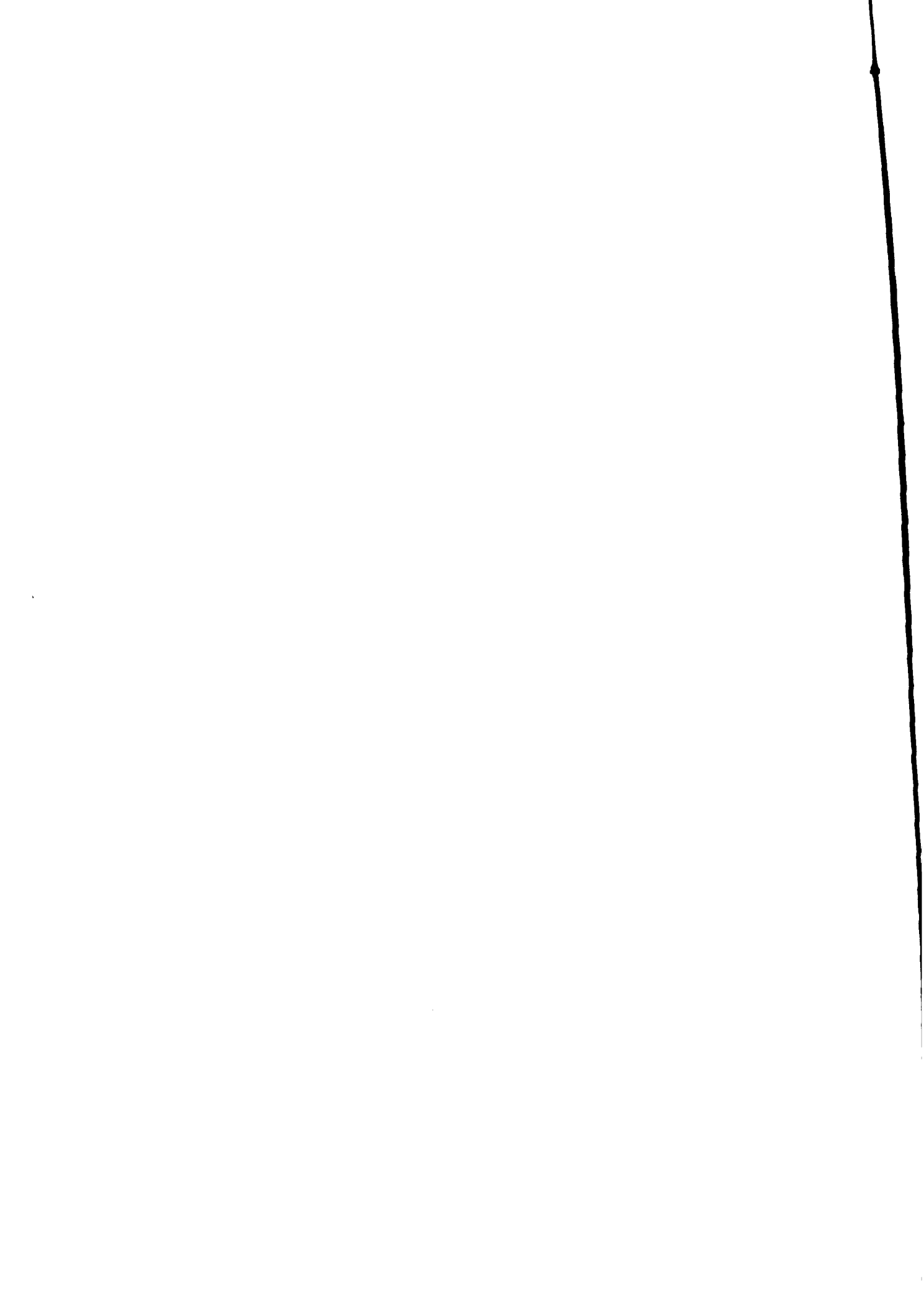
The needs and risk factors of the small farmer have to be resolved on a broad bases. Specific field projects are necessary, but the costs for improvements compared to market cost and other alternatives need to be considered. Also the cultural and social aspect is important.

4. Regional Cooperation

Technical contacts among individuals, developing countries and their institutions need to be promoted. Much duplication of activities may occur if there is no cooperation. Closer working relations with counterparts in neighboring countries may spread out the cost and accelerate the strengthening of national institutional capabilities.^{16/}

^{15/} Harrison, K., Henley, D. Riley, H. and Schaffer, J. Improving food Marketing Systems in Developing Countries: Experiences from Latin America, LAMP/M.S.U., Research Report n° 6.

^{16/} An example of this would be the recently created food technology information service between Andean countries, Mexico and Central America, that will speed up communications among the different institutions should lower the cost of maintenance of such a system. See final Report, Grant N° AID/ta-G-1238 LIFE-IFT, Nutrition-Food Technology Study for Latin America, 1977.



5. Technical Cooperation

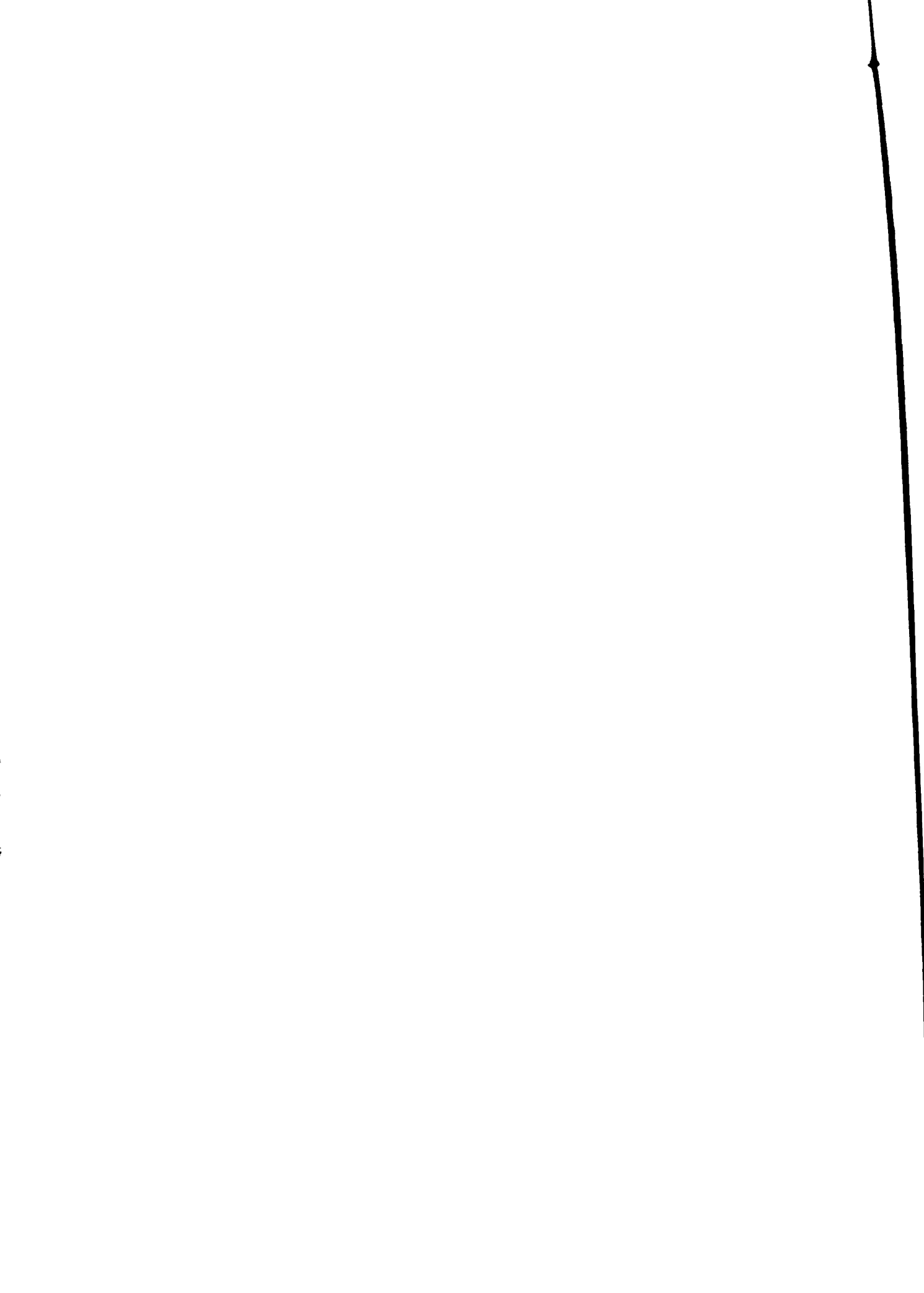
Many national and international agencies or institutions are providing technical cooperation to assist in the process of reducing post harvest food losses to small farmers. This is a long term process and continuity of the cooperation is vital. Few agencies may have the necessary committment and continuity to meet this task. (See list of institutions in Appendix).

6. National Institutional Strengthening

The institutions and organizations selected to improve food marketing and post harvest preservation are those involved in using their own resources and providing services plus coordinating and promoting both public and private sector efforts (e.g. Ministry of Agriculture - Extension and Credit, food technology institutes, marketing agencies, etc.) Strengthening these organizations entails 1) permanent adaptations of their objectives to the problem at hand and 2) better allocations of resources among different organizations and 3) improved coordination within the institutional system.

CONCLUDING COMMENTS

The problem of increasing income, food production and providing better nutrition on small farm holdings must be approached from a base of the existing farming system in terms of applying appropriate and practival post harvest technological innovations. This means direct association and discussion among agricultural professionals, technicians, change agents and the farmers, in order to:



1. Obtain information on the existing post harvest food system and understand the farming system.
2. Learn about the farmers priorities in his decision-making.
3. Determine innovations which might be helpful in improving his well-being given his present resources and knowledge base.
4. Implement collaborative on-farm testing of technology, which is likely to be adopted and
5. Improve problem identification of post harvest technologies which need supportive off-farm investigation.

The small farmer processes a store of knowledge related to the whole farm operation involving many activities and components which are fequently ignored, yet influenced innovations and modifications that have some impact on his welfare.

SUGGESTED ACTION PLAN

1. To develop and test methodologies for analyzing small farmer systems as they relate to post harvest technologies.
2. To identify and test with selected small farmers innovations or changes in present post harvest practices that might improve food supplies and net returns to the small farmer.
3. To assist in the training of interdisciplinary teams of agricultural professionals concerned with improving post harvest food technologies and its application on the small farmer. This would be part of a strategy to build national institutional capabilities in this field. An improved agricultural extension or technical assistance system is considered an essential element to transfer appropriate post harvest



technology to the small farmer. The system of training and visit^{17/} has experienced some success in improving productivity of the small farmer using low-level technology and traditional methods.

4. To analyze the effectiveness of different methodologies for working with small farmers and their impact on increased output and farmer welfare.

^{17/} Benor, D. and Harrison J.Q. Agricultural Extension: the training and visit system, World Bank, 1977



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PARTIAL LIST OF INSTITUTIONS OFFERING TECHNICAL ASSISTANCE,
RESEARCH, TRAINING AND INFORMATION ON POST HARVEST LOSSES
AND RELEVANT APPROPRIATE TECHNOLOGY

Inter-American Institute of Agricultural Sciences (IICA). Presently has one of the largest agricultural and food marketing technical cooperation programs in Latin America and the Caribbean. Recently started a permanent program of Post Harvest Food Losses. Currently has 14 full-time Senior Advisors located in 11 different countries.

IICA/PNCA (Programa Nacional de Capacitación Agropecuaria) offers courses in grain storage and conservation and grain silo. Also has generated a considerable amount of documentation of this subject matter.

Tropical Products Institute, London. Maintains a complete file of published articles concerning storage of cereals and export of tropical crops.

Kansas State University, Food and Grain Institute, USA. Carries out research, conducts training courses and responds to technical assistance inquiries. Also has published over 60 documents on food grain drying, storage, handling and transportation, including information on these functions in at least 13 Latin American and Caribbean countries. Drying technology concept is particularly good.

Food and Agriculture Organization (FAO). Has worked in marketing and post harvest losses for many years. Presently in the process of organizing a major effort in reducing post harvest losses.

International Development Research Center (IDRC), Canada. Conducts applied and adaptive research in cooperation with national institutions. Recently published David Spurgeon's Hidden Harvest a systems approach to post harvest technology.

League for International Food Education (L.I.F.E.) USA. One of their main functions is to sponsor, coordinate and provide information on post harvest losses. Recent efforts include a project entitled "Post Harvest Grain Losses: Development of an Assessment Methodology". Also a study just completed entitled "Nutrition Food Technology Study for Latin America with the Institute of Food Technologists (IFT).

Agency for International Development (AID). Has had extensive and varied activities in the post harvest food loss reduction area over the past ten years. Many of these activities are complimentary "add on" parts to other programs. Recently AID has contracted a full-time person to coordinate the post-harvest food loss reduction activities within the Agency.

IGAD/ALC (International Group for Agricultural Development in Latin America and the Caribe). A coordinating and promoting group made up of international financing and technical organizations. Post harvest losses was identified as one of the major programs that it should concentrate on at the present time.

Canadian International Development Agency (CIDA). Has had varied activities in the post harvest food loss reduction area over the past years. Has recently expressed increased interest in this area.

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World Bank. Currently supporting efforts of Professor Ricardo Amson, Instituto de Tecnología de Monterrey, in his studies on small farm grain storage in two micro regions in Mexico, and small farmer fruit and vegetable production and marketing project in six additional micro regions in Mexico.

National Academy of Sciences. Presently conducting a major research project world wide on post harvest food losses.

Inter-American Development Bank (IDB). The Inter-American Development Bank has had extensive project activities in the field of agricultural marketing and agribusiness. Many of these activities have dealt with post harvest loss problems.

CIAT. This Center carries out research and training activities to develop skills in the development and delivery of technology at the national level. Emphasis is on new technology that is economically viable, socially acceptable and biologically suitable under the conditions of low resource farmers.

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