

# Postharvest Operations and Marketing Channels of Potatoes in Thailand

Sing Ching Tongdee  
Applied Scientific  
Research Corporation  
of Thailand, Thailand

## Abstract

After harvesting, there are a number of stages that potatoes go through before reaching the consumers. Significant losses occur during each stage especially in developing countries where handling practices are comparatively crude and ineffective. With financial support from the International Foundation for Science, Sweden, ASRCT has undertaken a series of investigations into the specific problems and practices in potato cultivation, storage, transportation, etc. The objective of these investigations is to determine the relative importance of each stage and its significance in the deterioration of potatoes. It is hoped, by tackling this problem through a total system approach, that a better perception of the problems can be obtained.

The report showed that as potatoes passed from growing areas through local assembly centers, Chiang Mai wholesalers, Bangkok Song Wat market, and Hat Yai, total losses could be as high as 50% due to various causes. A number of pre-harvest factors affecting the keeping qualities of potatoes have been briefly described, taking environmental data and crop physiology into consideration. The study also suggests incentives and points out areas where improvements or adaptations are possible, such as in mode of transportation, packaging, sales practices and grading.

## Introduction

While there has been extensive studies on root crops, especially white potatoes and sweet potatoes under temperate countries, only a few were conducted under tropical countries. There are a number of stages involved in the postharvest operations. Significant losses occurred during each stage especially in developing countries where handling practices are much cruder and less effective. Postharvest operations of potato, present special problems in Thailand because the crops are mainly produced in the North. Potatoes are then transported to Bangkok where major market outlets lie or for export to neighboring countries. Though the distance is not too far, the marketing infrastructure of most agricultural produce in Thailand is such that defective handling operations are practiced. This article will consider the specific problems and practices used in potato transportation and postharvest operations to determine the relative importance of each stage and its significance to the postharvest deterioration of potatoes. The aim of the study is to see where available technology can be adapted or modified to fit into various operational stages and find a practical and applicable method of reducing postharvest losses of potato in Thailand.

### Potato postharvest technology study

**The sample.** The survey farms included in the study were drawn from a sample of potato-growing areas according to geographical distribution. Account was taken of various handling and storage systems. The samples were thus proportionately unrepresentative. Major warehouse operators and traders in the postproduction system at points close to the production sites through Fang, Chiangmai, Srongwat market and Pak-Khlong market in Bangkok, Bangkok-Noi and Hat-Yai were visited. A number of case studies on several large scale operators were undertaken to evaluate the postharvest operations as well as possible technology improvement or input. It was felt during the initial stage of survey that questions concerning costs, benefits and profits were too sensitive to ask and some traders became suspicious. Unless a rather cooperative mood was established, such questions were avoided. Due to limited personnel and time, and the lack of proper methodology used in damage survey, the report cannot be considered as a national damage survey.

**Production.** Due to its somewhat subtropical climatic requirements, potato in Thailand is produced mainly in the north especially in Changwat Chiangmai. Table 1 shows production of potato in the country.

Total production remained more or less constant since 1972. Marketing gluts became apparent with the withdrawal of American troops in 1975. Production in 1976 decreased as a result. Potato is sold as ware potato for domestic consumption. Small amounts have been used for processing and for export to neighboring countries. Table 2 shows the country's export (value highly underestimated) and import of potato from 1974-1977.

Imported potatoes were either in the form of ware potato or as seed potato for planting. Ware potato import continued to decline especially after 1976, while import of seed potato was maintained to substitute seed stocks degeneration every two to four years. Export appeared promising during the 1978 dry crop season. However, export which was active at the start of the rainy season suffered late in August and September because of inferior quality. Export prospects remain unpredictable.

### Preharvest factors

**Varieties and seed tubers for planting.** There are two major imported varieties, Spunta and Binje, grown in the country. Spunta appears to be more popular. Due to its larger oval shaped tuber with yellow flesh, farmers tend to get a premium price for their crop. Binje, one of the most popular varieties in Holland, is preferred in the Singapore market. Though it is known that varieties differ in their inherent keeping quality, no study was made during the present investigation. The cost of imported seed tuber is about five to ten times higher when compared with second, third or fourth generation seed tubers locally grown from imported tubers. It became a farmer's choice whether to invest in seed tubers in order to obtain higher yield (almost twice compared with locally grown seed tuber) of better quality tubers or to use locally grown seed tubers. Cholae area is known to import yearly fresh stocks of tuber and provide second generation seed tubers to growers in other areas. Several highland areas in Fang having cooler climate are also providing seed tubers to growers. Seed stock degeneration by either virus or physiological alternation, presents serious problems when using local seed tubers.

**Planting date.** By adjusting planting dates, it is possible now to grow three potato crops a year at highland areas in Fang – one of the major potato-growing regions. There are two croppings in the rainy season. The first crop is planted in April and harvested in July and followed by the second crop planted in August and harvested in November.

## Post-harvesting and Marketing of Potatoes in Thailand

Planting of dry season crop starts in November and December and is harvested in March to April. Planting is not done later than the 10th of December in the lowland Fang area as the crop will be affected by high temperature in March and April. As a result of adjusting the planting date, it is possible to obtain a year round supply of ware potato and seed potato for planting purpose. Storage of ware potato, once a rather profitable though risky venture, has lost its attractiveness as stored tubers will be competing with newly harvested tubers in the market. However, short term stocking of tubers to avoid market gluts during the harvesting season or even phasing out daily or weekly fluctuation of price is still highly desirable. Tubers in the highland can be kept at the farm for months without significant losses or for more than 3 weeks in the lowland, provided that tubers are not piled up on earth floors but on raised wooden floors. However, losses can be very great for rainy season crops. During the interview, 10 to 40% tuber losses were reported after a few days stocking under the same conditions used for dry season crops. Irrigation also significantly affects the keeping quality of dry season crops.

**Irrigation and fertilizer.** No irrigation is needed for the rainy season crop. In lowland Chiangmai and Fang area, the dry season crop is usually planted after rice and needs irrigation. Fertilizer is also applied except in highland areas. One case study visit was made on an experienced grower in Fang. It was found that potato tubers with good keeping quality (stored for up to 6 months without special storage structure except raised wooden floor) could be obtained only if irrigation was withdrawn 60 days after planting and a fertilizer formulation 13-13-20 is used. Application of fertilizer 16-20-0 or urea was practiced by some growers produced tubers of larger size and higher yield but of low keeping quality. The farmer is tempted to sacrifice keeping quality for higher yield if he tends to sell his crop right after harvest. He is able to reduce storage loss by using low nitrogen fertilizer and offset his lower yield by obtaining higher market price for his crop if he is able to store and avoid the market gluts during the peak harvesting season. — a technical and economic choice for experienced growers to make proper judgement.

**Harvest maturity and field diseases.** No exact criterion on harvest maturity is available. For tubers grown from imported seed tubers and from local available seed tubers, the crop is ready for harvest, two months and four months after planting, respectively. The price for early potato is higher thus there is no need to store. No mechanical or chemical destruction of haulm is used. Late blight is one of the most serious problems encountered during production. Late blight destruction of haulm is a major disease caused by immature tubers that are frequently harvested. Immature tubers are much more prone to mechanical damage and scuffing which is one of the reasons why tubers from Ban Mai are lower priced than tubers from nearby Ban Yang. Ban Yang tubers, grown at Ang Khang are also preferred, as tuber keeping quality is better because of cooler climate during the potato-growing period.

A three-year programme (1977-1979) with financial support from the U.S. Department of Agriculture on "Table and seed potato production on highlands of northern Thailand as a replacement crop for opium poppy" was undertaken by the Department of Agriculture and Kasetsart University. The study included variety improvement, agronomic factors, and disease and insect control in the field. Actual impact of the programme is too early to judge at this stage as there are interwoven technical, economic and social factors to be considered.

### Postharvest Operations and Marketing Channels of Potato

Subsequent operations at every stage after harvest were examined. Postproduction systems employed differ slightly between regions. Very often the available conditions and

## International Symposium on Tropical Root and Tuber Crops

resources were adapted to provide satisfactory economic advantages to its operators. The following table generalizes the established marketing practices for potato from points of production to wholesales markets and for export.

**Percentage losses were reported as interviewed.** Due to limited time and manpower and lack of proper methodology, it was impossible to make an accurate assessment during the investigation. Postharvest handling from production site to local assembly center is rather crude. Grading according to tuber sizes is done at large warehouses near production sites mostly in Chiangmai. There are 3 to 4 grades. Graded tubers are then packed in cylindrical bamboo baskets with markings made on the lid or side. Reselection will be needed for rainy season crops if stored 5 to 7 days or longer in Chiangmai. Tubers were transported from Chiangmai to Srongwat market in Bangkok and to Hat-Yai for export. The journey from Chiangmai to Bangkok takes 10 to 15 hrs depending on type of truck used. Early potato was sent from Bangkok-Noi to Hat-Yai by passenger rail—a journey of about 15 hrs. A greater amount of tubers was sent by commodity rail to Hat-Yai—a journey of about 3 to 4 days.

Stocking ware potato is more common at highland areas in Fang, where major crops are produced, to avoid market gluts during harvesting season. Storage loss is less under the cool, moist condition at the highlands. Potatoes are stored on the ground or raised wooden floor in piles against the muddy walls of the house up to one meter or higher. Seed potatoes are often stored as a thin layer on the wooden floor. Sometimes cylindrical bamboo baskets and crates, about 20 kg capacity, are also used. Insecticides, aldrin or DDT, are sprinkled over seed tubers against insect damage. Storage losses up to 40% of seed potato due to diseases is common. Stocking of rainy season crops at local assembly centers or warehouses near production sites can be very great. Apart from the simple storage practice, refrigerated storage has been done to a very small extent in Chiangmai. It is rather expensive and low temperature sweetening rendered tuber unsuitable for processing.

## Conclusion

Postharvest technology presents a special problem in developing countries. There is a need for a combination of location-specific organization, problem identification, information and adapted technology as stated in a USAID report. Extensive improvement can be achieved only through a combination of technology, administrative, and managerial factors. ASRCT's past attempts emphasize the technical aspects of post-harvest losses.

There are a number of stages involved in postharvest operations from producer to consumer. It was realized, during the study, that technology improvement involves, besides technical issues (their potential and their limitation), economic and social factors as well, and being unique for each specific commodity. The report, points out the significance and possible incentives of each operational stage to see where input of improved or adapted technology is possible. It is hoped, by tackling postharvest problems through this total system approach that proper perception of problems can be obtained to reduce postharvest losses. IFS's moral encouragement and financial support has been and will continue to be most important to ASRCT postharvest work.

## Post-harvesting and Marketing of Potatoes in Thailand

### Acknowledgements

The author wishes to express her deepest appreciation to the International Foundation for Science, Sweden for the financial support which made the project possible. A good many local people most of whom cannot be mentioned by name, who bore with patience and cooperation, have greatly assisted the author during the study. Sincere appreciation is also extended to Mr. Prapandh Boonklinkajorn for his interest in postharvest work; to Dr. Malee Sundhagul for her encouragement in many ways. Cooperation of Mae-Jo Agricultural Experiment Station, Department of Agriculture is also acknowledged.

**Table 1. Potato production in Thailand**

Year	Zone	Planted area (rai)	Production (kg)	Yield (kg/rai)
1972	Total	6,295	8,650,411	1,409
	North	4,911	7,233,521	1,521
	Northeastern	471	510,200	1,083
	Central	905	905,250	1,000
	South	8	1,440	1,800
1973	Total	4,244	5,427,763	1,047
	North	3,912	4,131,072	1,056
	Northeastern	262	227,981	923
	Central	24	39,600	1,650
	South	46	28,796	626
1974	Total	7,278	719,690	1,045
	North	5,373	6,366,996	1,278
	Northeastern	1,207	225,709	187
	Central	44	48,004	1,091
	South	654	552,948	85
Northeastern				
1975	Total	4,961	7,886,587	1,591
	North	4,303	7,336,615	1,705
	Northeastern	—	—	—
	Central	66	74,514	1,129
	South	592	475,104	808
1976	Total	2,576	2,872,238	1,116
	North	1,976	2,374,458	1,202
	Northeast	24	12,080	503
	Central	—	—	—
	South	516	443,700	865

