

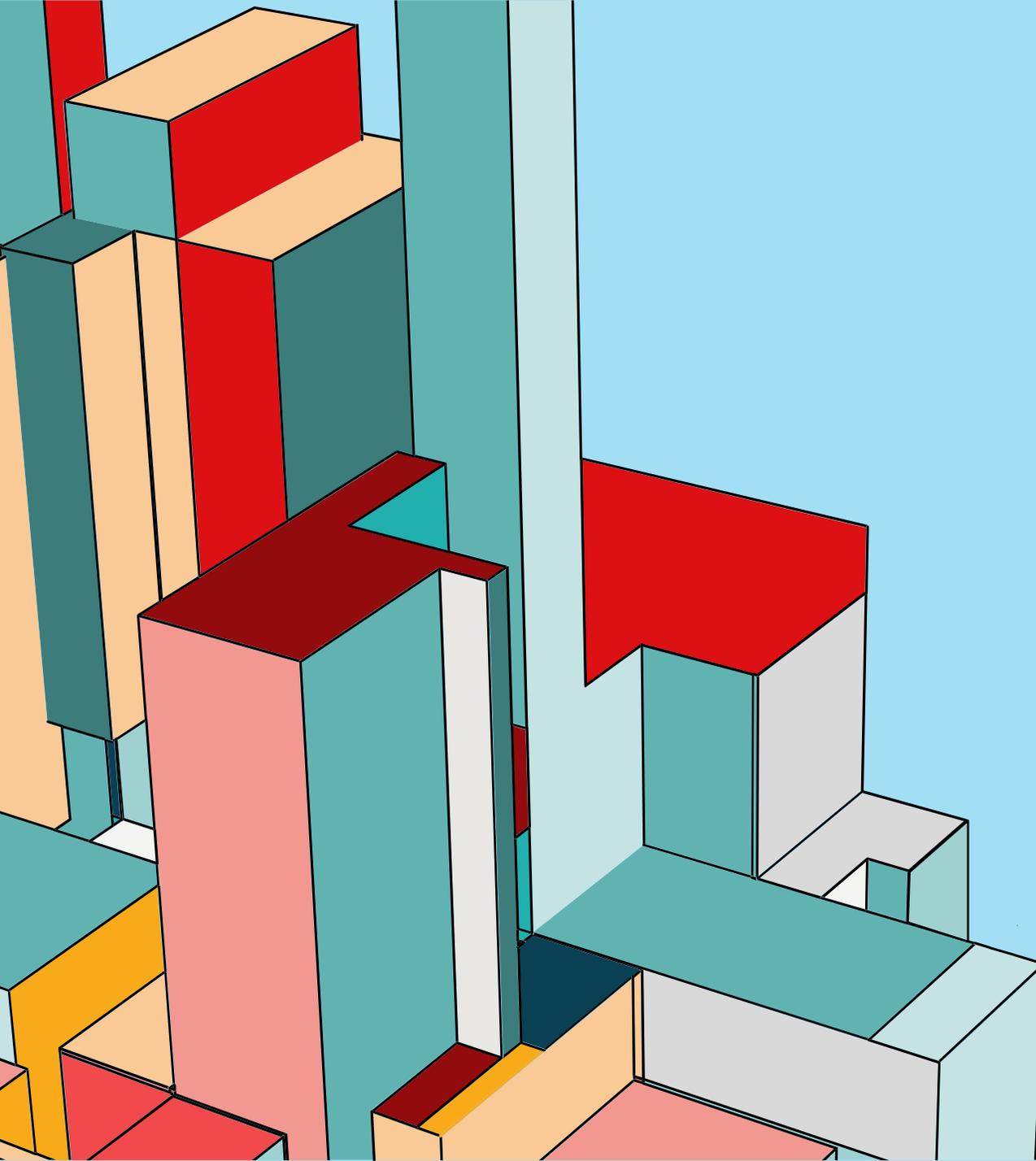


This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under agreement number 2021-38640-34714 through the North Central Region SARE program under project number LNC21-446. USDA is an equal opportunity employer and service provider. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

CULTIVATE The logo for Cultivate KC. The word "CULTIVATE" is in large, bold, green letters. To the right of "CULTIVATE" is a small green icon of a leaf with the letters "KC" inside it.



National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE



Water in the Garden

RAIN OR NO RAIN



- Rain falls gently and soaks into soil
- This water in the soil is available for plants
- IF very heavy rains, there can be flooding, or water rushing from high places and collecting in low places- Flood
- If lack of water, plants do not grow well.- Drought
- Climate and seasons play a role in the rains.
- DRY Farming- choice to not use any irrigation. Only rely on rains



FOOD SAFETY

Surface Water:

From river, or pond

From rain catchment

Highest food safety risk

Sometimes requires filtering and

Timing

Pre harvest- as crop is growing

Post harvest- after mature and fully grown

Potable water

Water is clean

- Safe for drinking
- Safe for washing produce.

From BPU in Kansas City

Lowest Food Safety Risk

Water is expensive.

As per the Land Lease and Service contract, water bill is paid by Cultivate KC to BPU

→ Each farmer will be charged a monthly water bill.

SCHEDULE:

Water is available in the greenhouse.

Water is available at the washstand, From Mid April to Mid Oct.

Water at each farm plot will be measured by a meter. This is what determines the payment amount.

Water is connected by staff. **Farmer Trainer will help you build out a system to water your plot.**

COST:

Free for each first year. Then each farmer pays for repairs and changes to the irrigation system.

Questions?

Supplies available at JGTF

Overhead

- Watering hose- 200 ft included for 1st years
- **Wobblers**- 20ft circle of water
 - Low pressure systems- save water
 - Usually built into lines
- Sprinklers
 - Full pressure hose, heavy water spray

Drip Irrigation

- **Drip tubes**- sturdy pipes, permanent investment,
- Drip tape- lays flat when not in use, cheaper
- Valves- shut off parts of irrigation system
- Connector - used to fix leaks and holes in pipes.

IRRIGATION- HOW FARMERS APPLY WATER TO CROPS

- Changing seasons- changing water needs
 - Crop selection
- Organic matter (mulches increase water holding capacity)
 - How can you build organic matter?
- Deep watering- water as deep as the root zone of crops.
- Soil infiltration (run-off, berm and swale, raised beds, drainage)



HOW TO BUILD AN IRRIGATION SYSTEM

Irrigation zones-

Smaller areas that get distinct water plans. Put plants with similar water needs together.

This shows a zone using drip Irrigation. This mainline is where the water comes in, then flowing down the drip Tubes delivering water to the roots on the plants.





WATER PRESSURE

Too much pressure is BAD, it can

1. break fittings, or valves in irrigation systems
2. make leaks in hoses
3. bust the heads off watering hoses

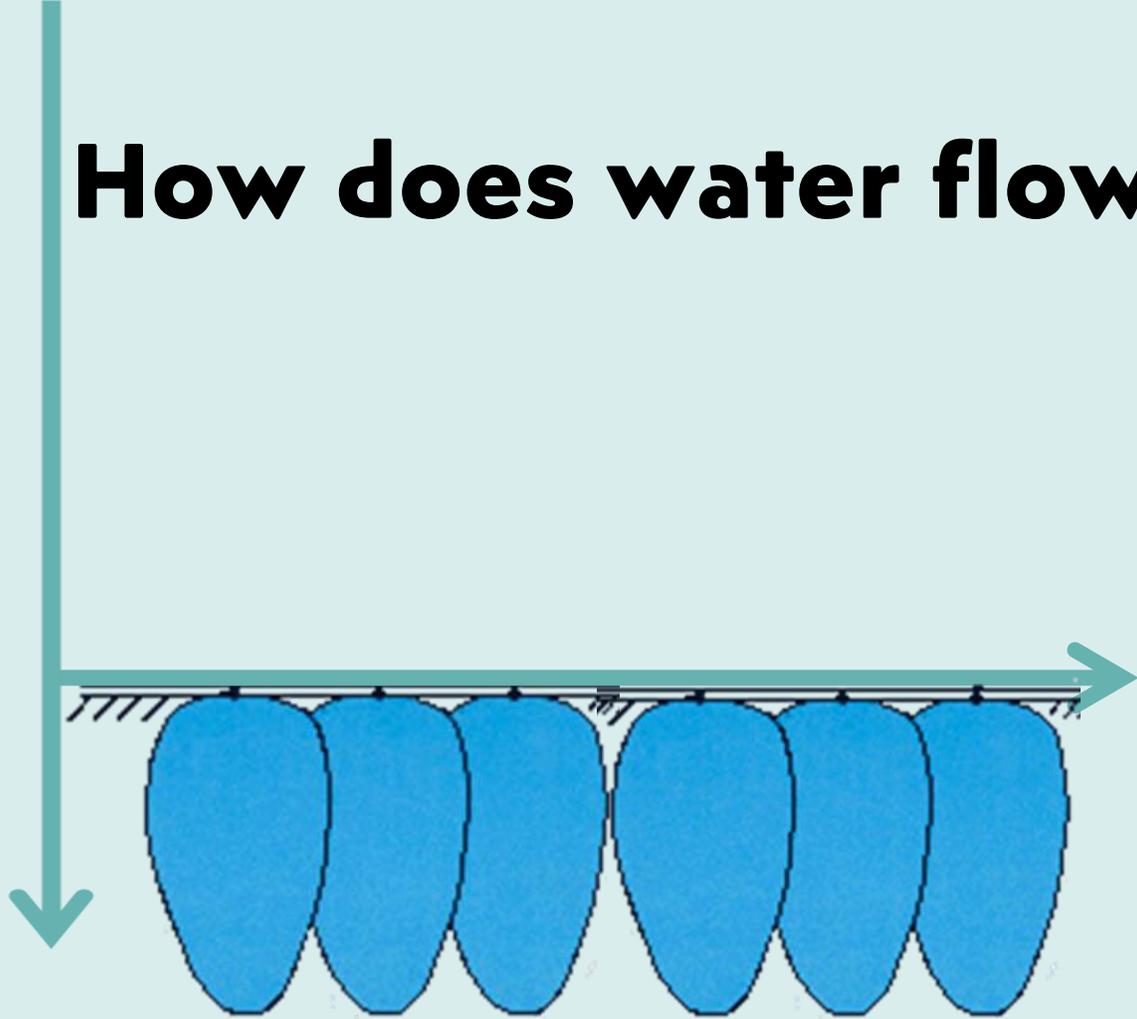
Too little pressure? Farmer might need to practice zone watering to maintain several smaller systems.



Always use a pressure regulator in irrigation systems, this puts a limit on the force of water in the system.

Is this water **on** or **off**?

How does water flow? What soil type?



Wetted Area Appearing on Soil Surface

Sandy



Loam

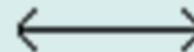
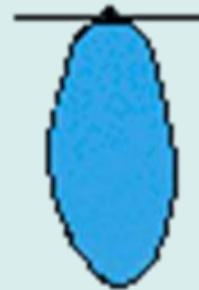


Clay



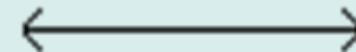
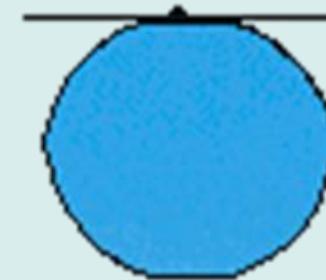
Cross Section of Wetted Area in Soil

Sandy



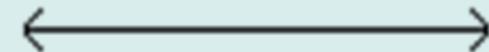
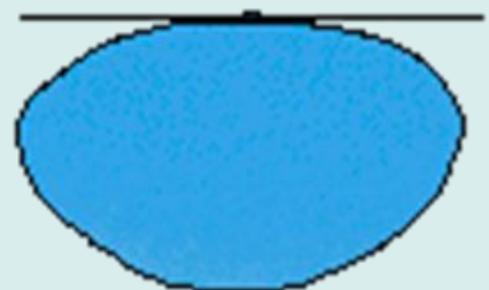
2' to 3'

Loam



3' to 5'

Clay



5' to 7'

Clay soils distribute water underground.
Next slide from KS garden guide

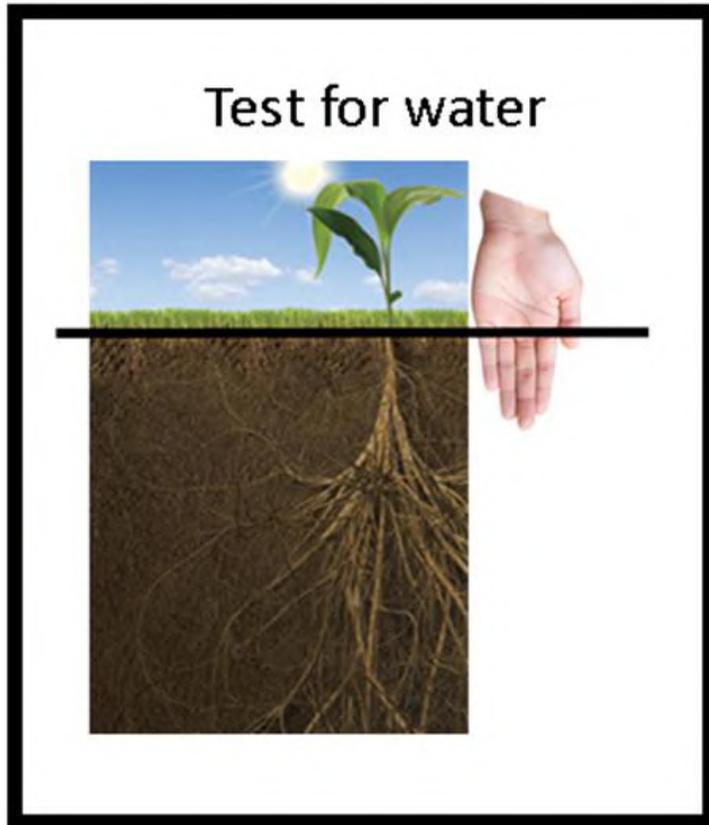
Effective Rooting Depths of Selected Vegetable Crops (top 50% of root zone)

Shallow (6-12")		Moderate (18-24")		Deep (over 24")	
Arugula	Lettuce	Beans	Kohlrabi	Asparagus	Squash
Bok Choy	Onions	Beets	Okra	Melons	Tomatoes
Celery	Radish	Broccoli	Peas	Pumpkins	Watermelon
Chives	Spinach	Cabbage	Peppers		
Endive	Swiss Chard	Carrots	Potatoes		
Fennel		Corn	Sweet potatoes		
		Cucumbers	Turnips		
		Eggplant	Tomatillos		
		Kale			

Periods of Critical Water Needs in Crops' Life Cycle

Stage	Crop
Germination	Seedlings, especially summer and fall crops
Transplanting	All transplanted crops
Pod enlargement	Beans, peas
Head development	Cabbage, broccoli, cauliflower
Root enlargement	Carrot, onion, potato, radish
Flowering to early fruit set	Corn, cucumbers, squash
Early fruit development	Melons
Uniform all season	Tomatoes, peppers, eggplant, lettuce

Deep watering- natural with slow, gentle rain, soaks into soil surface



Flooding/ RUN off : too much water that it cannot soak in where it falls, it moves and collects in lowest areas

What is best example of deep watering?

- A. Drip irrigation for 15 minutes every morning and evening
- B. 30 minutes drip irrigation only 2x per week
- C. 20 minutes daily hand watering

EVERY day on the farm
water ON at 7 AM
water OFF at 9 PM

Keep hoses and all supplies off the grass.
They must be on a pallet or inside your plot.

Ask Haley for help with building zones, or
any irrigation in your plot.

If you see a problem with washstand, main
pipes, or any problem with the meter,
please contact Ben- site manager.

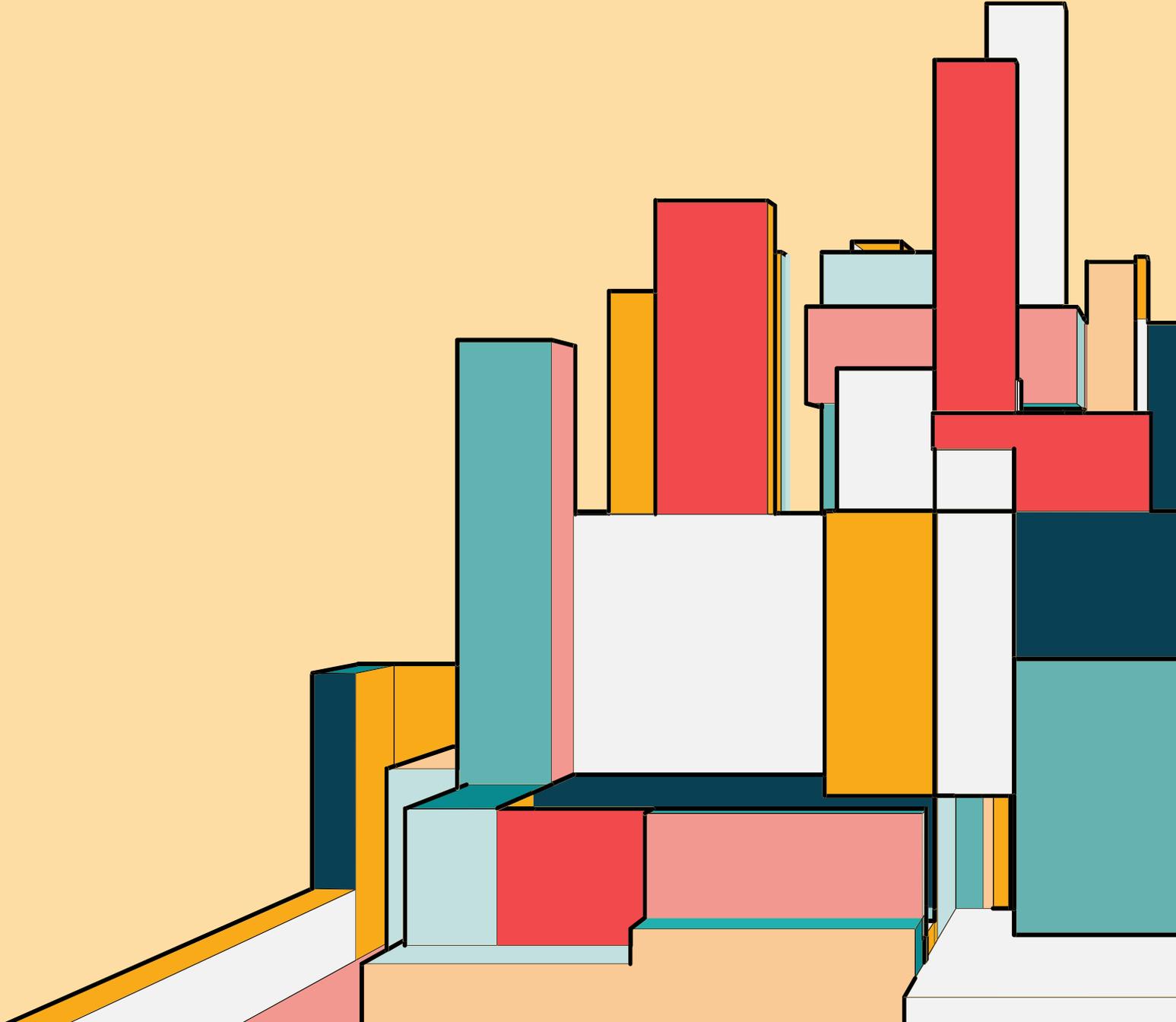
TEACH BACK

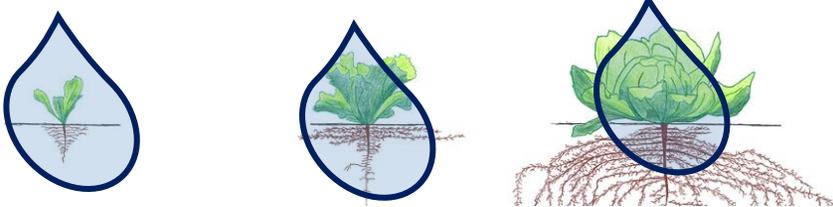
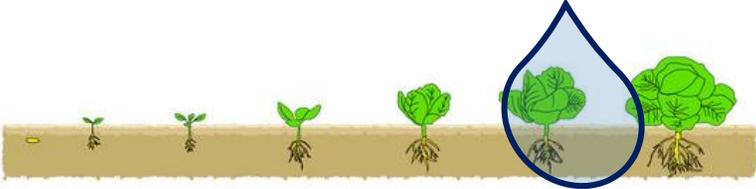
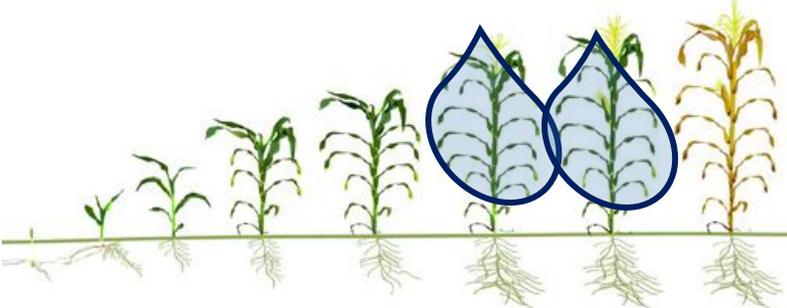
1. Describe when overhead watering is a good practice.
2. Describe when drip irrigation is a good practice.
3. Explain how to check soil moisture.
4. Explain deep watering
5. Explain the importance of pressure regulator.

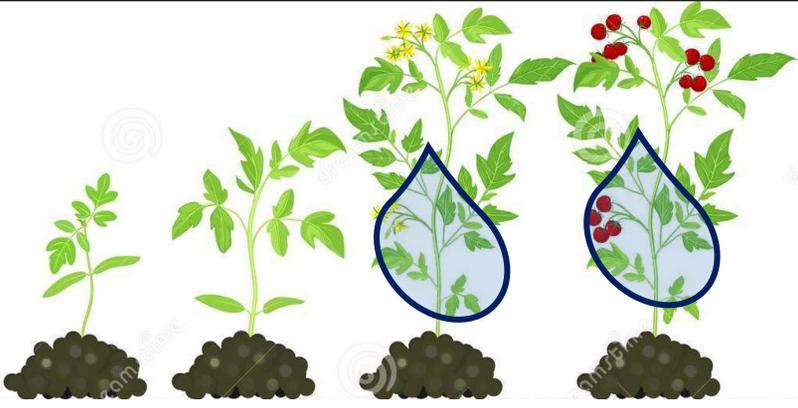
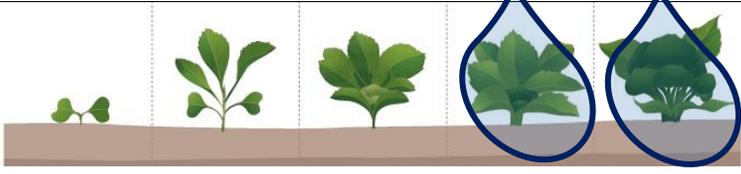
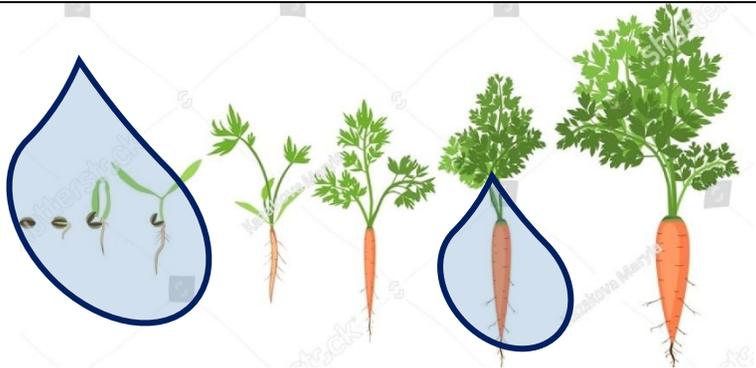


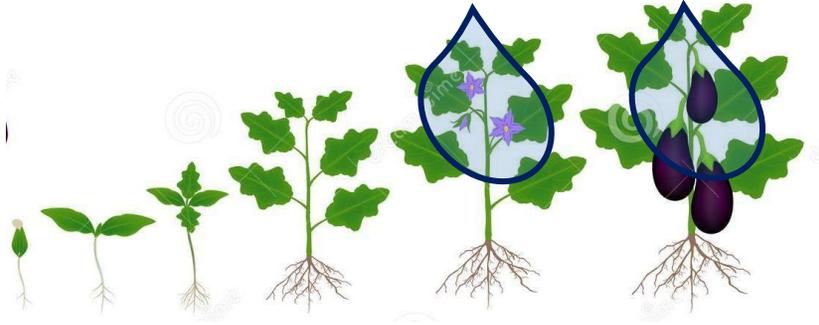
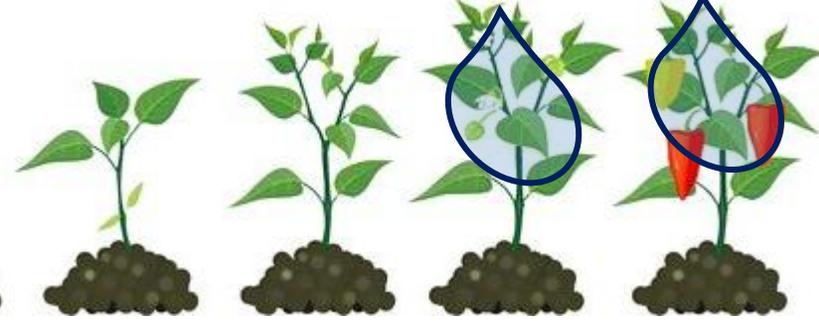
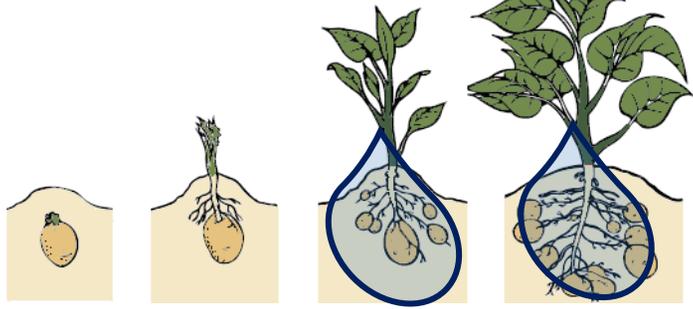
THANK YOU

Haley Drake



CROP	WHEN to water? Circle the correct plant growth stage		Water Demand
Greens/Leafy Vegetables/ Spinach	Continuous		HIGH
Onions	Bulb enlargement		Medium
Cabbage	Head development		HIGH
Sweet Corn	Silking and tasseling, ear development		HIGH

<p>Tomatoes</p>	<p>Early flowering, fruit set, and enlargement</p>	 <p>The illustration shows four stages of tomato plant growth from left to right. The first stage is a seedling with two leaves. The second stage is a seedling with four leaves. The third stage is a seedling with yellow flowers, with a blue water drop icon overlaid on the stem. The fourth stage is a mature plant with red tomatoes, also with a blue water drop icon overlaid on the stem.</p>	<p>HIGH</p>
<p>Broccoli</p>	<p>Head development</p>	 <p>The illustration shows four stages of broccoli plant growth from left to right, all within a single soil layer. The first stage is a small seedling. The second stage is a seedling with more leaves. The third stage is a seedling with a developing head, with a blue water drop icon overlaid on the head. The fourth stage is a mature broccoli head, also with a blue water drop icon overlaid on the head.</p>	<p>MEDIUM</p>
<p>Carrots</p>	<p>Germination and root enlargement</p>	 <p>The illustration shows five stages of carrot growth from left to right. The first stage is a seedling with two leaves, with a blue water drop icon overlaid on the stem. The second stage is a seedling with two leaves and a small root. The third stage is a seedling with two leaves and a larger root. The fourth stage is a seedling with two leaves and a large root, with a blue water drop icon overlaid on the root. The fifth stage is a mature carrot with a large root and leafy tops.</p>	<p>High</p>
<p>Beets</p>	<p>Root enlargement</p>	 <p>The illustration shows six stages of beet growth from left to right. The first stage is a seedling with two leaves, with a blue water drop icon overlaid on the stem. The second stage is a seedling with two leaves and a small root. The third stage is a seedling with two leaves and a larger root. The fourth stage is a seedling with two leaves and a large root. The fifth stage is a seedling with two leaves and a large root, with a blue water drop icon overlaid on the root. The sixth stage is a mature beet with a large root and leafy tops.</p>	<p>MEDIUM</p>

<p>Eggplant</p>	<p>Flowering and fruit development</p>		<p>MEDIUM</p>
<p>Peppers</p>	<p>Flowering and fruit development</p>		<p>MEDIUM</p>
<p>Potatoes</p>	<p>Tuber set and tuber enlargement</p>		<p>MEDIUM</p>
<p>Squash</p>	<p>Bud development and flowering</p>		<p>LOW</p>

<p>Cucumbers</p>	<p>Flowering and fruit development</p>	 <p>The illustration shows five stages of cucumber plant growth from a seedling to a mature plant with cucumbers. Two blue water droplets are overlaid on the flowering and fruiting stages, indicating water requirements.</p>	<p>LOW</p>
<p>Beans</p>	<p>Flowering and pod enlargement</p>	 <p>The illustration shows four stages of bean plant growth from a seedling to a mature plant with pods. A single blue water droplet is overlaid on the pod enlargement stage, indicating water requirements.</p>	<p>LOW</p>
<p>Peas</p>	<p>Flowering and seed enlargement</p>	 <p>The illustration shows seven stages of pea plant growth from a seedling to a mature plant with pods. Two blue water droplets are overlaid on the flowering and seed enlargement stages, indicating water requirements. The text 'PEA PLANT GROWTH infographic elements' is visible in the top left of the illustration area.</p>	<p>LOW</p>