

Section 6: Sorting and Packing

Presorting During Harvest

The first step of an efficient packing operation is training harvest crews on what produce to bring in and what to leave out in the field. The amount of scrutiny that will be demanded of the person packing the box for shipping will be directly affected by the skill and carefulness of the harvest crew. If pickers send in produce that will need to be rejected at the packing stage, it slows the packing task and is frustrating for the packer.



Photos: Atina Diffley

The top photo was taken twenty-four hours after harvest. One cracked tomato caused the loss of five others and created an environment for illness-causing pathogens to thrive. If a crack is "healed-over" it may be acceptable as a second quality/No. 2 Grade. It will often have a shorter shelf life. In the bottom photo the tomato is leaking juice from the crack and should not be put into a harvest tote with good tomatoes.

Damaged, Rotten, or Diseased Produce

Cut, bruised, nicked, diseased, rotten, or otherwise "distressed" produce will decay faster and be more susceptible to disease, causing good produce in the same box to spoil and increasing the potential of food safety issues. It should be presorted during harvest and left in the field.

For some contagious crop diseases, such as late blight in tomatoes, it is recommended to remove the diseased fruit from the field. Contact your extension agent or a disease identification lab for specific disease management information if you suspect your crop may have a contagious disease.

What Is a Second?

Seconds are produce items that are cosmetically imperfect in shape, size, or uniformity or are too ripe to meet the shelf life needs of your market. Seconds are also called No. 2 grade or commercial grade. Produce that is rotten, unsafe, dehydrated or near the end of its shelf life is not a second and it should not be sold.



Photo: Atina Diffley

Edible yes, but this sweet potato is not a #1.

If you have a market or other outlet developed for seconds they can be sorted into separate containers during harvest or in the packing shed. If there is not a market or use for them, it is generally recommended to presort them at harvest similar to damaged produce. Bringing unusable produce into the packing shed adds the labor of sorting it out during packing.

When Is Produce Sorted and Packed for Shipping?

Most fresh market produce is sorted and packed for shipping after cleaning and before storage. Cooling occurs before or after sorting and packing, depending on the crop.

Some produce will be cooled and stored (washed or unwashed) immediately after harvest, and then resorted and packed into cartons shortly before shipping. It is extra-important that produce stored for long periods be properly presorted to prevent spoilage of good produce and/or food safety issues.

Who Is the Customer? What Are Their Needs?

Meeting your customers' needs is a key component of business success. If you are direct marketing through roadside stands, farmers' markets, restaurants, or CSAs, flavor is often the major consideration and packaging to an industry standard is often not crucial. Direct market growers have a face-to-face opportunity to communicate with and educate the end-customers. However, retail stores and wholesalers generally have more stringent requirements, in particular to visual appearance, and require consistent and uniform quantity, quality, size, weights, and packaging. Some buyers and markets have their own preferences, but most expect produce to be packed to USDA industry standards.



Different markets have different demands. Brussels sprouts are often sold on the stalk at farmers' markets but they usually sell quicker cut off the stalk in retail stores.



Photos: Atina Diffey

In retail stores, most herbs sell quicker in clamshell containers than in bunches. Exceptions are parsley and cilantro.

USDA Grade Standards

The Agricultural Marketing Service branch of the USDA maintains a complete list of US Grade Standards for fruits and vegetables. Most common produce items have both No. 1/Fancy and No. 2/Commercial grades based on characteristics such as shape, size, color, damage, and freshness. The primary difference between the two groups is visual appearance and the specified tolerance for damage or decay.



Photos: Atina Diffley

Atina Diffley packed tomatoes to three grades. No. 1 tomatoes were sold direct to retail stores and wholesalers. They were close to cosmetically perfect, at a turning or light pink stage, and she expected them to reach maximum shelf life. No. 2 fruit went to her roadside stand (above photo). They had minor cosmetic flaws or were riper. No. 3s or "canners" were often pre-sold for a specific canning date. They were generally ripe, and could be cosmetically unattractive and mixed sizes. No fruit with a rotten spot or open flesh was allowed in any grade.

No. 1/Fancy grades are generally sold to buyers who will display the product directly to consumers – primarily grocery stores and food retail outlets. No. 2/Commercial grade produce is usually processed and sold to foodservice buyers, including restaurants, institutions, and processed foods producers, or is direct marketed. The crop profiles in this manual include summaries of the USDA Quality Standards. Full-text versions are available for free online at www.ams.usda.gov/standards/stanfrfv.htm.

Sorting

Purchasing produce is a sensory experience. The "organoleptic properties" of produce, including taste, sight, smell, and touch, have a huge influence on customers' purchasing decisions. Farms that market only well-displayed, No. 1- quality produce are generally in highest demand in every market.

Produce is generally sorted during the packing process. For many crops, each piece of produce needs to be examined individually and a decision made on its quality. For other crops, such as salad mix or green beans, the produce is sorted in bulk and bad pieces are removed. To maximize the efficiency of the sorting and packing process, rotating pack tables and conveyor belts are very useful.

Packing the carton is a last chance for quality control and is a "skilled"-level task. Developing an "eye" for quality and standards takes training and practice.

Packers should be trained to recognize the proper sizes and shapes. Some types of produce are traditionally sorted by weight, others by length or size. Sizing rings or examples of different shapes and sizes can be referred to as needed. For most crops, sizing is done visually and by hand. A sizing belt can be added to a pack line or a sizing table can be used to sort round produce, such as potatoes or apples.

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In the top photo, the small, misshapen, and damaged kohlrabi should have been left in the field at harvest. Instead, it was packed and shipped and put out on display in a retail store. It won't sell and it makes the entire display look bad. In the middle photo, the majority of the cucumbers are perfect but the two over-mature and yellow cucumbers on the top will negatively affect customers, who may then pass on purchasing altogether.



Photos: Atina Diffley

Jerusalem artichokes, also called "sunchokes," being sorted and packed on a conveyor belt after being cleaned in a brush washer at Harmony Valley farm.

Nicks and other visible damage to the produce are relatively easy to see and damaged produce should be culled. Food banks are often thrilled to receive this produce if it is not rotting and can let you know the best times and places to drop it off. Some communities have a food bank pick-up service and can send a truck out to your farm.

Sometimes subtle color differences are an indication that decay is developing or that bruising has occurred but is not yet highly visible. It can take a day or two before bruises fully develop after the damage has been done.

Sometimes rot and bruise spots are not easily visible to the eye and need to be felt to be detected. Fingers should be busy gently feeling for soft spots as they turn produce over to look for visible damage.

Produce can also be internally bruised, rotten, or diseased, and these problems may not be observable through an external examination. It is important to cut and taste a few pieces of a produce lot to check for internal quality.

When in doubt keep some of the questionable produce in your own storage facility for a few days to see if a problem develops. As packers gain experience they will learn when a color variation is a problem and when it isn't. Good lighting is important over the pack area to see these subtle differences.

Cosmetic requirements can be challenging to teach. To some degree the task is based on one's sense of visual beauty, which isn't the same for each person. Produce doesn't necessarily need to be "perfect." It does need to be attractive. For example, if a produce item has a small scar that is well healed it likely won't cause decay, and if the scar is small and isn't visually unattractive it may be considered a No. 1. Multiple combined small scars, or a long jagged scar may be too much and should be rejected.

When deciding on scars, produce that is irregularly shaped, or other cosmetic issues, first decide if spoilage is a concern. If it is, do not ship it. If there is not a spoilage issue, look at the produce item as a whole and ask if the cosmetic issues detract substantially from its visual appearance. This is a subjective question. As packers learn the expectations of the market they will gain a sense for what level of perfection is required.

Ultimately the most important thing is to understand and meet the needs and expectations of your market. Good communication with your buyer is crucial. Invite feedback; ask your buyer if they are satisfied, if you are packing to their specifications, and if your product is holding well for them. If you don't understand what they need, visit the warehouse or store and ask to be shown boxes that are packed the way that they want.

Trimming

Trim roots and leaves of crops such as onions and leeks for packing. Yellow or discolored leaves should be trimmed off of bunched roots. Broccoli stems should be cut to the correct length in the field, usually around 6 inches. If they are not trimmed in the field it will need to be trimmed at packing. If they are too long customers often break them off in the stores. Cabbage should be packed with a few outer leaves to protect the head. When the retailer receives it they will usually trim the outer leaves to "freshen" the cabbage for display.

Anything with a head, such as lettuce, bok choy, cabbage, cauliflower, etc, should have a nicely trimmed and clean "butt" end that won't catch and tear adjoining produce. Squash stems should be cut level, not angled and sharply pointed. If bulk roots have long "tails" they may be trimmed down to a few inches, but they shouldn't be trimmed all the way to the bulb or freshness and flavor will be lost. A few outer leaves can be left on



This cauliflower was "leaf wrap packed" for shipping protection and to hold in moisture. At harvest the outer leaves were trimmed off, but the inner leaves were kept and wrapped around the head for shipping. The retail store staff then trimmed off the inner leaves when prepping to put the cauliflower out on display.



This kohlrabi was packed with the top leaves on, making extra work for the retail buyer. It should have been trimmed at harvest.



If the farmer leaves a few outer leaves on cabbages for shipping, the retailer can remove them to "freshen" the heads up for display.

Photo: Aina Duffley

cauliflower and carefully wrapped around the head to protect it for a “leaf wrap” pack. Cauliflower can also be trimmed down to the head, and then wrapped with plastic to protect it. Check with your buyers for their preference. Much of this trimming occurs at harvest. It is the packer’s task to clean up any missed thing and to communicate if the harvest crew needs more training.

Packing the Box

Wholesalers and retailers expect a standard pack. Carton weight, size of produce, produce count, and type of carton are important considerations. Standardized weights and packaging are especially important when selling to a wholesaler because the retailer buying your produce will see it first as a line item on the wholesaler’s product list. If you have deviated from the standard pack they will not know what to expect and may not buy it.

Proper ventilation is essential for packaging to maintain cooling in storage or during shipping. Most containers will have vents for this purpose, and even perforated plastic

liners generally provide enough ventilation. When containers are stacked together, care should be taken to line the vents up so that they create a “tunnel” effect, and air can move between them.

Produce cartons come in different weights and strengths and are priced accordingly. If the carton isn’t strong enough to protect the produce, damage can occur. Buying a lighter weight carton can seem like a financial savings, but it can result in produce being damaged and lost sales. Collaborating with other farmers to order boxes together can be a way to reduce the cost through a volume purchase. Waxed cardboard cartons are generally used for hydrocooled and iced produce, and produce that is packed wet.

Produce should not be packed too tightly or too loosely in containers. Either extreme can cause bruising or injury – whether from over-compression or from loose produce bouncing around.

Smaller crops, like baby greens, bulk Brussels sprouts, beans, small potatoes, or bulk roots, do not have to be individually arranged. Larger produce should be placed into the packing container in an orderly fashion and in a way that protects the produce from compression damage.

First impressions can have a strong impact. When buyers open a carton, the visual appearance and presentation of the packed box make an impression and can affect their future purchasing decisions. When packing acorn squash, for example, similarly sized fruit lined up in orderly rows, with stems facing the same direction, the dark green sides up and the yellow ground spots down, are visually appealing. It sends a message of professionalism and quality. It creates trust and earns respect.

Totes/Crates		Boxes	
Green Tote Caja Verde	48	1/2 bu	1.38
Gray Tote Caja Gris	4.68	5/9 Tall	1.28
Black Tray Small Caja Negra Chica	3.58	5/9 Short (Fruit)	1.58
Black Tray Large Caja Negra Grande	3.58	1/2 bu	1.58
Bean Crate Dry Caja para Ejotes	3.38	12 Ct Leafy Green	1.68
Bean Crate Wet Caja para Ejotes Mojado	58	24 Ct Leafy Green	2.68
Wood Crate Caja de Madera	88	1.8 Bu (Cabbage)	38
1/2 Wood Crate Medio Caja de Madera		1 1/9 bu	1.98
Green Tote with Lid Caja Verde con Tapa	6.38		

Photo: Aitna Diffley

Posting container weights in the packing area provides workers with useful information. When packing boxes, the scale needs to be set for the desired produce weight plus the weight of the packing material.

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Photo: Atina Diffley

Bulk roots (top photo) do not have to be arranged individually. They are heavy though, so it's important that the box, especially the bottom, is strong. In the photo below, round cabbage is packed in the "nesting" style. This holds them secure and keeps them from shifting in transit.



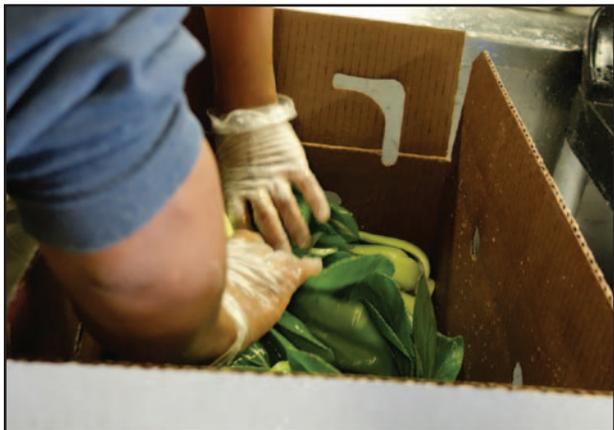
WRONG



RIGHT

Photo: Denis Fiser

The wrong and right way to pack peppers.



Baby bok choy is gently packed at 20 lbs. into leafy greens waxed cartons at Harmony Valley Farm and then covered with a waxed paper liner before the cartons are closed.



Photos: Atina Diffley

Packing cucumbers off of a rotating pack table makes selection and grading easier.

Box Liners

Perforated polyethylene liners in boxes are often used for produce susceptible to dehydration. The perforations allow excess water to drain from the produce and provide ventilation, while protecting the produce from dehydration by keeping a humid environment.

Paper liners are often placed below and/or on top of many crops to protect them from damage or to absorb free moisture. Some crops, such as broccoli, can be package-iced without any barrier between the ice and the broccoli. For others, such as some leafy greens, a sheet of paper should be placed between the ice and the produce.

For crop-specific container sizes and types, and additional packaging needs, refer to Section 11: Crop Profiles, or ask your buyer to educate you on their expectations.



Photo: Atina Diffley

Clean sunchoke are packed in perforated polyethylene liners inside of waxed cartons at Harmony Valley Farm.

Unit Packaging and Bunching and Product Labeling

Packing in clamshells or net, paper, or plastic bags can protect produce from compression damage and dehydration, and increase sales. Unit packaging can be easily labeled and is a great opportunity to brand produce with your farm name and logo, provide Price Look Up (PLU) codes or traceability information, recipes, marketing information, or other incentives to customers. Customers often purchase more when the produce is packaged and labeled than when it is sold in bulk.

Baby greens, apples, or root crops can be packed in plastic bags. Potatoes are sometimes packed in heavy paper bags. Bags can be labeled with a preprinted or attached label. The hard plastic of clamshell containers protects berries, mini-peppers, herbs, cherry tomatoes and other produce, and is perfect for applying a sticky-backed label. Net bags are commonly used for potatoes, onions and apples; a heavy paper label can be stapled to the top.

There are many suppliers of produce packaging and finding someone in your community is often the most economical



When packing and selling by weight, scales must be calibrated and certified. Containers should be filled at or over the sale weight.



Photos: Atina Diffley

These baby potatoes packed in fiber pint boxes on display in a retail store didn't sell well. The packaging looks worn, they are hard to handle without spilling, and can't be readily labeled. Without protection from light the potatoes have turned green. A net or plastic bag with a farm label would be a standard potato packing option, and generally will sell better and have a longer shelf life.

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Photos: Atina Diffley

At Harmony Valley Farm, netting to pack onions is purchased in a bulk roll, cut to the needed length, and then tied into a knot to close the bottom. Onions are weighed on an electronic scale in a standardized container and poured into the net bag. The top is closed with a knot and a label is then stapled on.

purchasing option. Monte Packaging (<http://www.montepkg.com>) and Hubert (<http://www.hubert.com>) are two options for produce packaging that ship nationally.

While plastic and paper bags can be preprinted, for small or diverse farms with multiple differently packaged crops it can be more economical to purchase a label printer to custom-print labels on the farm. There is more information on label printing machines later in this section.

There are many label and tag and packaging products that can be preprinted to identify, brand, market, and trace your produce. Twist-ties and rubber bands can be printed with farm information and used to bunch greens, herbs, and asparagus or to hold a loose head of lettuce closed so it will not dehydrate as quickly. Bunch tags can be slipped over



Photos: Atina Diffley

Tip scales make bagging carrots a quick and easy process at Tipi Produce.

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rubber bands. Options for custom printed ties, bands, and bunch tags include Bedford Industries (<http://www.bedfordind.com>), and Agri Label and Tag (<http://www.agrilabeltag.com/smalllargeplulabels.html>).

Small stickers can be put on each produce item and might include your farm logo, a PLU



At Harmony Valley Farm, labels are custom printed on the farm and attached to bags before hand filling and weighing.



Rock Spring Farm's culinary herbs are packed into clamshell containers and labeled with farm and product information. Six clamshells of one herb type are packed together in a plastic bag, and the shipping carton is packed with a mix of herbs.



Photos: Atina Diffley

These clamshells (packed with ground cherries) are the perfect container to display a brand name label.

number or other traceability code, or the USDA organic seal. If labels are applied directly to produce, the adhesive needs to have a food-grade label adhesive. For preprinted adhesive labels, there are thousands of companies that can supply your needs.

Some states have locally-grown promotional programs that supply free twist-ties, sticky labels, and tags to their members; and offer cost-sharing for development of farm-specific labeling that incorporates the state's buy local program. Check with your state department of agriculture to learn what is available to you.

Carton Labels

Produce cartons need to be labeled with your farm name and address, the name of the produce item with the weight or volume, and the lot number. The lot number is very important for linking produce back to the field where it was grown and to associated records. This system of traceability is crucial food safety information in the event of a recall or food safety issue. Lot numbers will also help you and your buyer rotate inventory for freshness.

Lot numbers should be used on produce cartons, bills of lading, invoices, or any other document that accompanies the sale and shipment of fresh produce from the farm. It does not need to be included on item labeling or packaging used directly on single units of produce, such as fruit stickers or twist ties.

Producers can develop their own lot numbering system specific to their operation. Essential information includes the date the box was packed and the field where it was grown. Lot numbers might also include the date it was shipped, the storage facility where it was stored, the name of the packer, or any other information that is important to track its history. At Diffley's Gardens of Eagan farm, lot numbers start with the field number where the produce was grown, followed by the packing date, and then the initials of the packer (Example: E37 | 9-13-12 | AD). Some farmers like to use a day of the year system for the packing date; in that case

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October 22, 2012 could be written as 296-12 for the 296th day of year 2012.

It doesn't matter what system you use as long as you and your buyer know how to interpret your code, all crucial information is included, and it traces back to your farm records.

Small- and mid-sized farms often use a generic label preprinted with farm name and address information. The information that changes for each crop – produce name, weight, and lot number – can be handwritten on the preprinted labels with a permanent marker or printed for each individual crop with a label printer. A label printer can also be useful to print labels with recipes or other information for unit-packed products.

The cost of a basic black and white label printer starts at \$500. A label dispenser or label gun may also be useful. These range from a simple wall-mount dispenser for \$20 to an electrical dispenser for \$500. Advantage Label & Packaging (<http://www.advantagelabel.com>) recommends the Tharo V label printer for small- and mid-sized farmers. Advantage also provides software and hardware to help farmers create databases to record and track lot number information.

Waxed cartons and humid room coolers need adhesives that will stay on in wet conditions. When ordering labels, work with a reputable printer and be sure the label materials are appropriate for your needs.

Sort and Pack in the Field

Sometimes produce can be sorted and packed right in the field. Advantages include minimizing handling that can cause bruising and other damage, quicker processing time, and reduced labor hours. Field packing requires a system to handle cleaning and cooling in the field at harvest, or in the packing shed after harvest, and extra care must be taken to keep shipping cartons clean (use an empty carton or container as a 'table' or use a wheeled cart to keep shipping cartons off the ground). Challenges can include quality control, and lack of shade.



Watermelons were dry brushed clean, and packed in wooden bins at Diffley's Gardens of Eagan farm. Retail stores rolled the bins directly onto the sales floor for display.



Photo: Atina Duffley

At Harmony Valley Farm parsnips are being picked with a FMC mechanical harvester and packed directly into plastic-lined wooden bins, where they will be stored through the winter until washing at shipping time. Some farms wash root crops before storage.



Photos: Atina Duffley

On cool days at Diffley's Gardens of Eagan farm, harvest crews field-packed kale directly into the shipping carton. Notice that the shipping carton is set on a plastic field tote to keep it off the ground. On hot days the kale was picked into plastic totes and brought to the packing shed where it was placed into water tanks to hydrocool, and then packed.