TRUE POTATO SEED

An Alternative Method for Potato Production

INTERNATIONAL POTATO CENTER (CIP)

CIP SLIDE TRAINING SERIES

CIP's Slide Training Series, produced by the Department of Training and Communications of the International Potato Center (CIP), assist in training individuals from potato programs in developing countries.

CIP Series III, Potato Production from True Potato Seed, is designed specifically for individuals interested or involved in producing potatoes from true potato seed (TPS). The first set in Series III is entitled, True Potato Seed: An Alternative Method for Potato Production. It introduces individuals to the advantages of TPS over traditional potato tubers for potato production in developing countries. Further, it describes three techniques for growing potatoes from TPS and briefly outlines a method for producing TPS.

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CIP's Slide Training Series may be used in instructor-directed training sessions or for individual learning. This guidebook is designed for study with or without the use of accompanying slides or for ready reference at an individual's work station. In all cases, complementary practice activities are recommended for effective skill development.

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International Potato Center (CIP)
Department of Training and Communications
P.O. Box 5969
Lima, Peru

TRUE POTATO SEED:

An Alternative Method for Potato Production

1

True Potato Seed: An Alternative Method for Potato Production

INTRODUCTION

Potato production from true potato seed (TPS) is emerging as a promising alternative to the traditional method of using seed tubers in developing countries.

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THE PROBLEM

Farmers traditionally propagate potatoes by planting seed tubers for several reasons. Seed tubers are easy to plant, and plants grow quickly and vigorously. Harvested tubers also are uniform in size, and yields are usually high.

Despite these apparent advantages, propagation by seed tubers has hampered, to a certain extent, the adoption and expansion of potato production, especially in developing countries.

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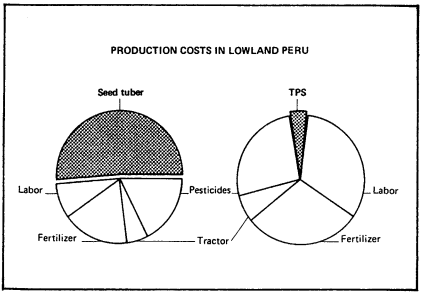

Seed tubers, which are often imported from developed seed-producing countries, are expensive. They can account for more than half the total production costs. This is especially true in many countries of North Africa and Asia where most seed tubers are imported.

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Seed tubers are often the main carriers of diseases and pests. These diseases can reduce yields considerably.

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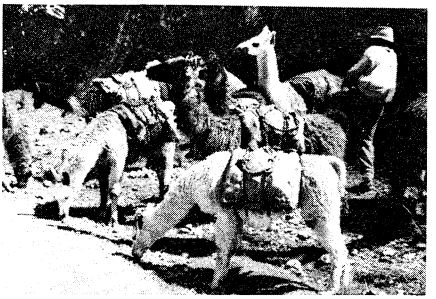

Seed tubers are perishable, bulky and difficult to transport to distant production areas.

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Furthermore, seed tubers often require costly refrigerated storage facilities to...

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...prevent rotting in storage, and to keep them in adequate physiological condition until the next planting season.

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But, most important, seed tubers used for planting represent food that is being buried in the field when it could be eaten instead. The two tons of seed tuber needed to plant one hectare are enough to feed an average Southeast Asian family of five for 80 years or a similar highland Peruvian family for four years.

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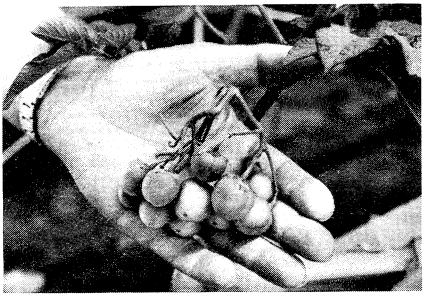

Because of these problems, the International Potato Center, along with other research and agro-industrial organizations, is working to develop alternative methods for potato production, based on true potato seed, that are applicable to conditions in developing countries. True potato seed, as this slide shows, is obtained from fruits similar to small, immature tomatoes.

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Main Advantages of TPS:

- **few pathogens**
- **easy storage and transport**
- **flexible planting time**
- **new potato production areas**
- **low cost**

ADVANTAGES OF TPS

The main advantages of using TPS instead of seed tubers are:

- TPS would minimize the problems associated with tuber-transmitted diseases. TPS carries few pathogens, especially viruses, from season to season.

- TPS can be stored by farmers conveniently and inexpensively from one planting season to another or for several years. TPS is also easy and economical to transport.
- TPS can be easily introduced into existing farming systems because planting time does not depend upon the sprouting stage of seed tubers.
- TPS can expand potato cultivation into regions that previously were unable to produce potatoes, particularly warm, humid tropical areas where it is difficult to produce and store high quality seed tubers.

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- And, TPS is a low-cost planting material that can reduce total production costs for farmers. To plant one hectare, farmers need only about 100 grams of TPS compared to two tons of seed tubers.

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Potato Production from TPS:

- **field sowing**
- **transplanting to field**
- **planting seed tubers produced from TPS**

POTATO PRODUCTION FROM TPS

Using TPS, potato crops can be grown by:

- field sowing,
- transplanting seedlings to the field, or
- planting seed tubers produced from TPS.

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Field Sowing

Field sowing TPS has potential in areas with mild temperatures, where rainfall is light and evenly distributed during the first five to six weeks after sowing. This permits good germination and seedling establishment in the field.

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But, sowing directly to the furrow often produces inconsistent results. There are ways to facilitate field sowing, such as the use of pelleted seed, fluid drilling, and the "plug mix" methods. With "plug mix," as shown here, seed is pre-germinated in a prepared soil mix and sown.

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Under favorable conditions, good plant emergence from direct sowing of TPS can be achieved.

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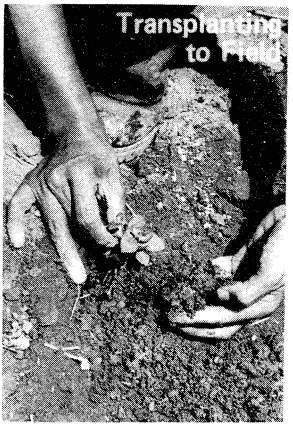

Transplanting to Field

Transplanting TPS seedlings to the field has several advantages over direct sowing. First, plants are in the field less time, freeing the land for other uses. Weed competition is also reduced and agronomic practices are simplified. Furthermore, this method adapts better to the usual practices of Third World vegetable farming systems.

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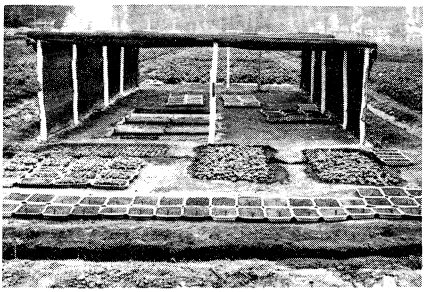

TPS can be sown in trays or ground beds in a nursery. In warm climates, use of shade in nurseries for 15 to 20 days after sowing helps achieve more uniform emergence and vigorous seedling growth.

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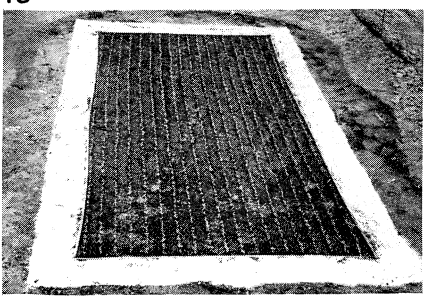

Seedling emergence normally occurs between eight to ten days after sowing. Seedlings are thinned a week to ten days after emergence.

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Approximately 35 days after sowing, the seedlings are ready for transplanting.

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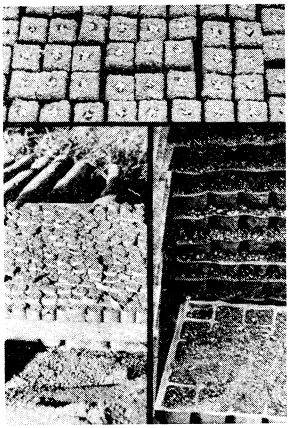

To reduce shock at transplanting due to adverse conditions, seedlings can be transplanted with soil-covered roots using containers such as compost cubes, banana leaf cups, or thin, plastic trays.

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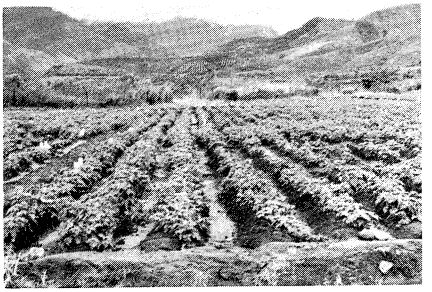

This system has promising applications, especially in areas where vegetable production by transplanting is a common practice. This, for example, is a field grown from transplants in San Ramon, Peru, located in a mid-elevation, tropical climate.

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When adequate management practices are followed, adapted progenies can yield more than 30 tons per hectare.

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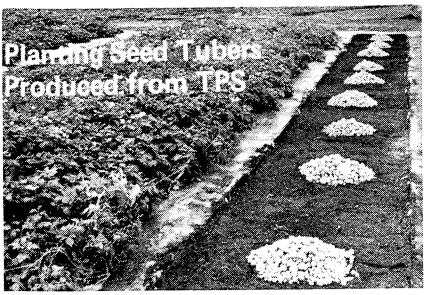

Planting Seed Tubers Produced from TPS

The first generation of tubers produced from seedlings grown from TPS are referred to as "seedling tubers." This production method combines the advantages of TPS with those of planting seed tubers.

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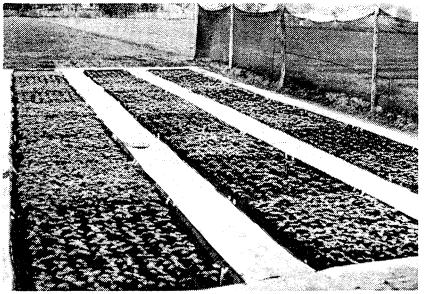

Depending upon environmental conditions, seedling tubers will grow in densely sown ground beds or in rows in the field.

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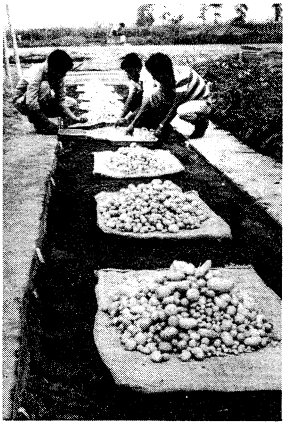

When properly managed, a nursery bed will yield as many as 800 clean seedling tubers per square meter.

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Seedling tubers can be used to increase seed tuber supply. Furthermore, tubers can be multiplied to produce additional potatoes for consumption.

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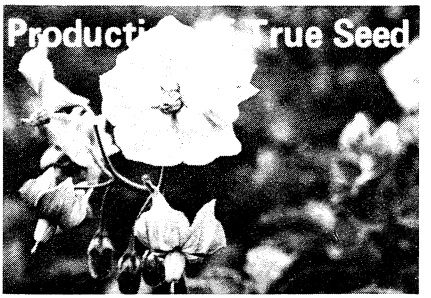

PRODUCTION OF TRUE SEED

Any successful true potato seed program must guarantee a reliable supply. Fortunately, TPS can be produced following steps similar to those used to produce many other vegetable crops.

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Under appropriate conditions, potato plants produce flowers and later produce fruits similar to small, immature tomatoes.

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Types of Pollination:

- natural
- controlled

Pollination

Pollination leading to sexual reproduction can occur naturally or under controlled conditions.

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If plants are left in the field to set fruits naturally, much of the seed will result from self-pollination. The proportion of out-crossing that occurs is caused primarily by insects. The resulting TPS is termed "open-pollinated seed" as only the female parent is known.

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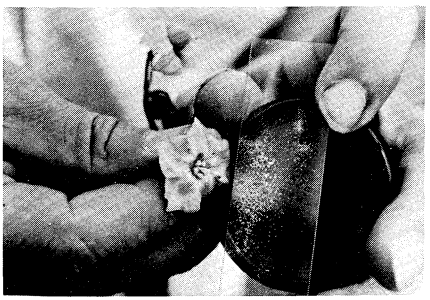

Seed also can be produced from controlled pollination done by hand. In this case, the TPS is termed "hybrid progeny."

With controlled pollination, pollen from the male parent is placed on the stigma of the flower. This can be done in the field or in the greenhouse under controlled conditions.

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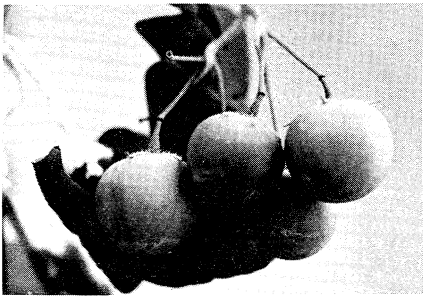

Harvest

A few days after pollination, berries will start to develop on the plants. In about 40 days, these berries will be ready for harvesting. Under field conditions, a flowering plant will produce an average of 20 berries.

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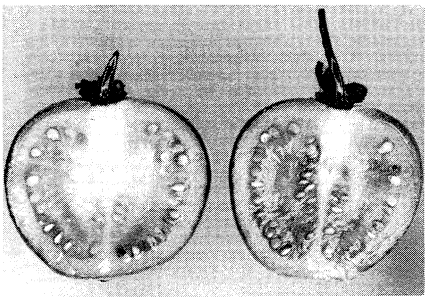

When berries are mature, they are harvested and kept at room temperature until they are soft enough to easily extract the seed. The number of TPS per berry can range from 50 to 500, though the average usually is about 200. One gram contains approximately 1,500 TPS.

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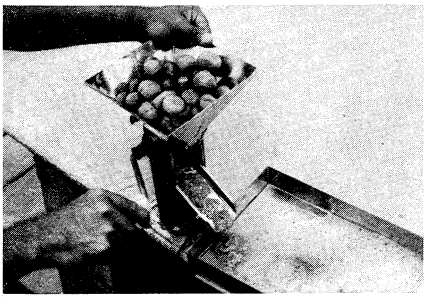

Storage

TPS extracted from the berries is then dried at room temperature in low relative humidity. When kept at room temperature, seed can remain viable for several months up to approximately two years. At 4° C, TPS can be stored for several years without losing germinability. In both cases, however, low relative humidity during storage is essential.

TPS also has a longer dormancy period than tubers. Although it lasts from four to nine months, it can be broken by a simple treatment with gibberellic acid.

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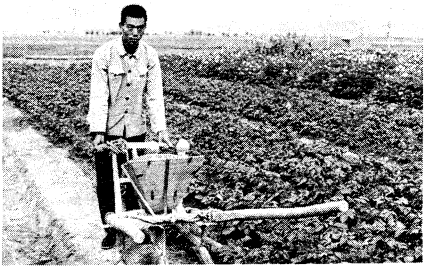

TPS PROSPECTS

Research on TPS is now going on in a wide range of areas throughout the world. The People's Republic of China, for example, is a pioneer in using TPS in a large-scale multiplication program, where TPS is substituted for basic seed tuber generation.

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A veteran vegetable farmer, A. G. Sarmis, of Sri Lanka has been experimenting with TPS since 1962. In 1982, he planted about five hectares using tubers produced the previous year from TPS.

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And, in some countries, TPS is now produced and sold commercially, a further indication of the tremendous potential for true potato seed.

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The International Potato Center (CIP) in Peru complements these research efforts on TPS with studies on the basic aspects of TPS physiology, agronomy and genetics.

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Through special training courses, CIP facilitates the exchange of research findings among scientists working on TPS throughout the world.

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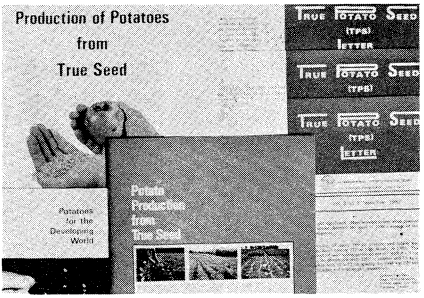

CIP supports this exchange with research publications and through the dissemination of information.

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More research still is needed to realize the full potential of TPS. Nevertheless, the TPS technology being generated at the International Potato Center and elsewhere can help reduce the problems of unavailability and high cost of seed tubers, as well as help expand potato production into new tropical areas where food production is critical.

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For more information on potato production from TPS, contact the International Potato Center (CIP), P. O. Box 5969, Lima, Peru.

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