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APPROACHES FOR IMPROVING MARKETING AND REDUCING
POSTHARVEST LOSS OF AGRICULTURAL PRODUCTS
FROM THE RAPTI DISTRICT OF NEPAL

Prepared by:

Dr. Jim McCullough
Helene Murray

Postharvest Institute for Perishables

Cooperative Agreement AID/DAN-1323-A-00-5093-00
USAID Bureau for Science and Technology/Agriculture

GTS Report No. 101

January 1989

Contract No. DAN-1323-B-00-6017-00 Delivery Order No. 06

Funded by USAID/Nepal



University of Idaho

in cooperation with
**United States Agency for
International Development**

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POSTHARVEST LOSS OF AGRICULTURAL PRODUCTS
FROM THE RAPTI DISTRICT OF NEPAL

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We would like to thank No Frills Consulting, particularly Mr. Teeka Pradhan for his technical advice and patience teaching us about walking and Nepali culture. We would like to also thank the USAID Mission and ARD in particular for their personal and logistical support. Rob Thurston, Ben Stoner, Shubagya Shrestha, and Madan Manandhar were particularly supportive. We would like to give our heartfelt thanks for the time and hospitality shown us by the many representatives of HMG we met and by the residents of Rapti who opened their homes to us during our visit to their area.

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EXECUTIVE SUMMARY

The Rapti Zone of Nepal is an area with significant agricultural production potential severely constrained by a lack of physical and social infrastructure necessary to support the marketing of that production. It is obvious that unless interventions are made to develop marketing potential in the near future, production gains will not be translated into increased income for producing families.

Although farmers are producing fruits, vegetables, and seeds of excellent quality, there are serious problems with the storage of these products. It is recommended that improved storage facilities for apples and onions be constructed and tested in the producing areas, and that farmers be trained in the correct methods of storage and handling of vegetable seeds. In order to increase the value of local products and resolve transportation problems, it is recommended that experimentation continue with drying of apples and potatoes, and be undertaken for excess onion production. Solar dryers should be constructed as demonstrations in both the onion producing areas around Chibang and the fruit growing region of Jinabang.

More difficult problems exist in the social organization for marketing products. Farmers in the region have no history of actively marketing products and there is very limited organizational capacity to undertake marketing activity. It is recommended that No Frills representatives identify a few farmers in each area who are interested in taking market risk and participating in the marketing of products. These farmers should be trained and given practical experience in marketing. At the same time, marketing training should be provided to agricultural agents in the Zone to support the marketing activities of the farmers.

To more effectively coordinate marketing activities and identify new opportunities, USAID should sponsor a series of seminars involving representative participants in the production and marketing system for important commodities in the

Zone. Using suitable methods, this type of seminar can both increase cooperation among channel members and provide a base of information on which to build appropriate marketing strategies for the producers.

In general, the small scale marketing activities and attempts at reduction of postharvest losses sponsored by No Frills are on track. It would be helpful if those activities could be broadened and systematized, and supported by relevant training in marketing. Specifically, it is felt that capabilities of the No Frills personnel could be greatly improved by a training tour of postharvest handling facilities of onions, apples, and other vegetable, fruit and cash (VFC) crops produced in the states of Idaho, Oregon, and Washington, USA. If this is done, there is great potential for continued growth of VFC crop production in the Zone and for significant increases in farmer income.

INTRODUCTION

This report is based on a three week evaluation of production, postharvest handling, and marketing of vegetable, fruit, and cash crops in the Rapti Zone of Nepal, conducted during the period 12 November to 6 December 1988 at the request of the USAID Mission to Nepal (see Appendix I for Schedule of Activities). This was in support of the activities of No Frills, a local consulting company responsible for agricultural development and marketing activities in the Rapti Zone.

The team consisted of Dr. James McCullough, Marketing Specialist and Helene Murray, Horticulture Specialist from the Postharvest Institute for Perishables (PIP) at the University of Idaho; Madan Manandhar, Agriculture Specialist from USAID; Teeka Pradhan, Field Representative from No Frills; and Ed Arata from the Private Enterprise Unit/Appropriate Technology Unit of the Agricultural Development Bank of Nepal (ADB/N).

The scope of work defined for this project was to work through the Rapti Project Coordinator's Office with No Frills, the Nepalese vegetable, fruit, and cash (VFC) crops contractor, and appropriate offices of the Department of Agriculture and the Private Enterprise Unit of the ADB/N. The purpose was to identify appropriate technologies and to develop appropriate programs to improve the storage, processing and market development of VFC crops in the Rapti Zone. To accomplish this, interviews were conducted in Kathmandu with the Government of Nepal (HMG), USAID, and other appropriate individuals to obtain background for a reconnaissance survey. Site visits to selected VFC crop areas in the Rapti Zone were undertaken to review and analyze existing and potential postharvest handling technologies and marketing mechanisms for VFC crops. A two week visit to the Rapti middle hills was conducted between November 18 and 29, 1988.

The specific objectives of this activity are outlined in the complete Scope of Work presented in Appendix II. This work could not have been accomplished without the

personnel at No Frills and the USAID Mission who provided invaluable assistance and guidance, and the representatives of His Majesty's Government (HMG) who gave of their valuable time to provide needed information.

Recommendations are based on interviews conducted with HMG and USAID officials in Kathmandu and on interviews, observations and other fieldwork conducted in the region during a trek visiting the areas of Chaurjhari, Chibang, Musikot, Jinabang, Salyan, Tulsipur, and Nepalganj. These recommendations should not be extended to products not studied or to regions of Nepal not visited without verification that conditions are similar for those areas and crops.

BACKGROUND INFORMATION

The Rapti Zone, with a population of approximately one million, is representative of the poverty of the rural areas of Nepal. Rapti comprises five districts (Dang, Pyuthan, Salyan, Rolpa, and Rukum). In the four very rugged mountain districts (Pyuthan, Salyan, Rolpa, and Rukum) the per capita income is less than half the national average. The southernmost district, Dang, with a larger percentage of arable land, a good road network, and favorable market access, has a per capita income that is 60 percent higher than the mountain districts. The Rapti Zone is a poor and underdeveloped area, but some economic growth and social development are taking place. The pace of development has accelerated in recent years, and there is considerable potential for further growth. Road construction into the area has brought major new inputs, improved market access, stimulated market activity, and increased household income.

Within the Rapti Zone, the Rapti Development Project (RDP) sponsored by USAID has been designed to assist the Government of Nepal (HMG) in increasing agricultural and forestry production through improved production technology transfer, strengthened local farmer organizations, and private sector services delivery.

The agricultural production component of the RDP consists of programs for cereals, livestock, vegetable, fruit, and cash crops (VFC), and agricultural inputs supply. The VFC crops program is working with fresh vegetable production (potatoes, onions, cabbage, leafy greens, peas, etc.) vegetable seed production (radish, cauliflower, onion, and potato), fruit production (citrus, apple, walnut, mango, and guava), and spices (ginger, pepper, and timur) with a focus on areas of commercial potential for particular crops as determined by production and market factors. With technical assistance, farmer training, and support provided by No Frills -- a Nepalese contractor -- the VFC program is concentrating on building private support capabilities. No Frills coordinates activities with HMG agricultural extension personnel but works directly with private nursery and orchard operators. Assistance for private businesses engaged in inputs

provision, processing, storage, and marketing of VFC crops is also provided under the project through the Private Enterprise Unit (PEU) of the Agricultural Development Bank of Nepal (ADB/N).

As production of VFC crops increases, marketing problems begin to threaten the continued success of the development effort. This study of postharvest losses and marketing problems was undertaken to identify approaches to resolve those problems before they become serious constraints.

METHODOLOGY

Recommendations were developed based on interviews with HMG, USAID, and officials of other donor agencies in Kathmandu, and on interviews, observations, and other fieldwork conducted in the Rapti Zone during a trek of the areas of Chaurjhari, Chibang, Musikot, Jinabang, Salyan, Tulsipur, and Nepalganj.

During this visit, we viewed the production of vegetable seeds and vegetable crops for fresh consumption and marketing, apple storage and processing, processed potato products (but no potato production or storage), and ginger production and marketing. Citrus was unavailable in the region visited nor was there any radish seed threshing occurring during the visit.

In agricultural systems such as those found in Rapti, marketing problems can be generally classified into three different areas: production/product related, distribution/transportation issues, and competitive/market development problems. Production problems generally arise from shortages of product or from products of inferior quality. This type of problem can best be solved by technical and managerial interventions in production. Distribution problems usually appear as localized shortages and surpluses, and can be resolved by investment in distribution infrastructure, transformation and storage of products, information systems, and improved transportation. More difficult are problems of competition and market development, since these occur when basic consumer needs are already satisfied by a competing product. A strategy to encourage consumers to change consumption patterns must be developed.

In developing these marketing strategies, however, correct identification of the nature of demand is essential. In Nepalese agriculture, four types of demand are likely to occur: latent demand, in which the consumer need only be made aware of the product to develop demand; absent demand, in which the consumer sees no advantage

in the product offering after being made aware of its availability; irregular demand, in which the supply or demand for a product vary resulting in an unsatisfactory situation (this is usually resolved by storage or transformation of products in time of surplus); and weak or faltering demand, in which there is a surplus of product relative to market needs and market development must be undertaken.

The postharvest situation in the Rapti zone was examined and the problems described using this framework. The recommendations were developed which were designed to eliminate those problems. Preliminary recommendations were presented to No Frills and USAID at a seminar on December 2, 1988. Based on comments received during that meeting, the revised recommendations presented in this document were developed.

RESULTS AND DISCUSSION

It should be recognized at the outset that several characteristics of the farmers in the Nepal middle hills work to inhibit effective marketing of cash crops and other agricultural produce. First, the farmers are primarily subsistence farmers and tend to operate in a relatively independent fashion. Although there are both traditional and political organizations in the areas visited, there are no farmer organizations suitable for the promotion and marketing of agricultural surpluses, and perhaps more important, no perceived need for creating such organizations. Second, farmers do not openly sell or market their products. In fact, there is apparently some social stigma attached to selling products. It is not clear whether this attitude will inhibit commercialization of VFC crops, but it has resulted in the absence of a market structure which can support this commercialization. The areas of Chibang and Khola Gaun are traditionally food surplus areas, but typically, farmers with surpluses wait for buyers to seek them out rather than trying to locate buyers. Third, farmers do not rely on a market system for the provision of food or the generation of cash through the sale of crops. In fact, many farmers interviewed expressed no need for the type of material goods typically provided by cash markets. In this context it is not surprising that there is no well developed market system in the hill country, nor any readily apparent base on which to build one.

As a point of initial analysis, it is perhaps useful to identify several major strengths and weaknesses of Rapti producers.

Strengths.

The producers visited in the Rapti Zone exhibited several positive characteristics on which to build a postharvest strategy. Technically, farmers are producing good crops, handling them well under difficult conditions, and getting adequate technical support from No Frills staff, and other supporting agencies. These personnel appear to be interested in developing the region and in providing technically correct and enthusiastic support for the farmers' efforts. The farmers are adequately pruning trees and

harvesting their fruit, and are attempting to handle and store products correctly. Seeds appear to be of good quality and are in apparent demand. Because of the isolated character of the various production pockets in the region, farmers should be able to maintain seed quality without problems of cross pollination.

Weaknesses.

Farmers have a very weak supporting infrastructure for storage and distribution. They are hampered by generally high transport costs and high losses in transport of highly perishable products like apples. Losses in storage of apples and onion bulbs are excessive. Farmers have very limited experience marketing products and a negative attitude toward such activities, preferring to remain independent of market relationships and to depend on buyers to approach them, rather than actively trying to develop markets for their products. As a result, producers are poorly organized and lack the skills needed to commercialize their production.

CONCLUSIONS

Discussions with individuals, at all levels from producers to HMG officials, clearly indicated concern for the marketing implications of significantly increased production of vegetable seeds and VFC crops. It is important that these potential problems be recognized and solved before they become serious and undermine farmer confidence in the development projects designed to increase their incomes.

The approaches taken by No Frills to develop market awareness and provide assistance appear to be going in the right direction but need to be expanded and provided in a more systematic fashion. Until more farmers have recognized the opportunities and possible financial rewards in the marketing area, it will not be possible to increase farmer incomes significantly. Unfortunately, these problems are not easily solved and often require considerable time and personal involvement by technical support staff. We feel that through the use of appropriate technology, with significant amounts of training and practical experience these problems can be resolved. It is important, however, that the project draw on as many supporting organizations as possible and maintain the high levels of interest that currently exist in the Rapti Zone.

It appears in most cases that farmers are able to produce products of adequate quality and quantity, but are unable to deliver the quality products to market. In nearly every case, however, the market is already saturated with products imported from India which have been designed to meet the needs of Nepali consumers. This is clearly true for Indian apples and vegetable seeds which are effectively marketed everywhere in Nepal. Once production and distribution problems are overcome through technical intervention, the more difficult task of competing in saturated agricultural markets will remain. It is for this reason, that the recommendations place strong emphasis on marketing training, rather than infrastructure investment.

RECOMMENDATIONS

Recommendations can be classified into three categories relating to the nature of the problems they address: (1) production/product quality issues, (2) distribution/transportation issues, and (3) marketing/competition related issues.

Production Issues.

Production problems are usually addressed through technical and/or managerial interventions to increase production or improve product quality. To alleviate identified problems the following activities are recommended.

1. Training farmers in seed handling and storage techniques.

There are serious loss problems associated with the harvesting and storage of seed produced under contract with the Agricultural Inputs Corporation (AIC). Individuals producing contract seed should be provided with additional training in seed storage and handling. This type of training is currently being provided by No Frills representatives and to a lesser extent by Junior Technician (JT) and Junior Technician Assistant (JTA) personnel of the Agricultural Development Office (ADO) of the Ministry of Agriculture. It would appear the personnel at the Musikot farm could provide assistance in both training and technical support to extension personnel. The Musikot farm technical staff could provide technical training to No Frills personnel, JT and JTA personnel to up-grade their skills.

2. Experiment with improved apple storage.

The primary constraint of apple storage in Jinabang appears to be a lack of maintenance of proper temperature and relative humidity within the storage room. Harvesting is sometimes unnecessarily delayed because of inadequate storage facilities. Growers claim if they harvest the fruit early in the season (mid to late August) the keeping quality is poor. If the growers had a cool place to store the fruit, keeping time and quality could be markedly improved. Fruit harvested mature but not "ripe" should store well.

While for the most part production practices are good, practices to control diseases which affect keeping-quality of apples need to be improved. In Jinabang, growers report a problem with black smut which causes apples to deteriorate more quickly in storage.

Temperature and relative humidity can be controlled to a satisfactory degree by building cellar type storage units into the sides of north-facing slopes. A study conducted by the Food Research Corporation examined the effectiveness of cellar storage on apple-keeping quality. Cellars were constructed using local materials (stones, mud, and wood) with water used to control relative humidity.

Temperatures inside the storage area ranged from 3 to 9 degrees C, with relative humidity maintained at an average of 85% over a four month period. The apples stored under these conditions maintained good quality for four months, after which time quality rapidly deteriorated.

Some pilot apple storage cellars should be built in the Jinabang apple growing region using a plan developed by the Food Research Corporation. Temperature and relative humidity should be monitored and recorded over the season to assess the effectiveness of the cellars in maintaining an appropriate storage environment.

Experimentation with the dehydration of apples and production of chips or apple leather should be expanded to facilitate storage of excess production.

3. Improved onion bulb curing and storage facilities.

Onion bulbs are harvested in June in the Rapti Zone, at the beginning of the rainy season. Observed storage losses were from 40-60%. The primary problem is a lack of adequate curing and drying of the bulbs before they are placed in storage. The reasons for this are twofold: first, with the onset of the rainy season, bulbs cannot be left to cure and dry in the field once they have been harvested, and secondly, even if the rains are delayed, the onions need to be

removed from the field so the land can be prepared for rice planting. Because of this, an adequate indoor curing and drying system needs to be developed. Onions simply cannot be stored for any length of time unless cured so the necks shrink and dry to inhibit ingress of pathogens. This can be accomplished by grading the onions by size according to intended use prior to storage. The smaller bulbs have been shown to be superior for storage and subsequent replanting the following year. The larger bulbs can be stored for shorter periods of time for household consumption. These can also be sliced and solar dried. It will also be important for onions designated for storage to be examined for damage to prevent the spread of rot diseases throughout the storage room.

Drying of the bulbs can be accomplished in a well-ventilated room with the bulbs placed on shelves constructed of bamboo, which is plentiful in the areas where onions are being grown. One grower we visited used bamboo shelves within the storage room but sanitation and room ventilation were poor and therefore bulb loss high. He also placed bulbs directly on the floor, which should be discouraged as air circulation and subsequent water build-up can increase losses. Another option that may be employed to dry onions on a small scale basis is to hang the bulbs by the stems from rafters in the storage area. Growers have found this works well but takes too much time on a large scale basis, although this technique would work well for growers wishing to save bulbs to plant for a kitchen garden.

A further, more long term option might be to experiment in the development of solar dryers/curers. These are used in commercial onion producing areas of the U.S. Even in the rainy season, when properly managed, they can cure and dry onions preparatory to long term storage. This is an attractive option for larger volumes as marketing capabilities increase. The same solar collectors (with some supplemental heat) could be used in the dehydration of onions recommended in the next paragraph.

4. Experiment with solar dehydration of onions.

As indicated above, there are serious problems with the storage and handling of onions. In addition, onion consumption in the hill areas is limited. If significant quantities of unusable and unstorable bulbs continue to be produced, it is possible a market could be developed for dried onions in the Terai or other areas where onions are consumed regularly. Onions dry and store well, and transportation from the hills could be facilitated. (PIP has considerable experience with the use of solar driers for food dehydration purposes. See Appendix III.)

5. Expand dehydrated potato chip production.

Although we were unable to see potato production areas, it is obvious that a dried product would reduce transportation costs while increasing the value of the product. This combination of factors could make a significant contribution to farm income. It appears potato chips have potential as a product which both fits existing patterns of preparation and consumption and can be produced in both quantity and quality sufficient for consideration as an option.

6. There is no need to improve ginger storage facilities.

Improved ginger storage was considered and rejected. Fresh ginger can be easily stored in the ground for relatively long periods. Farmers should be encouraged to participate more actively in the fresh ginger markets where there are significant opportunities for increasing incomes. For example, one grower was able to obtain a 50 percent increase in revenue by taking the fresh ginger to Tulsipur and negotiating directly with buyers rather than accepting farmgate prices.

Distribution Issues.

Distribution problems are usually solved by development of storage and transportation infrastructure designed to utilize localized surpluses. Although the region visited is remote, producers have considerable potential to effectively access markets. Despite the remoteness of the Rapti region, it is better situated than other more remote production areas. This may be a strength rather than a weakness. Improved carrying equipment, however, would greatly facilitate the transportation of products which must rely on human or animal transportation.

1. Continue experiments with improved "dhoka" transportation approaches.

Transport losses in fresh apples are high. It is possible alternative transportation containers might reduce that loss. No Frills is currently experimenting with improved local baskets called dhokas which are carried by human transporters. That type of experimentation should be encouraged.

2. Continue foundation seed production and expand seed promotion for fresh vegetable production at Musikot farm.

The Musikot farm should continue to produce foundation seed for farmers in the Rukum areas. Farm practices in seed production appear to be effective and good quality foundation seed cannot be obtained from other sources. The farm is an important source of extension support and should serve as a center for the promotion of vegetable production and seed sales. Distribution of seed produced in remote areas and development of the Nepali seed industry will continue to be problems for several years. AIC appears to be the best available vehicle for stimulation of seed production in the near term. At the same time, efforts should be made to promote vegetable consumption and production in the remote areas to provide a local market for locally produced seed.

Marketing Issues.

Marketing problems are, by their nature, more difficult to solve. They often require changes in social patterns, and require information about and sensitivity to consumer needs and behaviors. The most serious problems facing farmers occur because the market for much of Rapti production has been preempted by Indian importers. Entering these markets requires not only physical access but a point of differentiation. Achieving this requires a higher level of marketing sophistication than currently exists with Rapti farmers.

1. Build marketing awareness and increase farmer awareness of benefits participating in marketing activities through additional training.

Marketing training should be provided to producers by personnel from No Frills and possibly from JT and JTA of the Ministry of Agriculture. This training should be designed to familiarize farmers with the basic principles of marketing and to orient them toward a more aggressive posture in the marketplace. The technical support staff must be instructed before they can effectively train producers. Training could possibly be conducted by the Small Business Promotion Project.

2. Provide increased practical marketing experience for producers.

No Frills has encouraged producers to take a more aggressive position in the marketplace through loans and encouragement of participation. This type of activity should be increased and encouraged. More farmers should be taken to markets and shown the benefits of participation in marketing activities. No Frills personnel should attempt to identify a limited number of key individuals who can perform this type of activity and who are interested in taking the role for the community. This can help strengthen farmer organizations as they work with these individuals and develop an improved marketing capacity.

3. Increase integration and awareness through product oriented workshops and seminars.

One of the most serious problems in the marketing of agricultural products from Rapti is a lack of communication and coordination between the participants in the system, leading to inefficiencies. Because the marketing system for ginger is well developed and defined in a limited area, a workshop based on PIP's commodity systems approach, a systematic examination of a commodity within a marketing system, should be conducted for ginger producers in Tulsipur to identify constraints and opportunities in the marketing of ginger. This workshop should include participation by growers, transporters, brokers, and officials from HMG, the Rapti project, USAID, and other interested donors. If successful, this type of activity should be repeated for other significant commodities as the training process would transmit to workshop participants the knowledge to conduct systematic evaluations of other commodities in the future. A summary of the PIP commodity systems approach can be found in Appendix IV.

Other Issues.

Several other areas should also be considered in order to increase the effectiveness of the No Frills program.

1. There should be more adequate documentation of experiments in market development and technology transfer.

It would be useful to require No Frills personnel to prepare cases or other written documentation describing their activities. These should be done in the form of local stories or anecdotes rather than formal program reports.

2. The Musikot Farm should serve as a focus for technology transfer and training.

The Musikot Farm will probably continue to be involved in the sale and purchase of certified seed until a viable private seed industry develops in Nepal to replace the AIC. It is important to retain the Musikot Farm as a source of foundation seed until the private seed industry develops the capacity to provide that service. (It is unlikely these developments will take place in the near future.)

The Musikot Farm currently serves as a focal point for extension and for the provision of new seed varieties for on-farm vegetable production. It seems logical to expand this role, developing the farm as a center for training and extension activities in the Rukum area. The seed distribution activities at the farm should be continued and expanded to provide seed for sale to the general population.

3. Further training of No Frills personnel.

The No Frills personnel are active, well-motivated, and full of ideas for improving the economic well-being of the Rapti Zone. However, many of their activities are based on ideas without the full knowledge of how they should be applied. The Pacific Northwest (PNW) states (Oregon, Idaho, and Washington) produce and handle and export many of the VFC crops including seeds. It is recommended that PIP organize a learning tour for one to several of the No Frills personnel. This tour would be most effective in August-September time-

frame when these crops are being harvested, shipped, and stored. Given the common crops being produced in Rapti and the PNW, a long-term plan should be developed for the exchange of experts and information.

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APPENDIX I: SCHEDULE OF ACTIVITIES

| <u>Dates</u> | <u>Location</u> | <u>Activities</u> |
|----------------------------|-----------------|---|
| November 14-17 | Kathmandu | Interviews with HMG and other officials |
| November 18 | Chaurjhari | Site visit to Ag Service Center. Visits with Musikot Farm Mgr. and ADO. |
| November 19 | Khola Gaun | Site visit to No Frills activities. Meetings with local officials. |
| November 20 | Chibang | Visit seed production and onion storage. |
| November 21 | Musikot | Site visit to Musikot Horticulture Farm. |
| November 22 | Simiee | Site visit to local distillery. Meetings with local producers. |
| November 23 | Jinabang | Meetings with local producers. |
| November 24 | Jinabang | Site visit to Ag Sub Center. Meetings with No Frills agent and local producers. |
| November 25 | Malta | Meetings with ginger producers. |
| November 26-27 | Tulsipur | Site visit to Salyan. Meetings with Rapti PCO and local marketing officials. |
| November 28 | Nepalganj | Meetings with seed marketers. Site visit to cold storage facility. |
| November 29- December 3 | Kathmandu | Meetings with HMG officials and briefings of No Frills and USAID Mission. |

APPENDIX II: SCOPE OF WORK

The scope of work defined for this effort was to work through the Rapti Project Coordinator's Office with the Nepalese VFC contractor (No Frills) and the appropriate offices of the Department of Agriculture and the Private Enterprise Unit of the Agricultural Development Bank of Nepal to identify appropriate technologies and to develop appropriate programs to improve the storage, processing and market development of vegetable, fruit, and other cash crops in the Rapti Zone. The assistance will include the following activities:

Reconnaissance survey and site visit to a few selected VFC sites in the Rapti Zone to review and analyze existing and potential postharvest handling technologies and marketing mechanisms for VFC crops including: fresh and seed potato handling and marketing and possible cold storage facilities development; onion bulb storage; radish pod threshing; fresh vegetable handling and marketing; fruit (primarily apple and citrus) storage, processing, handling, and marketing.

Tasks involved include:

1. The review of existing information on postharvest handling, processing, storage and marketing of the specified VFC crops.
2. Identification, and assessment of the main opportunities and constraints on postharvest handling, processing, storage and marketing of VFC crops.
3. Prioritization of a few postharvest handling and marketing activities for immediate execution.
4. Recommendation for equipment, training, technical assistance and other inputs needed to undertake the priority activities.

Follow on areas

Training program development. Assistance may be need to develop training materials and provide training seminars in specific VFC postharvest handling or marketing subjects

Technical Assistance for VFC postharvest handling and market development. Assistance may be needed to provide technical assistance for specific VFC postharvest handling or marketing areas.

Reports

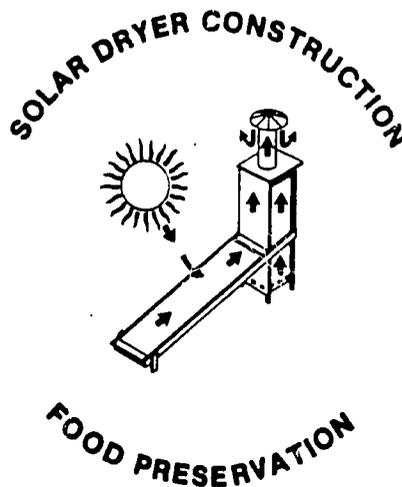
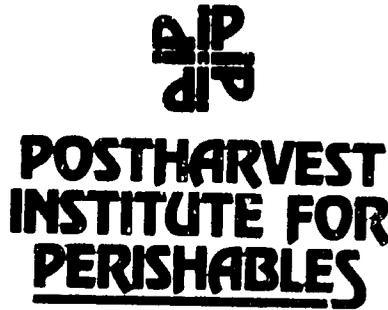
Written report with recommendations for follow-up actions and for future program development.

APPENDIX III: SOLAR DRYING

Major Topics Covered:

- Solar dryer design and construction using supplemental heat.
- Solar dryer use for food dehydration.
- Proper food drying as a preservation method.
- Preparation of foods for drying.
- Experimental design and selection of food and dryer parameters for drying trials.
- Evaluation of dried foods.
- Packaging and storage of dried foods.
- Reconstitution of dried foods.
- Methodology and extension outreach.

These and other topics will be covered in class and complemented with a variety of field experiences. The workshop will be oriented to problem-solving discussions between trainers and participants. Time will be allocated for participants to present problems unique to their localities and to obtain suggestions from trainers on how to resolve them.



Food Preservation

Solar drying of perishable foods and cereals has been used for food preservation for thousands of years.

Disadvantages of drying food products spread on the ground or hung in the air include lack of sanitation and temperature control, and handling inconveniences caused by inclement weather.

The solar dryer with supplemental heat that the Postharvest Institute for Perishables teaches in the workshop offers the distinct advantage of sanitation by protection from dust or dirt, insects, rodents and other animals. Also, drying temperatures can be controlled, and supplemental heat permits continuous controlled drying in any kind of weather — day or night.

PIP experts in solar dryer construction and nutrition have taught participants in Africa, Southeast Asia and the Caribbean how to preserve their perishable foods successfully by dehydration and packing.

Upon completion of the course, the participants will be prepared to apply the material at the small farmer or village level, or to teach others for application at that level.

APPENDIX IV: INFORMATION BULLETIN
ON RAPID APPRAISAL OF A FRUIT OR VEGETABLE COMMODITY SYSTEM

By
Postharvest Institute for Perishables

What is a Rapid Appraisal?

A rapid appraisal of a commodity system is a systems approach to develop an understanding of the functioning and structure of the production/marketing system of a particular commodity. The system includes the supply of inputs and information, through the production, postharvest handling and marketing channels to the ultimate consumer.

A commodity system is an interdependent structure which encompasses all the participants involved in the planning, production, processing, marketing, and support services of a commodity, including the diversity of public and private institutions and marketing intermediaries.

A commodity system appraisal outlines all the various functions that are performed during the process of producing, harvesting, and moving the product to the ultimate consumer in the form, at the time, and to the place the consumer desires.

Objective of a Rapid Appraisal

Using a formalized method to outline the structure and function of the commodity system, the overall objectives of a Rapid Appraisal are:

To identify and diagnose critical system constraints to efficient functioning of production and marketing of a commodity to the consumer.

To make specific recommendations on how to remove or minimize the impact of the constraints by identifying pilot projects, investments, institutions, interventions, research needs and/or training needs that can improve the efficiency of the marketing system.

Analysis of a Commodity System

Analysis of a particular commodity system includes the following levels:

Level one: Macro-environment and public policy issues including impacts on all sectors of the economy. Agriculture cannot be examined in isolation.

Level two: Specific commodity system, including participants, functions, problems, inputs, and needs.

Level three: Micro or firm level, including individual participants, functions, problems and needs.

Key Areas of Investigation in a Rapid Appraisal

In order to accomplish the type of analysis required in a rapid appraisal, the following key areas of analysis will be done:

Commodity characteristics

Consumption patterns

Production and supply situation

Price relationships and seasonality

Food system participants and organizational structure
Food system operation, conduct and performance
Marketing system infrastructure
Government marketing institutions and policies
International trade
Inputs to the system

Study Approach for a Rapid Appraisal

- When:** Designed to take advantage of the peak marketing season for the commodity.
- Where:** Concentrated on specific production areas, specific production systems, and the primary marketing area(s).
- Who:** Personnel from organizations concerned with agricultural marketing will conduct the study under the guidance of a multidisciplinary coordinating committee headed by a marketing specialist well acquainted with rapid appraisal techniques.
- Coordinating personnel must have technical expertise and be capable administratively to train and guide individuals in the collection and analysis of information.
- The private and public sectors should be represented on the committee.
- How:** The study will be conducted under the guidelines set forth in the PIP/IICA commodity system rapid appraisal methodology.