NC MARKETREADY™

Fresh Produce Safety – Field to Family

A Program of NC Cooperative Extension

Module 2:
GAPs Field Practices

Acknowledgments

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Module 2: GAPs Field Practices

Estimated duration: *2 hours*

Instructional overview:

Instructional objectives:
- Recognize that water used in the production of fresh fruits and vegetables can be a source of pathogen contamination and dissemination.
- Recognize fertilizer and animals in production areas as a potential source of contamination.
- Recognize harvest worker hygiene as one of the top three sources of contamination.
- Recognize potential sources of contamination during the harvest operation.

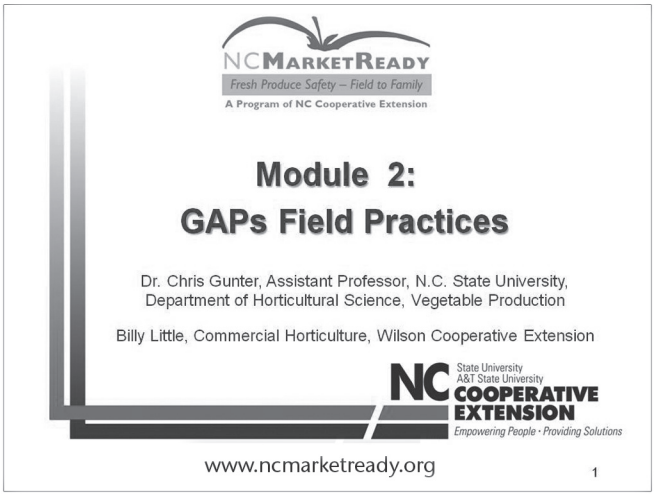
Equipment, supplies and materials needed:
- Laptop and LCD projector
- PowerPoint (PPT) presentation on CD
- Nametags, pens

Preparation needed:
- Review Module 2 and PPT prior to day of the workshop; become familiar with GAPs programming—how each module is an integral part of the other modules.
- Secure a laptop computer with PPT capability and an LCD projector. Save a copy of the presentation (from CD) on computer.
- Make copies of workshop activities, pre-test and post-test (if applicable) for all participants.
- Obtain easels, flip charts, markers if needed.
- Prepare room to accommodate participants and projector. Prepare sign-in sheet and nametags, as applicable.

Module 2

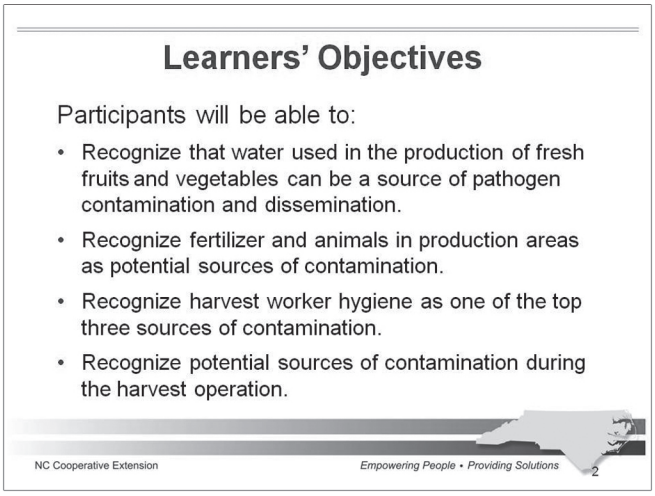
Welcome

Have participants make nametags and introduce themselves



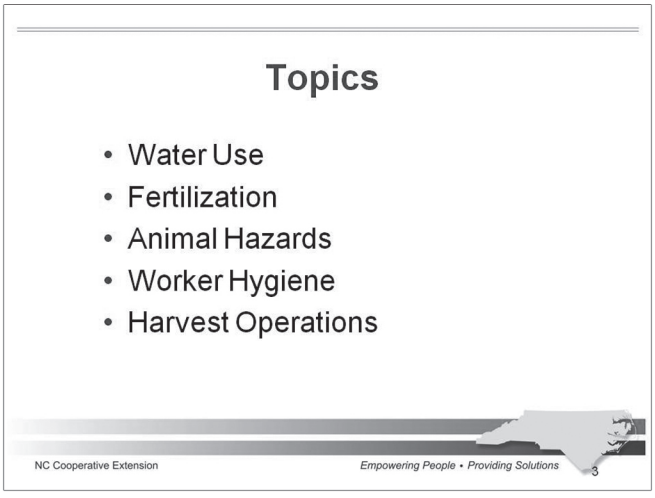
PPT 2-1: Module 2: GAPs Field Practices

Activity—Participant Pre-test



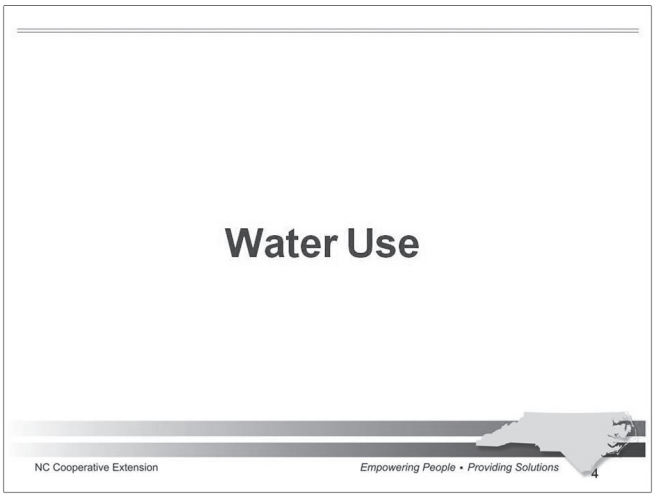
PPT 2-2: Learners' Objectives

No notes



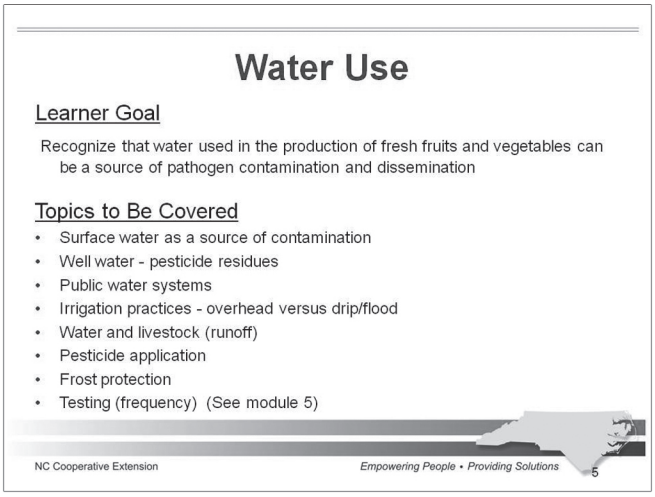
PPT 2-3: Topics

No Notes



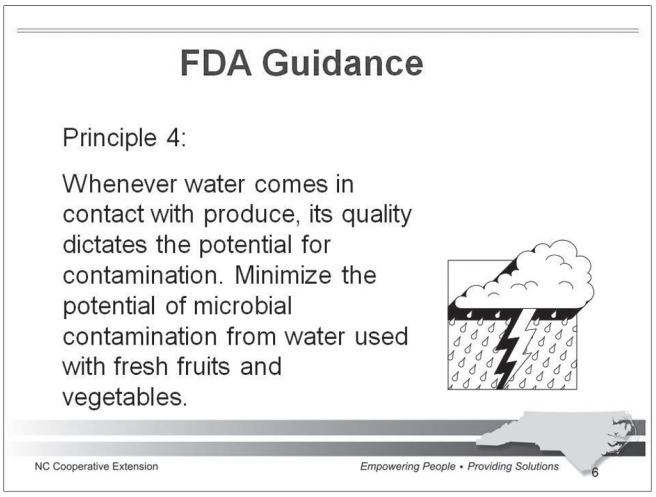
PPT 2-4: Water Use

No notes



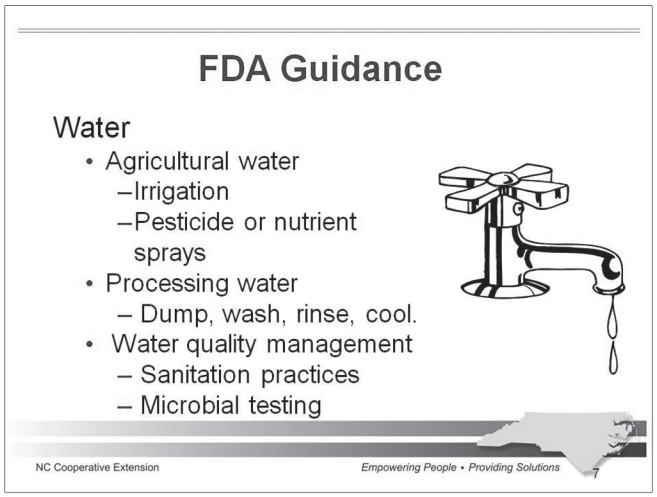
PPT 2-5: Water Use

No notes



PPT 2-6: FDA Guidance

Water-quality management is perhaps the single most important issue in preventing food-borne diseases. The topic is covered in much detail in our workshop.



PPT 2-7: FDA Guidance

Water may be inherently bad if contaminated at the source, and it may serve as a vehicle for spreading contamination as it is used for any specific purpose.

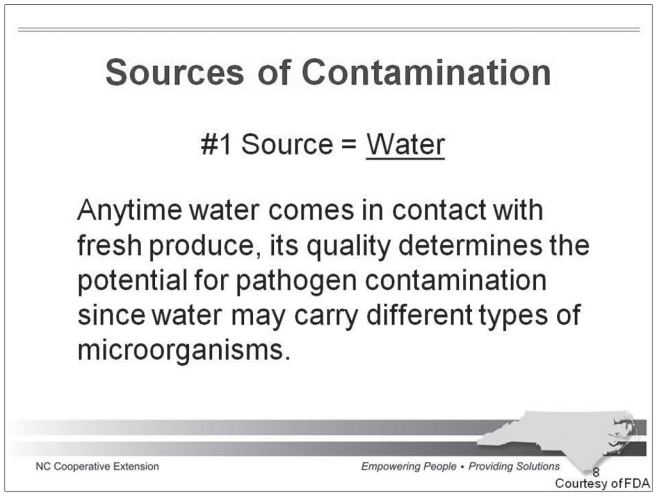
- We will discuss water-quality management in two distinct categories:
- Agricultural water used for irrigation, nutrient applications or pesticide mixes, and
- Process water used for
  - -Dump, wash, rinse, cool
  - -Water Quality Management
  - -Sanitation practices
  - -Microbial testing

PPT 2-7 (continued)

- Concerning agricultural water: There are three main sources of agricultural water. Usually, water for agricultural uses comes from:
  - -Surface sources such as rivers, streams, irrigation ditches and canals and reservoirs
  - -Ground water from wells (open or capped)
  - -Public water systems such as those provided by towns or other municipalities

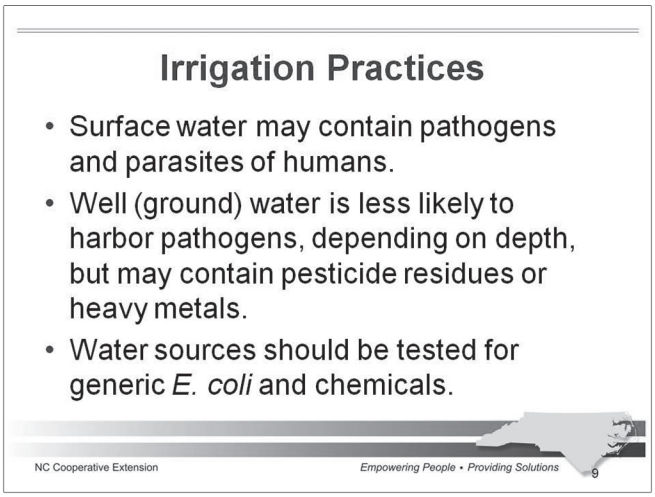
Agricultural waters can be readily contaminated by a variety of biological and chemical hazards, which include:

- Bacteria and viruses
- Domestic waste
- Nitrate nitrogen
- Synthetic organic chemicals
- Heavy metals
- Petroleum residues
- Combustion products from roadways



PPT 2-8: Sources of Contamination

Water is an important source of contamination.



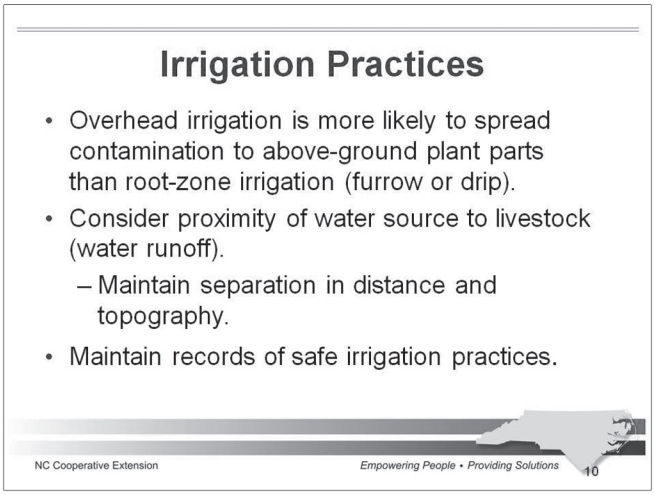
PPT 2-9: Irrigation Practices

Make sure surface and ground waters are clean and usable for crop production and keep the test records!

Surface water may contain pathogens and parasites of humans.

Well (ground) water is less likely to harbor pathogens, depending on depth, but may contain pesticide residues or heavy metals.

Water sources should be tested for fecal coliforms and chemicals.



PPT 2-10: Irrigation Practices

1. You must consider these items when planning to irrigate your fields:
   - Frost protection is typically overhead and you must consider water cleanliness.
   - Ideally, this water should be of drinking water quality (potable).
   - Prefer groundwater.

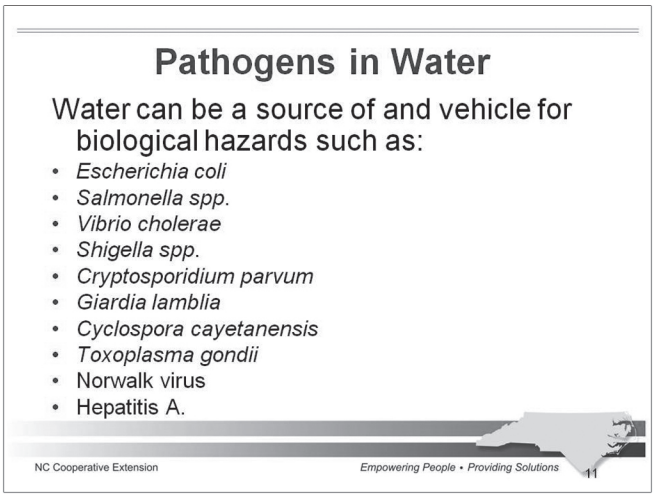
   Management of frost protection water is similar to that of irrigation water, but must have more stringent control measures since this water is intended for direct fruit contact.

PPT 2-10 (continued)

2. Water used for pesticide mixing
   - Should use potable water.
   - Guatemalan raspberry-*Cyclospora* incident:

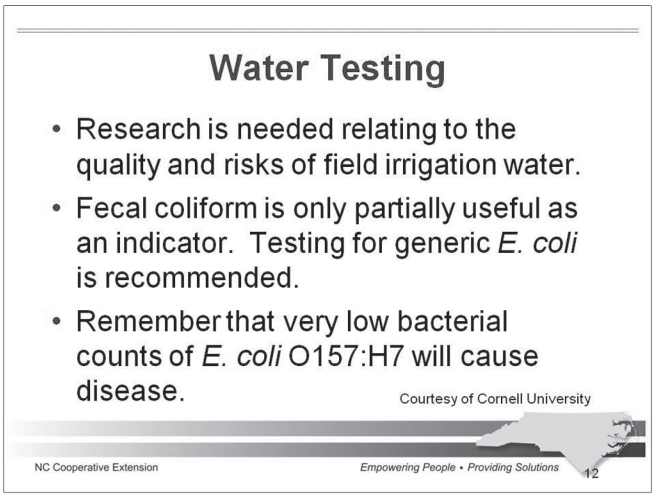
   In 1996, California strawberries were implicated in an outbreak of *Cyclospora*. It was eventually discovered that raspberries from Guatemala were the culprit. The berries had been sprayed with a pesticide mixed in tainted water. Remember, despite popular belief, pesticides are not lethal to all life forms—most of them are specific to certain pests. This means parasites in water used to prepare fungicides will remain viable.

3. Ground water should be used exclusively and "ideally" treated or filtered for cleanliness before use, if at all practical.



PPT 2-11: Pathogens in Water

Many human pathogens are readily transported in water.



PPT 2-12: Water Testing

Testing and quantifying irrigation water's microbiological condition are very important. 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.

PPT 2-12 (continued)

All agricultural water used to irrigate and wash fresh produce should be tested for the presence of generic *E. coli*. This is a special group of coliform (mentioned in PPT 2:9) that reside in the intestinal tract of warm-blooded animals. The notorious pathogen *E. coli O157:H7* is a member of this group. High counts of fecal coliform indicate the water may have been contaminated with *E. coli O157:H7* and/or other human pathogens. This water may be unsafe to use to irrigate crops or wash fresh produce. Based on risk assessment research, the recommended generic *E. coli* testing is as follows:

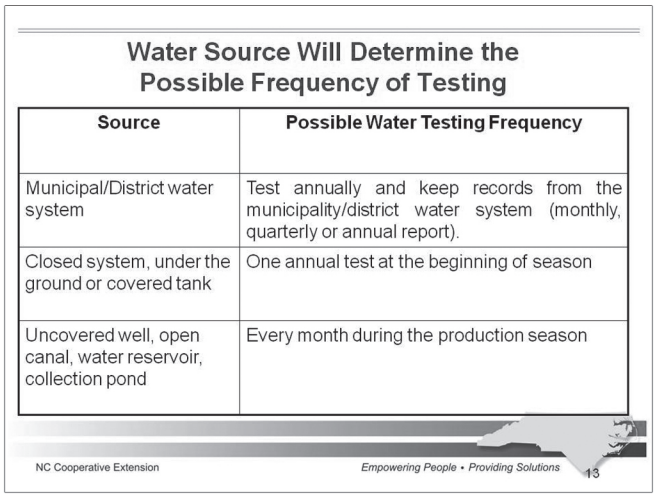
For water not coming in direct contact with the edible portion of a plant:

- Acceptance Criteria: Less than or equal to 126 MPN/100mL (geometric mean of 5 samples)
- Acceptance Criteria: Less than or equal to 576 MPN/100mL (for any single sample).

For water coming in direct contact with the edible portion of a plant:

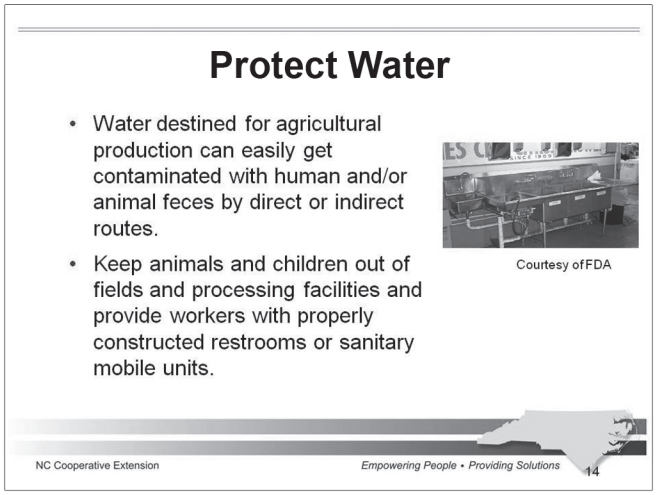
- Acceptance Criteria: Less than or equal to 126 MPN/100mL (rolling geometric mean n=5)
- Acceptance Criteria: Less than or equal to 235 MPN/100mL (for any single sample)

Water used to wash produce must meet the U.S. Environmental Protection Agency's (EPA) goal for maximum contamination, or MCLG. The MCLG is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals. MCLs (maximum contaminant levels) are enforceable standards. MCLs are set as close to MCLGs as feasible, using the best available treatment technology and taking cost into consideration. The MCLG for total coliforms in drinking water is zero.



PPT 2-13: Water Source Will Determine the Frequency of Testing

The water used in agricultural activities must undergo microbiological testing, depending on its source. Tests should be taken at the source closest to the edible produce. The sources are listed in order of risk from low to high.



PPT 2-14: Protect Water

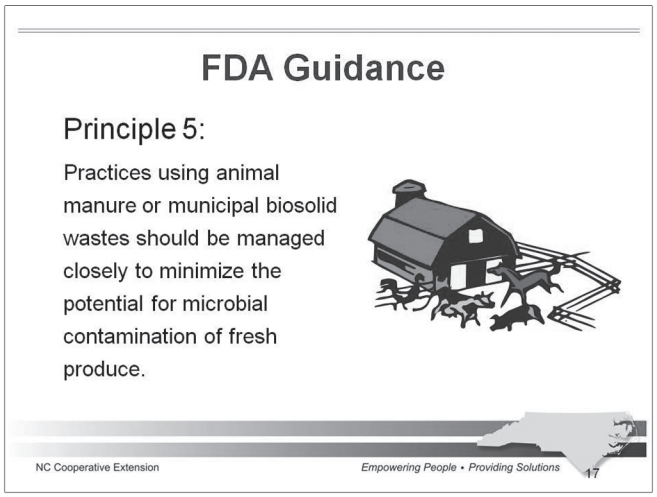
Water used in agricultural production can become contaminated in many ways. It is very important to think about potential direct and indirect routes and sources of contamination.

PPT 2-15: Fertilization

No notes

PPT 2-16: Fertilization

No notes

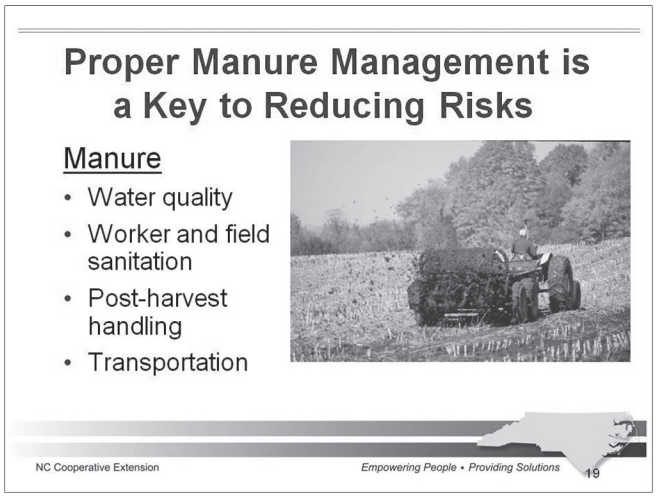


PPT 2-17: U.S. Food and Drug Administration (FDA) Guidance

This clearly has special importance for producers of organic products.

PPT 2-18: Fertilization Practices

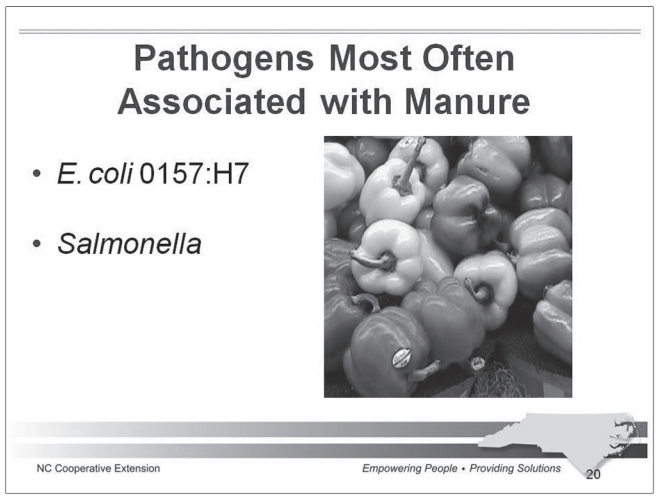
Inorganic fertilizers are less likely to have pathogens than compost, but well-composted materials are also quite usable.



PPT 2-19: Proper Manure Management Is a Key to Reducing Risks

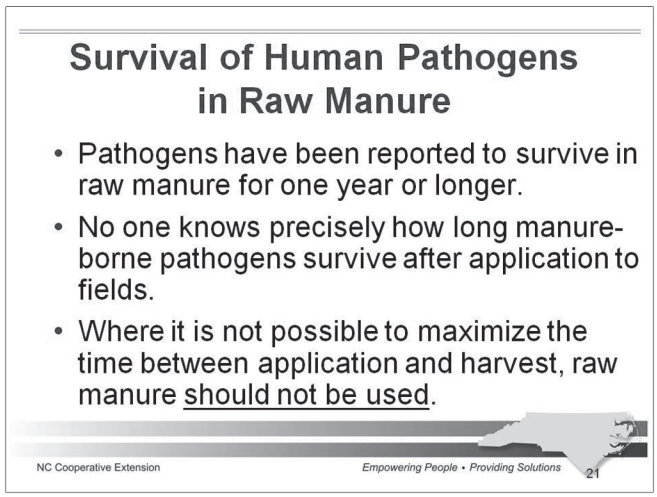
Proper handling of manures and biosolids is crucial to a successful food safety program. The use of properly composted manures is preferred over the use of raw manure.

The use of manure is highly regulated when used on crops. (See Module 5 on fertilizer and composted manure for greater details.)



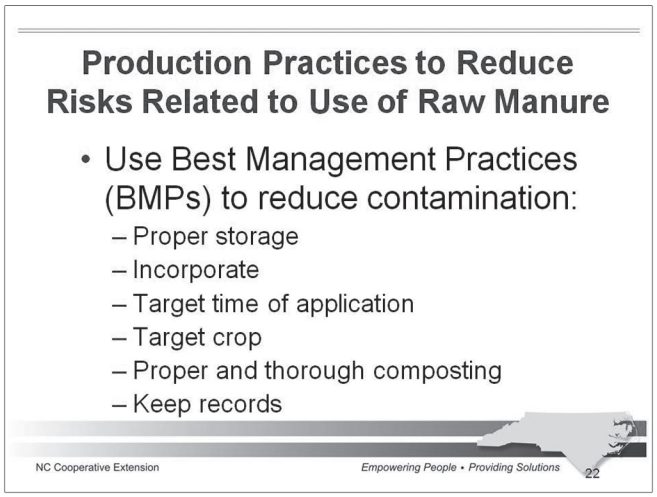
PPT 2-20: Pathogens Most Often Associated with Manure

Raw manures can be a source of contamination harboring a number of human pathogens, viruses and parasites. The two pathogenic organisms most commonly associated with food-borne illness outbreaks are *E. coli* and *Salmonella.*



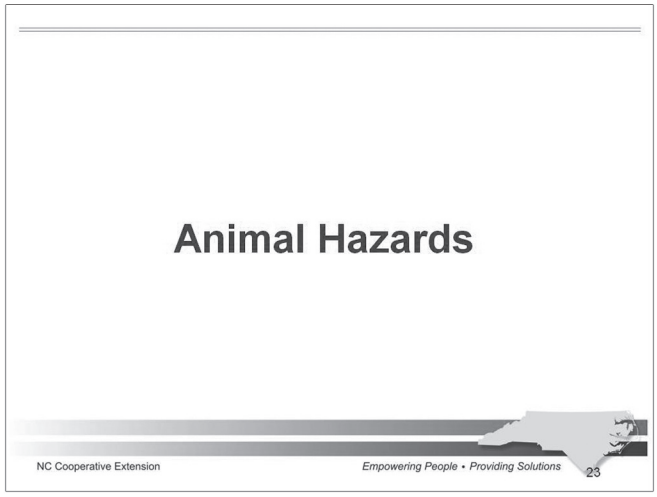
PPT 2-21: Survival of Human Pathogens in Raw Manure

If the use of manure cannot be managed to prevent contamination or at least reduce the level of contamination risk to a negligible level, do not use raw manure on a food crop.



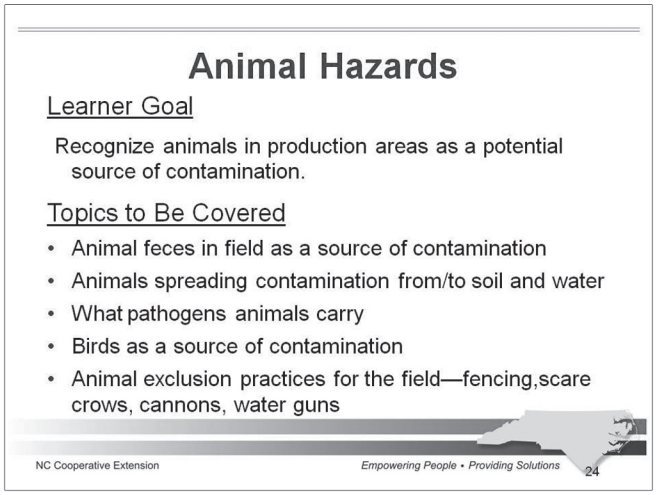
PPT 2-22: Production Practices to Reduce Risks Related to Use of Raw Manure

Use management practices that prevent cross contamination or that properly compost raw manures. Keep records!



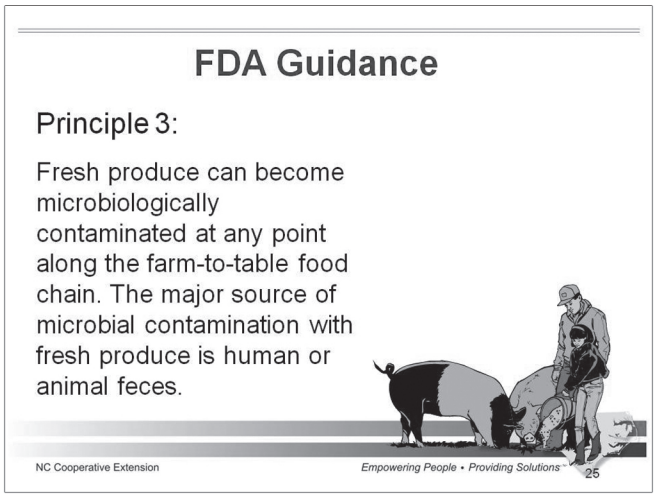
PPT 2-23: Animal Hazards

No notes



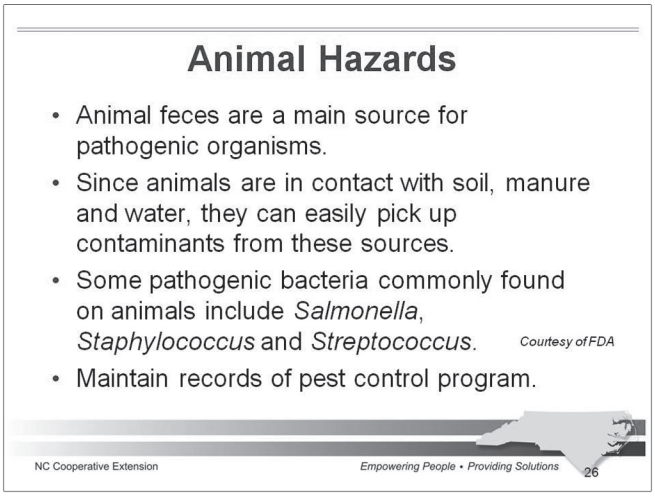
PPT 2-24: Animal Hazards

No notes



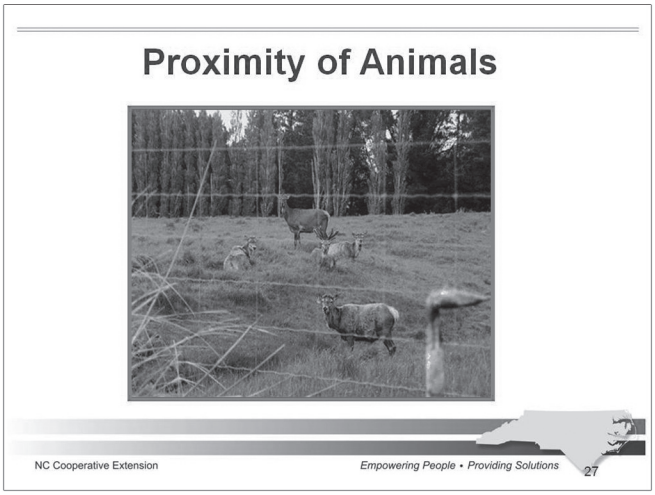
PPT 2-25: FDA Guidance

Vigilance is required of every food handler from the field to the dinner table.



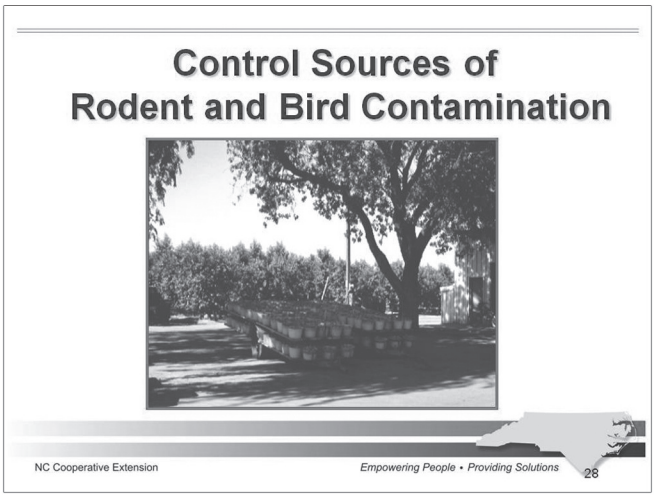
PPT 2-26: Animal Hazards

Animal waste is another important source of contamination.



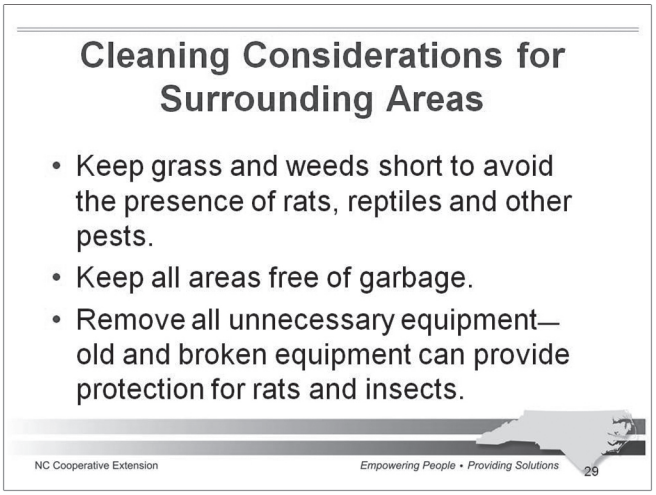
PPT 2-27: Proximity of Animals

Keeping wild animals out of agricultural lands is not always practical or even possible.



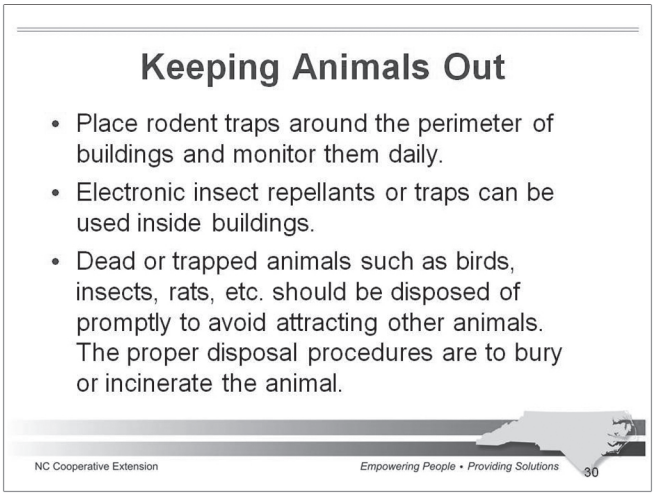
PPT 2-28: Control Sources of Rodent and Bird Contamination

Good intentions (keeping produce shaded) sometimes have negative consequences. Birds in the trees may contaminate the fruit stored under the trees!



PPT 2-29: Cleaning Considerations for Surrounding Areas

All animals have the potential to cause contamination. Animals should be kept away from production and handling areas (agricultural fields, storage facilities, packaging areas, machinery, etc.), in order to prevent the contamination of fresh fruit and vegetables with biological hazards that can harm the consumer.

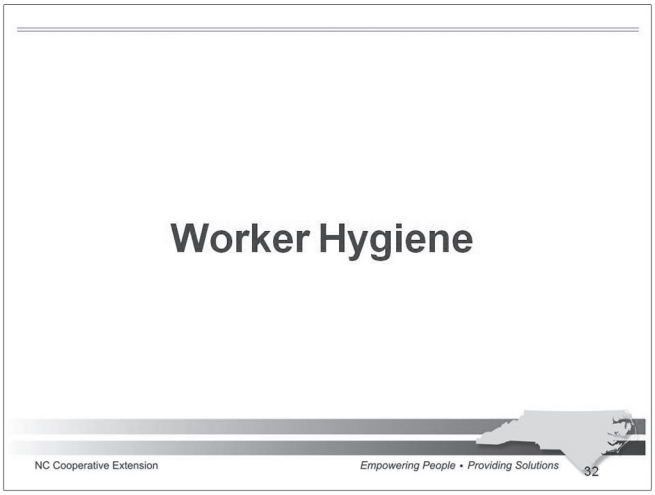


PPT 2-30: Keeping Animals Out

No notes

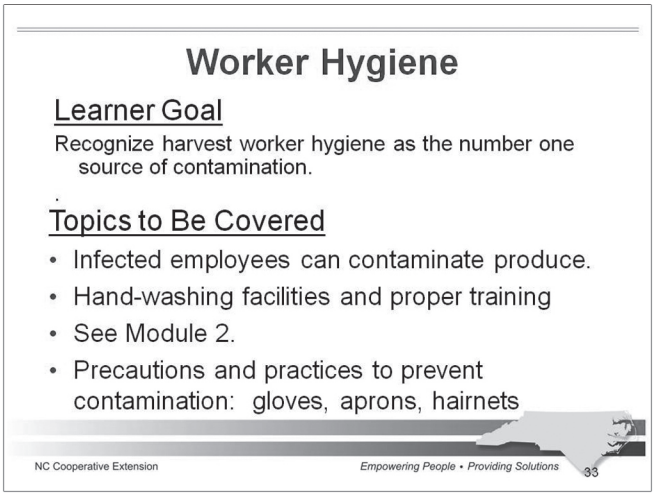
PPT 2-31: Rats with Wings?

No notes



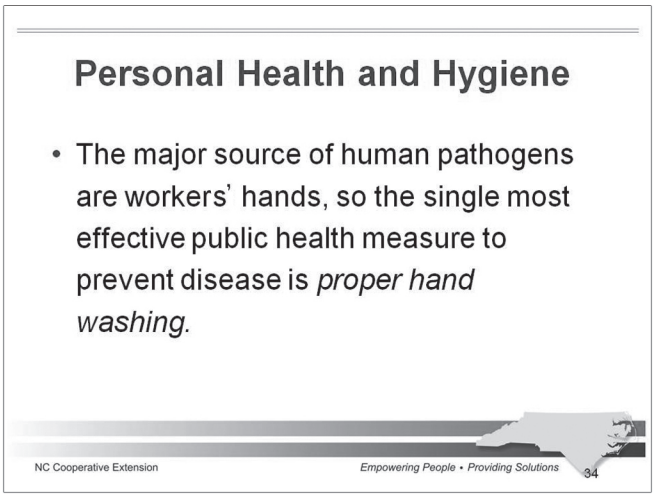
PPT 2-32: Worker Hygiene

No notes



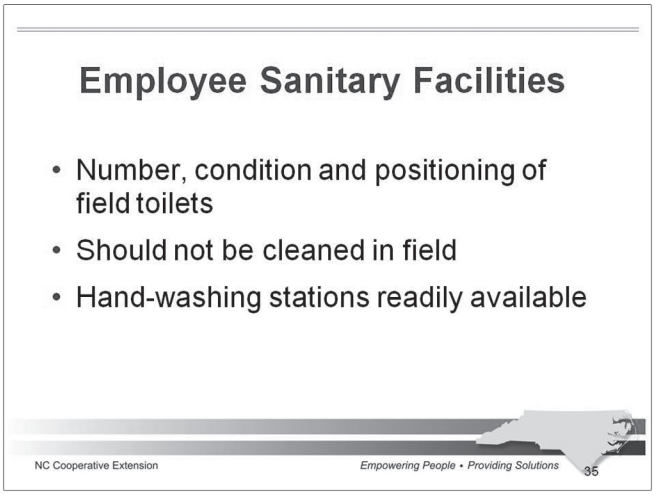
PPT 2-33: Worker Hygiene

No notes



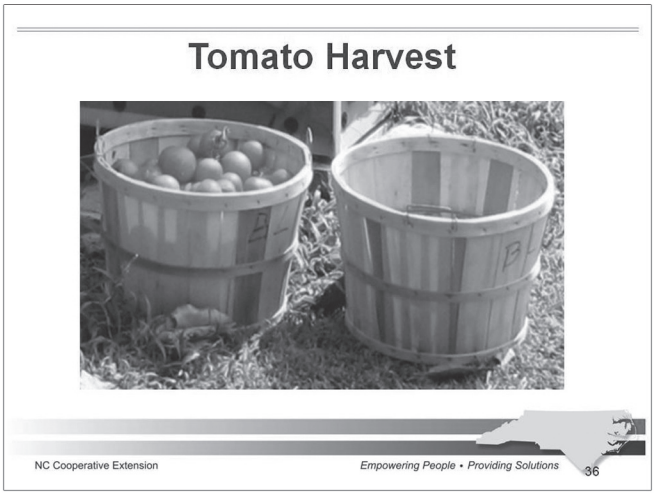
PPT 2-34: Personal Health and Hygiene

Proper hand washing before handling produce can be an effective disease prevention measure.



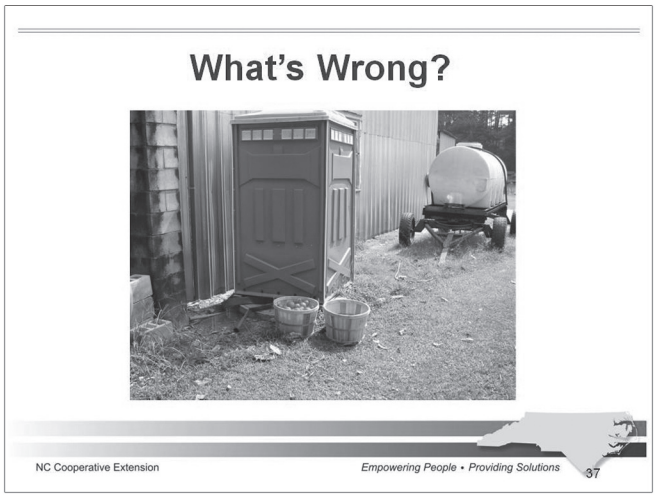
PPT 2-35: Employee Sanitary Facilities

Sanitary facilities in the field are better known as "port-a-johns." Federal law states there should be one "port-a-john" and hand-washing station for every 20 field workers, and the sanitary facilities should be stationed no farther than one-quarter mile from the work activities and workers. Facilities need to be easily accessible for cleaning. A response plan needs to be in place in the event of a major spill or leak. Check with the service provider to determine if they have a spill or leak response plan in place. Records of cleaning and servicing should be maintained.



PPT 2-36: Tomato Harvest

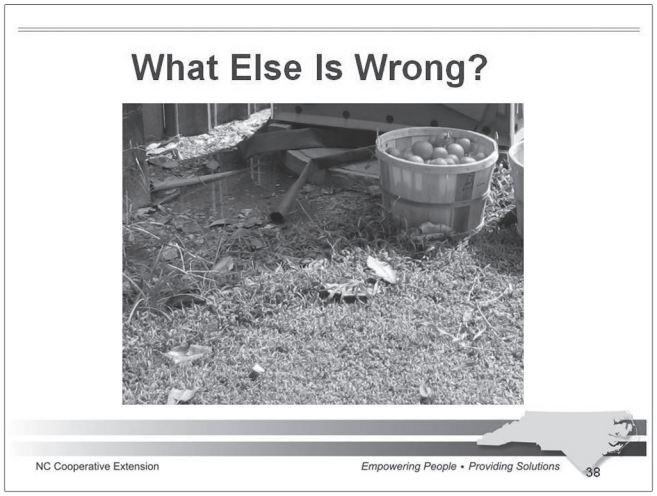
No notes



PPT 2-37: What's Wrong?

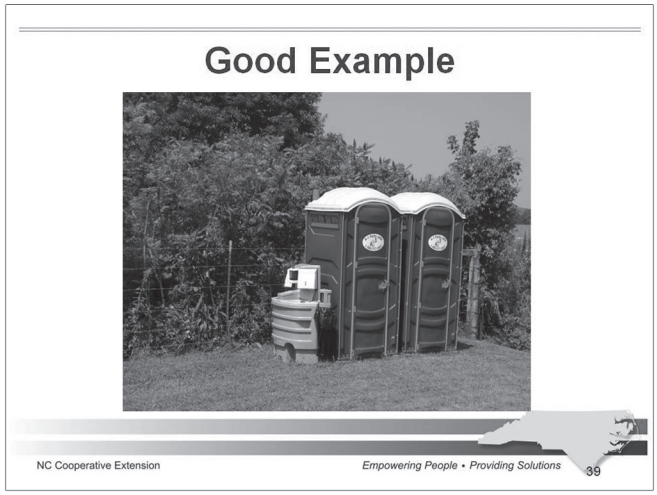
So what's wrong in this picture?

Produce is too close to the facility. There is no visible hand-washing station (maybe inside the facility). What about the portability of this unit? Is it near the field?



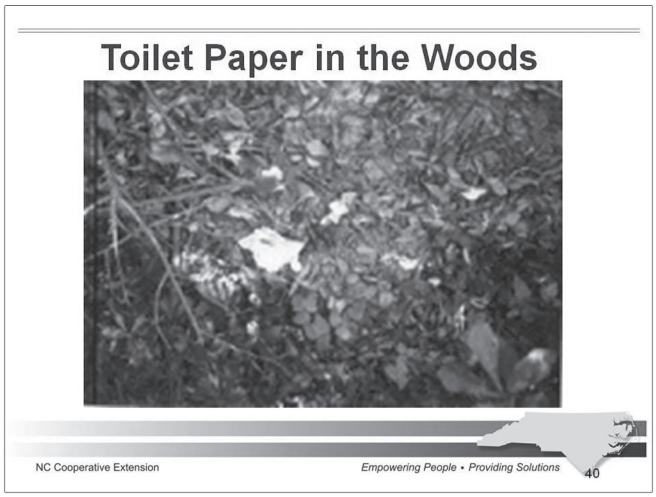
PPT 2-38: What Else Is Wrong?

Also, notice drainage water near the basket.



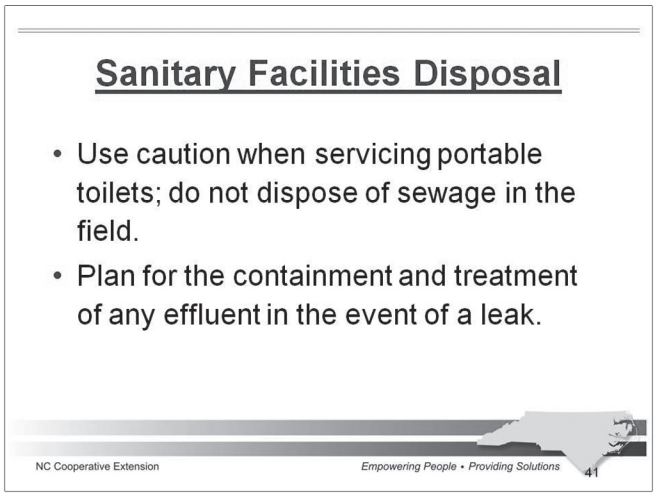
PPT 2-39: Good Example

No notes



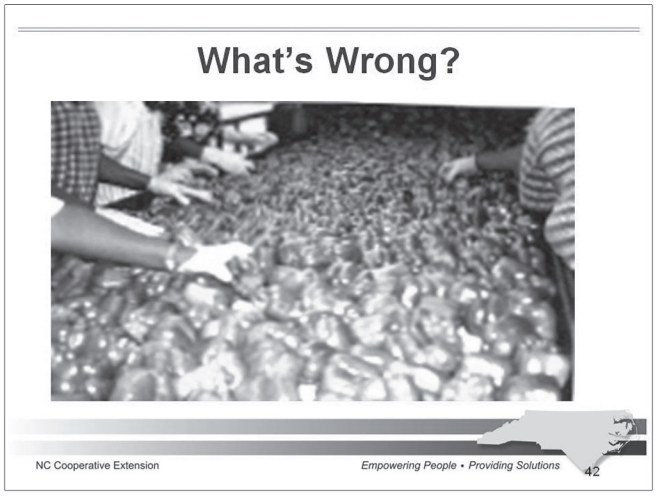
PPT 2-40: Toilet Paper in the Woods

Workers will take the easy route in taking care of business. Then how are they to wash their hands?



PPT 2-41: Sanitary Facilities Disposal

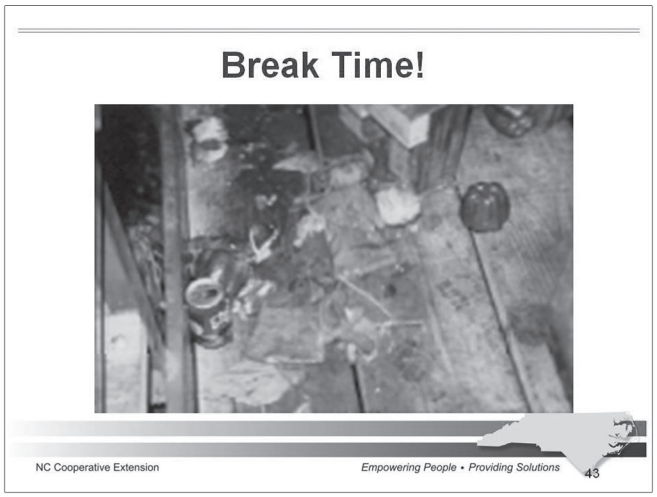
Growers should never empty sewage from "port-a-johns" directly onto a field. Some pathogenic bacteria and viruses can survive for up to a year in fertile topsoil.



PPT 2-42: What's Wrong?

Although these packing-house workers are wearing gloves, another hazard is present. The plastic or glass dial face of the wristwatch can easily loosen or be broken and fall into the processing line.

Activity: Break into small groups to identify problems in photos. Then show photos on screen of PPT 42, PPT 43, PPT 44, PPT 45. Have participants analyze what is wrong or what is the problem area in each picture. Have each person in the group write down how they would address the problem issue.

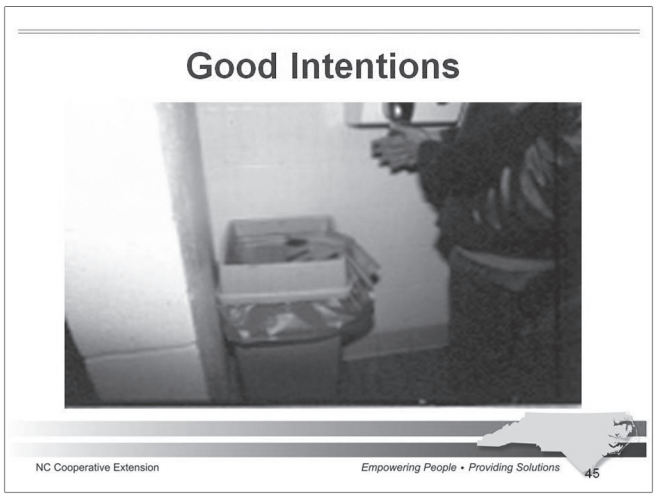


PPT 2-43: Break Time!

Here is what some workers do with their gloves when it's time for a break.

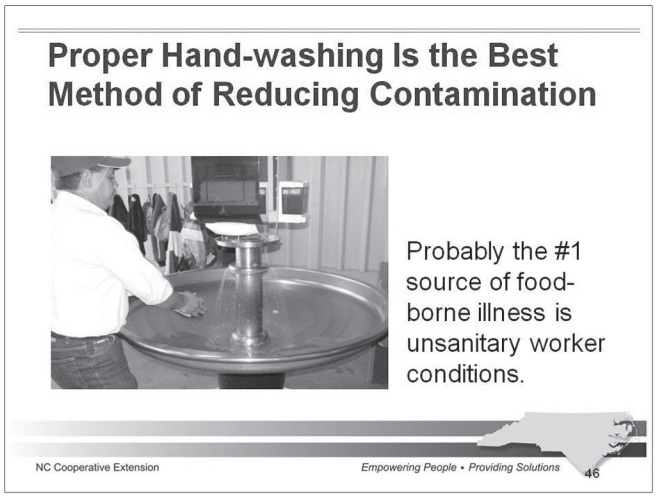
PPT 2-44 : Mmmm—Tastes Good!

Good Management Practices (GMPs) dictate that workers should never be allowed to eat, smoke or drink while working on a grading belt.



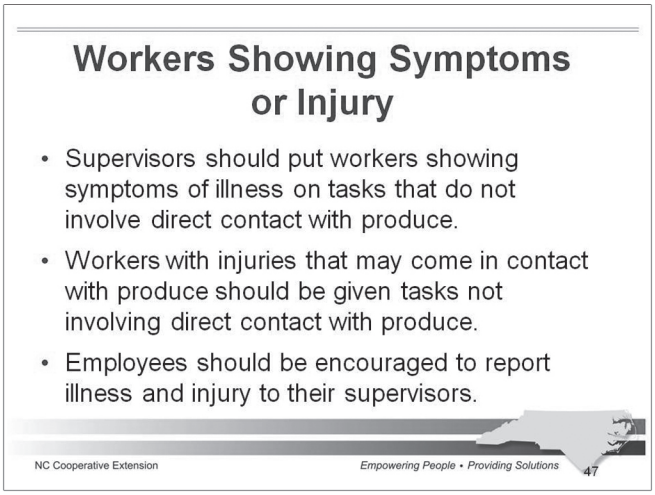
PPT 2-45: Good Intentions

Here is an employee using good personal hygiene, but look where he has placed his gloves!



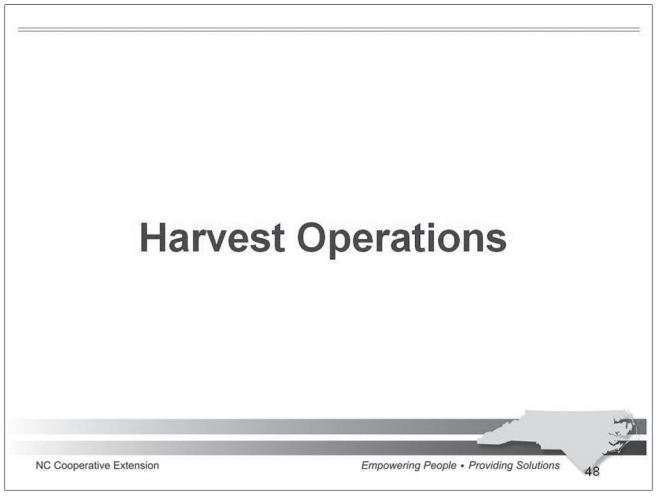
PPT 2-46: Proper Hand-Washing Is the Best Method of Reducing Contamination

No notes



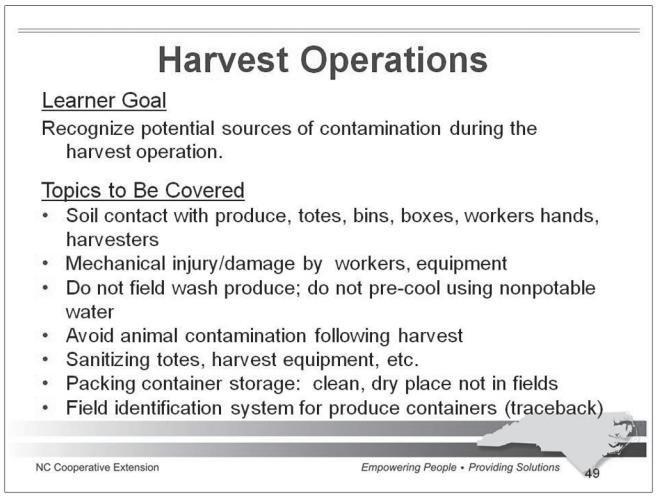
PPT 2-47: Workers Showing Symptoms or Injury

No notes



PPT 2-48: Harvest Operations

No notes



PPT 2-49: Harvest Operations

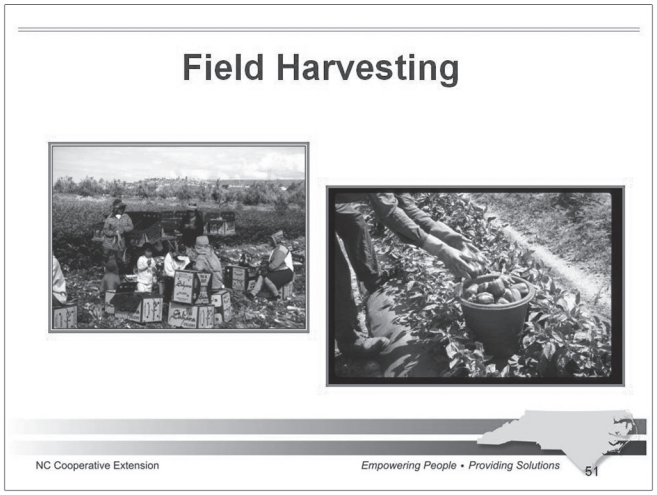
No notes

PPT 2-50: Field Work

Field sanitation is a critical step in GAPs implementation. Field packing has its own special requirements since the product may go directly from the field to the consumer in the same package. Buyers or third-party certifiers may have specific recommendations.

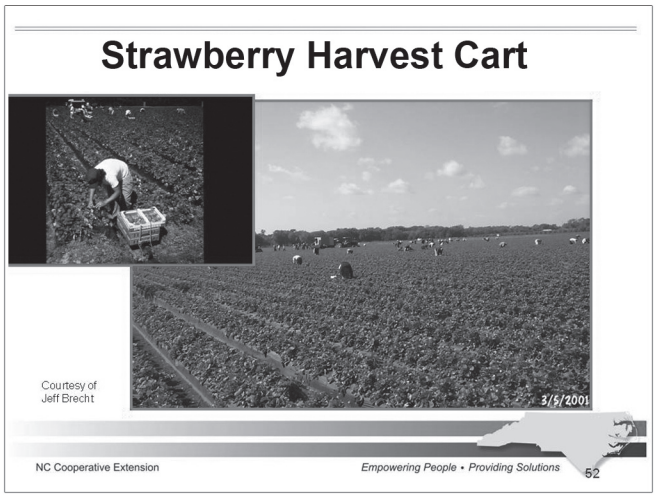
Proper cleaning and handling of bins or other harvest containers is essential. Assure that cross contamination between animal and produce operations does not occur.

- Bins and Harvest Containers
- Field Equipment
- Field Packing
- Bins

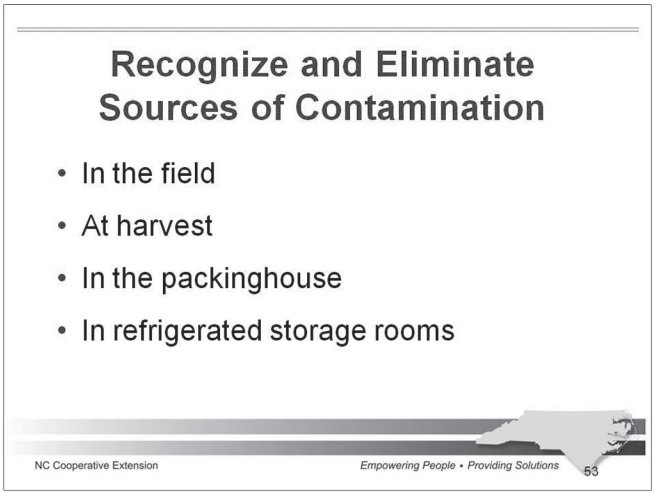


PPT 2-51: Field Harvesting

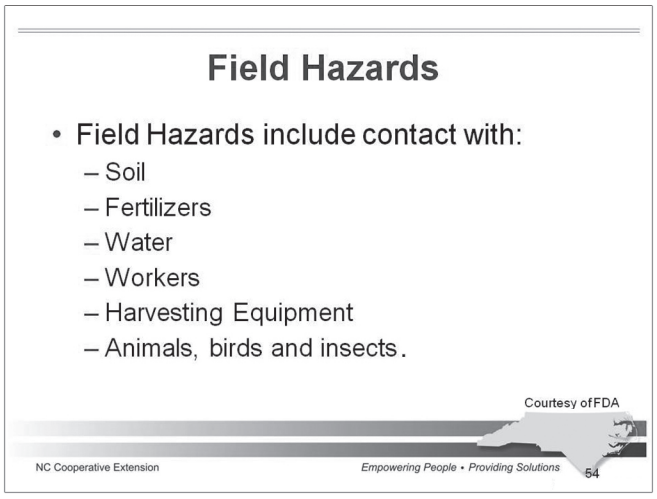
There are many opportunities for fresh produce to be contaminated by human contact. Here are a few of them.



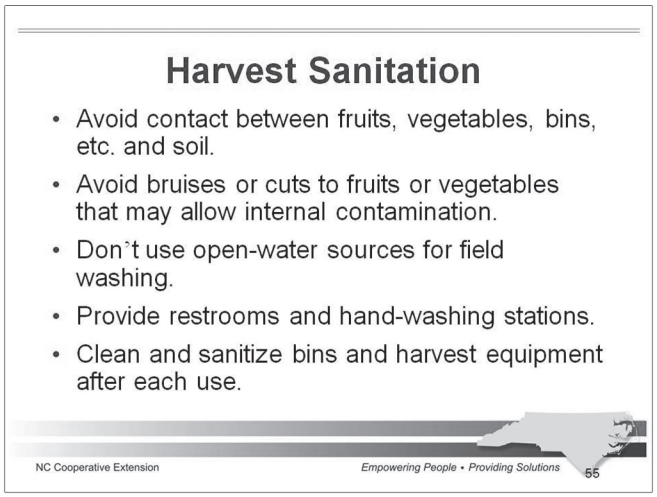
PPT 2-52: Strawberry Harvest Cart
And more examples.



PPT 2-53: Recognize and Eliminate Sources of Contamination
Follow these steps.

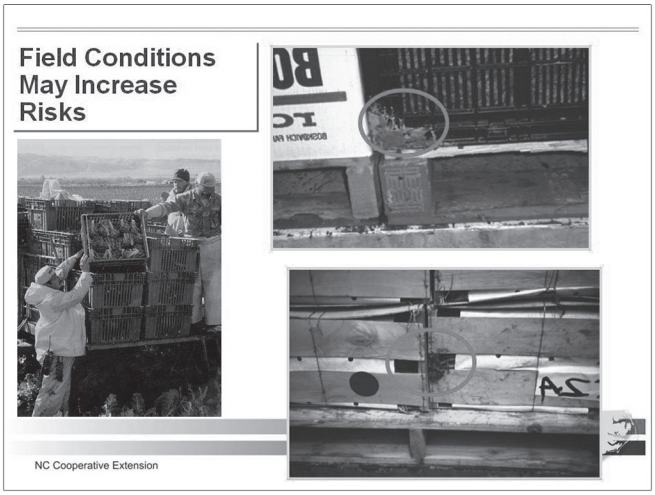


PPT 2-54: Field Hazards
Field hazards are important concerns.



PPT 2-55: Harvest Sanitation

Harvest time is a critical time in crop sanitation.



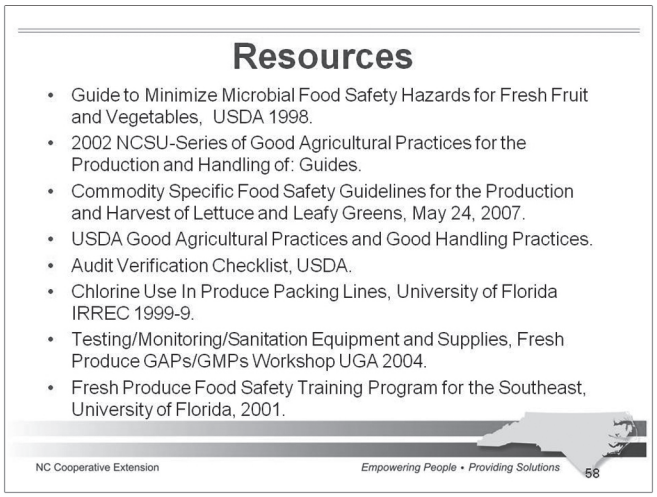
PPT 2-56: Field Conditions May Increase Risks

Soil carried from the field on containers becomes a source of contamination in the packing house. Clean and sanitize (disinfect) harvest containers and harvesting implements prior to use. Equipment should be in good repair. Light bulbs and glass on harvest equipment are protected against breakage and contamination of produce.

PPT 2-57: Summary

No notes

Activity: Post Test



PPT 2-58: Resources

No notes

Module 2: GAPs Field Practices

Pre-Test/Post-Test

ID Number/Name: _____ Date: _____

1. Land-use history plays a major role in the potential for produce contamination. ..... True or False

2. Well water is less likely to contain pathogens depending on depth.. ..... True or False

3. Overhead irrigation is more likely to spread contamination to plant parts than root zone irrigation.. ..... True or False

4. Water used in the field for uses other than irrigation, for example frost protection or pesticide application, can be a source of contamination. ..... True or False

5. Raw or uncomposted manure can be used during the growing season.. ..... True or False

6. Composted manure can be recontaminated by birds, rodents, animals and wind or water contaminants.. ..... True or False

7. The farm owners' dog is allowed in production fields, when accompanied by the farmer..... True or False

8. The hygience of harvest workers plays no role in contaminating fresh produce..... True or False

9. Soil contact with produce bins can be a source of contamination.. ..... True or False

10. Pests and rodents in the packing facility may contaminate produce during grading or storage.. ..... True or False

Module 2: GAPs Field Practices

Pre Test/ Post Test Answers

1. Land-use history plays a major role in the potential for produce contamination. ..... **True** or False

2. Well water is less likely to contain pathogens depending on depth.. ..... **True** or False

3. Overhead irrigation is more likely to spread contamination to plant parts than root zone irrigation.. ..... **True** or False

4. Water used in the field for uses other than irrigation, for example frost protection or pesticide application, can be a source of contamination. ..... **True** or False

5. Raw or uncomposted manure can be used during the growing season.. ..... True or **False**

6. Composted manure can be recontaminated by birds, rodents, animals and wind or water contaminants.. ..... **True** or False

7. The farm owners' dog is allowed in production fields, when accompanied by the farmer..... True or **False**

8. The hygience of harvest workers plays no role in contaminating fresh produce..... True or **False**

9. Soil contact with produce bins can be a source of contamination.. ..... **True** or False

10. Pests and rodents in the packing facility may contaminate produce during grading or storage..... **True** or False

Module 2: GAPs Field Practices

Activity – ID Problems
(Time: 10 minutes)

1. Break into small groups to ID problems in a photo. Then show photo on screen (slide #37).

2. Have participants analyze wrong is wrong or what the problem area is.

(Example: Display photo of produce field downslope from a cow pasture. Have each person in group write down how they would address the issue if they see a problem. Share results within group and with other groups.)