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AGRICULTURAL MARKETING IMPROVEMENT STRATEGIES PROJECT

PROPOSAL FOR A PILOT INNOVATION TO IMPROVE VEGETABLE SEED HANDLING AND MARKETING METHODS IN NEPAL

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March 1990

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A Proposal for

A Pilot Innovation to Improve Vegetable Seed Handling and Marketing Methods in Nepal

Submitted to USAID/Nepal

Kathmandu, Nepal

A Collaborative Research Program Between

USAID/Nepal, No-Frills Consultants, and AMIS

Agricultural Marketing Improvement Strategies (AMIS) Project

Michael Chilton

Postharvest Institute for Perishables

March 1990

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Preface

This report results from a collaborative effort between USAID/Nepal, No-Frills Consultants, and the USAID Bureau for Science and Technology funded Agricultural Marketing Improvement Strategies (AMIS) project, Contract No. DHR-5447-Z-00-7074. The three parties are undertaking a program of applied research and pilot innovations on the marketing of high-value commodities produced in the hill regions of Nepal. This program began in August 1988 and is currently funded through March 1990.

AMIS is a five-year project which is being implemented by Abt Associates, Inc., the prime contractor, in collaboration with the Postharvest Institute for Perishables at the University of Idaho, and Deloitte & Touche (formerly Deloitte Haskins & Sells). It seeks to:

1. Improve diagnosis of marketing system constraints,

2. Identify and design appropriate marketing system innovations and improvements, and

3. Build local capacity in both the public and private sectors to do marketing systems analysis.

The consulting mission of the author, Michael Chilton, (November 18-December 10, 1989), vegetable seed grower and marketer, was funded under a USAID/Nepal buy-in to the AMIS Project. Chilton worked closely with No-Frills private enterprise consultants Rajendra Shrestha and Jamuna Kayastha to determine organizational, technological, and managerial needs for the development of the vegetable seed export industry in Nepal.

Special thanks are due to many people for making this consultancy a success. In Nepal, Mr. Robert Thurston of USAID, Dr. Ramesh Munankami and the No-Frills staff, Dr. SS Rekhi of FAO/Khumaltar Station, and many contacts in the private and public sectors all contributed generously with ideas and time to help develop the details of this report. AMIS wishes to thank the Project Officer, Tom Mehen, for his review, comments and input to the proposal.

In Taiwan, Drs. Paul C. Ma, and Yien-si Tsiang, Chairman and Deputy Chairman, respectively, of the Board of Directors of AVRDC organized Mr. Chilton's schedule with AVRDC, the Food Industry Development & Research Institute, and Known-You Seed Company staff. Without their help, these contacts would have been impossible in the short time period there. In Thailand, several contacts were made in the public and private sectors and thanks are extended to Tim Welsh for making the arrangements.

Finally, the author expresses his gratitude to AMIS staff John Holtzman, Harvey Neese and Tom Dechert for their considerable time and effort helping to develop this proposal.

The collaborating institutions invite comments and suggestions on this report. Comments may be directed to:

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Summary

This report, in the form of a proposal for a "pilot innovation" to improve vegetable seed handling and marketing, is the result of work funded by USAID/Kathmandu. In developing this proposal, there have been several consultancies through the Agricultural Marketing Improvement Strategies (AMIS) project, the Postharvest Institute for Perishables, and others, and considerable work by No-Frills Consultants. These consultancies have identified needs for organizational, technological, and managerial inputs for the seed industry to be able to expand its sales in Nepal and begin exporting seeds to other countries in the South Asia Region.

This report contains the proposal, with a time line and illustrative budget; a bibliography of reports and other materials which have contributed to the proposal; and appendices covering the author's work on this consultancy to Nepal, Taiwan, and Thailand to develop the proposal.

Introduction

Vegetable seed handling and marketing in Nepal are at an early stage of development. With few exceptions, most seed is produced and processed manually. The vegetable seed is marketed by a few, young, small companies that are beginning to explore the possibilities for expanding internationally.

Chilton and Shrestha (1989) recognized the potential for a viable and expanding private seed industry in Nepal as:

1. Domestic market opportunities prevail throughout a largely agrarian Nepali population that is becoming aware of the advantages of quality seed for their crops;
2. Various climatological zones exist, creating a broad spectrum of specific growing environments for many types of seed;
3. Export market opportunities exist within the South Asian Region (over one billion people) with similar cultural heritages and tastes or demand;
4. Private sector seed production occurs in the Kathmandu valley and is beginning in other parts of Nepal;
5. Labor, compared regionally, is cheap and trainable.
6. A Nepal National Seed Act has been enacted by the Rastriya Panchayat (National Legislature) and approved by His Majesty, providing credence to growth and strengthening of the private seed sector;
7. The current transit and trade crisis with India provides an opportunity to gain market share against imported seeds, and clarifies the need for Nepal to develop its capability to replace seed being imported into the country.

A viable seed industry must compete with imports from India for the domestic market, and with numerous Austral-Asian sources for regional markets. The author of this report has concluded from this study, a previous trip to Nepal, and the reports of other consultants that the trends for vegetable seed marketing in Nepal and other countries in the South Asia region indicate strong possibilities for increasing market share if Nepalis can reliably produce quality seed. In terms of the problem faced by most developing agroindustries, whether markets or production should be developed first, the Nepali vegetable seed industry is in the enviable position of having growing markets available. The primary issue then becomes the improvement of the Nepali production and postharvest handling capability.

The Nepal vegetable seed industry must develop an adequate organizational and technical capability. Several reports (Holtzman, 1988; Holtzman et al, 1988; Chilton and Shrestha, 1989) have identified some of the organization and technical changes necessary for the Nepal vegetable seed industry to become competitive. This consultancy results in a report/proposal for a method whereby the Nepal vegetable seed industry will be able to organize itself and acquire the technical inputs necessary to improve its competitiveness in the domestic and regional markets.

Traditionally, vegetable seeds have been produced in Nepal by farmers who grow and save their own. These small farmers are beginning to demand improved seeds, are learning how to produce them, and form the basis for expanding the industry. However, as small farmers in one of the poorest countries in the world, they face problems of producing the quantity and quality of seeds for marketing, and lack the capital to be able to invest in even the lowest-technology, seed-handling equipment available. The answer is seen as organization of the seed growers and marketing middlemen to facilitate the development of quality standards, sufficient quantity to achieve economies of scale in processing and marketing, and to introduce technology through cooperative effort.

The proposed vegetable seed production/marketing system innovation for the Nepal vegetable seed subsector will develop the local capability to identify needs and implement the adaptive research, extension and training necessary to improve production, postharvest handling, and marketing. The proposed innovation would be private sector-driven, with support from the public sector, and would receive initial funding from a granting agency. Activities for beginning the project and a framework for the Nepal Seedsmen Association (NSA) to develop subsequent activities are described for a three-year time span.

Background

Increasing commercial possibilities for seed production and marketing within a small but emerging private sector provide a base for upgrading the seed handling and marketing procedures in Nepal. The U.S. Agency for International Development (USAID) and other donor agencies are working with His Majesty's Government of Nepal (HMG) to improve the functioning of the vegetable seed subsector. The USAID-funded Agricultural Marketing Improvement Strategies (AMIS) project has been working with the development of this subsector from a marketing systems point of view.

The organization of the Nepal Seedsmen Association (NSA) is currently underway. The NSA represents various elements of the commercial seed trade in Nepal. Its membership includes those companies and individuals who are handling seed in either the domestic and/or the export market. There are currently over twenty members of the NSA, primarily from the areas in and around Pokhara and Kathmandu.

Perhaps most important for the NSA is the role it will serve as a collective voice of the private sector in relation to the newly written National Seed Law. The voice must grow and become credible to the government agencies that support domestic and export seed trade. With an interested and participatory membership, the NSA can function effectively in such areas as introducing and adapting new production and postharvest technology; developing phyto-sanitary controls and regulations; developing production practices which lead to proper isolation of specific crops to avoid inter-crossing; resolving marketing problems and identifying new market opportunities; promoting Nepalese seed in domestic and regional markets; representing Nepal at international seed conferences and meetings; and upgrading the national seed sector by supporting training and development of technical skills.

The NSA provides the private vegetable seed subsector a way to organize research on practical seed handling issues encountered in the field. The research to identify solutions to field problems is often costlier than a single company can afford. Similarly, individual producers need help identifying and funding technological improvements for their operations. The NSA will need to assume the responsibility of identifying technologies needed to improve seed production and handling, help manage any adaptive research for the technology, identify at which level (individual producer, village, regional collection point, seed marketing company, etc.) the technology should be introduced, help procure funding for the prospective owners of the equipment, and provide training for the use of the equipment.

Especially as the Nepal seed industry moves into international marketing, seed production and handling will have to meet the standards of the buying countries or companies. Many of these standards for quality and quantity can only be met by Nepal adopting improved technologies. The NSA will have to take the lead role in integrating international marketing strategies, appropriate technologies for Nepal farmers, and helping small farmers as the producers find a way to be able to incorporate the required new technologies into the production/marketing system. Clearly, given the lack of capital and expertise in rural Nepal, many of these inputs can only be managed at the cooperative level that the NSA offers.

Paramount to a successful approach in practical seed subsector field research is the broadening of the membership base and the cultivation of interest of various support agencies. This should occur at the initiation of those benefiting from the research--the private sector--although initial guidance from experienced individuals and/or organizations outside the local private sector would be useful. However, the NSA must develop its own strength from within in order to perform in a useful and meaningful way. The effectiveness of the proposed pilot innovation can have long term significance only if the NSA develops internally, based on membership and organization.

Agencies and individuals available to help with the development of the NSA include the Nepal Ministry of Agriculture Vegetable Development Division, the Seed Technology Improvement Project, Khumaltar Station, Butwal Technical Institute, the Nepal Agricultural Development Bank (ADB), local fabricators, universities, private consultants, and donor agencies. From these would come the technical & engineering skills necessary to help develop and evaluate the proposed project activities.

As a "pilot innovation" within the guidelines of the AMIS project, this proposed intervention will strengthen the functioning of the vegetable seed industry. The proposal assumes that the Nepal Seedsmen Association will continue to grow and broaden its base to represent all the seed industry in Nepal on a democratic membership basis. Also, the proposal assumes that the Nepal Chamber of Commerce will act as contracting agent, and will assume responsibility for channelling funds and other resources to strengthen the NSA.

Purpose and Goals of Proposed Project

The objective of this project is to enhance the opportunity for growth of the vegetable seed industry in Nepal by improving vegetable seed handling, processing and marketing technology and management methods. To date, activities funded by USAID/Kathmandu have identified a number of technological, administrative, educational, and managerial inputs which could improve

the structure and functioning of the Nepal seed industry. This project is designed to help the private sector prioritize and implement the proposed interventions.

The goals are to:

- promote growth of the private vegetable seed industry in Nepal;
- strengthen the capability of the private seed industry to represent itself effectively in dealing with the government of Nepal;
- expand vegetable seed exports to regional South Asian markets; and
- reduce imports of vegetable seed from other countries in the region, especially from India.

The project will be funded by USAID/Nepal (or another funding agency), which will provide financial and technical assistance to the Nepal Seedsmen Association.

Project Output

The NSA will develop the capability to:

- identify research needs to improve the industry and expand marketing of Nepali vegetable seeds;
- design, manage and implement research programs to meet these needs;
- disseminate research results to all members of the NSA; and
- assist NSA members to adopt successfully tested seed production, handling and processing techniques.

The proposed institutional structure is designed to complement and strengthen existing organizations associated with the vegetable seed industry in Nepal. The proposed activities (innovations in the structure and functioning of the vegetable seed industry) are designed to be fully integrated into and taken over by the industry after a sufficient period of growth. The project is planned for three years to produce these outputs. However, the development of the NSA capability is not easily predictable. The project may need to be extended beyond three years until the NSA becomes self-sustaining.

Role and Strategy of Project Participants

Funding agency. The funding agency, USAID/Kathmandu, is interested in identifying activities (inputs) which will strengthen agro-enterprises. The NSA has been formed to strengthen the vegetable seed industry. A mechanism is needed to channel funds and other inputs from the funding agency to the NSA. The Nepal Chamber of Commerce was identified during the 1989 Agro-enterprise Workshop as the likely organization to channel funds and other resources to strengthen private sector organizations.

The funding agency will have primary responsibility for providing:

1. Funds to start the project and help NSA get organized.
2. Salary of the NSA project manager and administrative assistant for the first two years of the project.
3. Financing for the technological interventions already identified.
4. Funding for further interventions as developed and proposed by the NSA.
5. Funding for No-Frills and AMIS to assist and monitor the pilot innovation.
6. Guidance in the funded activities.

Funds for items 1 and 2 will be provided through the proposed intermediary, the Nepal Chamber of Commerce. Funds for item 3 and 4 will initially be channelled through the Chamber of Commerce, but will eventually be provided directly to the NSA. Funds for item 5 will be contracted to No-Frills and AMIS.

The funding agency will also be responsible for encouraging the Nepal Agriculture Development Bank (ADB) to provide funding to private sector individuals and companies so they can produce or purchase and manage the technological interventions introduced and developed by NSA. The success of the project will be determined by its ability to introduce technology and management innovations which will pay for themselves, and therefore, can be funded by the ADB.

The funding agency will also have responsibility to setup and chair the Advisory Board for the project.

Chamber of Commerce. The Nepal Chamber of Commerce is proposed as the organization through which resources would be made available to the NSA. While it may be necessary to identify another entity for this role, it is considered necessary to channel funds and resources through an intermediary organization until the NSA has developed the organizational and managerial expertise to be able to administer the proposed project activities and account for funds and resources provided. The Chamber of Commerce would be the contracting organization with the funding agency, and would then be responsible for results.

The managing and accounting role of the Chamber of Commerce will be well defined at the outset of the project, and all records and reports relating to the project will be readily available to HMG, NSA, and USAID. The Chamber of Commerce and the NSA will develop a plan to be approved by the Advisory Board whereby the NSA will progressively take on more responsibility until it is able to operate independently.

Nepal Seedsmen Association. The NSA is seen as the pivotal organization for the development of the Nepal vegetable seed industry. The NSA provides the organizational umbrella under which numerous activities must take place, ranging from working with individual growers to representing Nepal in the international marketplace. Working with its members, both individual producers and trading companies, the NSA will: identify technology needs, and work to solve them; develop grades, standards, strategies and ethics for domestic and international marketing; develop and maintain an active working relation with the members; represent the members to HMG, and other domestic and international organizations; provide an active training program for all members--producers, handlers, middlemen, and marketers; and help secure funding for NSA sanctioned equipment and activities.

The NSA will need to assume a number of responsibilities for this project to proceed and will need to reaffirm the commitment of its members to activities of this project. Since public funding will be used to support the NSA, a private sector organization, it must establish self-policing parameters within the organization to insure minimal governmental intrusion. In addition to elected officers of the NSA, a Project Director should be identified. As the NSA develops, it is expected that it will be able to contract directly for support, particularly from South and Southeast Asian organizations and firms. This will require the development of administrative, accounting and business capability.

As the NSA grows, it should be able to fund further activities through taxation of the membership. The concept of becoming self-supporting should be emphasized from the beginning of the project, although it is recognized that some years of growth will be necessary before the NSA will be self-supporting. It must be clear that the help provided at the beginning is provisional on the NSA's recognition of the long-term goal of independence, growth, and self-financing.

NSA Project Director. The Project Director will be designated by the NSA administration, with approval of the Chamber of Commerce, as the administrator responsible for the project. The Project Director will oversee project activities implemented by the Project Manager (see below), and will be responsible for ensuring that the NSA will be able to integrate project activities into its structure and functioning.

The proposed project provides initial funding of two years for a Project Manager and an Administrative Assistant who will implement activities of this project. The Project Manager will be a member of the NSA and responsible to the Project Director and the Chamber of Commerce.

NSA Project Manager. The Project Manager will be the person within the NSA responsible for day-to-day project activities. This person will be key to the success of the project and should be selected with the utmost care, using guidelines developed in collaboration with the funding agency and the Chamber of Commerce. The person selected should be approved by the Advisory Board.

Initially, the Project Manager will be in charge of implementing the technological interventions funded by this proposal. As the project proceeds, the Project Manager, in collaboration with members of the NSA, will develop proposals for other interventions to improve the seed industry, will submit them for funding (initially to the funding agency for this proposal, but eventually to whomever might be a source of funds, including the ADB, or the self-taxed NSA membership), and will implement these new activities.

The NSA Project Manager will work with the NSA Project Director to provide financial and managerial accountability for the project. For each intervention activity, the NSA Project Manager will provide a report which will be made available to all the membership. In the case of technological or managerial interventions which have been tested and approved, the Project Manager will be in charge of seeing that prospective users within the industry are encouraged to adopt the practice. He/she also has the responsibility to see that an effective extension of the results is made to all NSA members and that they are helped to adopt the practice, whether it be new technology, new management, or other interventions. To work effectively with the NSA membership and international marketing organizations, the Project Manager should have had extensive private sector and international experience.

From a management point of view, the Project Manager will have to delegate much of the work to accomplish the goals of this project. As an example, actual testing and adaptation of the pedal-powered screening mill could be done by personnel at the Khumaltar Station, and extension of the results may be turned over to the seed companies and government extension agents. The Project Manager's role is to make sure that the activities are completed by somebody, are accounted for, and reported. He/she will collaborate with the Project Director and the Chamber of Commerce to develop realistic work plans.

Administrative Assistant. In order to facilitate the record keeping and paper work developed by the project, the funding agency will provide funds for the NSA to hire a full-

time Administrative Assistant. This individual will be responsible to the Project Manager and help in the day-to-day operation of the project. He/she will maintain the financial records for the project in a manner consistent with the requirements of the Chamber of Commerce and the funding organization. By the end of the second year of the project, the NSA will take over paying the salary of the Administrative Assistant.

Through project activities and shared responsibility with the Chamber of Commerce, the NSA will develop its administrative, managerial, and accounting capability. The NSA, collaborating with the Chamber of Commerce, will prepare an organizational development plan for the three years of the project, with the goal of having the organization become increasingly independent and self-funded.

The more important responsibility of the NSA will be development of the capabilities of producer groups. A certain amount of knowledge and sophistication about vegetable seed production and handling already exists in Nepal among some organizations and individuals. The NSA must adopt a policy of actively educating and upgrading all member producers of the association. In addition, all traders who stand to benefit from NSA activities must be committed to working with producers to help them upgrade to international standards.

Advisory Board. The Advisory Board will be made up of representatives from the funding agency, the NSA (including the Project Director and the Project Manager), the Chamber of Commerce, the Nepal ADB, HMG, and the project monitors--No-Frills and AMIS. The Advisory Board will meet at least two times per year to review project progress and provide input for activities and plans. It is important that the ADB be part of the Advisory Board because it is expected that it will provide commercial loans for the equipment and interventions as they are adopted by members of the NSA.

Project Monitors. No-Frills Consultants and AMIS will work with and monitor the activities and the development of NSA capabilities. A primary monitor from No-Frills Consultants will be selected to work on a part-time but day-to-day and long-term basis with the project and NSA. This individual should have some technical background and experience in seed handling, processing, and marketing. Initially, No-Frills and AMIS consultants will be strongly involved in the development of project proposals and implementation of particular activities. Later, NSA will develop its own proposals for research needed on specific problems, and for methods of finding solutions. Eventually, NSA will be able to pursue research programs on its own.

The consultants will be able to provide technical advice to funding agencies and monitor the success of the project as an intervention that might be applicable in other developing countries.

AMIS will monitor the project under the category of "pilot innovation". In this case, AMIS is hypothesizing that funds channelled to the private sector, which the private sector will use to solve problems they have identified, will strengthen the capacity of the private sector to identify and solve problems, screen and adapt improved technology, improve seed handling and marketing methods, promote Nepalese seed in domestic and international markets, and represent the seed association in public fora.

Project Activities

This proposal primarily addresses activities of the NSA in the implementation of the project. Contractual arrangements will have to be made among the funding agency, the Nepal Chamber of Commerce, and the NSA which are beyond the scope of this proposal. In addition, organizational arrangements will have to be made with the ADB, entities of HMG, and others. The list of project activities discussed below assumes that these precursors to the project will be satisfactorily completed.

The activities are presented in four categories: organization and management of the NSA, technological interventions, education and extension for the NSA members, and market studies. However, as the proposed time-line for the project presented in the following section shows, many of the activities will occur simultaneously. The success of the project will depend on the NSA learning to do all of these and finally being able to perform them independently from the Chamber of Commerce and the international funding agency.

I. NSA Organization and Management

1. Activate the NSA. Convene the NSA and consolidate the organization with the election of officers and development of a mode of operation (by-laws). In order to begin this proposed project, the NSA will have to reach a consensus supporting its goals and activities. Part of the activation of the NSA should involve the democratic approval for participation in this project. The NSA will plan for the development of the association to be able to administer this project and other needed activities.

   The proposal calls for a Project Director to be supported by the NSA, and a Project Manager from the membership, supported by the funding agency. The funding agency will also support an Administrative Assistant for the project. It is expected that the Project Manager and Administrative Assistant positions will be maintained by the NSA to continue

operations beyond the three years' financing provided by this project. The NSA members should determine whether this is how they want to manage the project and then designate their choices for the positions, understanding that concurrence is required from the funding agency and the Nepal Chamber of Commerce.

2. **Develop a Work Plan.** In collaboration with the Chamber of Commerce and the Advisory Board, the NSA, particularly the Project Director and the Project Manager, should develop a general work plan for the first three years of the project and a specific work plan for the first year. This first work plan will require the approval of the funding agency and the Advisory Board. Subsequent work plans will require the approval of the Advisory Board until such time as the NSA begins to operate independently from the Chamber of Commerce and the funding agency.

3. **Administer the Project Activities.** The NSA, specifically the Project Manager, will be responsible for managing the following project activities:
   - Develop the annual work plan;
   - Initiate and maintain international contacts for equipment and consultants;
   - Contact and work with consultants for inputs to project activities;
   - Oversee the development and testing of seed handling prototypes, including the purchase and import of machines and equipment to be tested;
   - Organize and implement foreign market study tours;
   - Oversee the distribution of information from market study tours and testing of seed handling prototypes to NSA membership;
   - Set-up training and demonstrations for membership in use of prototype machinery and seed handling management;
   - Maintain an accounting and reporting procedure for project activities;
   - Prepare proposals for new project activities to further the needs of the NSA;
   - Identify training needs for NSA membership;
   - Communicate with HMG organizations, the Advisory Board, and the ADB to keep them informed of developments within the NSA.

II. Development and Introduction of Prototype Technologies

The following discussions cover the technical innovations that could be studied/developed in support of seed handling procedures.

1. **Seed Conditioning**

A. International Follow-up

Seed conditioning equipment would be sourced in much the same way and likely with many of the same companies as discussed under "Threshing, A. International Follow-up" (#2, below).

B. Locally Fabricated Screens

Only small amounts of work have been done in the development of simple cleaning tools. There is a good possibility that simple screens could be constructed primarily for scalping (rough cleaning) purposes with the assistance of the Butwal Technical Institute and local fabricators.

Screens could be made from light metal flat stock using screens already in-country as models. If not, a set of reasonably inexpensive trial screens could be ordered from a supply house (suggestion: Seedburo Equipment Co, 1022 West Jackson Blvd. Chicago, Illinois, 60607 USA) for the same purpose. Different sizes and configurations of hand screens would be fabricated for trial under field conditions.

Based on the testing of screens ordered from a U.S. source and with the help of Butwal Technical Institute (BTI), prototype simple hand screens with various sized openings could be built for testing and use at the village level in the upcoming season's seed harvest.

C. Pedal-Powered Clipper Machine

A system of scalping at decentralized locations is necessary to reduce transport weights, and to service emerging decentralized markets. A relatively portable screen and winnowing machine would support this requirement.

A human-powered (by pedals) Clipper cleaner made by the Blount Agri-Industrial Corp, 805 South Decker Dr., Bluffton, Indiana, 46714 USA, might answer some of the problems of seed scalping in remote areas. Dr. Rekhi at the Khumaltar Center has indicated a willingness to purchase this machine as a working model for evaluation and use where electrical or fossil fuel sources are either scarce or nonexistent.

Cooperating with Dr. Rekhi's FAO office, NSA should place an order for a three-screen, pedal-operated seed winnower-cleaner, Model 3-W Clipper, for trials in and around Khumaltar Station.

D. M2BC Seed Conditioner

In addition to the decentralized pedal-powered cleaners, there is a need for high-quality cleaners at central locations to prepare the seed for export. There is a basic two-screen conditioner available from the Blount Agri/Industrial Corporation, P.O. Box 256, Bluffton, Indiana, 46714, USA, which allows a final quality seed conditioning process. Although it does not have a large capacity, it is simple and well adapted to situations where basic cleaning processes are required. This equipment normally is operated by an electric motor, and is supported witn a gasoline-driven generator. It is usually placed in a centralized location, but can be moved if necessary. The total cost for the equipment, ten screens, replacement parts and the generator is US$5,500.00 c. Calcutta (See Appendix IV for technical specifications for this equipment).

2. **Threshing Activity**

A. International Follow-up

Improved threshing activities can be developed from different sources. First, international follow-up can be initiated by correspondence with Taiwan sources who have agreed to assist in gathering data on locally constructed traditional harvesting equipment. Letters have already been written both to AVRDC and to Known-You Seed Co. for that purpose.

The Project Manager, in collaboration with the Project Monitor consultant, should re-establish correspondence with Taiwan sources for evaluation and procurement of threshing and cleaning machines from Taiwan, or other countries. Other correspondence should be initiated with companies in Korea, India, Pakistan and Thailand.

Contact has also been made with KOTRA, the Korean trade representative in New Delhi. Interest was conveyed to the KOTRA representative for the purpose of locating Korean harvesting equipment which is specifically designed for the large amounts of radish seed grown in that country.

Additionally, a peanut harvesting prototype has been built at the Asian Institute of Technology, Bangkok, which has potential for being modified to thresh radish seed. It is portable, pedal-powered, and possibly applicable for village use in Nepal (See picture in Appendix V).

Other possibilities to be explored are in nearby countries. In recent years, Pakistan has become a large consumer of radishes and growers generally produce their own seed. References need to be developed and contacts made with local producers of threshing equipment. The same needs to be done for India. Rajendra Shrestha of NSA is familiar with a manufacturer in the seed-growing area of Pune. It is possible that other contacts would be available once an initial contact is made.

B. Improvement of Traditional Burr Mill Concept

Some radish seed in the Kathmandu area has been removed from the pod using a traditional grinder for preparing grains. The shortcoming is that precise adjustment between the rubbing surfaces is not possible resulting in uneven threshing. It is possible that the staff and students at the Butwal Technical Institute (BTI) might be interested in improving the machine to enable a more even and uniform threshing.

3. **Seed Drying**

The problem of seed drying, either by natural and artificial means, is a critical part of producing and maintaining a high quality seed. Nepal is no exception, particularly because part of the country, the lowland Terai, has humid, tropical weather conditions. For this reason a capability to assure acceptable moisture levels within each seed lot is essential. Drying equipment that can be moved to decentralized production areas becomes valuable.

The project should either build or purchase a portable tunnel drier which would accommodate either bagged or bulk seed. An appropriate heating source and control will have to be determined. The following technologies involve drying or drying support capabilities and should be evaluated for application to Nepal.

A. Prototype bag/bulk tunnel dryer

This equipment is designed to provide an air source, heated or not heated, that can be passed through a unit of seed for purposes of removing seed moisture. It is called a tunnel dryer because it is constructed as a tunnel with a perforated top where either bags of seed or bulk seed in a box with a perforated bottom can be placed. Air driven by a fan at one end of the tunnel is then pushed through the seed for necessary drying.

Some smaller commercial designs are made so that they can be disassembled for portability. Such a capability would appear to be important for Nepal. The seed program

in Nepal has distinct drying requirements, and plans should be made to purchase or construct drying units for evaluation purposes. Purchases might be investigated through an Indian company specializing in drying equipment, such as Thermax Pvt.,Ltd., Pune, India.

B. Dryer design from AIT (See picture, Appendix V)

A second type of dryer that has potential application is a prototype which is being developed at AIT/Bangkok. This unit operates on the principle that seed will continuously fall through a front of moving warm air. The unit is portable and can by modified for most seed crops. Details should be obtained from Professor Gupta of the Agricultural & Food Engineering Department, AIT, Bangkok, Thailand.

C. Moisture Measurement

A quick, reliable means to measure seed moisture content should be available to members of the NSA, since some kind of moisture measuring capability must accompany a drying operation. This consultant recommends a Digital Moisture Computer "700" manufactured by Burrows and available in 220V, 50/60 Hz. (Since moisture measuring capacity is now available, budget allocations will determine the desirability of this advanced equipment.)

There are many moisture measuring devices on the market which meet differing levels of acceptability, based on desired accuracy, consistency and portability. The Burrows 700 Digital Moisture Computer would provide a consistent, reliable and rapid means to determine moisture in a wide range of seed types. This equipment has been used by the consultant in the Northwest US for over six years with entirely trouble-free service. There are two shortcomings for use in Nepal -- the function is digital and service would be unlikely in case of operational difficulty, and it is not portable. Unless other more suitable equipment is identified, however, the seed sector in Nepal will soon need the capability this equipment offers.

4. **Storage/Packaging**

Evaluate container development by the Seed Technology Improvement Project (STIP) for seed company and village storage of stock seed and seed production, and create prototype models for evaluation under actual conditions.

A. Storage

After moisture levels have been reduced by either natural or artificial means, it is important that seed be stored to maintain a low moisture content. In most cases where tropical or

sub-tropical climates are an issue and cool storage is not available, moisture barrier containers are used.

Research has been conducted both within and outside of Nepal, and certain general conclusions have been reached. It is important that the results of in-country research be exhausted first before funding new research or looking for results from outside of Nepal. The place to begin is with the STIP where they have conducted storage trials and would be prepared to discuss research findings along with the best ways to proceed in determining the economics of storage procedures for Nepal.

B. Packaging

Adequate moisture barriers for storage and seed presentation in the marketplace are key points in the economics of seed marketing. First, one must determine adequate moisture barriers for storage to maintain quality and germination over the shelf-life of the seed.

Seed presentation in the market place follows close behind. Eye appeal and ease of handling are essential ingredients for creating a package that has market presence and is known as a reliable product. Major seed companies have learned the importance of a marketable package, and their reputation has, in part, depended upon their ability to continually upgrade their presentation.

While this consultant is not in a position to determine what best meets the marketing needs of the Nepal vegetable seed industry, it is essential that emerging seed companies be aware of the importance of putting continuous effort into the improvement of a shelf product. To that end, NSA members might attend and show Nepali-produced and -packaged seed at marketing conferences in South Asia. An example was the India-Pack 1990 conference held in New Delhi January 29 through February 2. This type of meeting has the potential for being a source of new ideas and procedures that could be applied to the emerging private seed industry in Nepal.

III. Market Studies

In order to expand and enhance international marketing capabilities, the NSA should maintain a well-planned itinerary of market study tours in target countries. Some studies appropriate to vegetable seed export have already been completed in Bangladesh, Thailand, and Taiwan. These studies should be carefully analyzed for their application to the Nepal vegetable seed industry. Other studies should be planned for India, Pakistan, Malaysia, and other countries which might be appropriate export market targets. The foreign market study tours should be

conducted primarily for the benefit of the NSA. Although the NSA might request technical help from HMG or other experts, the private sector must direct the studies and participate in them to insure that the results are appropriate and shared with the entire membership.

IV. Extension and Additional Training for NSA Members

1. **Extension Activities.** Ultimately, individual producers or producer groups will be the owners and users of technology and management introduced by the NSA and this project. In cases where HMG extension agents are willing and capable of extending information to the farmers, advantage should be taken of this resource. However, in the more likely event that NSA will have to take this responsibility, NSA should establish a strong schedule of informational and training meetings in each growing area, within easy access distance by the farmers. As the needs for this activity are better identified, AMIS consulting services may be required to help set up an extension structure.

   Traders and seed companies who will benefit from improved farmer production and handling should be encouraged to take charge and present the information and training whenever they can. By working directly with the farmers to help them produce the desired quality, they will also build an appreciation for the incentives necessary to get farmers to adopt a particular practice.

   If outside expertise is required, they should be used in a "trainer of trainers" mode, rather than working directly with farmers. The NSA must build its internal knowledge base and capability to work with all its members. Over time, the NSA probably should be looking to having its own paid extension agents.

2. **Asian Institute of Technology.** The Asian Institute of Technology (AIT) should be explored as a possible future resource for development of prototype requirements under grants and/or scholarships. AIT should be considered a likely place for future study for Nepalese students interested in seed industry development and technology. Such training could follow undergraduate agricultural education at JAAS in Rampur.

3. **Haryana University, Center for Advanced Studies in Seed Technology, Hisar Haryana, India.** This institution provides advanced studies in seed development and technology and should be considered for formal training of future participants in the seed industry. NSA members should consider attending short courses offered there.

4. **Training for Project Administrators.** The Project Manager should spend a month's internship at the beginning of the project with a seed association in a South Asian country, perhaps Thailand, or with a commodity commission or marketing board in the U.S. The Project Manager could then learn the breadth of operations of such an organization--how it is organized, how it is financed, how it maintains itself, how it communicates with its members, how it relates to other organizations, including the government and banks, and many other useful things. It may be appropriate to repeat this internship for the Project Director, and later in the project, again for the Project Manager.

V. Consulting Inputs and Project Monitoring.

The funding agency, the Chamber of Commerce, the Nepal Agricultural Development Bank, No-Frills Consultants, the AMIS project, and perhaps others will provide inputs to the project. No-Frills Consultants and AMIS will monitor development of the project. The project's annual work plan will identify possible consulting needs for the year. However, it is to be expected that problems will arise when unforeseen consulting services will be required. For those consulting needs not foreseen in the annual workplan, and therefore not budgeted, the NSA will need to make arrangements on an ad hoc basis.

It is recognized that considerable consulting input may be needed to begin project operations for such activities as developing the bylaws for operation of the NSA, developing the first year work plan, learning to develop and write proposals, organizing prototype equipment development, developing testing protocols for the prototypes, developing an effective communication and extension network with the membership, setting up training and internships for the project administrators, developing training plans for the NSA, organizing international marketing studies, and others. This proposal contains funding for several consulting activities of the first year and fewer in the second and third years. NSA will be required to develop proposals and request funding for consultants in the years two, three, and beyond.

Project Time-Line (See following page)

Time-Line for Nepal Vegetable Seed Handling and Marketing Pilot Innovation

Activities	<--- PROJECT SET-UP ---> JUN 90	JUL 90	AUG 90	SEP 90	OCT 90	NSA Members Meeting NOV 90	DEC 90	JAN 91	FEB 91	MAR 91	APR 91
I.1 ACTIVATE the NSA	Members meet & elect officers	Develop By-Laws, Broaden Membership Set-up Record-keeping system				Members Meet Approve project plan	Develop new proposals Identify needs, Broaden membership				
I.2 WORK PLANS REPORTS	Hire Proj. Dir. Proj. Mgr.	Advisory board plan-->					Complete 6 mo rpt	Advisory board meet plan-->			
II.1 SEED CONDITIONING A. International Follow-up	Establish International contacts via FAX, correspondence, etc.	Prepare plan & budget to import equipment				Report		Establish file of sources; develop contacts			
B. Fabricate Screens				Order & receive Screens		Work Plan & Budget / BTI		Develop Prototypes		Field test & evaluate	
C. Clipper (pedal)				Order & receive Clipper		Work Plan/Budget / Rekhi		Test & Evaluate by Rekhi		Field test & evaluate	
D. Cleaner, M2BC				Determine requirements		Identify seed companies, help finance/order cleaner				Field test & evaluate	
II.2 THRESHING A. International Follow-up	Establish International contacts via FAX, correspondence, personal, etc. (as above)							Identify Threshing Consultant		Evaluate local threshing techniques & needs	
B. Improve Local threshing											
II.3 SEED DRYING A. Tunnel Dryer	Contact India for specifications & prices					Report	Import thru Nepali Seed Co			Field test	
B. AIT Dryer							Re-establish contact with AIT			Determine Nepal needs	
C. Moisture Test											
II.4 STORAGING/PACKAGING A. Storage	Develop cooperative contract with STIP for storage systems research					Report and plan	Initiate contract	STIP design & setup storage tests			
B. Packaging	Identify packaging preferences: Thailand, Bangkok, India, Pakistan					Report	Design packaging to advertise NSA & meet export needs				
C. Exhibition	Identify Regional Exhibitions - Plan for NSA to attend and show					Report on feedback/interest	Continue exhibiting				
III. MARKET STUDIES 1. Thailand	Complete reports of market studies done					Presentation of Results	Extend results to members				
2. India						Identify other possible markets	Plan & propose market study tour (budget, for whom, etc.)				
3. Pakistan											
IV. TRAINING 1. Program Admin	Determine training needs and identify institutions & funding sources for NSA members 1 mo in Thailand, India or US										
2. AIT	<---Identify training needs & compare to AIT potential --->										
3. Haryana	<---Identify long-term training needs - NSA professional needs --->										

	1st year evaluation-------								2nd year evaluation				
	NSA members meeting MAY 91	Advisory board meeting JUN 91 JUL 91	AUG 91 SEP 91 OCT 91	NSA members meeting NOV 91	DEC 91	JAN 92 FEB 92 MAR 92 APR 92	NSA members meeting MAY 92	Advisory board meeting JUN 92 JUL 92	AUG 91 SEP 92 OCT 92	NSA members meeting NOV 92 DEC 92	
Members meet plan Year 2		Begin Extension program, implement new proposals, identify needs		Members meet Self-taxing		Begin collecting taxes Develop new props.	Members meet plan year 3	NSA to pay Project Manager		Members meet	--->
Year 1 Report		Advisory Board plan--->			6 month report	Advisory Board plan--->	Year 2 Report	Advisory Board plan--->			6 mo report --->
Report		Communicate regularly; provide feedback									
Report		Help local fabricators get setup Extend to farmers & demonstrate - ADB help					Report	Evaluate program		Continue extension --->	
Report		Re-design & test if necessary, or extend to membership					Report	Evaluate program		Continue extension program>	
Report		Extend results to all seed Companies & NSA members					Report	Evaluate program --->			
Report		Budget and plan adaptive research	Contract BTI & ATI to develop prototypes			Test prototypes	Report	Develop other proposals to improve threshing ---> Evaluate, redesign if necessary develop local manufacture/extension --->			
Report		Determine Nepal needs		Report	Extend to members or propose adaptive research		Report	Implement adaptive research --->			
Report		Contract AIT to construct prototypes in Thailand or Mepal				Test prototypes / report		Redesign/test & develop local manufacture --->			
	Members determine needs & plan	Identify & contact sources/purchase					Report				
	Run tests			Report	Evaluate & extend or re-design		Report	Extension --->			
Report		Set standards For Nepal - test market in selected countries					Report	Evaluate, plan, & continue improving --->			
Report				Report			Report	Feedback to members through out the project -->			
			Develop & implement market plan, if warranted --->								
Report			Year 2 market study in one country				Report	Market plan --->			
			Plan & propose market study tour in another country					Year 3 market study --->			
Report		Determine need for more training for NSA Administration					Report Plan	Propose for funding --->			
Report		Propose for funding	NSA member short-term training at AIT				Report				
Report		Propose for funding	NSA members begin long-term (2 yr) training at Haryana,				Report	or US university --->			

Illustrative Budget

Illustrative Budget
for
Vegetable Seed Industry Marketing Improvement
Pilot Innovation

Item	Nepal Chamber of Commerce and NSA	AMIS and No-Frills
Salaries		
1. NSA Project Manager		
$2400/year X 3 years	$ 7,200	
2. NSA Administrative Assistant		
$1800/year X 3 years	5,400	
3. Nepal Chamber of Commerce administration		
$2400/year X .25 FTE X 3 years	1,800	
4. AMIS administration		
$50,000/year X .10 FTE X 3 years		$ 15,000
Fringe @ 40%		4,800
5. AMIS secretarial		
$20,000/year X .05 FTE X 3 years		3,000
Fringe @ 40%		1,200
6. AMIS/No-Frills project monitor		
$6000/year X .10 FTE X 3 years		1,800
Consulting Fees		
1. Contracted from AMIS/No-Frills by funding agency		
year 1: 80 days X 260/day		20,800
year 2: 40 days X 270/day		10,800
year 3: 20 days X 280/day		5,600
2. Contracted by NSA from regional expertise		
year 1: 20 days X $100/day	2,000	
year 2: 40 days X $100/day	4,000	
year 3: 60 days X $100/day	6,000	
Per Diem		
1. AMIS/No-Frills consultants		
165 days X $75/day		12,540
2. NSA contracted consultants		
150 days X $75/day	11,250	
3. NSA market study trips to South Asia Region		
6 trips X 20 days/trip X $100/day	12,000	
4. NSA project administrator training in U.S.		
2 trips X 30 days/trip X $75/day	4,500	

(continued on next page)

Travel			
1.	AMIS/No-Frills consultants		
	4 trips from U.S. @ $4000 ea.		16,000
	4 trips from South Asia @ $1500 ea.		6,000
	Insurance @ 5%		1,100
2.	NSA contracted consultants		
	6 trips from South Asia @ 1500 ea.	9,000	
3.	NSA market study trips to South Asia Region		
	6 trips X $1500/trip	9,000	
4.	NSA project administrator training in U.S.		
	2 trips X $2500	5,000	
Operating Expenses			
--NSA			
1.	Seed handling equipment purchase	10,000	
2.	Equipment shipping	5,000	
3.	Prototype equipment construction and testing	10,000	
4.	Extension activities to NSA	10,000	
5.	Miscellaneous expenses	10,000	
--AMIS/No-Frills			
1.	Communications		10,000
2.	Report publishing		5,000
3.	Miscellaneous expenses		10,000
4.	Training fees for project administrators training		10,000
	Sub-Totals (not including overhead)	**$122,150**	**$133,640**
Overhead			

Note: This illustrative budget does not include overhead, which will be different depending on how the different funds and activities are finally allocated. A ball-park figure can be estimated for the AMIS/No-Frills column by adding 50% for indirect costs and fees. Also, this budget does not contain any projected costs for training of NSA members at AIT, Haryana, or long term training in the U.S.

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Appendix I

Summary of Consultant's Activities in Taiwan and Thailand

Justification

There exists a need to pursue and develop a simple technique in handling and processing vegetable seeds in Nepal for the purpose of enhancing uniformity and quality of seed lots. For furthering the above stated needs, contacts with individuals associated with the seed industries of Taiwan and Thailand were made prior to arriving in Nepal.

The consultant's first stop was in Taiwan, where visits were made to offices both in the public and private sectors. A quick overview of equipment possibilities was provided in discussions with personnel in the Council of Agriculture (Taipei), Asian Vegetable Research and Development Centre (Shanhua), and Known-You Seed Company (Kaoshiung).

In Thailand, discussions were held with personnel in the private sector (Bangkok companies), FAO representative in charge of seed programs (Ministry of Agriculture), and Asian Institute of Technology.

Results -- Taiwan

Vegetable Seeds Production and Marketing in Taiwan

Taiwan is one of the larger vegetable seed producers in the world. The island nation both exports and imports vegetable seeds. In 1988 it produced 1330 mt., imported 634 mt. and exported 654 mt. of vegetable seed. The Taiwanese vegetable seed market is highly competitive (as Japan, USA, and other developed countries are the suppliers in the market) and sophisticated in the sense that the quality and standard of seeds required are stringent. Also, the vegetable seed growers prefer hybrid seeds, especially in the case of fruit/flower vegetable seeds. These, at present, may deny the Nepalese seed exporters from venturing into the Taiwan market. However, there are certain niches in the Taiwanese vegetable seed production and import market which provide opportunities to the Nepalese vegetable seed exporters.

Decreasing Production

In 1986, Taiwan's total vegetable seed production was 1550 mt; in 1987, it was 1587 mt; but in 1988 it decreased to 1330 mt. This happened not because of weather but due to, first, an appreciation of the N.T. dollar, and second, a shortage of skilled young farmers and a high cost of labor. This trend will probably encourage seed firms in Taiwan to strengthen breeding research and focus on the production of high-value, F1-hybrid seeds, such that Taiwan will

probably become increasingly dependent on imports of common open pollinated seeds for which Taiwan has become uncompetitive to produce.

Import/Export Composition

In 1988, the total value of Taiwan's vegetable seed imports was only 22 percent of the total value of exports, although the quantity imported was only three percent less than the exported quantity. This was because most of the vegetable seeds exported were high-quality, high-priced, F1-hybrid seed and the imports were low-priced, open-pollinated seeds.

Since Nepal can produce high-quality, open-pollinated vegetable seeds, the Taiwan market provides a good prospect for Nepali exporters, especially for seeds of cabbage, spinach, onion, pea, and garlic bulbs, which are imported by Taiwanese seed firms in large quantities (see highlighted lines in Appendix II). A roster of seedsmen importers and exporters in the Republic of China is presented in Appendix III.

Details of Visit

The visit to Taiwan focused on the southern part of the island where most seed facilities are located and most seed is grown. These visits were arranged with the assistance of Dr. Yien-si Tsiang of the Council of Agriculture, Taipei. According to Mr. C.C. Chen, seed specialist with the Council of Agriculture, there is no seed handling equipment manufactured in the area of Taipei since little seed is grown in the less desirable climatic conditions of the northern part of the Island.

Dr. Paul Ma, Chairman of the Board of Directors of AVRDC, arranged discussions with key personnel. Dr. Ma is also Director of the Food Industry Research & Development Institute at Hsin Chu which is involved in research & developmental support to the Taiwan food industry. Very interesting discussions were also held with staff members of the Institute.

According to Dr. James T.S. Tsay, Chairman of the Production Systems Program at AVRDC, it maintains a large germplasm repository of major vegetables, and carries out breeding programs in most important types. Additionally, AVRDC conducts research to determine cropping patterns required for agricultural diversification and changes in population preference. Within the Genetic Resources & Seed Unit (GRSU) a full complement of laboratory seed handling equipment exists as well as storage, both long and short term, for the diverse range of vegetable varieties and lines from different origins.

While the AVRDC does not emphasize appropriate technology in simple seed processing and seed handling techniques, Dr. David Tay, GRSU Division Director, is familiar with private, locally-made harvesting and processing equipment that might be applicable to Nepal. Arrangements were made so that a follow-up could be done by correspondence, giving precise requirements for what is desired in Nepal.

At the Known-you Seed Company, the largest seed production and marketing company in Taiwan, most of the basic equipment is hi-tech from Japan and the USA. A new processing facility is being built which will contain equipment of even more complexity and greater cost and capacity. None of this would meet the current needs of the Nepalese seed industry.

However, a locally made fanning mill and radish thresher are available, although the thresher was located at another processing site and was not seen during the visit. It is possible both pieces of equipment would have practical application in the Nepalese setting. Mr. Chiou, General Manager, and, Mr. C.H. Yu, Research Director, indicated they would provide necessary details on request by correspondence.

Results -- Thailand

While three different seed companies were visited, little new information was uncovered as regards simple seed processing equipment. Most seed is purchased, either domestically or imported, already processed. From in-country locations, seed comes in small quantities and has generally been processed manually. Most of the seeds grown are wet-seeded crops such as tomatoes, melons, pepper and cucumbers.

However, interesting possibilities do seem to exist for cooperation with the Asian Institute of Technology (AIT), a regionally important graduate school located north of Bangkok. The Division of Agricultural and Food Engineering has developed prototypes of simple pieces of agricultural equipment designed to do various jobs such as seed drying, seed treating, peanut threshing, and seedling transplanting. This equipment has been developed for use where no electrical power is available. Some machines are designed with pedal power. It is possible that some of the currently designed equipment is suitable either as is, or with some modifications, for Nepalese conditions.

Additionally, there is the possibility of using AIT facilities for development of specialized equipment under grant cooperation, or as part of student study with the Division of Agricultural and Food Engineering. The school also maintains an excellent library on Asian information and resources as part of its educational curriculum.

Other resources in Thailand should be explored, but it was not possible on this trip, because of distances and the unavailability of key personnel. They include the following:

1. East-West Seeds Ltd. - A vegetable seed firm, headed by Mr. Simon Groot, a Dutch expatriate. They are developing a breeding program based on local varieties and were one of the Thai companies which had expressed an interest in the Nepal Agro-Enterprise Workshop held 30 Nov. - 2 Dec., 1989.

2. AVRDC Regional Training Center, an extension of AVRDC (Taiwan) and an international training component of this institution. It is headed by Dr. Charles Chan, who was out of the country during this visit to Thailand.

3. Seed Unit at Kham Pheng Sen campus of Kasetsart University. As a training unit, it is well-equipped with machinery primarily from Japan. It is headed by Dr. Anothai Choomsai, an academician well informed on the issues of seed handling in the tropics. He is currently on sabbatical leave in Malaysia.

4. Known You-Seed Company (Thailand) has established a branch operation for production of hybrid seed in Thailand.

Tim Welsh, AMIS/PIP consultant in Bangkok, is working with No-Frills and NSA on this project, and will no doubt make many of these contacts during a consultancy scheduled for January 1990. The results will be in his report available through USAID/Kathmandu.

Appendix II

Import and Export of Vegetable Seed -- Taiwan, 1988

Article	Import		Export	
	Quantity*	Value**	Quantity*	Value**
Oriental Pickling Melon	---	---	230	84
Cucumber	1,394	1,364	4,643	9,546
Waxgourd	2,070	20	8	43
Squash	---	---	39,010	19,936
Watermelon	15,472	14,260	123,463	192,750
Seedless Watermelon	---	---	930	13,519
Other Fruit Vegetables	28,113	10,931	84,446	234,099
Cabbage	**5,412**	**22,630**	**4**	**199**
Chinese Cabbage	44,979	12,349	17,686	3,690
Water Convolvulus	30,500	800	20,697	1,548
Spinach	**117,433**	**16,263**	**1,007**	**167**
Edible Amaranth	---	---	13,331	1,339
Asparagus	---	---	94	964
Onion	**2,130**	**3,876**	**13**	**11**
Other Leaf Vegetables	141,375	14,853	251,070	115,230
Kidney Bean	12,350	1,214	16,814	1,724
Pea	**114,210**	**4,245**	**40,999**	**2,820**
Cowpea Bean	3,250	221	15,979	2,535
Other Beans	5,050	341	12,309	1,002
Garlic Bulb	**3,526,932**	**89,863**	**2,500**	**129**
Sweet Corn	110,000	23,423	1,490	427
Total	4,160,656	216,653	656,055	601,762
(Total Excluding Garlic Bulbs)	(633,724)	(129,790)	(653,555)	(601,633)

*Quantity in Kg

**Value in NT$ X 1000

Appendix III

Persons Contacted in Taiwan and Thailand

Taiwan

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Shanhua, Tainan, Taiwan 74199
Tel : 06-5837801-Ext.240
Fax : 06-5830009
Telex : 73560 AVRDC

Name : Wun-Yu Chen
Position : President
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Main Office : 26 Chung-Cheng 2nd Road
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Fax : (07)241-1446
Telex : 71450 KNOWNYOU

Name : Lung-Mu Chen
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Name : A-Chang Chiou
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Name : Vinich Chuanchai
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Telex : CHIATAI TH 82015

Name : Somsak Srirawewongsa
Position : President
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Fax : (662) 225-8358

Name : Simon Groot
Position : Director
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Bang Bua Thong
Nonthaburi 11110, Thailand
Tel : (01) 211-2781

Name : Dr. Charles Yang
Address : AVRDC/Thailand
Tel : 579-5535/4720

Name : Dr. Anothai Choo' .sai
Position : Director
Address : Seed Unit, KPS Campus
Kasetsart University
Bangkok, Thailand

Name : Pong Marutaralert
Address : Chia Kwang Seng R.O.P
29 Soi Thaklang Ban Moh Sai Nai
Pakklongtalad
Bangkok, Thailand
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Fax : (662)236-8028

Name : M.L. Prachaksilp Tongyai
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Bangkok 10100, Thailand
Tel : 223-0156-7, 255-0068
Fax : 255-4514
Telex : 21461 THAIFIN TH

Name : Mogens Lemonious
Position : Manager
Address : Regional Seed Program
FAO Regional Office for Asia & Pacific
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Bangkok 10200, Thailand
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Fax : 280-0445
Telex : 82815 FOODAG TH

Name : Dr. Chandra Prakesh Gupta
Position : Professor-Agricultural Engineering
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Bangkok 10501, Thailand
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Telex : 84276 TH

Name : Tim Welsh
Position : General Manager
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36/11-12 No. 21
Soi Lang Suan, Ploenchit Road
Bangkok 10330, Thailand
Tel : (662) 252-5351, 252-6571
Fax : (662) 253-3436

Appendix IV

Manufacturer's Specifications for

"Clipper M2BC" Seed Cleaning Machine

QUOTATION

BLOUNT AGRI/INDUSTRIAL CORP.

A Blount, Inc. Co.

CLIPPER® / MIX—MILL® / ROSS®

805 S. Decker Drive P.O. Box 256 Bluffton, IN 46714 (219) 824-3400 TELEX 232419 MMCLIPPER BFTN

TO

Mr. Mike Chilton
Agricultural Alternatives
3533 Ridgeway Drive S. E.
Turner, OR 97392

QUOTE NO. C-6857

SHEET: 1 of 1

DATE: January 9, 1990

This quotation is based on current conditions, prices and specifications shown hereon and is firm for no longer than 30 days from date. **BLOUNT** AGRI/INDUSTRIAL CORP. reserves the right to revoke or modify this quotation at any time prior to acceptance.

QTY.	MATERIAL	PRICE UNIT	PRICE TOTAL
1	BLOUNT/CLIPPER M2BC Seed Cleaner with: - Control Feed Hopper - Two (2) 62.2 cm x 56.5 cm screens - Bottom Blast Fan - Ball Tray Screen Cleaning - 1/2 H.P., 50 HZ, Motor and Drive		$2,252.00
1	1400 Watt Gasoline Powered Portable Generator		920.00
1	Bagging Auger with two-way bagging spout length 1.83 m (6 ft.)		340.00
10	Additional 62.2 cm x 56.5 cm perforated metal screens	$ 28.00	280.00
1	Set of Spare Parts per attached list		381.00
	TOTAL NET EX WORKS		$4,173.00
	EXPORT BOXING		250.00
	FREIGHT, INSURANCE, DOCUMENTATION AND HANDLING		1,080.00
	TOTAL NET C.I.F. CALCUTTA, INDIA PORT		$5,503.00

ACCEPTANCE OF THIS QUOTATION IS MADE SUBJECT TO ALL SALES AND MARKETING POLICIES PUBLISHED IN BLOUNT AGRI/INDUSTRIAL CORP. CATALOGUES, PRICE LISTS AND ALL PROVISIONS ON THE REVERSE SIDE HEREOF INCLUDING THOSE LIMITING WARRANTIES.

SHIPMENT 4-6 Weeks after receipt of order.

TERMS Cash upon receipt of order.

F.O.B Bluffton, IN

ACCEPTED BY BUYER _____ 19 _____

BY _____

ACCEPTED _____ 19 _____

BY BLOUNT AGRI/INDUSTRIAL CORP.

BY _____

QUOTATION BY **BLOUNT** AGRI/INDUSTRIAL CORP.

BY _____

David E. Mrozinski
Product Manager

35

BLOUNT

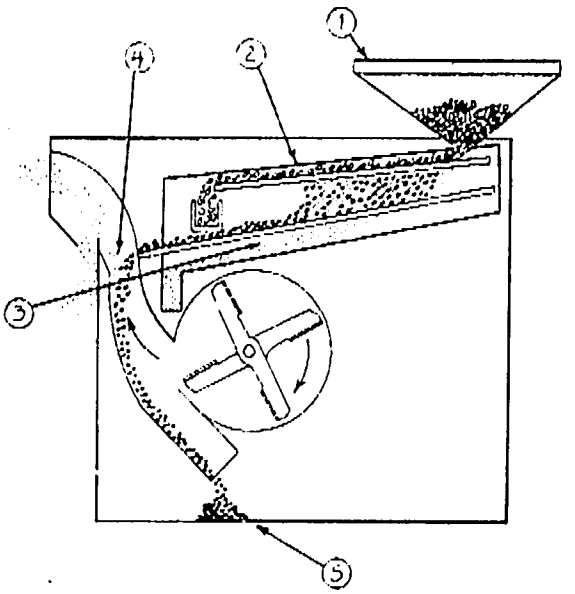
SPARE PARTS FOR 1 TO 3 YEARS

CLIPPER M2BC

QTY	PART NUMBER	DESCRIPTION	PRICE/EA.	EXTENDED
2	40000017	Bearing for auger	12.60	25.20
1	45001056	Truflex Belt 56"	5.40	5.40
2	F92400001	Flange Bearing 1"	7.80	15.60
2	4000004	Flange Bearing 5/8" for Hopper	3.70	7.40
1	4000017	Flange Bearing 5/8" for Hopper	12.60	12.60
1	4000020	Flange Bearing 5/8" for Hopper	27.20	27.20
1	F30000900	Eccentric Assembly	116.00	116.00
1	45001048	A-46" Belt	5.10	5.10
1	F91161053	53" "A" Truflex Belt	7.50	7.50
1	F30001000	Pitman Arm Assembly	28.40	28.40
4	F30001800	Shoe Hanger Assembly	8.60	34.40
2	F30001400	Bridgetree Bearing	32.00	64.00
1	F30404300	64" Open End V Belt	15.50	15.50
1	F30404302	31" Open End V Belt	16.70	16.70
				$381.00

Clipper Cleaners For Farm Or Laboratory Contain Many Of The Same Features Found In Full Size Cleaners.

- **Bouncing balls keep screens clean.** CLIPPER® ball screen cleaning is standard on both the M2BC cleaner and the 27-S cleaner.
- Adjustable **iris controlled shutters** on the office tester and **adjustable slides** on the M2BC and 27-S combine with a **3-step pulley fan drive system** to provide the operator with an **infinitely adjustable air blast** for final cleaning of virtually any commodity.
- **Perforated metal or wire cloth screens in over 200 different sizes** are available for all cleaning or grading requirements.
- An optional 6 foot **bagging auger with a handy 2-way spout** is available for **easy bagging** of clean product.



TYPICAL COMMODITY FLOW

(1) The commodity is fed to the hopper and is spread evenly across the full width of the top screen.

(2) The product then moves across the top screen, which has openings larger than the product itself. The large foreign material is "scalped" off while the good product falls® through the screen.

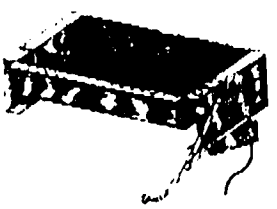
(3) The bottom screen has openings smaller than the commodity being cleaned. Trash, weed seeds and splits drop through the bottom screen while the good product passes over it.

(4) Next, the product is routed through a column of air from the bottom blast fan. This blast of air effectively removes any lightweight trash and dust that may have remained after screening.

(5) Good, clean product is discharged at the bottom of the cleaner or through an optional discharge auger.

Cleaner	Screens	Screen Size	Height*	Width*	Length*	Weight	Motor H. P.	Approx. Capacity
Office Tester	2	10" × 15"	24"	17"	46"	75 lbs	1/6 - 60 hz 1/4 - 50 hz	—
M2BC	2	24-1/2" × 22-1/4"	47"	36"	48"	520 lbs	1/2	up to 40 bu./hr
27-S	2	34" × 42"	71"	52"	69"	985 lbs.	1/2 & 1/4	up to 100 bu./hr

*Dimensions do not include optional bagging auger or slurry treater.



SLURRY TREATER

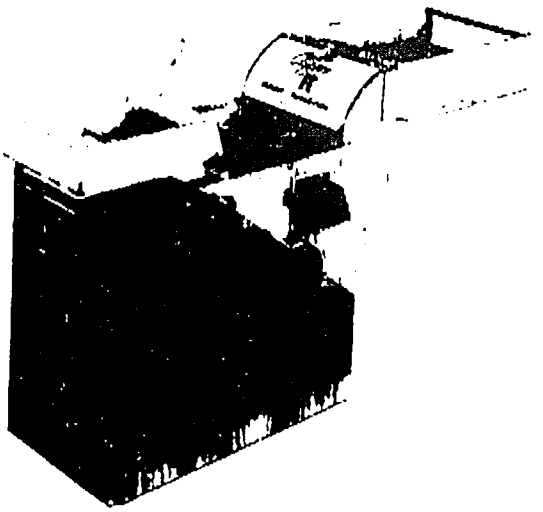
Both the M2BC and 27-S can be equipped with a self contained slurry treater, which meters a wettable powder or liquid treating agents by means of a piston driven from a rotating shaft in the hopper. A rubber hose routes the liquid to the lower end of the bagging auger where the treating agent is allowed to drop onto the clean seed. When treating, the cleaner must be equipped with a Control Feed Hopper and a discharge auger.

BLOUNT
AGRI/INDUSTRIAL CORP
Manufacturers of CLIPPER®

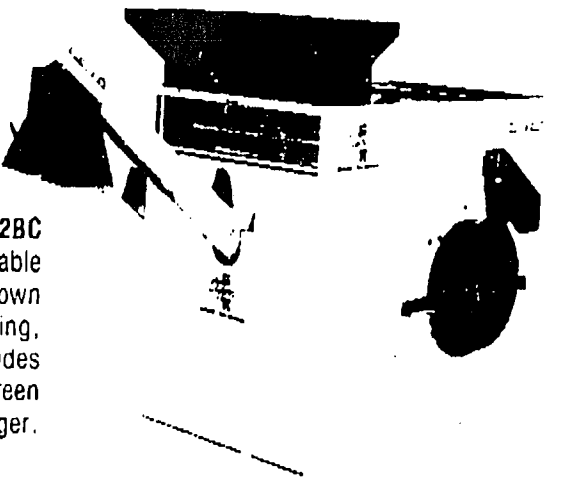
805 South Decker Drive
P. O. Box 256
Bluffton, IN 46714
(219) 824-3400

Clipper® Cleaners For Farm Or Laboratory

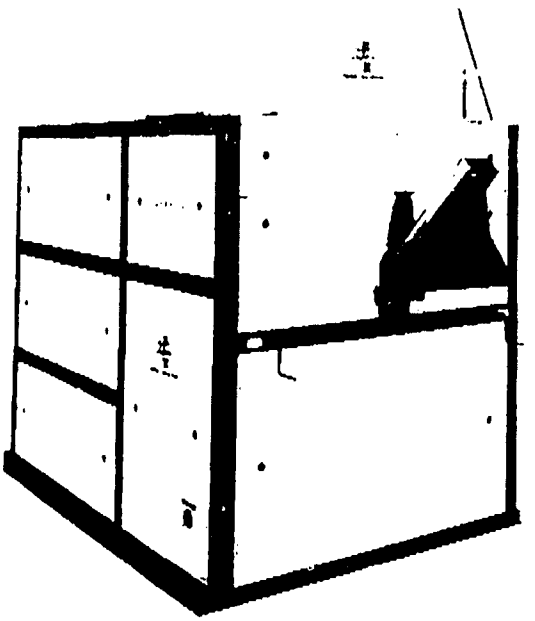
Accurate, Dependable Performance For Small Lot Cleaning, Testing Or Sampling.



CLIPPER® OFFICE TESTER
Table top design is small, yet accurate. Used in seed plants for sampling large lots. Also popular with vegetable and flower growers and in seed stores for specialized cleaning, grading and sizing. Many laboratory uses. Compact, easily moved. Scalper and sifter screens are standard.



CLIPPER® MODEL M2BC
The most popular small seed cleaner on the market today. Reliable and versatile, it is favored by farmers who prefer cleaning their own seed. Used in small commercial operations for grading and sizing, foundation seed work, small lot cleaning and salvage. Includes motor, drive and two screens. Features CLIPPER® ball screen cleaning. Shown with optional bagging auger and two-way bagger.



CLIPPER® MODEL 27-S
Perfect for on-farm use or small scale seed cleaning operations. More screen surface and more capacity than the M2BC. The 27-S is an excellent choice for seasonal work. It lends itself to portability, making it easily moved and stored during the off season. Comes standard with Roll-Feed hopper, CLIPPER® ball screen cleaning, motor and drive. Shown with optional bagging auger and two-way bagger.

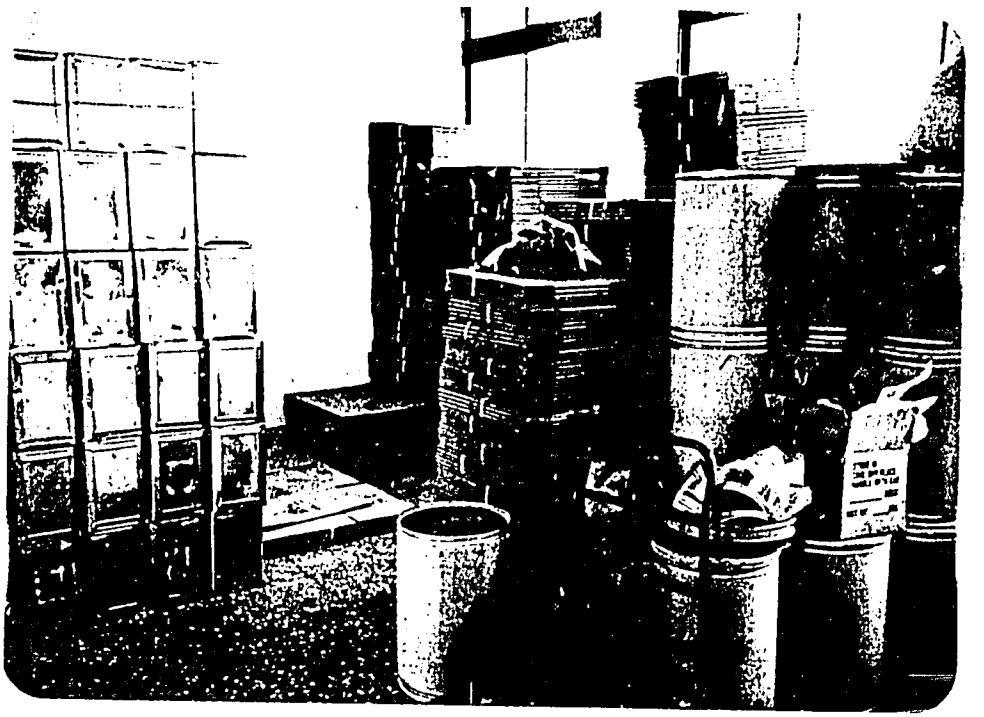
BLOUNT
AGRI/INDUSTRIAL CORP
Manufacturers of CLIPPER®

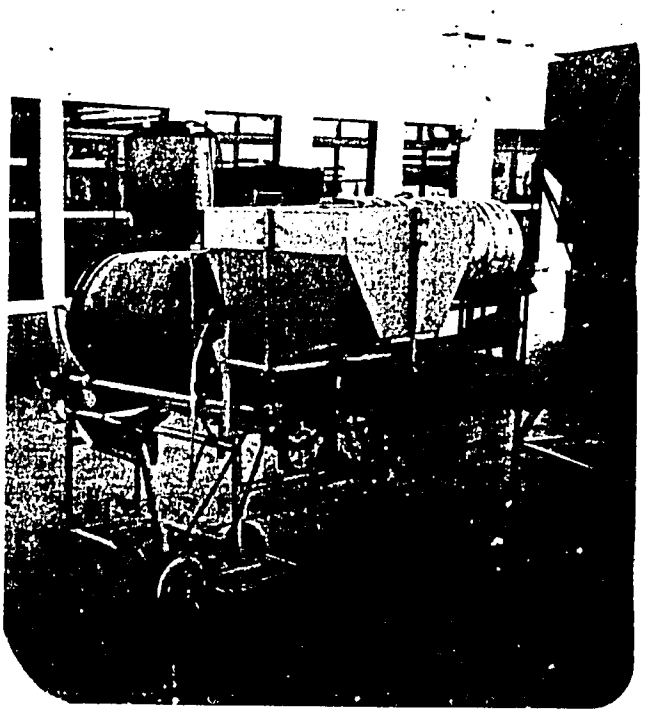
Appendix V

Photographs of Low-Technology

Seed Handling Equipment

Copies of the photographs or other information about the seed handling equipment can be obtained from the author through the Postharvest Institute for Perishables, University of Idaho, Moscow, Idaho 83843.

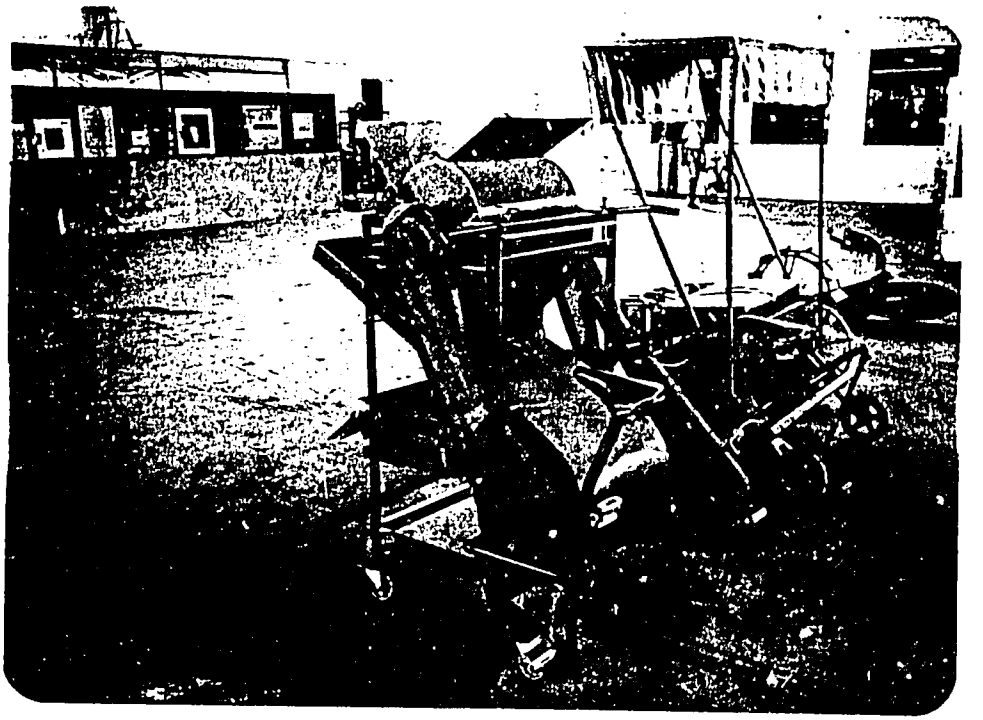


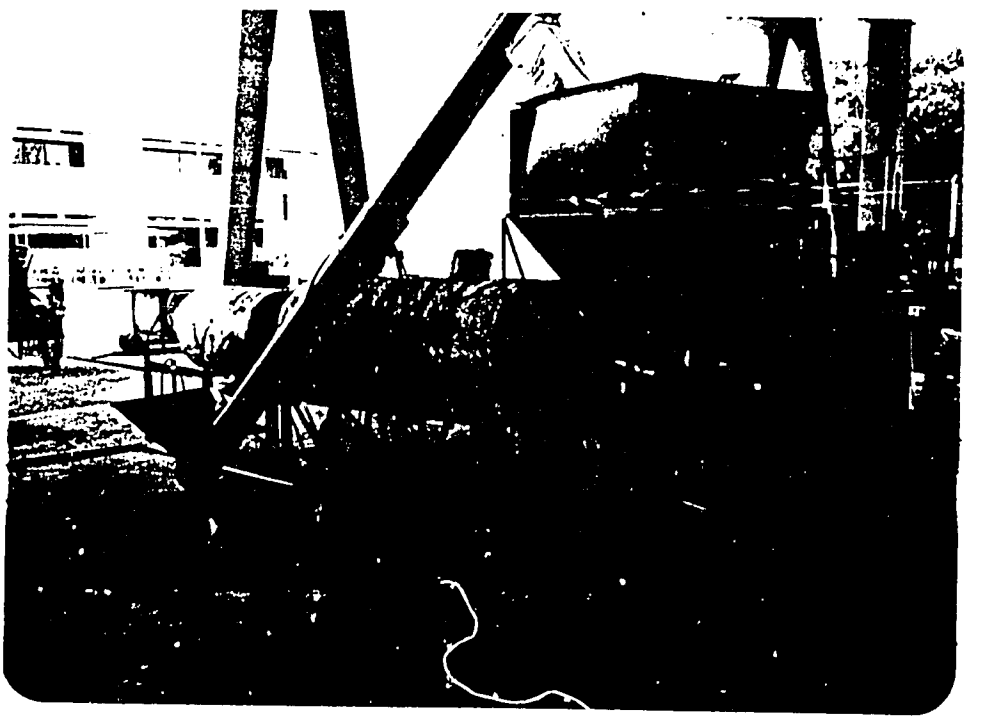


Top: Packaging materials, Known-You Seed Co. Taiwan

Left: Hand Planters for bean crop, AIT-Bangkok.

Right: Man-powered Seed Treater prototype, AIT-Bangkok.





Top: Man-powered thresher prototype, AIT-Bangkok.

Bottom: Portable seed drier prototype, AIT-Bangkok.