



PRODUCE 101

To fully understand the concept of fresh produce handling we must first understand the roadmap of fresh produce from “Farm to Fork”. Today, as it’s been for over 150 years, it is a science growing fresh produce, farmers use not only years of family practices but also the latest and greatest of current technology to maximize the quality and quantity of their yield.

PRODUCE TERMS:

Market Alert – Simply put, market alert is what is going on in the market at that given time. Remember, this could change daily based on supply, demand and weather.

Extreme Market Conditions -- Extreme is just that, extreme. Not within the normal range of what historically has been happening. This could be mostly due to growing conditions and the demand is still there on a daily basis. Extreme Market will also be extremely high prices as well. Quality can also be adversely affected.

Strong Market -- This means that the price of the product is at the higher end of norm. Growers and Shippers have a stronger demand for the product that commands a higher price.

Weak Market – Just the opposite of a strong market a weak market is where the product is plentiful and the FOB prices are at the lower end of the norm.

Escalation – This is when the pricing is on the rise. Several factors could be supply and demand, poor quality issues, gap in growing regions.

Remains active – Movement within the commodity group is still at its norm and the demand is still good.

Tighten up – This is where the product is getting scarcer for the demand.

(Normal) Steady and in fairly good supply – The commodity is just where it should be with nothing out of the ordinary.

PACA – Acronym for Perishable Agricultural Commodities Act – This is a federal law that deals with the produce trade from Farmers, Wholesalers to Retailers.

FOB – Means “Freight or Free on Board”. This has to do with the cost of the product without freight, buyers need to know the cost and if the price is delivered or at shipping point

USDA Mid - Mid Mostly -- This has to do with the prices that the USDA collects and puts out as to what the markets are doing. Example Iceberg –Wrpd \$12-\$14.85 Mostly \$12-\$13.50

Act of God – We have contracts for pricing for various items. Sometimes through no fault of anyone prices sky rocket well above the range of norm. Usually because of severe weather conditions, drought, hurricane’s, storms, freezing or anything else that may severely affect product loss and unavailability

HORTICULTURE: is the branch of agriculture that deals with the art, science, technology, and business of plant cultivation. It includes the cultivation of fruits, vegetables, nuts, seeds, herbs, sprouts, mushrooms, algae, flowers, seaweeds and non-food crops such as grass and ornamental trees and plants.



Horticulturists apply their knowledge, skills, and technologies used to grow intensively produced plants for human food and non-food uses and for personal or social needs. Their work involves plant propagation and cultivation with the aim of improving plant growth, yields, quality, nutritional value, and resistance to insects, diseases, and environmental stresses. They work as gardeners, growers, therapists, designers, and technical advisors in the food and non-food sectors of horticulture.

Why do we need to know this? It all starts here and knowing that will allow you to appreciate all what everyone along the chain puts into the growing, harvesting, transporting, distributing and preparing of fresh produce.

SEED SELECTION:

Seeds are one of the least expensive but one of the most important factors influencing yield potential. Cost of seeds stock usually is less than 5-10% of total production costs.

Seed quality is determined by germination and purity analysis. By law, all crop seeds must be labeled for germination percent, crop seed, weed seed and inert matter content, and the date of germination test. Growers must purchase seed stock from a reputable seed dealer who has proper cleaning, handling and storage facilities. Some farms also use nurseries to grow seedlings for the fields. The seedlings are then transplanted into the fields.

CROP ROTATION:

The goals of crop rotation are to help manage soil fertility and also to help avoid or reduce problems with soil borne diseases and some soil-dwelling insects, such as corn rootworms. Soil balance is important because different crops require different nutrient requirements. The general rule of thumb for balancing out soil nutrients is to avoid planting the same general category of crop (root, legume, and leafy/fruitlet) successively in the same place. It's best to follow nitrogen-fixing legumes such as peas or beans with nitrogen-loving leaf or fruiting crops such as lettuce or tomatoes. Then, follow the heavy feeding crops with light-feeding root crops.

SOIL PREPARATION:

First, test your soil. Results will reveal its pH, phosphorus, lime, potassium, soluble salts, soil texture and more. However general tests will not reveal insects, diseases, or chemical residues. Know your N-P-K. Nitrogen, phosphorus, and potassium. Fertilizers can adjust your needs, there are chemical/synthetic fertilizers but these can damage roots and/or reduce the availability of other elements. It is virtually impossible to overdo Organic fertilizers and plants cannot distinguish between synthetic and organic fertilizers. Nitrogen promotes strong leaf and stem growth and dark green color, such as desired in broccoli, cabbage, lettuce and herbs. Phosphorus promotes root and early plant growth, including setting blossoms and developing fruit and seed formation; it's important for cucumbers, peppers, squash and tomatoes. Potassium promotes plant root vigor and disease and stress resistance and it enhances flavor. It is vital for carrots, radishes, turnips, onions and garlic. Another type of soil preparation example is that the fields for strawberries are fumigated to prevent certain types of diseases before they are planted.

TILLING:

Prior to planting, the soil needs to be prepared, usually be some form of tillage or chemical "burn down" to kill the weeds in the seedbed that would crowd out the crop or compete with it for water and nutrients. The optimum time for tillage (to prevent soil erosion) is just before planting. However, wet spring weather can often make it difficult to get equipment into the field as early as needed to optimize yield. Late planting can



seriously reduce yields. For example, in the eastern corn belt, corn yields are reduced by 1 bu/acre for each day after May 1 that planting is delayed.

SOIL EROSION:

Environmental concerns related to soil preparation is erosion. Soil erosion is natural process that occurs when the actions of water and/or wind cause topsoil to be removed and carried elsewhere. How can we plant to best manage the reduction of soil erosion? Planting like contour, strip cropping, and cover crops for late fall and winter coverage, terraces, grass barriers are a few ways to plant to reduce erosion and windbreaks are the best. Why is this important? On-Farm impacts due to the loss of soil and nutrients include: lower fertility levels, development of rills and gullies in the field, poorer crop yields, less water infiltration into the soil, more soil crusting, and more runoff in the spring and after storms.

PLANTING:

Farm management practices regarding planting consists of planting depths and planting population. Knowing when to plant for yields and conditions are important. Cool season (45') growing is start good for Lettuce, Cabbage, and Peas on Cabbage. Warmer season (55') is good time to plant tomatoes, sweet corn, and peppers. Very warm season (60') good to start squash, watermelon and cucumbers. Planting at the wrong time can affect the yields and condition of the product.

GROWING:

Water, too much, too little is a problem. Water Management worldwide helps with achieving some of these needs. One such management method is irrigation. Irrigation is a method of transporting water to crops in order to maximize the amount of crops produced. Many of the irrigation systems in place do not use the water in the most efficient way like overhead sprinklers. This causes more water than necessary to be used or for there not to be enough water to ensure healthy crops. According to the World Bank, irrigation management works to upgrade and maintain irrigation systems, such as groundwater irrigation, that are already in place and expands the areas of irrigation to increase the amount of crops being produced. Another method is water management for rain fed agriculture. Rain fed agriculture is the most common method of agriculture in developing nations. Approximately 80% of the land farmed around the world is rain fed and it contributes to about 58% to the global food basket. Some techniques in water management for rain fed agriculture include the use of supplemental irrigation and water harvesting techniques, such as rain catchment systems and weirs or sand dams. These techniques help provide much needed water to areas where rainfall is inconsistent. Having this water helps to increase the number and quality of the crops grown.

Crop plants also must compete with 30,000 species of weeds, 3,000 species of nematodes and 10,000 species of plant-eating insects. Despite the use of modern crop protection products, 20-40% of potential food production is still lost every year to pests. An adequate, reliable food supply cannot be guaranteed without the use of crop protection products. Farmers get back at least \$14.60 for every \$1.00 invested of fungicides which allows them to use that money to further invest in seeds and other farming costs to grow more and better crops. Integrated Pest Management (IPM) is a system using biological, cultural, physical, and chemical tools to manage pests. Farmers use methods such as IPM, buffer zones, and reduced and no-till farming to protect the environment.

Although the world population has doubled in the last 40 years, the area of land devoted to food production has remained virtually constant; crop protection products have enabled farmers to produce higher yields of their crops. U.S. farmers provide 18% of the world's food supply on only 10% of the world's farmland.



Currently in the U.S., 3 million acres of farmland are devoted to growing rice. Without crop protection products, it would take twice as many acres to provide the same supply.

Nuisance Wildlife and domestic animals with lack of animal control can destroy and infest crops. Ground Squirrels, Pocket Gophers, Voles, Rabbits, Woodchucks, Birds, Deer, Skunks, Raccoons, and Coyotes, dogs, cats, including hobby farms are just a few examples of nuisance wildlife and domestic animals that can adversely affect farms and fields. There are many different ways to deal with nuisance wildlife and domestic animals, figuring out what is best for you farm would be your choice.

GAP / GHP:

Good Agricultural Practices and Good Handling Practices audits focus on best agricultural practices to verify that fruits and vegetables are produced, packed, handled, and stored in the safest manner possible to minimize risks of microbial food safety hazards from the definition of USDA. There is government publication that is reference for all good agriculture practices and good handling which is called *Guide to Minimize Microbial Food Safety Hazards for Fruits and Vegetables*. These guidelines cover water, manure, municipal bio solids, worker health and hygiene, sanitary facility, field sanitation, packing facility sanitation, transportation and trace back.

ORGANIC PRODUCE:

Organic farming is much friendlier for the earth and the local economy than massive corporate farming practices. Instead of using chemical-based fertilizers to create a high-yield soil, organic farming uses traditional methods of plowing the soil to break down soil compaction that can reduce water and air getting to the plants' roots, rotating the crops to prevent crop-specific diseases or pests from building up in the soil, and growing cover crops that naturally add nutrients to the soil.

Organic farming also emphasizes the use of physical, mechanical, or biological controls instead of chemicals to handle weeds, insects, and plant diseases. You can pull weeds by hand or machine, for example, or introduce a beneficial insect to eat a harmful one (for example, ladybugs to eat aphids). The lack of chemicals also eliminates the risk that dangerous substances will run into nearby rivers, streams, and the water table, affecting water quality. In turn, you're less likely to be eating any chemicals used to keep bugs at bay and the soil fertile.

In the United States, farmers have to meet the USDA definition of organic through the National Organic Program. Basically, the program says that in growing crops natural substances are allowed and synthetic substances aren't, with some exceptions. Specifically, organic means that crops are grown without the use of most chemically based pesticides or petroleum- or sewage-based fertilizers. Genetic engineering and ionizing radiation aren't allowed at any stage of the food creation process.

HARVEST TIME:

Harvest is the process of gathering mature crops from the fields. Reaping is the cutting of grain or pulse for harvest, typically using a scythe, sickle, or reaper. The harvest marks the end of the growing season, or the growing cycle for a particular crop, and social importance of this event makes it the focus of seasonal celebrations such as a harvest festival, found in many religions. On smaller farms with minimal mechanization, harvesting is the most labor-intensive activity of the growing season. On large, mechanized farms, harvesting utilizes the most expensive and sophisticated farm machinery, like the combine harvester. Harvesting in general usage includes an immediate post-harvest handling, all of the actions taken immediately after removing the crop—cooling, sorting, cleaning, packing—up to the point of further on-farm processing, or shipping to the wholesale or consumer market.



For fresh produce, many of the crops are hand harvested and packed in the fields. They are taken to coolers in preparation for shipping.

Areas of concern with the harvesting of products are many, Field workers have a major influence on quality. They should be made aware of the importance of good sanitation practices, be properly instructed in selecting for maturity and be cautioned on proper handling.

Food safety begins in the field, and should be of special concern, since a number of food borne illnesses have been traced to contamination of the fields. Common-sense prevention measures include a number of don'ts. Don't apply raw dairy or chicken manure or slurries to a field where a vegetable crop such as leafy lettuce is growing. Don't apply manure to an area immediately adjacent to a field nearing harvest maturity. Don't forget to clean equipment that has been used to apply manure to one field before moving it to another field in production. Don't irrigate with water from a farm pond used by livestock. These are just a few point that must be followed for safe food handling. Quality cannot be improved after harvest only maintained; therefore it is important to harvest fruits and vegetables at the proper stage, size and at peak quality. Immature or over mature produce may not last as long in storage as that picked at proper maturity. The harvesting of fruits and vegetables should start as early in the day as possible and continue through the day. Once harvested, product should be transported quickly to the cooler or iced in some cases. It is very important to keep track of cut to cool time. It has bearing on the shelf life and quality of the produce. Handle produce gently. Crops destined for storage should be as free as possible from skin breaks, bruises, spots, rots, decay, and other deterioration. Bruises and other mechanical damage not only affect appearance, but provide entrance to decay organisms as well.

PACKAGING- CHILLING:

Packaging is designed to prevent physical damage to fresh produce, and to be easy to handle. Product is packed in such a way to ensure through the transportation chain product will not lose its quality. Cauliflower is a good example where being packed that way. Single layer of the cauliflower helps to eliminate the bruising of this product. Temperature is even more important factor in maintaining quality after harvest. Refrigerated storage retards the following elements of deterioration in perishable crops: aging due to ripening, softening, and textural and color changes; undesirable metabolic changes and respiratory heat production; moisture loss and the wilting; spoilage due to invasion by bacteria, fungi, and yeasts; undesirable growth, such as sprouting of potatoes. One of the most important functions of refrigeration is to control the crop's respiration rate. Respiration generates heat as sugars, fats, and proteins in the cells of the crop are oxidized. The loss of these stored food reserves through respiration means decreased food value, loss of flavor, loss of salable weight, and more rapid deterioration. The respiration rate of a product strongly determines its transit and postharvest life. The higher the storage temperature, the higher the respiration rate will be.

Rapid pre-cooling to the product's lowest safe temperature is most critical for crops with inherently high respiration rates. These include artichokes, Brussel sprouts, green onions, snap beans, asparagus, broccoli, mushrooms, peas, and sweet corn. Crops with low respiration rates include nuts, apples, grapes, garlic, onions, potatoes (mature), and sweet potatoes.

There are several ways of cooling Room Cooling, Forced-air cooling, Hydro-cooling, Top or Liquid icing, and Vacuum cooling. Each different way of cooling would service the needs of different product.

PROPER STORAGE:



The majority of fresh produce is at the peak of quality when harvest. Proper storage and handling is a must to ensure maximizing best quality and life of the product. Vegetables that are cut off its root base must be chilled and transported as soon as possible. Many of the fresh vegetables have a maximum life of only 7-14 days from harvest. When you consider the transportation time on fresh veggies that does not allow much time for error. Temperatures for fresh veg's are usually around 32-36 degrees F. with a 90-98% relative humidity. Other fresh veg's require chill sensitive awareness and can cause chill damage on the product. Examples of these are Green Beans, Bittermelon, Cucumbers, Eggplant and others require 45-48 degrees F. The difference between the 32 degrees and 45 degrees and can cause severe chill damage.

There are products that can be held in proper storage and last 3 to 9 months like potatoes and onions. Idaho Potatoes fall harvest begins late August and will complete late October. Proper storage in dark, temperature and humidity controlled sheds will hold for the potato for up to ten months. Onions after harvest time needs to be dried and in the state of complete dormancy before packed. Grading and Packing of onions suffer the most damage during the Grading and Packing process. Mechanical damage from bruises, scrapes, and cuts are cumulative but may not be evident until later. Onions may be stores for several months in the right conditions. Regulated temperatures and humidity will prolong the life of the onions.

Apples can be held in CA rooms for up to a year, CA rooms are Controlled Atmospheric storage that is like putting the fruit to sleep. In a sealed room, the oxygen that the fruit takes in and gives off as carbon dioxide is reduced, slowing the process. Oxygen is replaced by nitrogen gas. Temperature are reduced and kept in the low to Mid-30s. Apples can be stored for about a year depending on the variety.

Know the proper storage requirements for each specific fruit and vegetable is extremely important for the freshness and quality of product.

TRANSPORTATION:

Proper handling during transportation from timely delivery, proper refrigeration, breaking the temperature chain all can affect the products quality. Produce leaving the packing facility must be suited to the handling it will receive as it is transported to market. Locally produced fruits can be fairly mature and ripe because the time to market is short. Produce shipped from great distances is often a little less mature than locally produced produce and must be free of mechanical damage and other conditions predisposing it to noticeable quality loss in a long postharvest handling period. Mixed loads having varying requirements for temperature and humidity, and have varying sensitivity to absorbing odors or ethylene induced damaged from other produce. If some produce is mixed with a commodity with different storage requirements, the quality of the load can be compromised in the three to four day trip to Eastern markets from the west coast. The problem is even more severe in marine containers traveling several weeks to their destination.

Proper temperature is the most important factor affecting the quality of horticultural produce. Fresh fruits and vegetables remain alive by respiration, a process where carbohydrate in the produce and oxygen are used and carbon dioxide, water and heat are produced. High respiration rates rapidly deplete stored carbohydrate, shortening produce life. Temperature is the main factor controlling respiration rate. Berries like strawberries, raspberries and blackberries have a shelf life of 7 days at 32 degrees F. but only 1 day at 68 degrees F. That is an extreme example but shows how the shelf life is rapidly shortened by temp controls. Temperature below recommended levels cause freeze damage or chilling injury to produce. Signs of chilling injury are; tissue darkening or drying, surface pitting, failure to ripen normally, off flavors, or increased susceptibility to decay. Also, once arrived at the destination, produce must not be unloaded and held in ambient temperatures to avoid both heat and chill damage.



DISTRIBUTION:

The importance of the wholesale produce distribution channels frequently has been overlooked. These channels provide critical functions, however, including handling, transportation, storage, importing and exporting, and distribution. Close to half of all fresh produce distributed in the United States moves through the wholesale distribution system, consisting of produce packers, field buyers, distributors, brokers, repackers, and various types of receivers located both off and on terminal markets. This system connects producers on one end of the system with retail outlets and food service establishments on the other end. Like all other distribution systems, the purpose of this fresh produce distribution system is described as: "...delivering products and title to them to consumers at the right place, at the right time, and in the right amounts,..." During this time many factors could affect fresh produce. Receiving practices, storage (FIFO), time of storage, temperature of proper storage and delivery to final destination are areas of concern. At this stage of the fresh produce chain, proper handling of produce is important for final inspection before it is sent to its final destination customer.

Final Storage End User: These are the end users that will prepare for final customers. Proper handling from, storage to inspection to preparation are all factors that will determine the quality that ends up on the plate. Here are a few safe handling tips that are used in restaurants today.

Receiving: Order fresh produce frequently, and set up receiving guidelines. Check delivery truck and containers' condition; look for damage, signs of pests and dirt or debris. When receiving fresh-cut produce, reject items that have passed their expiration dates or haven't been received at the correct temperature. Accept only produce in good condition. Look for signs of spoilage, such as unusual colors, unpleasant odors, mold, or wilting. Reject any produce that shows signs of insect infestation.

Storing: Store raw, whole produce and raw, cut vegetables packed in ice as they are. Containers must be self-draining and ice should be changed regularly. Don't wash most produce before storing it. Moisture often promotes the growth of mold. Store cut melons, cut tomatoes, and cut leafy greens at 41°F (5°C) or lower. These items need temperature control to keep them safe. Avoid cross-contamination in storage. Store produce away from raw meat, poultry and seafood; otherwise, meat juice could drip on produce.

Preparing: Wash fruit and vegetables thoroughly under running water. The water should be slightly warmer than the temperature of the produce. Make sure fruit and vegetables don't come in contact with surfaces exposed to raw meat, poultry, and seafood. Prepare fruit and vegetables away from these items. Clean and sanitize utensils and equipment that will be used to prepare produce. This includes knives and cutting boards.

Specifications (Specs):

This is defined as requirement product specified agreed on by the buyer and the seller. The Specs under the USDA terms are ones defined as when is an acceptable product. A product specification is a document that provides critical defining information about a product and can include labels, rules, standards that may apply along with a visual illustration.

What Is FSMA and the Produce Rule?

The Food Safety Modernization Act (FSMA), signed into law Jan 4, 2011, requires the Food and Drug Administration (FDA) to write standards for produce safety (Produce Rule). This proposed proactive approach to food safety instead of a reactionary approach as in the past. As a key element of this preventive approach, FDA was mandated under FSMA to establish science-based, minimum standards for the safe



PRODUCE ALLIANCE

growing, harvesting, packing, and holding of produce on farms to minimize contamination that could cause serious adverse health consequences or death. This proposed Produce Safety Rule is anticipated to be final October 2015.

What are Allergens?

Food allergy is an abnormal response to a food triggered by your body's immune system. Allergic reactions to food can sometimes cause serious illness and death. Although nearly any food is capable of causing an allergic reaction, only eight foods account for 90 percent of all food-allergic reactions in the United States. These foods are: Peanuts, Tree Nuts, Milk, Egg, Wheat, Soy, Fish, Shellfish. Proper labeling of products to inform the public of safe product handling is essential and if products prepared were in contact with any Allergens.

Sustainability

Sustainable agriculture is a way of growing or raising food in an ecologically and ethically responsible manner using practices that protect the environment, safeguard human health. Are humane to farm animals, and provide fair treatment to workers.