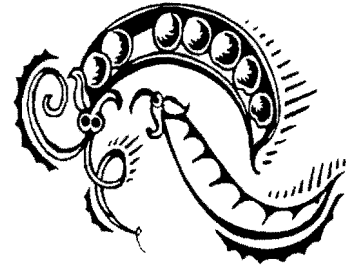


CHAPTER 11



INTRODUCTION TO PART II: SMALL-SCALE PROCESSING

There are many reasons to become familiar with the many technologies used for processing horticultural crops. Economic opportunities abound for enterprising small agri-business people worldwide. Processing produce to a fresh-cut or preserved state can **add value** to produce that commonly sells for a low price in its fresh state. Starting a small-scale processing operation **provides new jobs** for your community, requires only a small capital investment in equipment and supplies, and can result in a fast return on investment. When conditions are not suitable for storage or immediate marketing of fresh produce, processing **reduces perishability**.

While storage of fresh produce requires special facilities and cooling equipment, constant temperature and RH management and strong, ventilated storage containers, processed horticultural product can be stored in any cool, dark location, has a much longer shelf life, and often increases your marketing options. You can avoid selling your fresh produce at the lower prices offered during glut periods or during the usual season for fresh market, and decrease some of the costs associated with fresh handling, storage and transport. Processed products can then be offered for sale during periods when the fresh produce is not available or is in short supply, or during holiday periods when people purchase food gifts and use specialty processed foods for their celebrations.

Typical quality problems and sources of losses when processing horticultural products include some of the same problems encountered when handling fresh produce, as well as problems related to the use of inappropriate processing methods and packaging practices.

Typical quality problems and sources of losses when processing horticultural products:

Harvesting at improper maturity
Inadequate sorting to remove diseased and contaminated produce
Inadequate washing and cleaning of produce before processing
Improper trimming (removing too much or too little of the inedible portions)
Use of improper processing methods
Misuse of processing methods (incorrect times or temperatures for processing)
Inadequate or inappropriate packaging materials

The second part of this book will assist you to identify and utilize scale-appropriate, cost-effective postharvest technologies for horticultural produce to:

- Reduce postharvest losses due to weight loss, decay and physical damage
- Maintain produce quality and economic value during processing and storage
- Assure food safety during processing
- Increase income by adopting postharvest technologies that are profitable for your small-scale operation.

Many horticultural crops can be successfully processed to high quality food products using simple technologies. Being technically able to process produce, however, is often quite different than being able to do so and make a profit. The key element is always the market, and what consumers want to buy and eat, and whether they will pay you enough for the processed product to cover your costs and leave you a profit. In some regions of the world, canned and dried products are shunned. Consumers may believe processed foods are less nutritious or somehow unnatural. In other countries, some processed products are given high value, and producers may grow purely for processors. Organic apples in the US sell for \$30 to \$75 more per ton as compared to conventionally grown fruit.

Freezing produce is relatively easy, but requires higher capital investment by processors (in the equipment for freezing and maintaining low temperatures during handling, storage, shipping and

marketing) and has a higher cost for consumers (home freezers). Another factor are your costs for labor and the power for processing. Labor costs may differ by the level of skills required for processing various products, while power costs will depend upon the method chosen and the time required for processing.

Once you have identified a processed product that is valued by your potential customers, you must have a reliable supply of high quality fresh produce. When you are also the grower, this will simplify planning and procurement. You can process only the fresh produce you can't sell immediately after harvest, or deliberately sort for the various markets (highest grade for fresh market, seconds for processing). Processing is not the way to get rid of your culls, however, although sometimes you can salvage some produce with purely cosmetic problems or minimal defects. Drying or canning over-mature, stringy green beans or over-ripe tomatoes is sure to give your customers something to complain about. Care must be taken to sort out decayed or infested produce, since one strawberry or one tomato with a fungal infection or will contaminate the flavor of your entire batch of juice. **Always begin with produce of high quality**, since processing will not improve visual, textural or flavor quality. Produce for processing must be harvested at the proper maturity and handled very gently during transport to the processing facility and during sorting operations (ripe fruits, red tomatoes, fresh young vegetables are very delicate). Pretreatments are often used to preserve color, flavor and fresh texture, and all these costs must be considered.

WORKSHEETS

Worksheets are provided the end of Part II of the book to assist you to calculate the costs and benefits associated with handling and processing horticultural products and determine potential profits. Processed products depend upon high quality fresh ingredients, so the postharvest handling steps for fresh produce discussed in Part I are still very important considerations and are part of the costs you will encounter. Worksheet 5 focuses on collecting basic information needed for producing and marketing products of any kind (overhead, expected yields, estimated postharvest losses, anticipated market prices). Worksheet 6 requires that you calculate and list the actual direct costs incurred when you grow, handle, store and/or process a horticultural crop.

**Worksheet 5:
Basic Information****Worksheet 6:
Costs****Worksheet 7:
Benefits****Worksheet 8: ROIC**

Much of this you should know from your day-to-day recordkeeping for running your business. Worksheet 7 outlines expected benefits in terms of sales and profit, and Worksheet 8 helps you to determine the return on investment (leading you through the calculation of how long it will take to recover invested capital). If you are not sure of the market prices you may receive, you can do the calculations for a worst case (lowest price) and best case (highest price) scenario and determine whether your investments will be worthwhile within that range of possible outcomes.

PROCESSING METHODS

When choosing a processing method you must consider the type of produce, the costs associated with the method and the market demand for the processed product. Fresh-cut technologies are the most complex and can be expensive, and must be undertaken with great care to protect food safety. The processing methods that are more commonly used by small-scale produce handlers include dehydration (drying), fermenting, juicing, freezing, pickling in acid or salt, preserving in oil or sugar, canning and bottling.

FRESH-CUT (minimally or semi-processed): Cleaning, trimming, coring, slicing or otherwise processing fresh produce to a "ready to eat" state adds value but also increases perishability and requires special packaging and excellent temperature management. Shelf life is typically reduced to 7 to 14 days and refrigeration is critical throughout the marketing period. See Chapter 12 for details.

DEHYDRATION: Removal of water from most fruits and vegetables increases shelf life, and drying reduces weight and volume, which reduces the cost of storage and transport. Most dried products are packaged in air-tight containers (plastic bags or glass or plastic bottles), while some can be covered with edible oil and bottled. See Chapter 13 for details.

FERMENTATION: Popular throughout the world as a food preservation method, and over 3,500 individual fermented foods have been described by Campbell-Platt (1987). The details of fermentation are too complex to be covered in this book.

JUICING: Many fresh fruits and some vegetables can be processed into excellent juices either alone or in combination. Juices must be heat processed to stabilize flavor and color, then canned, bottled or frozen to reduce perishability. See Chapter 14 for details.

FREEZING: One of the best methods for preserving natural color, flavor and nutritive value. Two excellent references are the *Ball Blue Book* (1995), and *Keeping the Harvest* (Chioffi and Mead, 1991). Details on freezing are not offered in this book, since it is difficult to manage a freezing operation profitably on a small scale. Inadequate packages or fluctuating temperatures can lead to immediate quality deterioration (soft, mushy produce) and a single power failure can be a disaster.

PICKLING: Preserving in vinegar or brine is defined as pickling. Olives and cucumbers can be salt or brine cured to add value and increase shelf life. Recipes vary widely and are often related to the region of the world where processing was first undertaken. Vinegar is used for vegetable pickles (cucumbers, gherkins, hot peppers, tomatoes, onions, cole crops) fruit pickles (peaches, pears, watermelon rind), relishes and chutneys. See Chapter 14 for details.

PRESERVING IN OIL or SUGAR: Specialty products such as peeled garlic, fruit jams and chutneys are preserved in oil or sugar. Processing can add value and greatly increases shelf life and marketing options. See Chapter 14 for details.

CANNING/BOTTLING: Produce can be canned or bottled alone or in combinations, in its raw state or after cooking. High acid products such as most fruits, tomatoes, pickles and preserves can be heat processed in a boiling water bath (100 °C or 212 °F), while low acid products such as vegetables must be processed at 115 °C or 240 °F in a steam pressure canner. Specialty product preparations (juices, preserves, jams, pickles) are often bottled to increase shelf life, enhance display qualities (labels, bottle style) and increase marketing options. See Chapter 14 for details.

INFORMATION SOURCES FOR FOOD PROCESSING

Many useful reference books are available to guide you in selecting appropriate techniques and methods for processing your fresh produce. The Ball Corporation publishes *The Ball Blue Book: Guide to home canning, freezing and dehydration*, which is an excellent source of basic information for anyone who is new to food processing. A catalog of postharvest processing equipment is available from Intermediate Technology Publications (9 King Street, London WC2E 8HW, UK). Included are driers, storage containers, cleaners, hand mills, power mills, shellers, decorticators (seed removers), oil processing equipment, fruit presses, and root crop cutters/graters. Sources of specific processing equipment and supplies are listed at the end of Chapters 12 through 14.

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