
Food Safety Begins on the Farm
Risk Management Education
Fresh Produce
Food Safety Training
for
Farm and Shed Managers
Complied by:
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EXTENSION
FIELD
SANITATION

FIELD SANITATION

Acknowledgements :
Dr. James Rushing – Clemson University
Dr. Darby Granberry - University of Georgia

Everyone loses when an outbreak occurs. Even though your farm may not have been the problem, Consumers react to problems with the produce not the farm.

Everyone involved in producing, handling, packaging and distributing the crop **MUST** be dedicated to the practice of Good Practices that curtail the potential for food borne illness outbreaks

It Is the Growers Responsibility to Recognize and Eliminate Sources of Contamination

- *In the field*

&

- *At harvest*

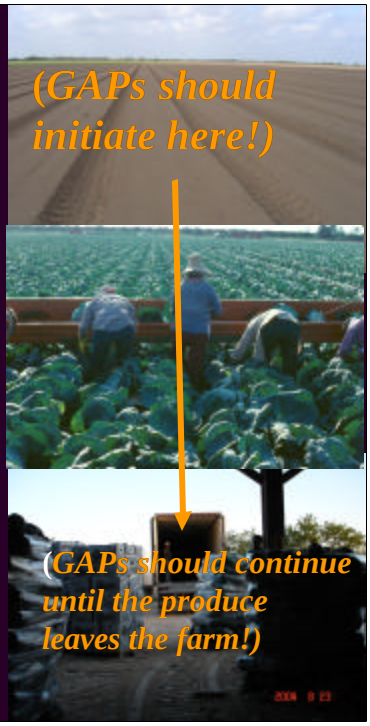
He is the one who will be liable if an outbreak is traced back to his farm

Although everyone needs to be aware of the potential for produce contamination and should do everything possible to insure it does not become contaminated, it is still the responsibility of the grower to make certain it does not.

Good Agricultural Practices Address 3 Major On-farm Issue Areas

1. **Site selection and preparation**
2. **Production practices**
   - ***Irrigation***
   - ***Fertilization***
3. **Harvesting, handling & loading for distribution**

Growers have complete control over occurrences in these areas!!!



Growers should what they can to discourage contamination because once the produce leaves the farm, it is out of the hands of the grower. It is then at the mercy of the re-packer, distributor and retailer to reduce contamination potential.

Information Needed When Selecting a Field Site

- *Has it been grazed by animals or used for domestic animal production*
- *Has it been used as a garbage or toxic waste disposal site*
- *Has it been used as a sanitary waste management site*
- *Has been used for mining activities, oil or gas extraction*

Document in detail this information

There are several important questions that should be asked to determine if the field site is OK for produce production in an attempt to limit the potential for production contaminated product.

Proper site selection based on good common sense and time spent to gather information on the site will go a long way in reducing potential problems

Site Selection Information Cont.

- *Has it been used for the disposal or storage of mineral residues*
- *Is it adjacent to or near a production site or has or has had barns or farm animals at a short distance to the cultivation site*
- *Has it experienced any serious flooding.*

Site Selection Information Cont.

- *Has it been treated in an uncontrolled manner with organic and inorganic fertilizers and/or pesticides.*
- *Is the field near cull piles, refuse dumps*

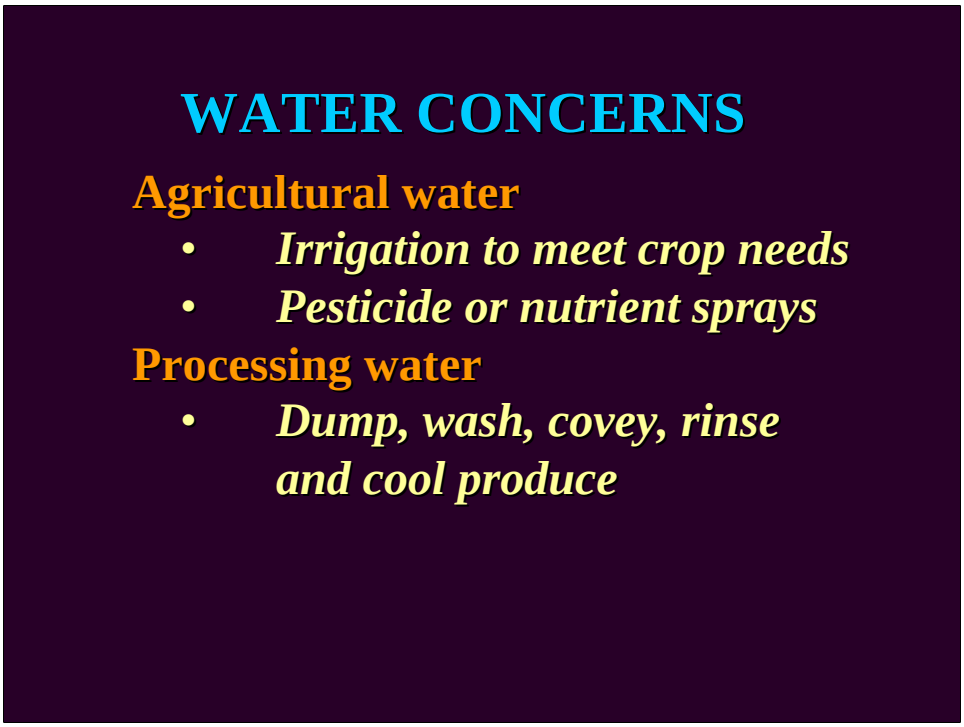
Soil Microbiological Testing

- ***Microbiological analysis of the ground is generally performed to detect fecal contamination.***
- ***Generally the determinations include presence of fecal coliforms and E. coli as an indicator organism to quantify contamination.***

Testing is critical if site has animal use history!

If a field is of unknown history, it is a good idea to have the soil tested for the presence of harmful bacteria.

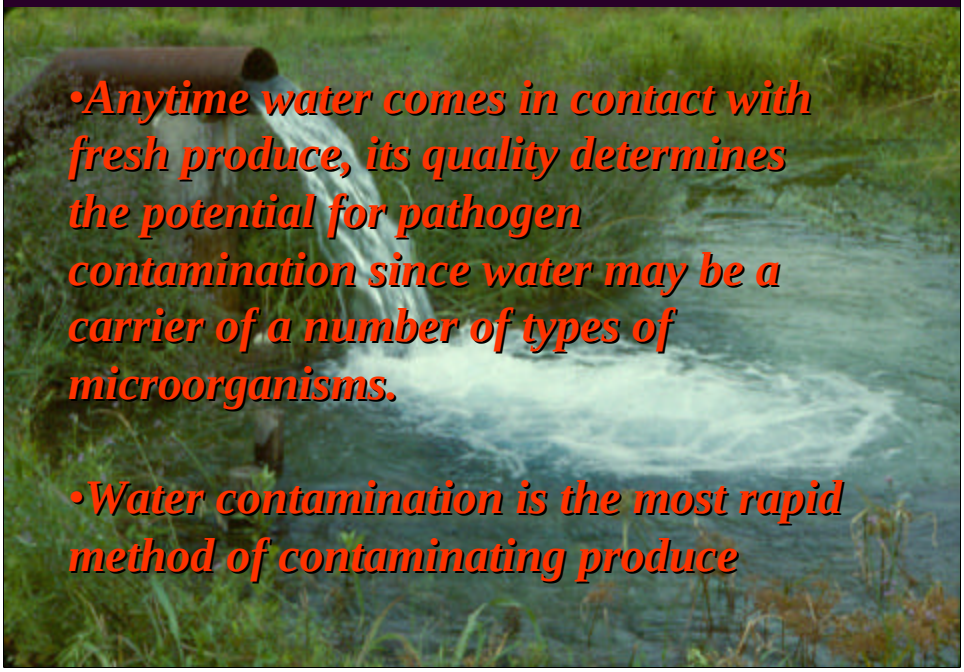
Generally vegetables are produced in the uncontrolled environment of a field. Consequently they come in contact with many things that are potential hazards related with contamination. The three major concerns are water, workers and animal waste.



Water is used in all phases of production and handling of produce.

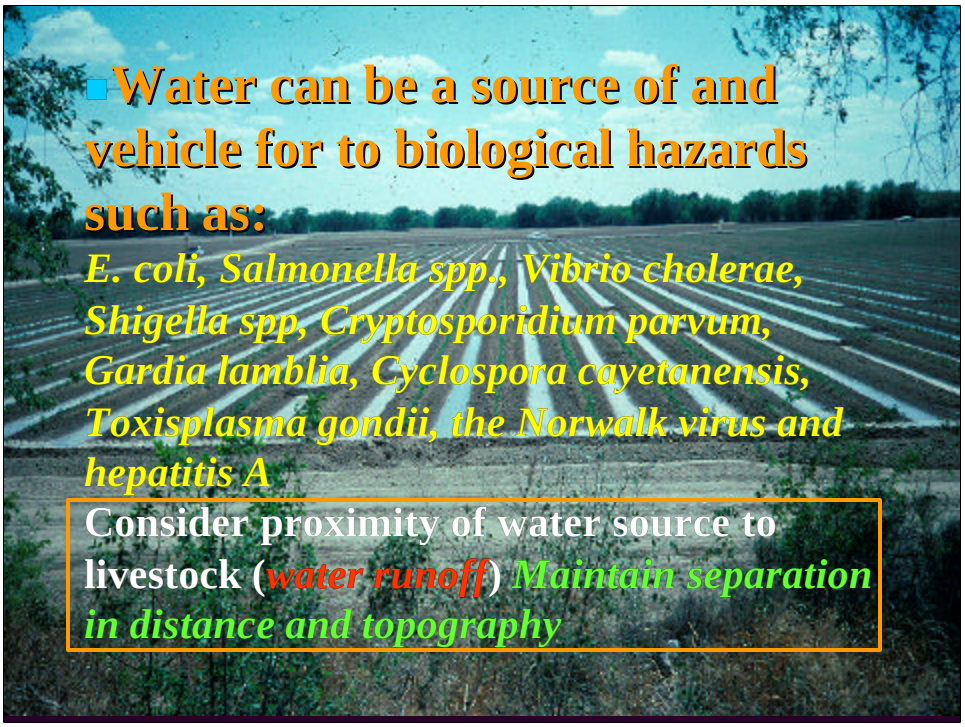
Therefore, the use of clean, uncontaminated high quality water is extremely important when in these operations in order to reduce the spread of any harmful bacteria to produce.

Water #1 Field Hazard



- *Anytime water comes in contact with fresh produce, its quality determines the potential for pathogen contamination since water may be a carrier of a number of types of microorganisms.*

- *Water contamination is the most rapid method of contaminating produce*


Water can be a source of and vehicle for to biological hazards such as:
E. coli, Salmonella spp., Vibrio cholerae, Shigella spp, Cryptosporidium parvum, Gardia lamblia, Cyclospora cayetanensis, Toxisplasma gondii, the Norwalk virus and hepatitis A
Consider proximity of water source to livestock (water runoff) Maintain separation in distance and topography

Water quality management a must to insure safety

- Sanitation
  - Use all measures possible to maintain quality
- Microbial testing
  - Periodic evaluation of quality

Two keys to good quality management of water is sanitation and microbial testing.

It is of no value to use good quality clean water if it is poured into dirty or contaminated equipment or used in contaminated fields.

Cleaning all surfaces that come in contact with water is essential

Microbial testing is a good barometer that insures water quality is maintained or to initiate proper steps of bacterial buildup is noted.

Microbiological Testing

- Microbiological testing is used in the verification steps of a safety assurance program.
- It is important to document the frequency and results of each water test for comparison purposes.
- These records would become very important in the event of a microbiological outbreak investigation.

Water Source Will Determine the Possible Frequency of Testing

Source	Possible Water Testing Frequency*
Closed system, under the ground or covered tank	*One annual test at the beginning of season (Document)*
Uncovered well, open canal, water reservoir, collection pond	*Every three months during the season (Document)*
Municipal/District water system	*Keep records from the municipality/district water system (monthly, quarterly or annual report)*

*** Obtained from California Strawberry Commission (1998) Quality Assurance Program**

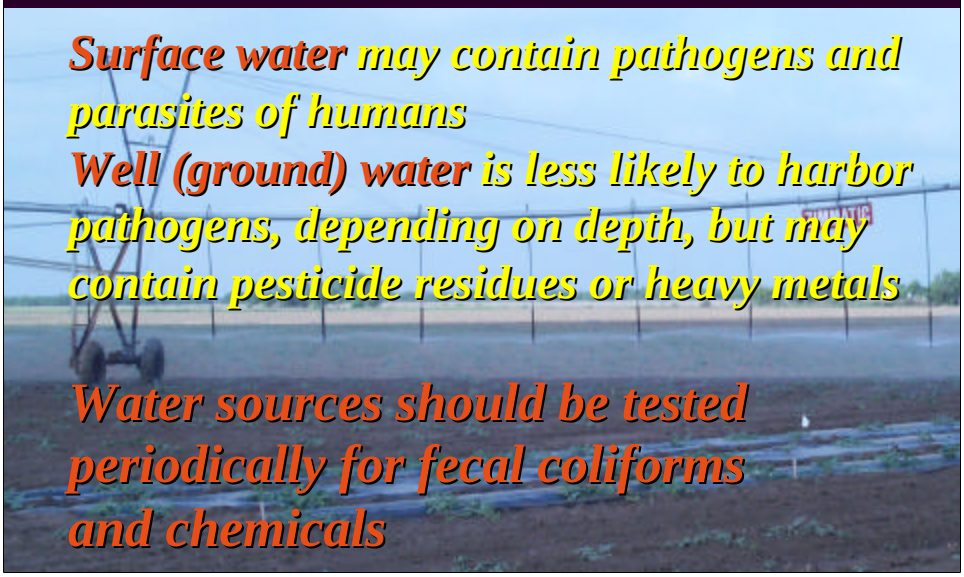
Irrigation water sources should be tested periodically

The above are suggested frequencies for various sources.

Sources of Water for agricultural uses:

1. **Deep wells** ***(usually least problematic)***
2. **Surface sources** ***such as rivers, streams, irrigation ditches and canals*** ***(usually most problematic)***
3. **Reservoirs**
4. **Municipal water systems (*usually safest due to chlorine treatment*)**

Agricultural Water Source-Irrigation



Irrigation water is usually spread across all of the production field as a result it can serve as an inoculation technique to contaminate all of the produce contained within the irrigated area.

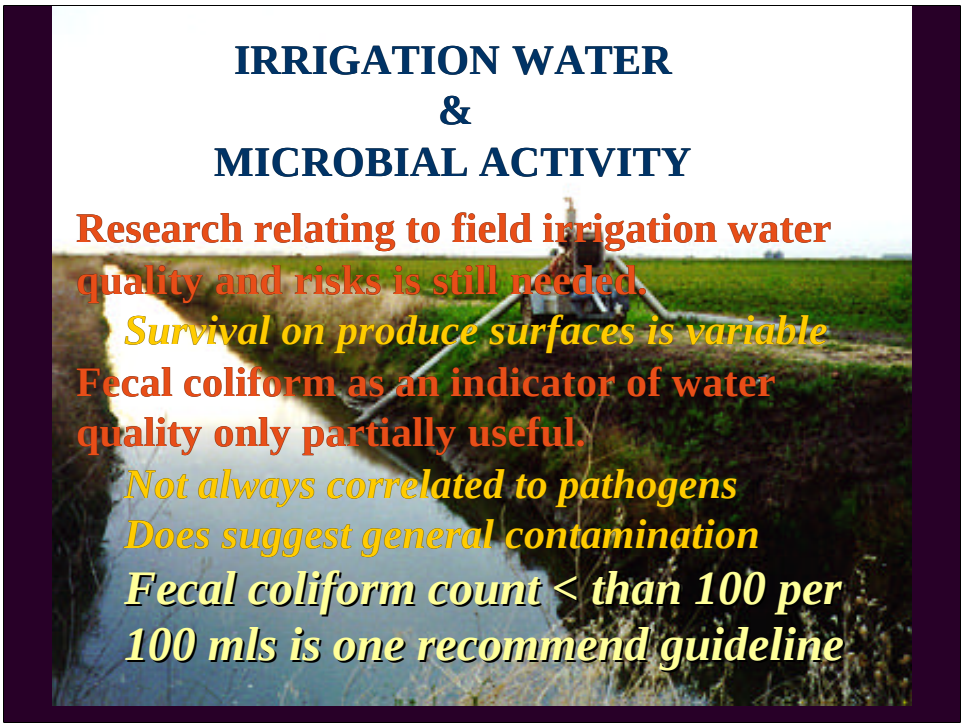
Therefore water used for irrigation should also be tested frequently.

Irrigation practices

Overhead irrigation is more likely to spread contamination to above-ground plant parts than root-zone irrigation (*furrow or drip*)

***Maintain records* of safe irrigation practices**

Irrigation method can influence the spread of food borne pathogens. Drip irrigation is by far the safest method.



Although water testing is recommended, little can be done if sources such as river, stream, lakes etc. are contaminated.

Too little is know about decontaminating these sources.

However, if these sources are used to for purposes other than irrigation, testing is appropriate because things can be done to clean water before using it for these purposes (wash water, dump water and spray solution and delivery).

Other Water use:

– pest control

- frost protection

Always use potable water!

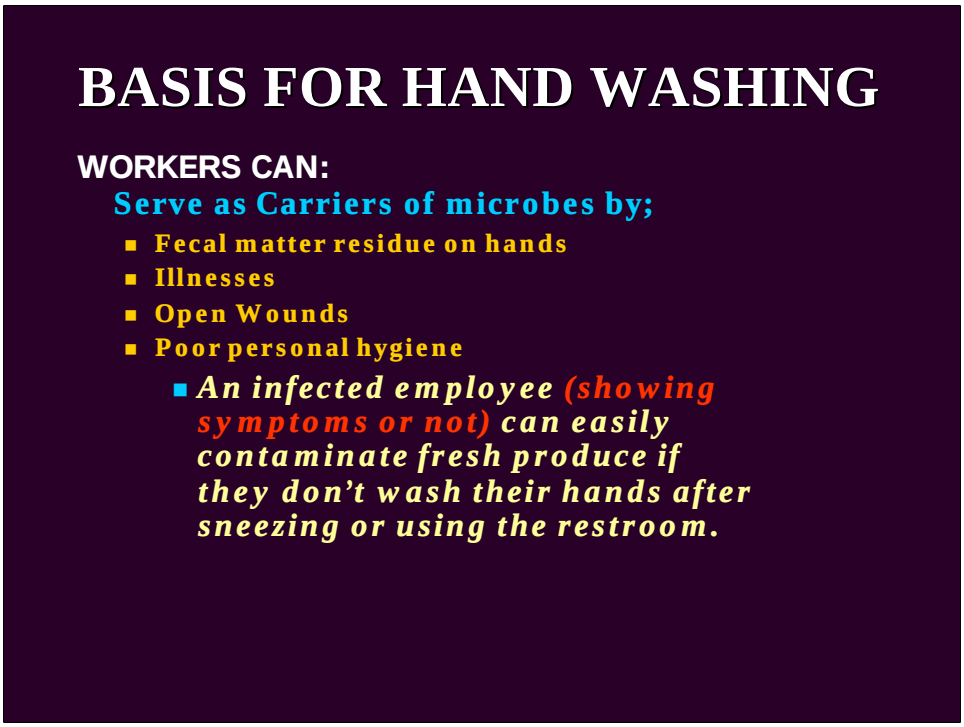
Often overlooked is the potential for contaminating a crop with food borne pathogens is the spray water. Some growers believe because a pesticide is being sprayed that the bacteria will be killed. Not so. Bacteria specific products are the only kill compound. However, these may not be practical to use. Therefore, sanitation and the use of pathogen free water is the best option.

2 Source: **WORKERS:**
Personal Health and Hygiene

- ***The major source of human pathogens are worker's hands, so the single most effective public health measure to disease prevention is proper hand washing.***

Training in proper hand washing techniques seems foolish in this day an age but it is not. Studies have shown that even many well trained professionals do not wash there hands when using rest room facilities, and those that do, do not do so properly.

Hand washing is a must before handling produce. This simple procedure can be an effective disease prevention measure.



If a worker has obvious wound make certain that the proper protection is used. In some instances it may be best to reassign a worker to an area where he does not come in direct contact with produce or even to send him home. If these measures are taken make certain that you explain the reasoning behind your decision. His illness or wound infection can cause serious harm to consumers of the produce.

A bandage is necessary to protect the wound from the produce. However, bandage can become the source of contamination if they are not kept clean and covered with a latex glove. Band-Aids and cloth coverings can become soaked with infection ooze. Make certain that employees understand this and take the necessary protective measures to prevent contamination.

Worker Hygiene Training and Adequate Facilities are Must For All Produce Operations

- ***Proper hygiene procedures should be established and included in hygiene and health training programs.***
- ***Maintain records of training***
- ***Toilets and hand-washing stations must be available, accessible and properly maintained (keep maintenance records)***

One of the key areas of hygiene that should be stressed is Hand Washing and proper use of rest rooms facilities

As a result, adequate and easily accessible facilities are needed.

Sanitary facilities

Stocked with single use paper towels
Closed disposal container for used towels
Hot water

For sanitary facilities to be effective they need to have hot water and be properly stocked as suggested above.

Demand worker to wear clean clothing
Provide a locker room with hand washing facilities

In addition, rest and / or lunch rooms separate from produce handling areas should be available.

GMPs specify that a clothing rack must be located outside employee restrooms so that workers can remove their gloves, smocks, aprons, etc., before entering these facilities.

Field sanitation measures are critical to the development of good food safety programs.

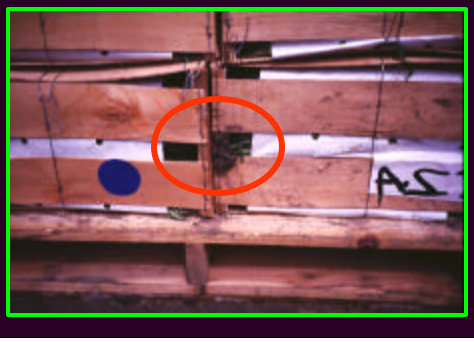
All surfaces that come into contact with produce have the potential to be come contaminated.

Proper cleaning, disinfecting and storage of bins, harvest aids and other farm field equipment is a must.

In the photo above, irrigation pipe stacked and stored on the grown provides ideal nesting sites for rodents, snakes etc. These animals all carry bacteria and secrete feces that can serve as contaminants once the pipe is used to irrigate a field. Store irrigation pipe above grown on racks and keep the area around and under the racks free of weeds and debris

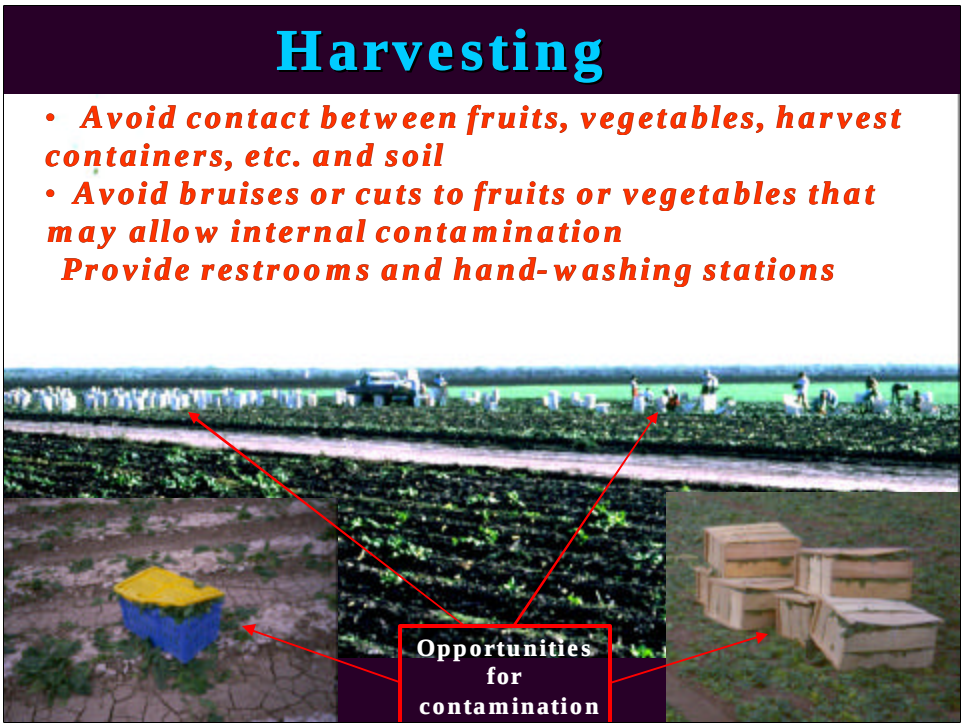
Hose out all irrigation pipe prior to use.

Sanitize and repair All totes, crates, pallets etc prior to use



It is of no value to use GAPs to produce the crop if when harvested it is placed into contaminate containers.

Broken containers etc can cause injury to produce and provide easy access for harmful bacteria.



Anytime produce comes into contact with soil the potential for contamination occurs. The suggestion listed here should be strictly enforced.

Harvest is the initial place where field workers come into contact with produce. Proper training of harvest techniques designed to reduce produce bruising and contamination should be conducted and dates recorded.

In addition training in the cleaning and storage of harvest bins, harvest aids etc are needed (record all training sessions and who attended).

Field workers come in contact with both produce and soil during their everyday activities. As a result they can easily transfer soil borne pathogens directly to produce. This can cause serious problems especially if field packing for shipment is being practiced.

When using harvest and packing aids make certain that these items are cleaned prior to each use and that workers using them also practice good sanitary measures (clean shoes prior to climbing on equipment, use of latex gloves and change them often)

Never place produce to be packed directly on the soil.

Never allow children and pets in the field

Never allow food to be consumed while working with produce or in the area where produce is being harvested or packed

However, it does no good if harvest aids etc are sanitized if workers are not following GAPs that reduce potential contamination

There are many things happening in this photo that should not be occurring.

1- Young children walking around the area where produce is being packed

2- Workers are sitting on boxes being used to pack produce

3- Use of dirty gloves

4- Harvested produced to be packed stacked on the soil

Daily On-Farm Sanitation Routines; include high pressure equipment, wagon etc washing

Clean with disinfectant

- Bins
- Bags
- Buckets
- Gondolas
- Tractors etc

All produce production operations should have power washing capability

High pressure washing can go a long way to reducing spread of pathogens

3: Animal Hazards

- *Animal feces are a main source for pathogenic organisms*
- *Since animals are in contact with soil, manure and water, they can easily pick up contaminants from these sources*
- *Some pathogenic bacteria commonly found on animals include Salmonella, Staphylococcus and Streptococcus*
- *Maintain records of animal control program*

It is a common practice to place loaded produce wagons under trees etc to get the products out of the sun while waiting to further process. Although preventing produce to heat up is recommended, this can cause potential contamination. Shaded areas also provide good nesting places for birds etc. Droppings from them can contaminate the produce

E. Coli 0157:7 is the real serious culprit. These organisms can easily cause a very painful death.

This organism can become internalized within produce under the right circumstances.

Sources of Salmonella

- *People*
- *Rodents*
  - Rats
  - Mice
  - Etc.
- *Fowl*
- *Snakes*
- *Insects*

Tend to seek refuge and nest in out buildings, storage barns field wagons, irrigation pipes etc.

PEST CONTROL IS A MUST IN THESE AREAS

It is not uncommon to field pack and load semi for shipment. Just as permanent packing sheds need to have good sanitation so do these type of set ups. Because these type of packing facilities gene ral do not have access to fresh clean water, they can pose serious risk for produce contamination. In this photo, the packing line is set up next to a brush line. Brush offers good shelter for rodents and other forms of wildlife which are carriers of harmful bacteria that can easily be spread to the produce. There are no worker sanitation facilities available and the cull piles are next to boxed produce ready for shipment.

Sources of Salmonella

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Tend to seek refuge and nest in trees, out buildings, storage barns, brush lines etc.

Manure = Fecal Matter = Microbes = POTENTIAL CONTAMINATION

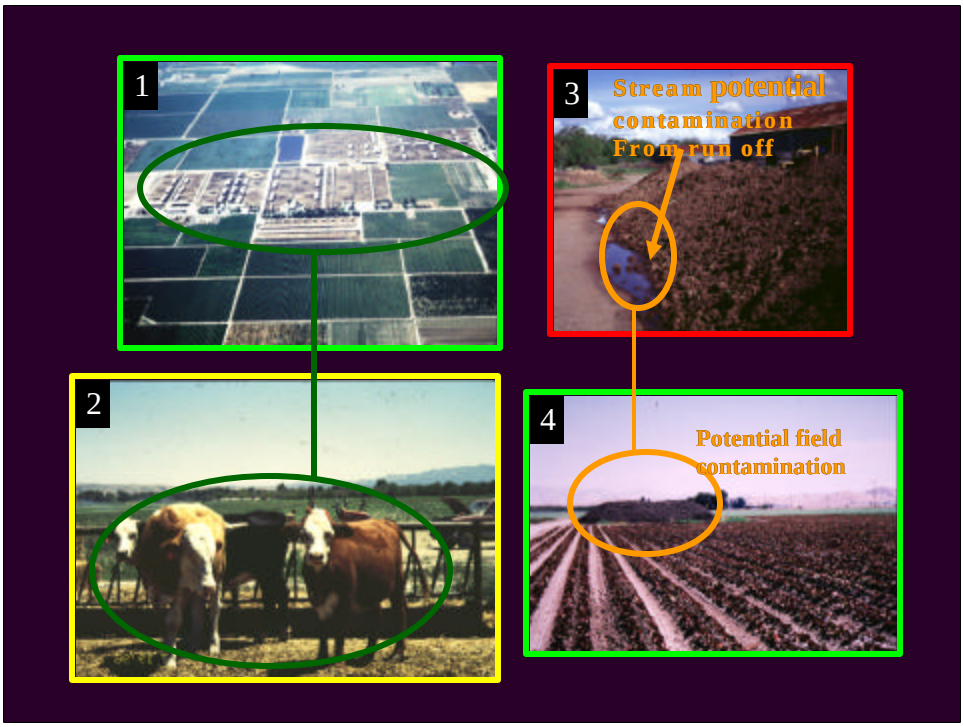
- *Keep manure away from produce.*
- *Preventing contamination is the goal.*

Courtesy of Darbie Granberry
University of Georgia

The emphasis is on preventing manures/bio-solids from coming into contact with produce. Properly composted, pathogen-free manure is on the left, while on the right is a potential source of produce contamination.

Keeping Animals Out

- ***Maintain domestic and farm animals away from production fields and packing facilities and establish physical barriers or vegetation to avoid animal entry. These precautions are especially important in the field near harvest time.***
- ***Workers (growers included) should not be allowed to bring dogs, cats or other domestic animals into the field, packaging shed or storage facilities.***
- ***Dead or trapped animals such as birds, insects, rats, etc should be disposed of promptly in order to avoid attracting other animals. Proper disposal procedures are to bury or incinerate the animal.***



Field adjacent, down hill or down stream from animal installation should be avoided.

Photo 1 depicts an animal installation that is surrounded by crops.

Photo 2 Animal feces is a major source of bacteria such as E. coli. Run off resulting from heavy rains can cause contamination of adjourning fields. Planting down hill or stream from these situations should not be practiced.

Photo 3 Manure stock piles, either waiting to be removed for the animal operation or to be used as fertilizer, are concentrated and can cause serious contamination from runoff as well. These stock piles should be circled by a barrier of some type to prevent runoff from reaching field or streams.

Photo 4 When fertilizing field with manure, use only well composed manure. An added safety precaution is to barrier the down hill ends of the fields especially when they are prone to drain into a ditch, stream or river.

Therefore, it is always best not to select field near animal production or feeding facilities. Wind blown dust from these operations can transport bacteria as easily as water.

Fertilization practices

- **Inorganic fertilizers** originate from synthetic chemicals, so pathogenic bacteria are not likely to be present
- **Incompletely composted manure** may contain pathogenic bacteria
  - *Use only well-composted manure*
- **Maintain records** of safe fertilization practices

Use only properly composed manure and keep record of how manure was composed if you do your own composting.

If manure is purchased, obtain records of the vendors composting procedure with particular emphasis on temperature

Handling Organic Fertilizers: Manures, Biosolids and Compost

Use Best Management Practices (BMPs) to reduce contamination:

- **Proper storage**
- **Best to incorporate 3 months prior to planting, or 4 months prior to anticipated harvest**
- **Target time of application**
- **Target crop**
- **Proper and thorough composting**
- **Keep records**

Plastic mulch can help to reduce contamination by serving as a barrier between the produce and the soil

4 - Soil Hazards

Soil is the only permanent production resource

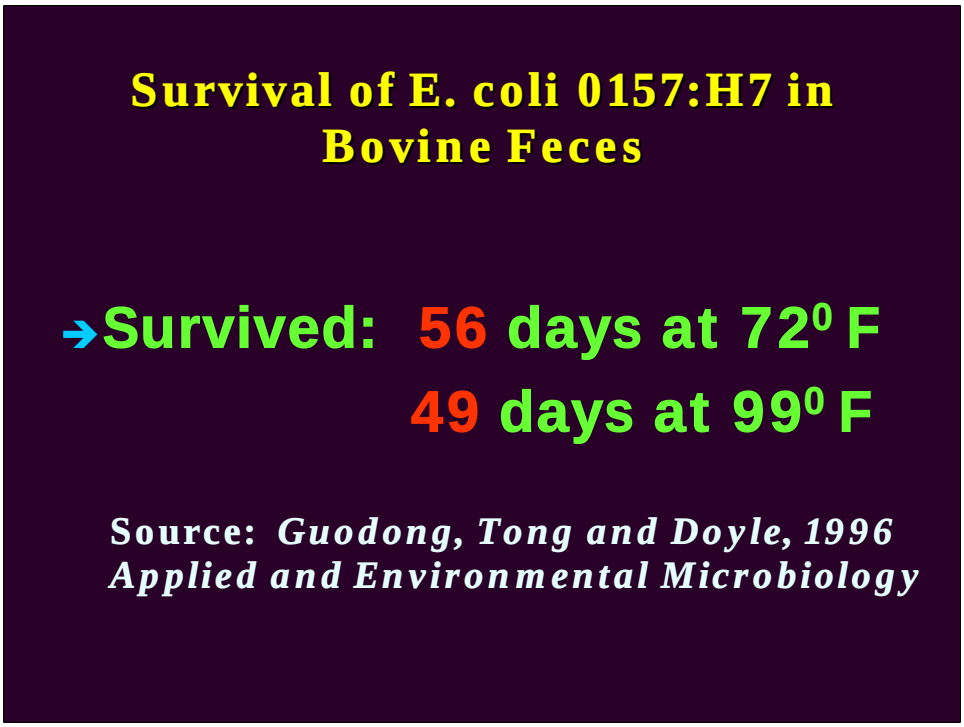
Over the course of a season people, animals, bird and equipment make many visits to or travel across the soil within a production field

Contaminates introduced into the field often time will colonize in the soil

Toxic compound used to grow a crop or the fuel and maintain equipment can also accumulate in the field soil

Plants grow in the soil or their fruits come in contact with the soil during normal production.

Thus, contamination potential is high.



Therefore, GAPs that reduce the potential for E. coli and other pathogenic bacteria from building up in a field should be followed.

WHAT CAN BE DONE TO REDUCE LIABIALITY?

- ***KEEP RECORDS! KEEP RECORDS! KEEP RECORDS!*** ***DOCUMENT EVERY EFFORT TO FOLLOW FDA GUIDELINES***
- ***DEVELOP GUIDELINES*** ***FOR EMPLOYES ON FOOD SAFETY***
- ***DESIGNATE INDIVIDUALS*** ***TO AREAS AND HAVE THEM MAINTAIN RECORDS.***
- *Train workers in manure use and hazards*

If an out break occurs and the produce is traced back to your operation adequate, accurate records are your only defense against fines, loss of business and/or law suits.

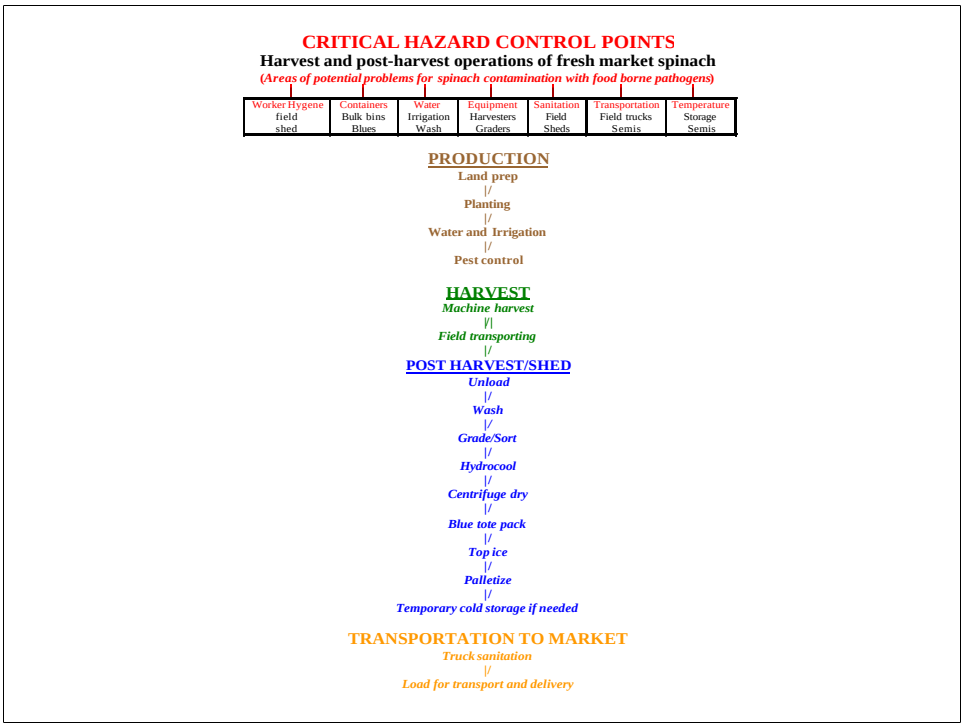
GOOD AGRICULTURAL PRACTICES
for
Production, Handling and Shipping
of
FRESH PRODUCE

Complied by:
Frank J. Dainello **Extension Horticulturist- Commercial Vegetable Crops**
Department of Horticultural Sciences

Sponsored by:
The Wintergarden Spinach Producers Board

Growers and shippers should get a copy of this guide and follow it.

The guide contains good agricultural practices and a check list to be followed to insure the GAPs are in place and their use documented.



The guide follows the above flow chart.

Across the top of this page is the main critical points where produce can become contaminated. Attention should be paid to these items to reduce the incidence of potential contamination.

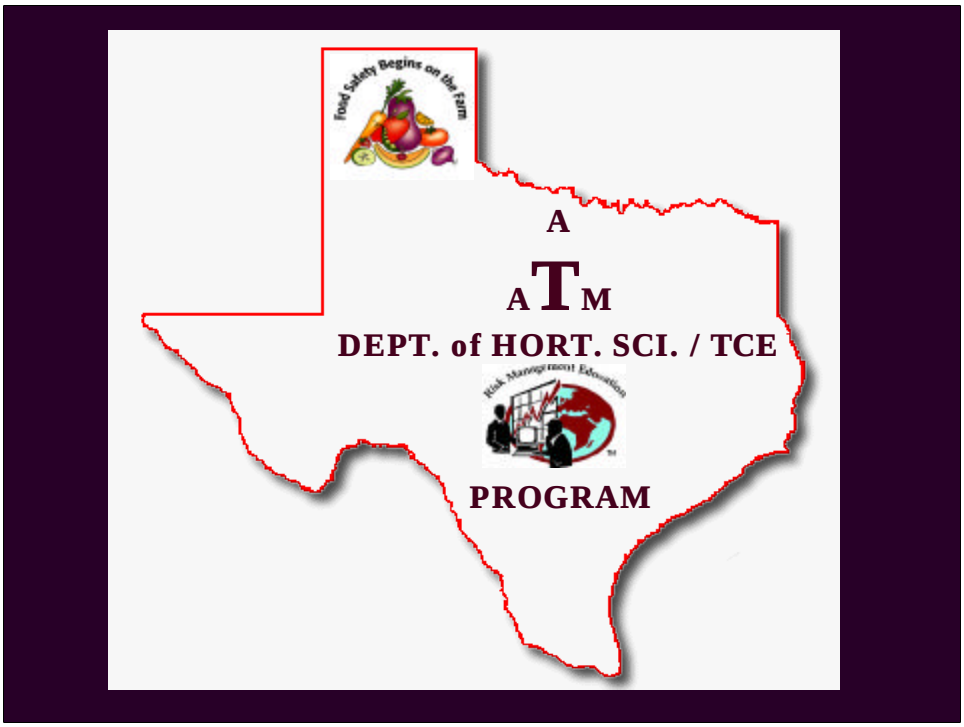
The items down the page represents all facets of the cultural practices normally employed in the production, handling and shipping of produce. Most of the hazard areas are important within each of the cultural facets.

The guide attempts to address each of these.

The check points outlined within the guide can be modified to reflect each individual operation. A computer spread sheet is helpful to document what and when these items have been affected.

POSTED ON WEB
(Coming soon!)

- This training
- GAPs for Fresh Produce Safety
  - Aggie Horticulture
    - Extension
      - Commercial Horticulture
        - Food Processing and Safety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