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Instructor Guide

Lesson Title/Topic: Climate Resilient Farming

Length: 90 minute interactive workshop

Description: This lesson plan accompanies the power point titled, "Climate Resilient Farming Presentation." This workshop introduces the basic concepts of climate resilient agriculture by: explaining how climate change is changing the weather, why our climate is changing, how changing weather is making it harder to grow crops, two kinds of climate risk management strategies - protect and adapt - that promote climate resilience in vegetable production, and some examples of effective practices for each strategy used by small- and mid-scale diversified vegetable farmers in the U.S.

Objectives

Participants will be able to…

1. Describe some weather conditions that are making growing more difficult at your farm and how weather conditions are expected to change in the near future.
2. Describe the characteristics of adaptable farmers, land, and community.
3. Describe some Adapt practices that farmers can use to cultivate the climate resilience of their farm.
4. Describe some Protect practices that farmers can use to cultivate the climate resilience of their farm.
5. Describe some examples of Protect and Adapt practices that they already use and one new climate resilience practice that they want to try in the future.

Materials/Resources:

- Introduction to Climate Resilience (powerpoint presentation) w/group discussion periods
- Workshop Handout
- Qualities of a Climate Resilient Farm: Adaptable farmer, adaptable land, adaptable community (poster)
- A Climate Resilience Toolbox for Vegetable Growers presents different climate resilience practices according to the climate risks they help to reduce (poster)

Vocabulary:

- Atmosphere: The layer of air that surrounds the earth.

SARE
Sustainable Agriculture Research & Education

- Weather: The day-to-day temperature, light, and moisture conditions of the atmosphere in a particular place.
- Climate: The pattern of weather in a particular area over a long time.
- Cultivate: To create conditions that support the healthy growth and development of someone or something, for example healthy soils, healthy crops, healthy community.
- Protect: To keep safe from harm or injury.
- Adapt/Adaptable/Adaptability: To be able to change ideas or behavior in order to do well in changing conditions.
- Resilience: The ability to easily adapt to new or changing conditions and to think ahead and prepare for future changes.
- Protect Practices: Farming practices that reduce the chance of harm or injury to crops from bad weather without changing how you manage soil or the plants you grow, for example, irrigation and growing plants under cover.
- Adapt Practices: Farming practices that increase the adaptability of a farm to bad weather by improving soil health and increasing plant diversity, for example, shifting to no-till planting and adding cover crops.

References/Continued Learning:

Cultivating Resilience on Farms and Ranches. USDA SARE. 2018.

Resilient Agriculture: Cultivating Food Systems for a Changing Climate, 2nd Edition. New Society Publishers. 2022

Real World Resilience: Stories of Land, People and Community. Cultivating Resilience. 2023.

Course Content Warm-Up

Begin the lesson with a discussion question

If you knew for sure that we will have a long summer drought like last year, what crops would you grow? What would you plan to help those crops grow well in such hot and dry conditions?

I. Vocabulary Instruction

1. Show each vocabulary word with a picture, saying each word out loud. Give further explanations as needed.
2. Go through the words again and ask students to repeat the word after you.
3. Show students just the pictures of the vocab words and ask them to say the word.

II. Main Content

PART 1 - Weather, Climate, Climate Change and Farming

How is climate different from weather? Climate is the average weather in a region over a long period of time. Climate, particularly the length of the growing season, determines the kinds of crops that farmers can grow in a region. Weather is the day to day variability of the condition of the air (wet, dry, sunny, cloudy, hot, cold, windy) in a particular place within a region. Farmers use many different kinds of practices to help crops grow well in changing weather conditions during the growing season.

What is climate change? The earth is surrounded by a thick layer called the atmosphere. The atmosphere is like a blanket that surrounds the earth. When we burn fossil fuels like coal and natural gas for energy, it is like we are adding more blankets to the earth. The more blankets that we add, the more heat is trapped under the blankets and the hotter the earth becomes. This extra heat is changing the earth's climate and disrupting our weather.

How is climate change changing the weather? Weather is more variable, Seasonal weather patterns are changing, The growing season is getting longer, There are more very hot and very cold days, There are more very wet and very dry days, Damaging storms, floods, droughts, heat waves and cold waves happen more often.

How is climate change making it harder to farm? Seasonal weather patterns are changing:

- Winters are warmer and wetter, More rain, More warm periods, More big shifts in temperature, Plants and animals are more active for longer, More pests survive;
- Springs are more variable, Wetter weather, more heavy rain, Last frost earlier, but more variable, More big shifts in temperature, Crops grow faster and mature earlier, Pests and disease come earlier, More and stronger winds;
- Summers are hotter and dryer, More dry periods and drought, More humidity, Lower pollination/fruit set, More common pests and diseases, More new pests and diseases, More and stronger winds:
- Falls are warmer and dryer, More dry periods and drought, Higher temperatures interfere with fall crop establishment, Higher numbers of common pests and new pests and diseases, More and stronger winds.

Hand Out Discussion Worksheet and Introduce Discussion Circle #1: What is one kind of weather that makes it hard for you to grow at your farm? Instructor leads a discussion of each season by asking participants to look at weather changes listed on the lesson handout and pick one that is making it hard to grow, or add one if they are struggling with a kind of weather that is not on the list.

PART 2 - Adaptable Farms and Climate Resilience

Is an adaptable farm a climate resilient farm? Adapt/Adaptable/Adaptability means to be able to change ideas or behavior in order to do well in changing conditions. Resilience means the ability to easily adapt to new or changing conditions and to think ahead and prepare for future changes. One way to think of the difference between these two ideas is to notice that adaptation/adaptability does not mention how easy or hard it is to change in order to do well in changing conditions. Resilience describes the ability to easily adapt - in other words, to be able to make changes to do well quickly and at low cost.

Why must adaptable farmers cultivate climate resilience, rather than build or buy it? Cultivate means to create conditions that support the healthy growth and development of someone or something, for example healthy soils, healthy crops, or healthy community. The growth and development of all living beings takes time and requires some care and good luck. The goal of climate resilience is achieved through many different kinds of steps taken by the farmer over time to care for and sustain the health of land, people and community. Farms depend on all three - land, people, community - over the long term to be resilient.

What are some qualities of the adaptable farmer, adaptable land and adaptable community that help improve the climate resilience of a farm?

- Adaptable Community - Many good food and farming friends, many local food markets, community climate resilience plans.
- Adaptable Land - Healthy soils, Biodiversity, Reliable water
- Adaptable Farmers - Can produce profitable crops, Try different ways of doing things, Make mistakes and learn from them, Can ask for help and offer help to others, Can cope with loss and change, Have some non-farm income, some savings and access to credits, loans, and grants, Cultivate adaptable land and community.

Discussion Circle #2: Are you an adaptable farmer? What is one way that you are already pretty good at being adaptable? What is one way that you can improve your adaptability? Instructor asks participants to review the list on the lesson handout and pick one way they are already an adaptable farmer and share group, then ask participants to pick one way that they would like to improve and share. Instructor closes the circle by inviting the group to add to this list.

PART 3 - Two Kinds of Climate Resilient Practices

What practices can farmers use to make their farm be more adaptable to changing weather? Resilient farmers use two kinds of practices to increase the climate resilience of their farms:

1) Protect practices reduce the chance of harm or injury to crops from bad weather without changing how you manage soil or the plants you grow, for example, irrigation and growing plants under cover. For example,

utilizing a heated greenhouse early in the season, and row cover or high tunnels in the late season can protect crops from shifting dates for last frost and first frost. Other protect practices included in the lesson: Fertilizers and pest management strategies, Irrigation/drainage, Heated and Cooled Houses, Fertilizers and Pesticides, Storage of important farm inputs like seeds, fuel and water, Making food products from farm produce, Making energy on the farm. F

Discussion Circle #3: What Kinds of Protect Practices Do You Use?

2) Adapt Practices increase the adaptability of a farm to bad weather by growing healthy soils and increasing plant diversity, for example, no-till planting and growing cover crops. For example, increasing the diversity of crops a farmer grows helps mitigate risk in case unusually high pest and disease pressure knocks out on variety of crop by providing the farmer with alternative sales options. Other adapt practices included in the lesson: Grow plants that invite helpful insects to live on your farm, Observe and learn from your farm's adaptability to different kinds of weather.

Discussion Circle #3: What Kinds of Adapt Practices Do You Use?

Lesson Recap:

- **What Makes An Adaptable Farm?**
- **What Kinds of Tools Cultivate Climate Resilience?**

Closing Circle: What is one new climate resilience practice you would like to try?

III. Wrap-up/Self-assessment

Give main take-aways or have farmers do a self-assessment

What is one kind of change in weather that is making it harder to grow crops in Kansas City?

What are some qualities of the land, the farm family and the community that help to make a farm more adaptable to changing weather?

What kinds of protect practices can you use to make your farm more climate resilient?

What kinds of adapt practices can you use to make your farm more climate resilient?

What is one new climate resilience practice that you would like to try?

IV. Additional Materials/Resources for Students

Cultivating Climate Resilience on Your Farm

Laura Lengnick, Director of Agriculture
The Glynwood Center for Regional Food and Farming

Images via Canva 2025
Illustrations by Taylor Fourt

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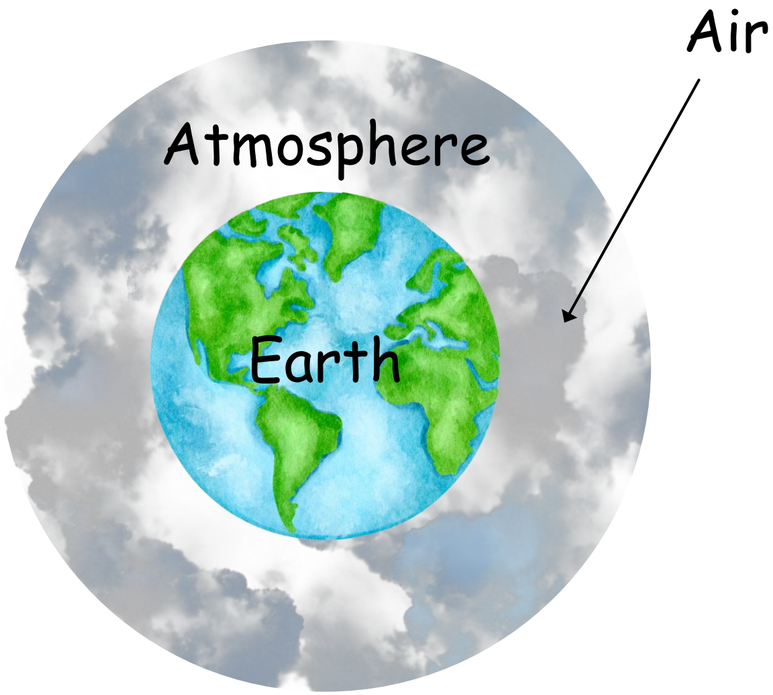
National Institute of Food and Agriculture

U.S. DEPARTMENT OF AGRICULTURE

Important Words

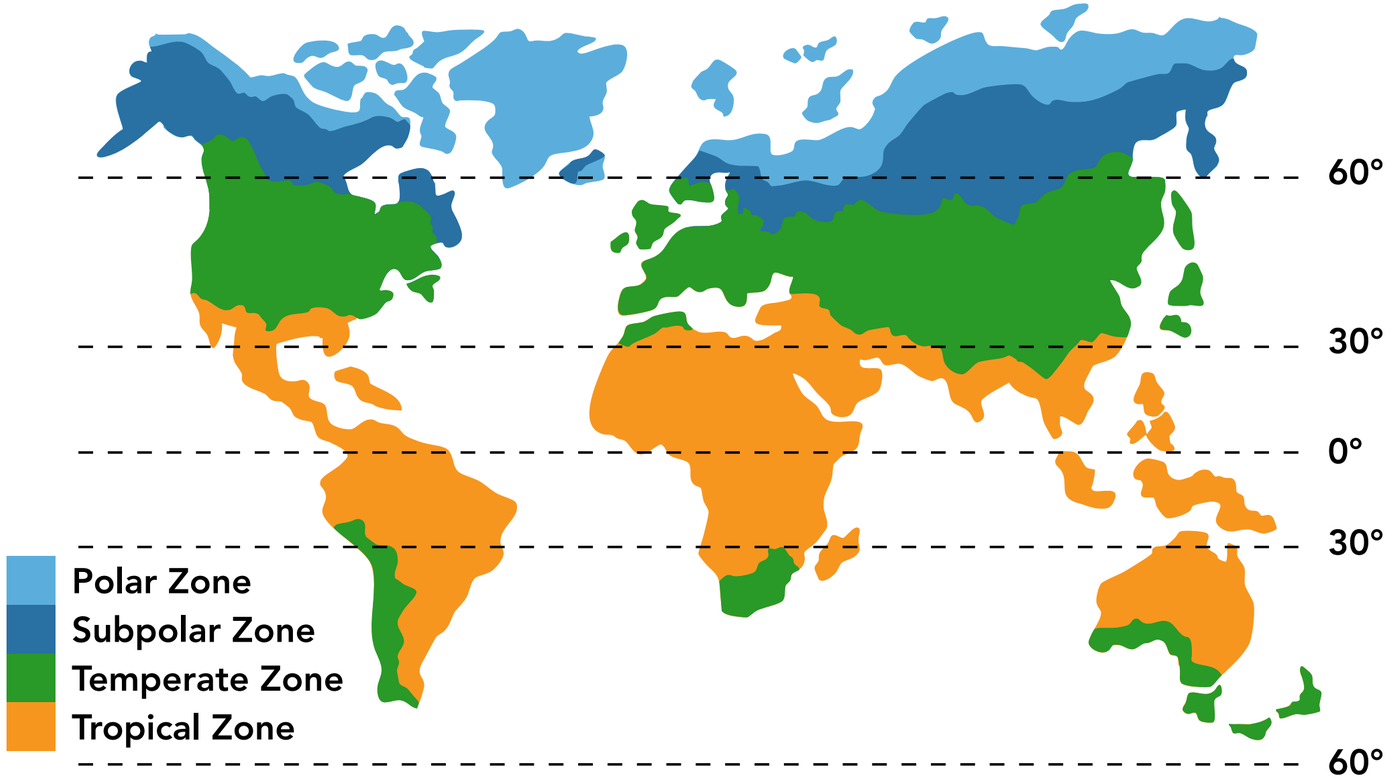
- Atmosphere: The layer of air that surrounds the earth.



- Weather: The day-to-day temperature, sunlight and moisture conditions of the atmosphere in a particular place.

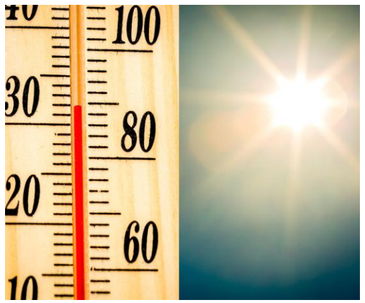
Important Words

Climate: The average weather conditions – especially temperature and rainfall - in a region over many years.



Important Words

Climate Change: The change in the average weather conditions in a region.



HIGHER Temperatures

MORE Heavy rain

MORE Heat Waves

MORE Drought

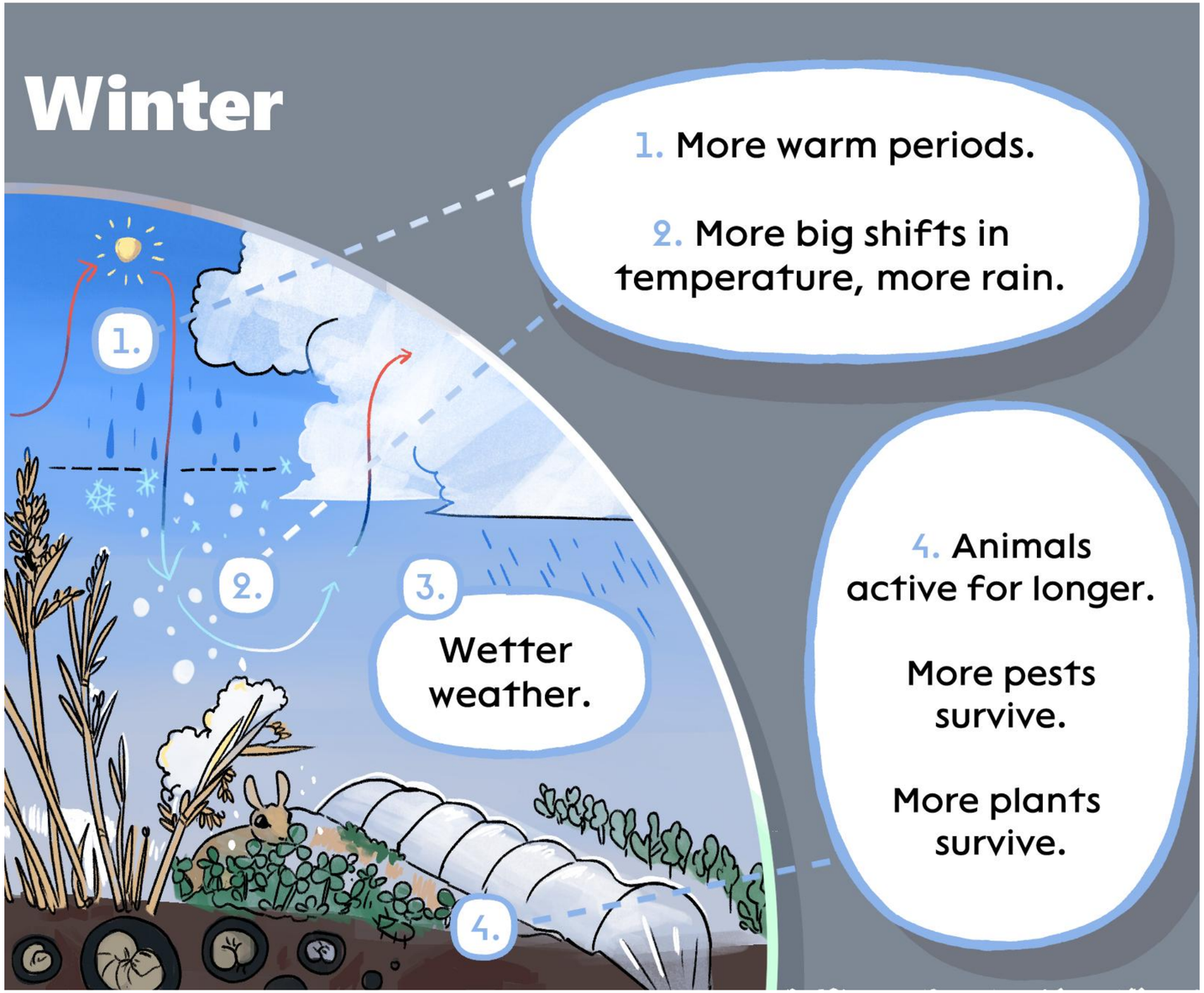
LONGER Growing Season

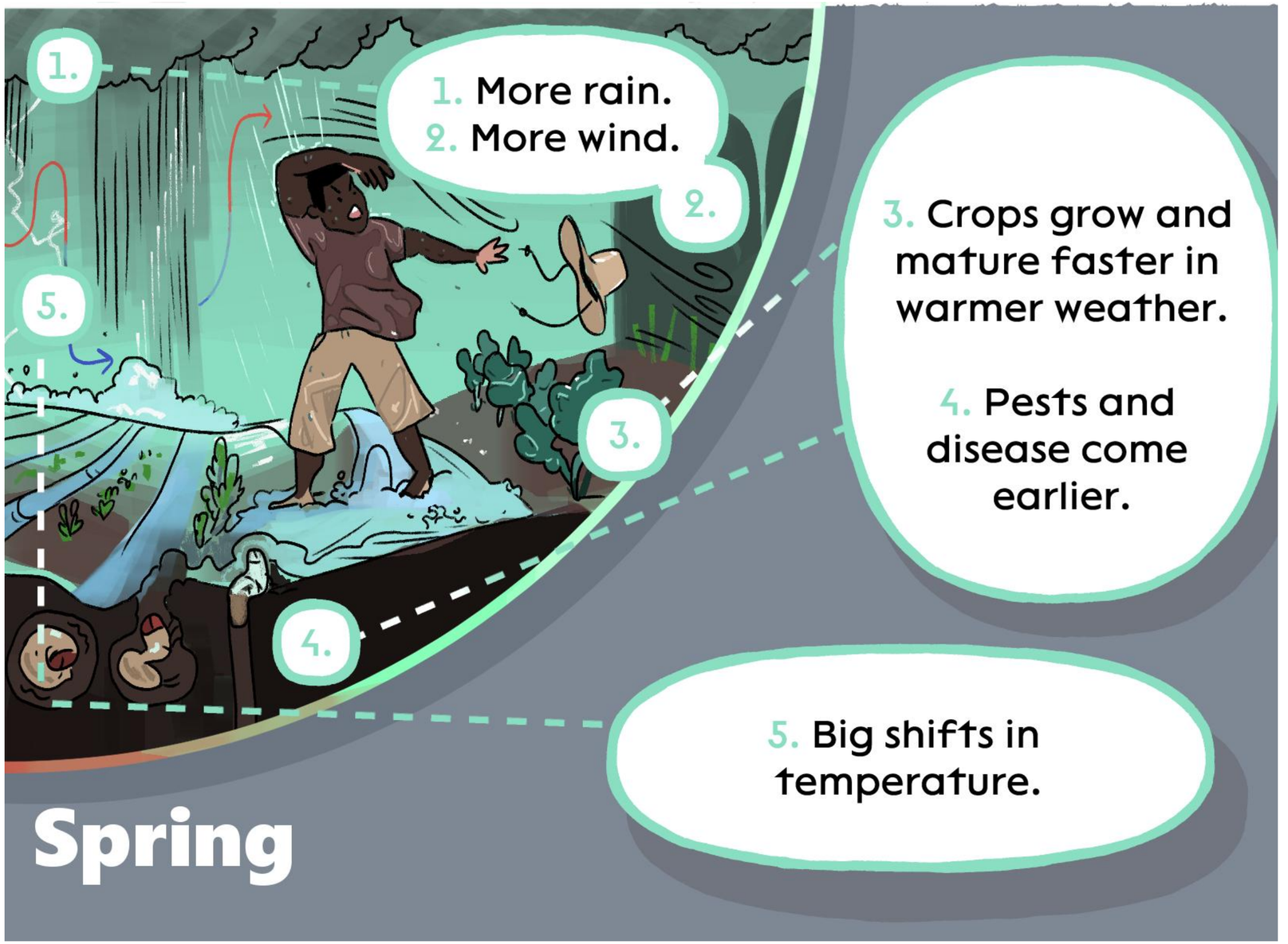
MORE Wildfire

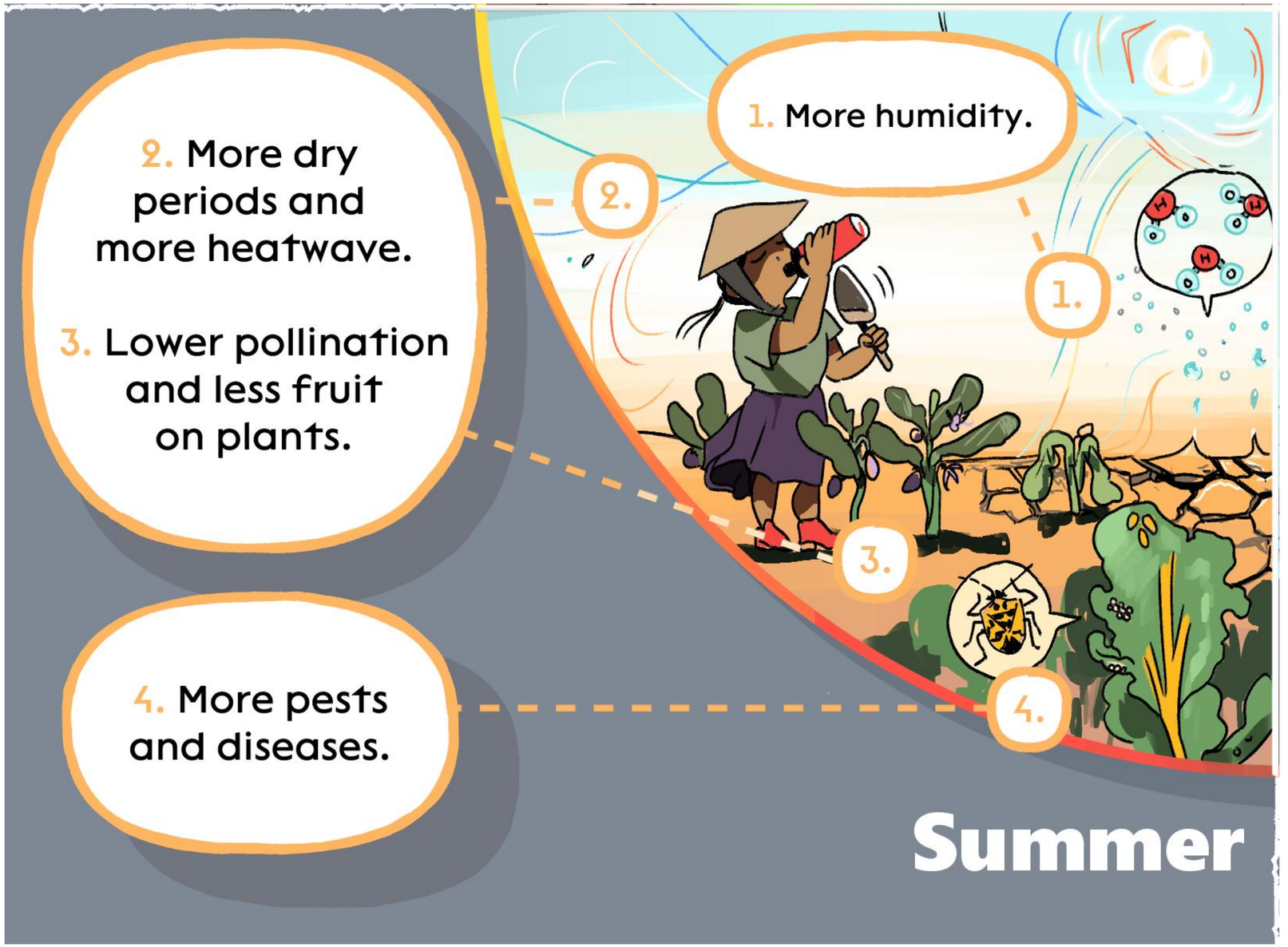
Why is Our Climate Changing?

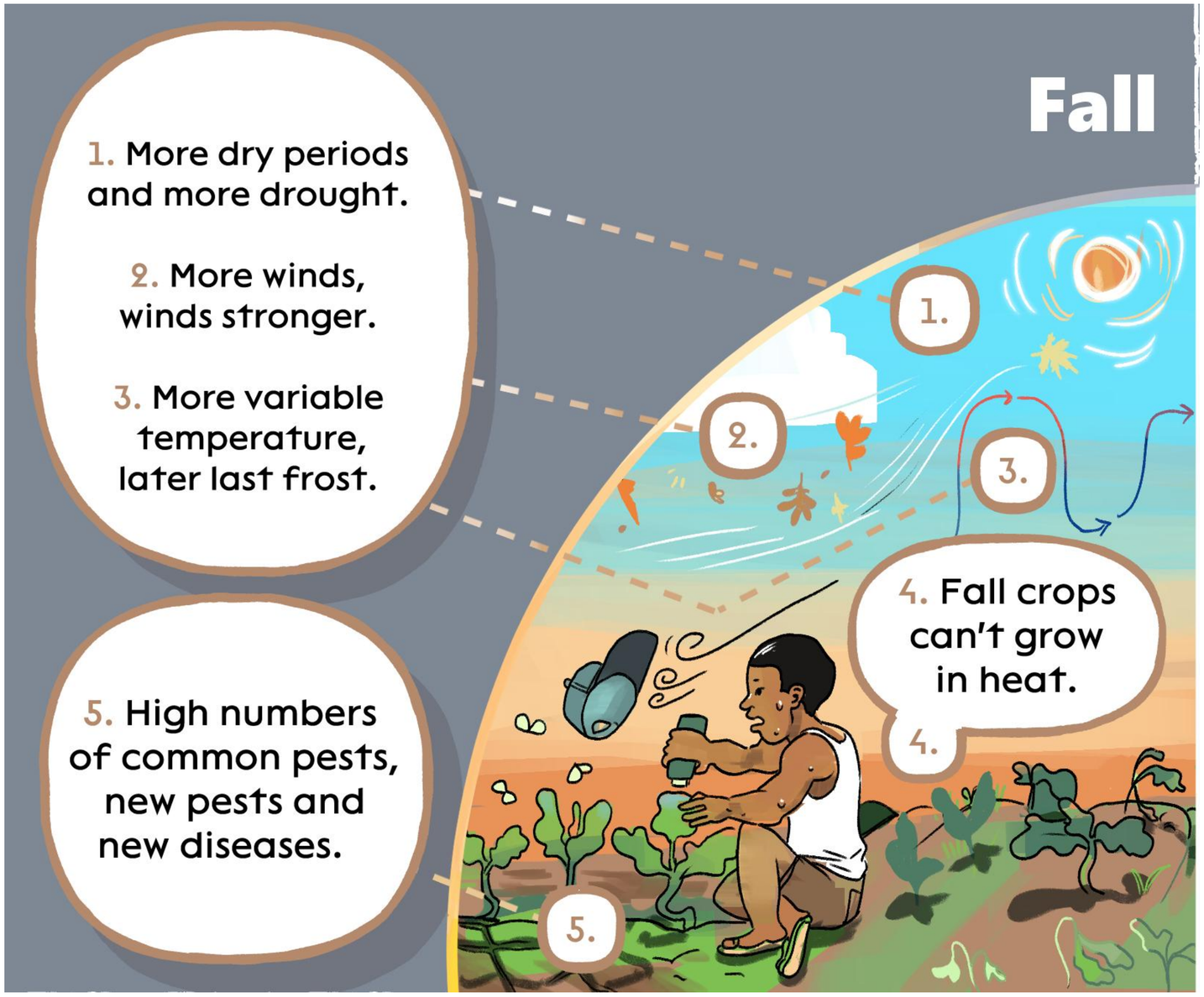
- The atmosphere is a layer of gas that surrounds the earth like a greenhouse.
- Burning gasoline or oil makes the atmosphere thicker.
- The atmosphere keeps more heat from the sun inside when it is thicker.
- This extra heat is changing the earth's climate and disrupting our weather.

How is Climate Change Making it Harder to Farm?


Winter
1. More warm periods.
2. More big shifts in temperature, more rain.
1.
2.
3.
Wetter weather.
4.
4. Animals active for longer.
More pests survive.
More plants survive.


1.
1. More rain.
2. More wind.
2.
5.
3.
4.
3. Crops grow and mature faster in warmer weather.
4. Pests and disease come earlier.
5. Big shifts in temperature.
Spring


1. More humidity.
2. More dry periods and more heatwave.
3. Lower pollination and less fruit on plants.
4. More pests and diseases.
1.
2.
3.
4.
Summer


Fall
1. More dry periods and more drought.
2. More winds, winds stronger.
3. More variable temperature, later last frost.
5. High numbers of common pests, new pests and new diseases.
1.
2.
3.
4. Fall crops can't grow in heat.
4.
5.

Discussion Circle: What is one kind of weather that makes it hard for you to grow food at your farm?

Important Words

- Adapt/Adaptable/Adaptability: To succeed in changing conditions.

- Resilience/Resilient: To be able to easily adapt to new or changing conditions and to think ahead and prepare for future changes.

What Makes a Farm Climate Resilient?

Adaptable Farmers

Adaptable Land

Adaptable Community

The Adaptable Farmer

Adaptable Land Has…

An Adaptable Community Has…

Many Good Food and Farming Friends

Many Local Food Markets

Government Action for Climate Resilience

Discussion Circle: Are you an adaptable farmer?

What is one way that you are already pretty good at being adaptable?
What is one way you can improve your adaptability?

Adaptable Farmers Use Two Kinds of Practices to Cultivate Climate Resilience

Protect Practices keep the farm safe from harm or injury in bad weather.

Adapt Practices change the soil, crops, land and people so that the farm is more adaptable to bad weather.

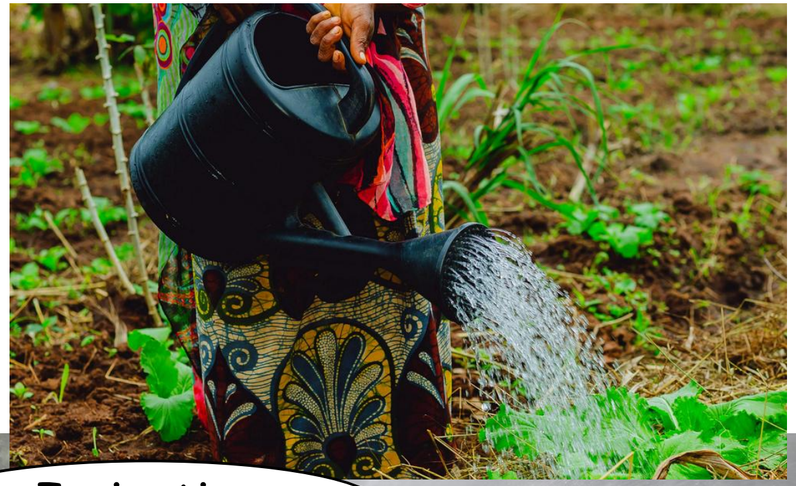
Important Words

Protect: To keep safe from harm or injury

Practices that Protect

PROTECT

PROTECT



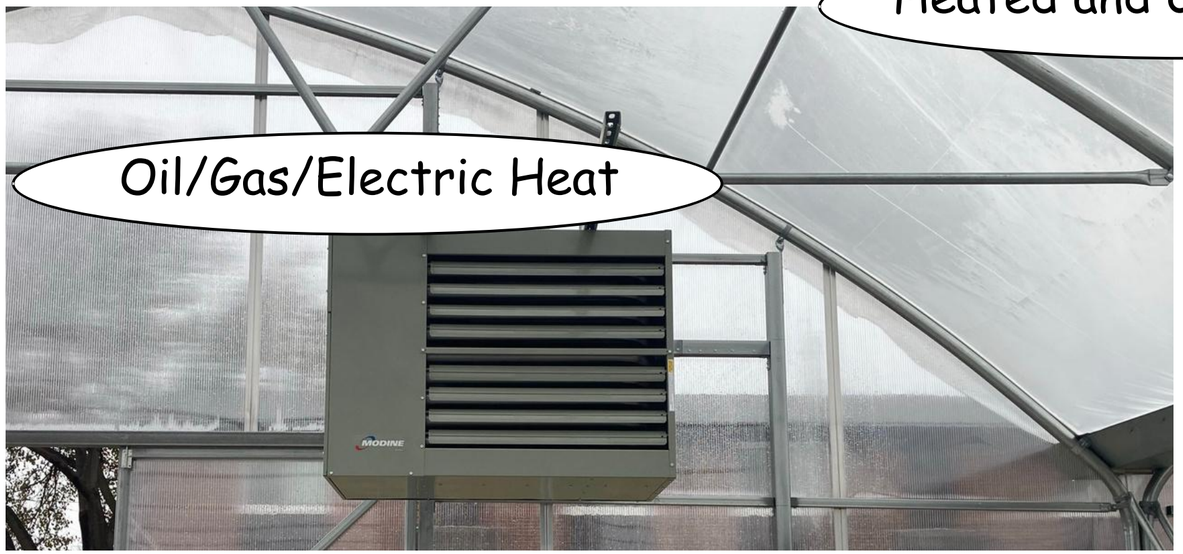
Irrigation

Drainage

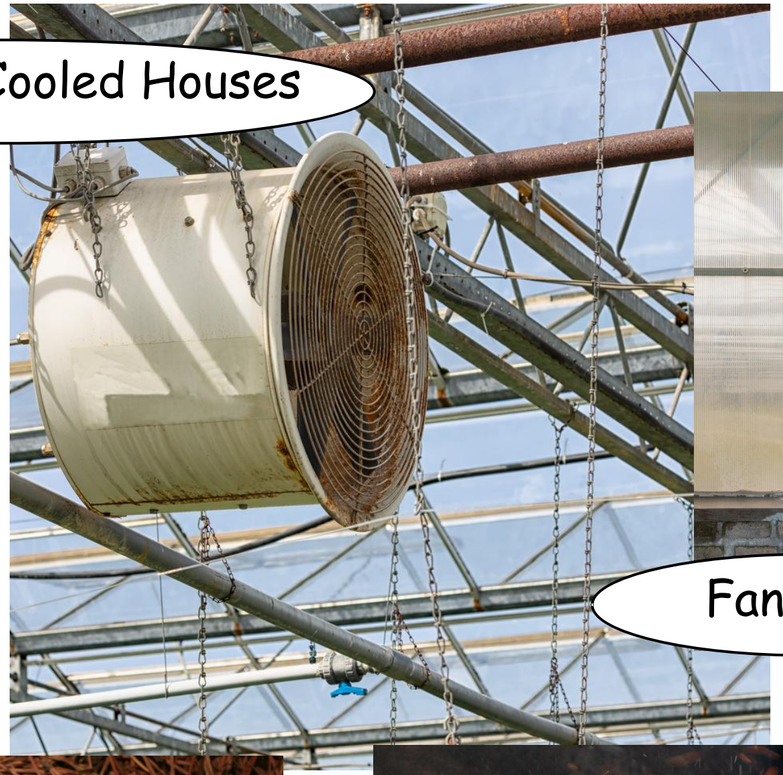
Rainwater Harvest

PROTECT

Heated and Cooled Houses

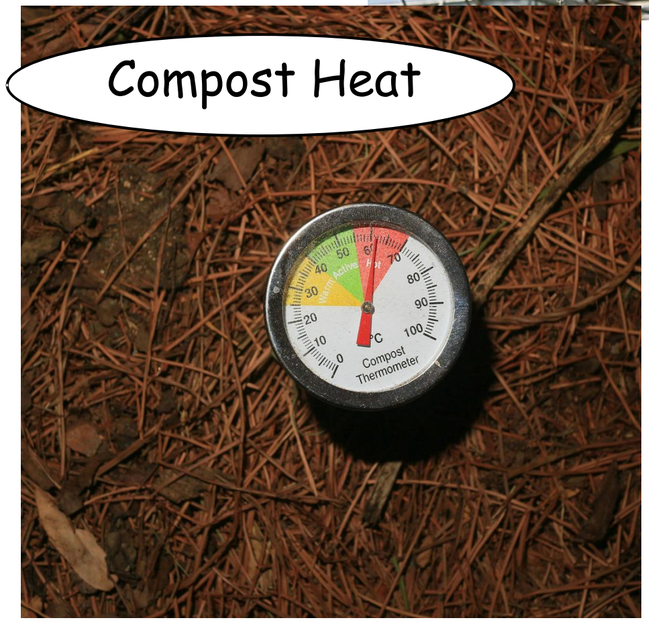


Oil/Gas/Electric Heat



Fan Cooling

Water Heat



Compost Heat

Wood Heat

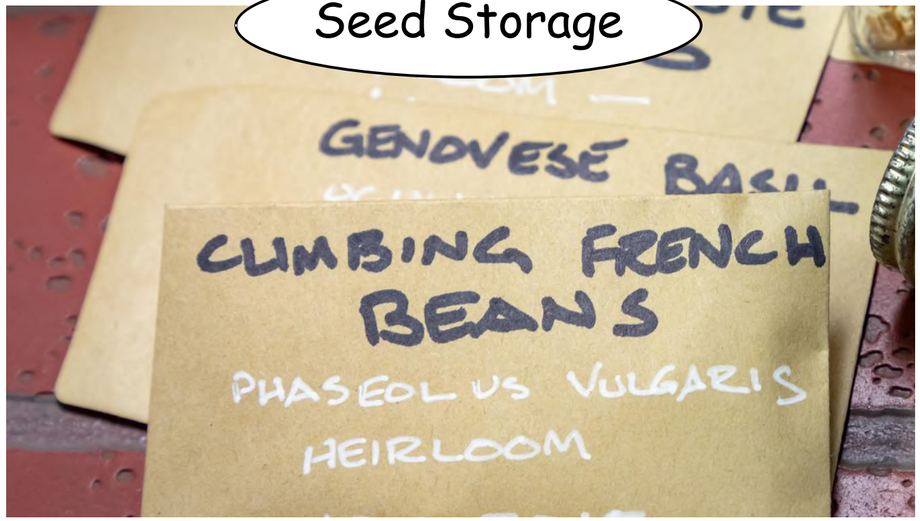
PROTECT

Organic Fertilizers

Organic Pesticides

PROTECT

Seed Storage



Fuel Storage

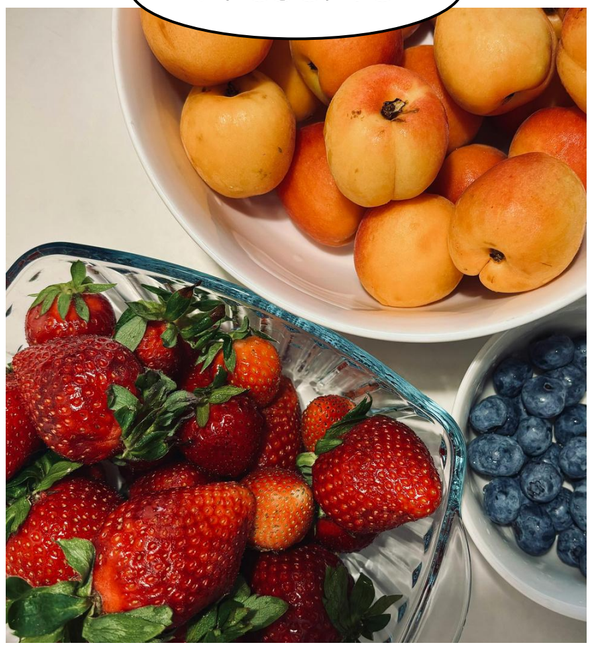
Backup Power

Water Storage

PROTECT

Ferment

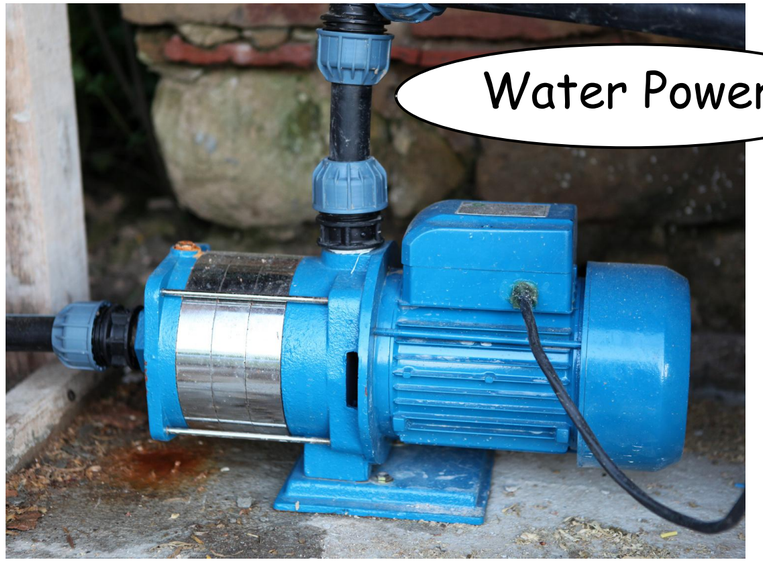
Preserve



Pickle

PROTECT

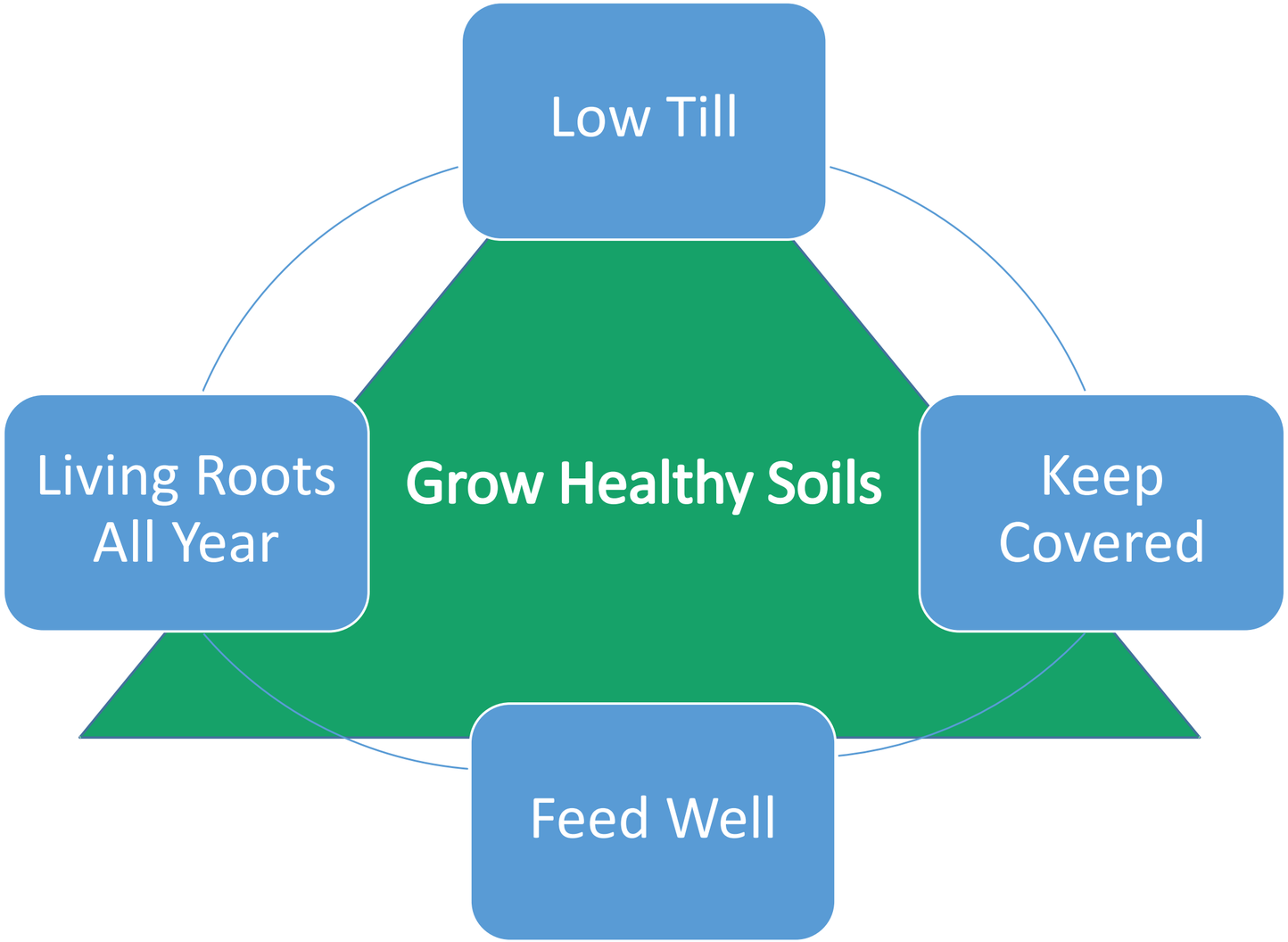
Solar Power



Discussion Circle: What Protect practices do you use?

Practices that Adapt

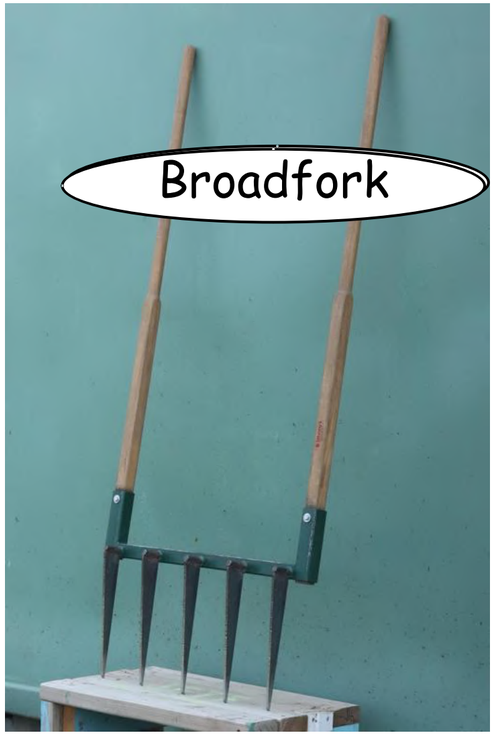
ADAPT


Low Till
Living Roots All Year
Grow Healthy Soils
Keep Covered
Feed Well

ADAPT

Rotary Plow

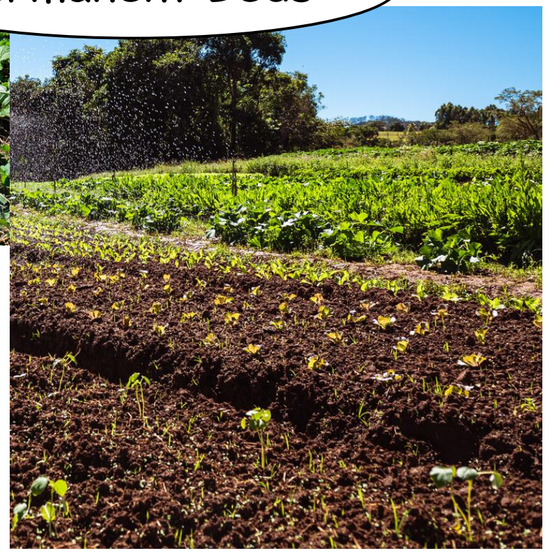
Tilther



Broadfork

Low Till

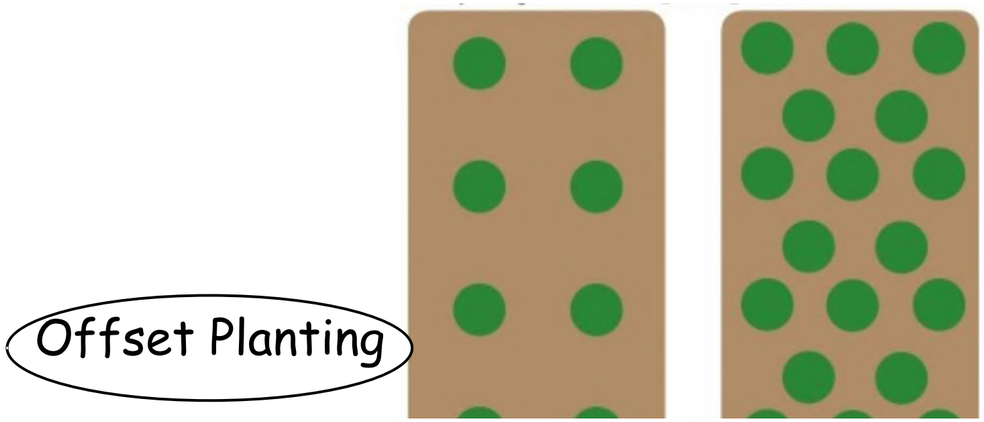
Permanent Beds



Tarp

ADAPT

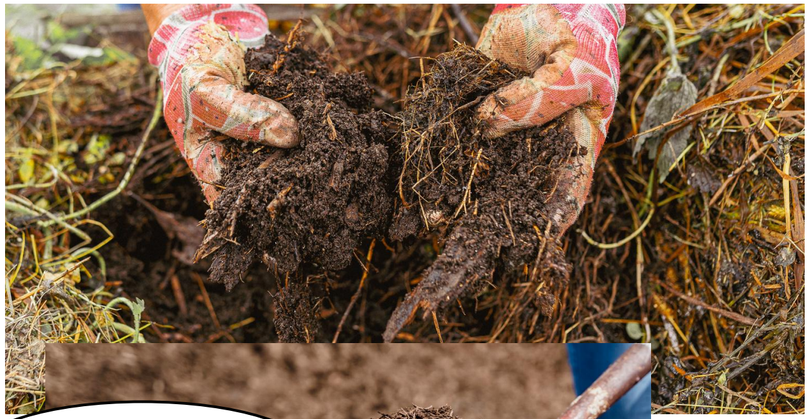
Keep Covered



ADAPT

Soil Test

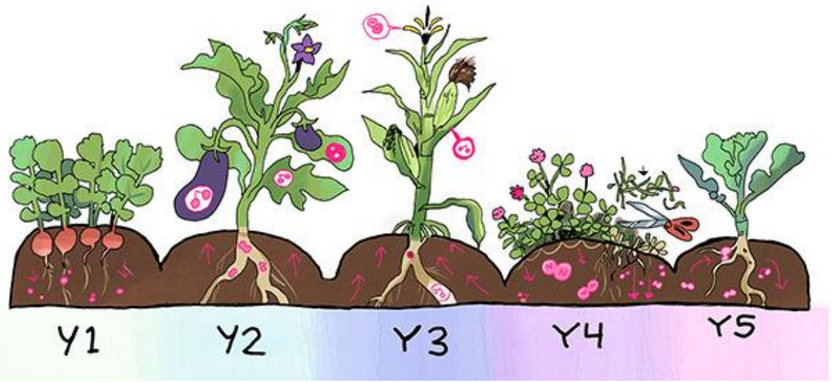
Cover Crops



Compost

Feed Well

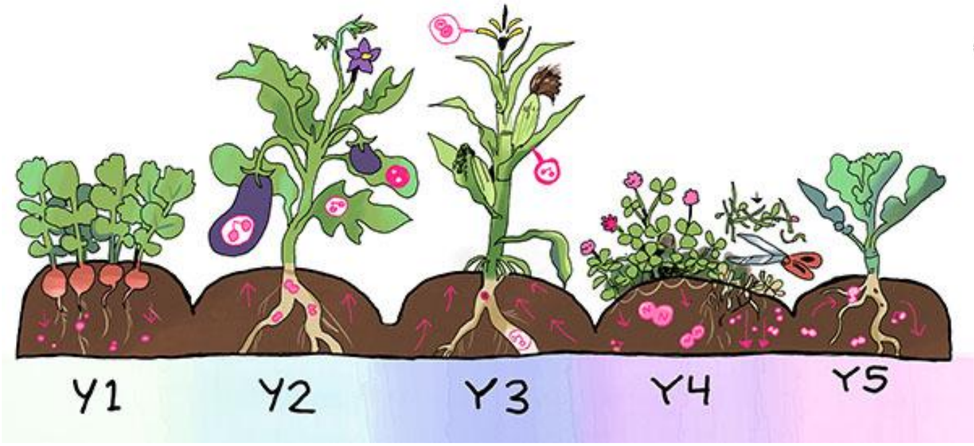
Crop Rotation



Organic Fertilizers

ADAPT

Crop Rotation



Living Roots All Year

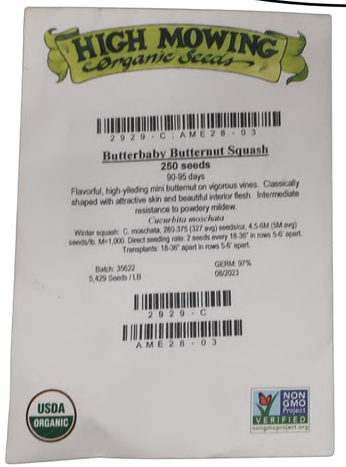
Cover Crops

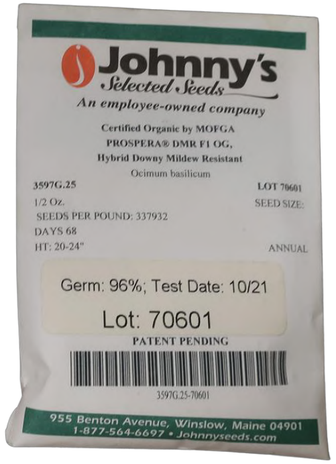
Perennial Crops

ADAPT

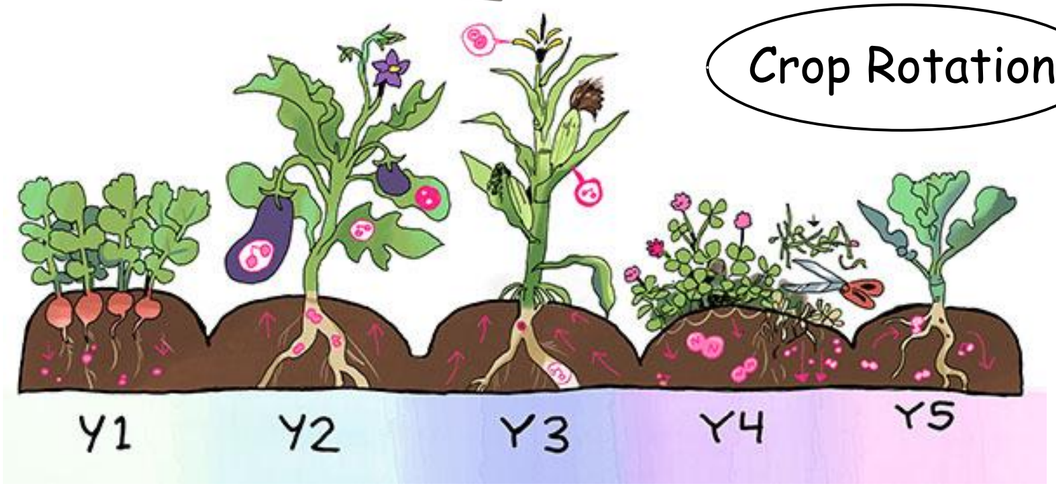
Grow Many Different Kinds of Plants

Resistant Plants





Cover Crops



Crop Rotation

Good Bug Crops

ADAPT

Observe and Learn From Your Farm

Which crops grow best for you in each season?

Which crops grow best for you no matter the weather?

Discussion Circle: What Adapt practices do you use?

What Makes a Farm Climate Resilient?

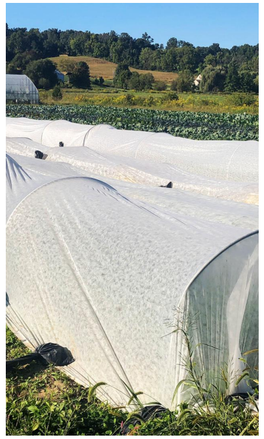
Adaptable Farmers

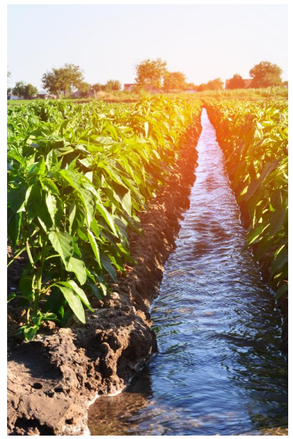
Adaptable Land

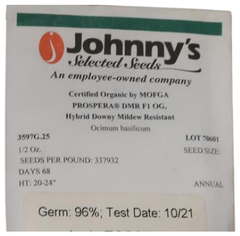
Adaptable Community

How Can Farmers Cultivate Climate Resilience?

Protect your farm from bad weather.

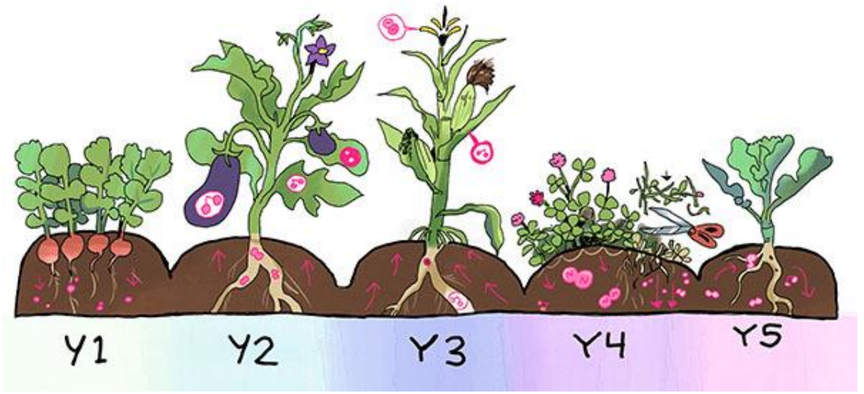






Help your farm adapt to bad weather.

Closing Circle: What is one new climate resilience practice you would like to try?

Questions that will be answered in this workshop

- How is climate different from weather?
- What is climate change?
- How is climate change changing the weather?
- How is weather changing in Kansas City?
- What are some qualities of the adaptable farmer, adaptable land and adaptable community that improve the climate resilience of a farm?
- What kinds of practices can farmers use to make their farm be more climate resilient?
- What climate resilience practices do you use on your farm?
- Did you learn about a climate resilience practice you may try this year?

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Climate Resilience Handout

Important Words

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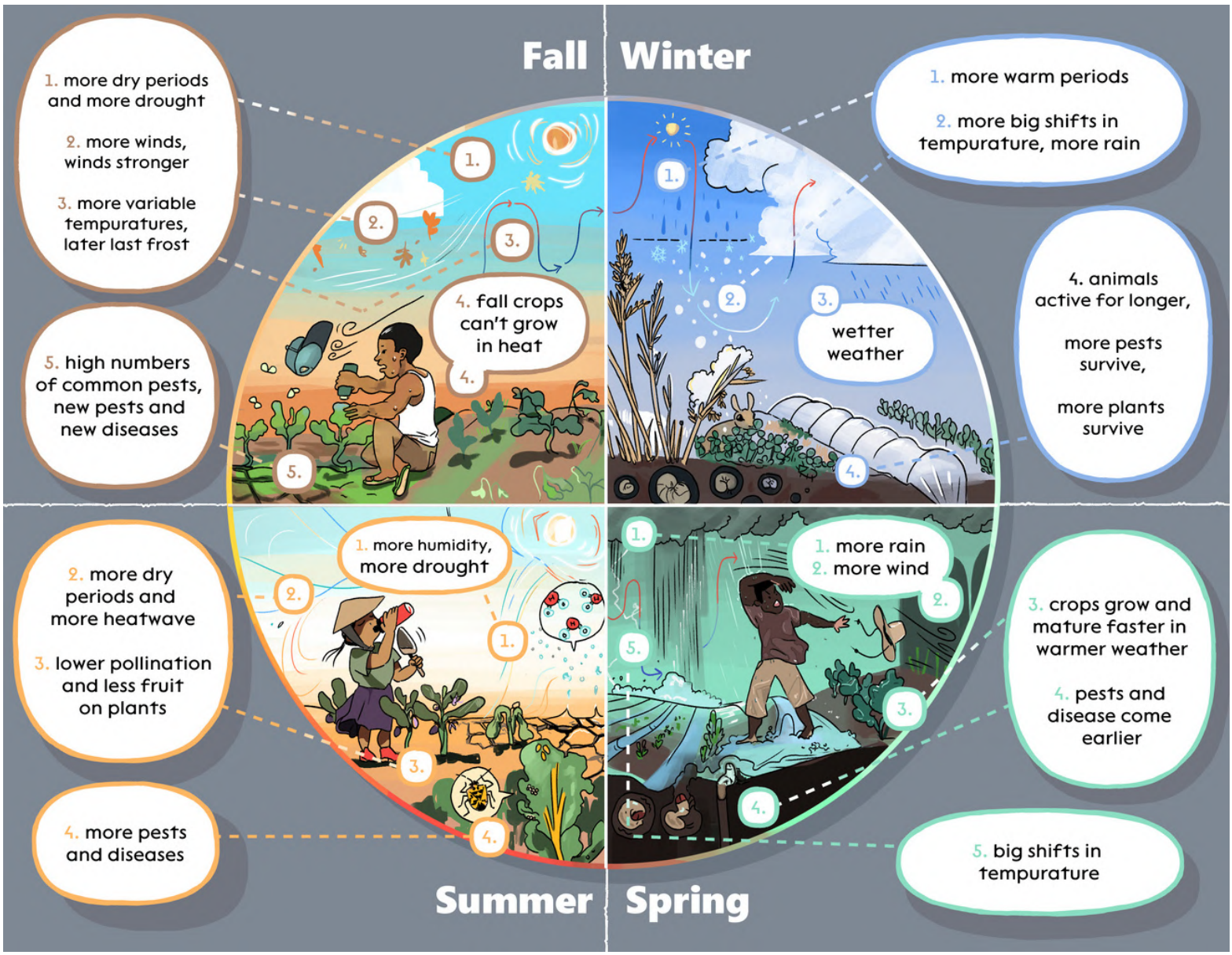
- **Weather:** The day-to-day temperature, light, and moisture conditions of the atmosphere in a particular place.
- **Climate:** The pattern of weather in a particular area over a long time.
- **Cultivate:** To create conditions that support the healthy growth and development of someone or something, for example healthy soils, healthy crops, healthy community.
- **Protect:** To keep safe from harm or injury.
- **Adapt/Adaptable/Adaptability:** To be able to change ideas or behavior in order to do well in changing conditions.
- **Resilience:** The ability to easily adapt to new or changing conditions and to think ahead and prepare for future changes.
- **Protect Practices:** Farming practices that reduce the chance of harm or injury to crops from bad weather without changing how you manage soil or the plants you grow, for example, irrigation and growing plants under cover.
- **Adapt Practices:** Farming practices that increase the adaptability of a farm to bad weather by improving soil health and increasing plant diversity, for example, no-till planting and growing cover crops.

Discussion Circle #1:

What kinds of weather makes it hard for you to grow at Juniper Gardens?



Discussion Circle #2:

Are you an adaptable farmer? What is one way that you are already pretty good at being adaptable? What is one way you can improve your adaptability?

The Adaptable Farmer

Discussion Circle #2:

What kinds of climate resilience tools do you use?

Low and no-till	Cover crops	Row cover	Rainwater Harvest
Keep soil covered	Crop rotation	Shade cover	Heated/Cooled House
Feed soil well	Perennial crops	Hail cover	Seed storage
Living roots all year	Disease resistant crops	Caterpillar tunnel	Water storage
Broadfork	Drought tolerant crops	Organic fertilizers	Fuel storage
Rotary plow	Cold tolerant crops	Organic pesticides	Backup power
Permanent beds	Heat tolerant crops	Hand watering	Preserved vegetables
Silage Tarp	Good bug crops	Sprinkler irrigation	Fermented vegetables
Mulching	What crops do well in each season?	Drip irrigation	Wind power
Off-set planting	What crops do well no matter the weather?	Raised beds	Water power
Soil test	Natural fertilizers	Drainage pipe	Solar power

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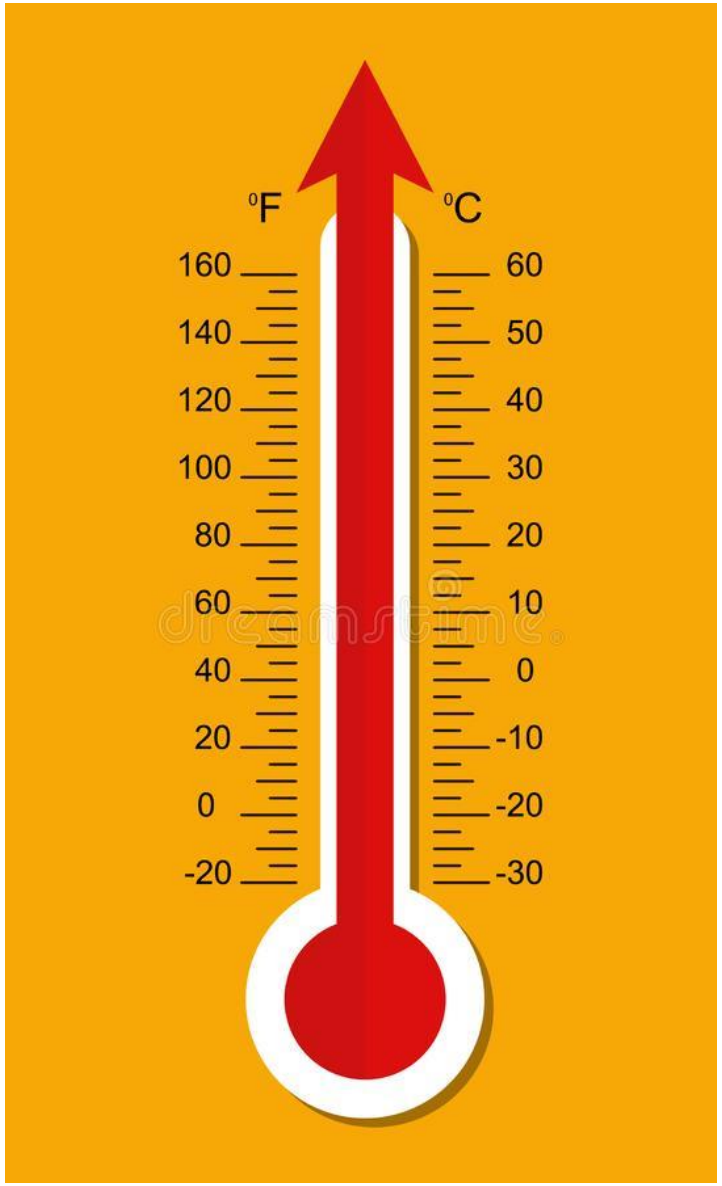


HEAT

LONGER GROWING SEASON

DROUGHT/DRY

WILDFIRES

RAIN

CHANGE IN TEMPERATURE

STRONG WINDS

MORE HUMIDITY

MORE PEST & DISEASE

LOW POLLINATION/FRUIT SET

PROTECT

ROW COVER

PROTECT

CATERPILLAR TUNNEL

PROTECT

HAIL COVER

PROTECT

SHADE COVER/CLOTH

PROTECT

IRRIGATION

PROTECT

DRAINAGE

PROTECT

RAINWATER HARVEST

PROTECT

OIL/GAS/ELECTRIC HEAT

PROTECT

FAN COOLING

PROTECT

WOOD HEAT

PROTECT

COMPOST HEAT

PROTECT

WATER HEAT

PROTECT

ORGANIC FERTILIZER

PROTECT

ORGANIC PESTICIDE

PROTECT

SEED STORAGE

PROTECT

FUEL STORAGE

PROTECT

BACK-UP POWER

PROTECT

WATER STORAGE

PROTECT

PRESERVATION

PROTECT

SOLAR POWER

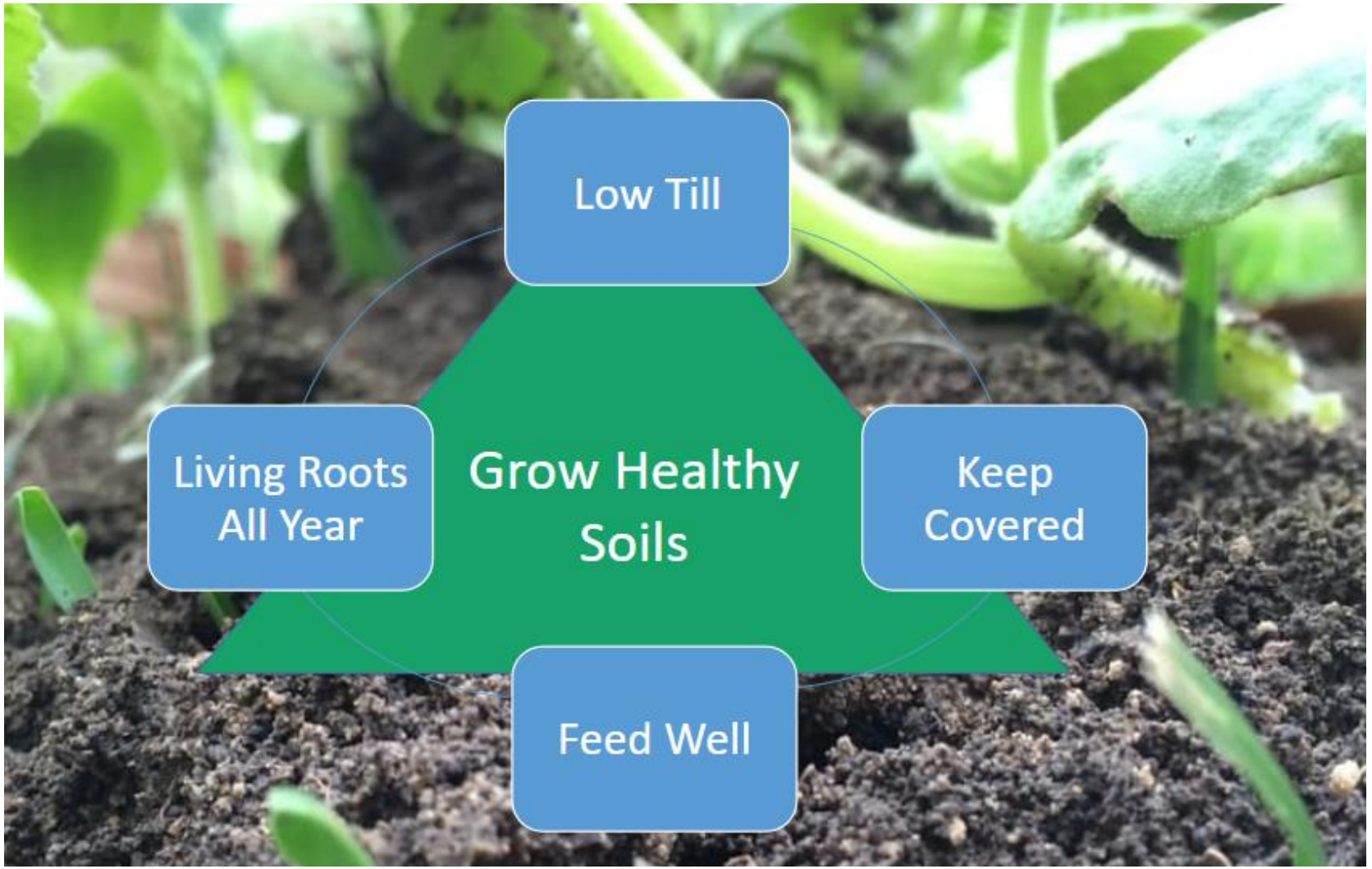
PROTECT

WIND POWER

PROTECT

WATER POWER

ADAPT



GROW HEALTHY SOILS

ADAPT

PERMENANT BEDS

ADAPT

SILAGE TARP

ADAPT

BROADFORK

ADAPT

ROTARY PLOW

ADAPT

SPADER

ADAPT

HARROW

ADAPT

TILTHER

ADAPT

COVER CROPS

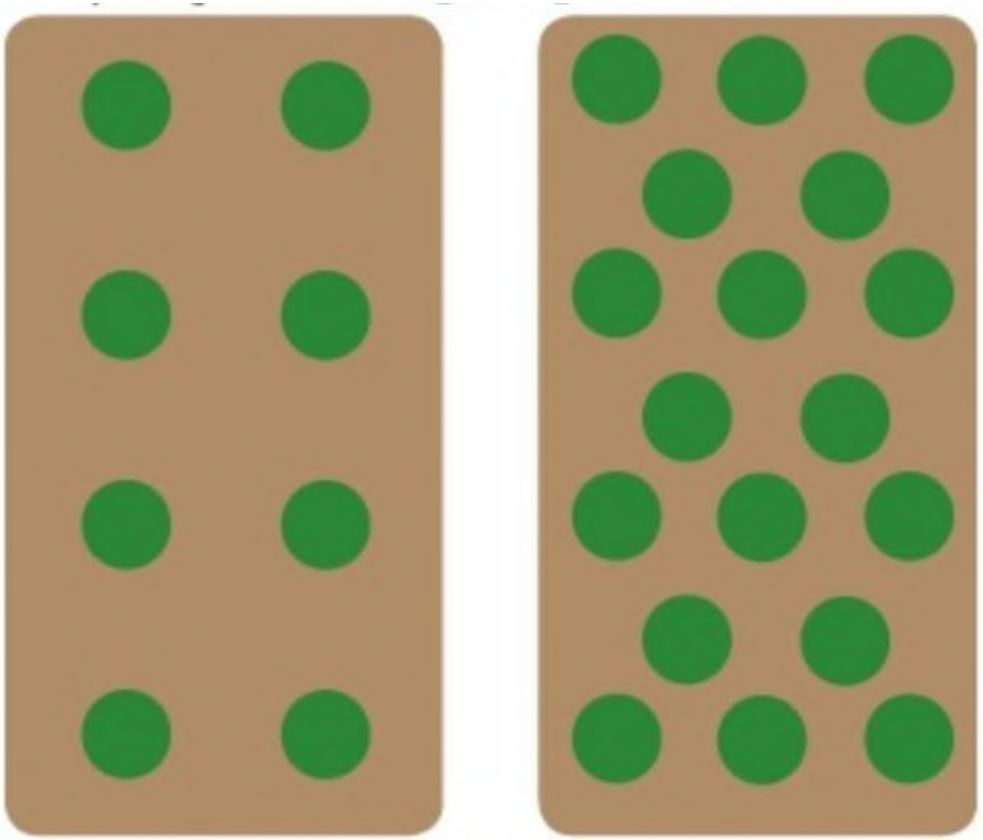
ADAPT

MULCHING

ADAPT

COMPOST

ADAPT

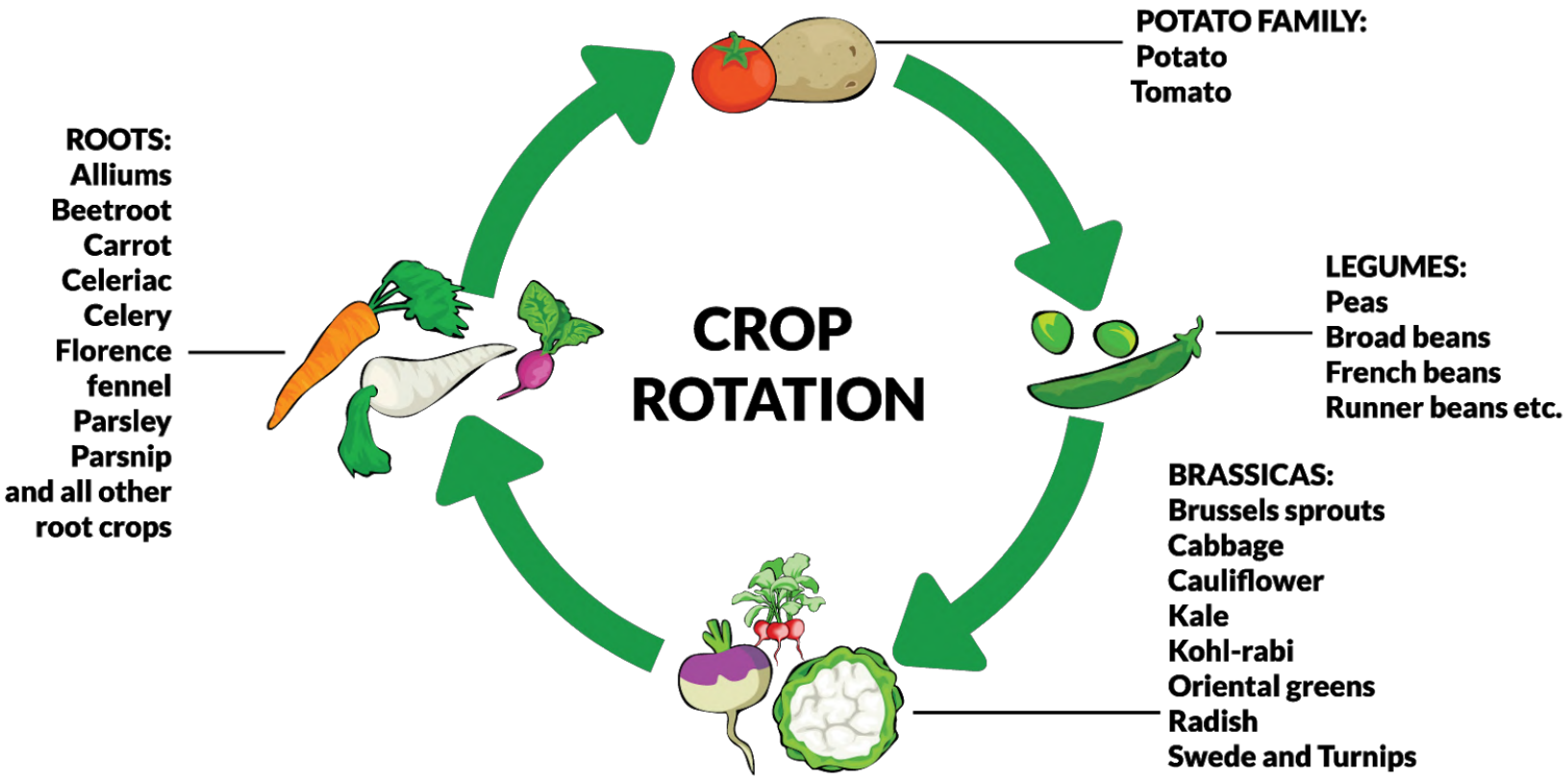


INTERPLANTING/OFFSET PLANTING

ADAPT

SOIL TEST

ADAPT



CROP ROTATION

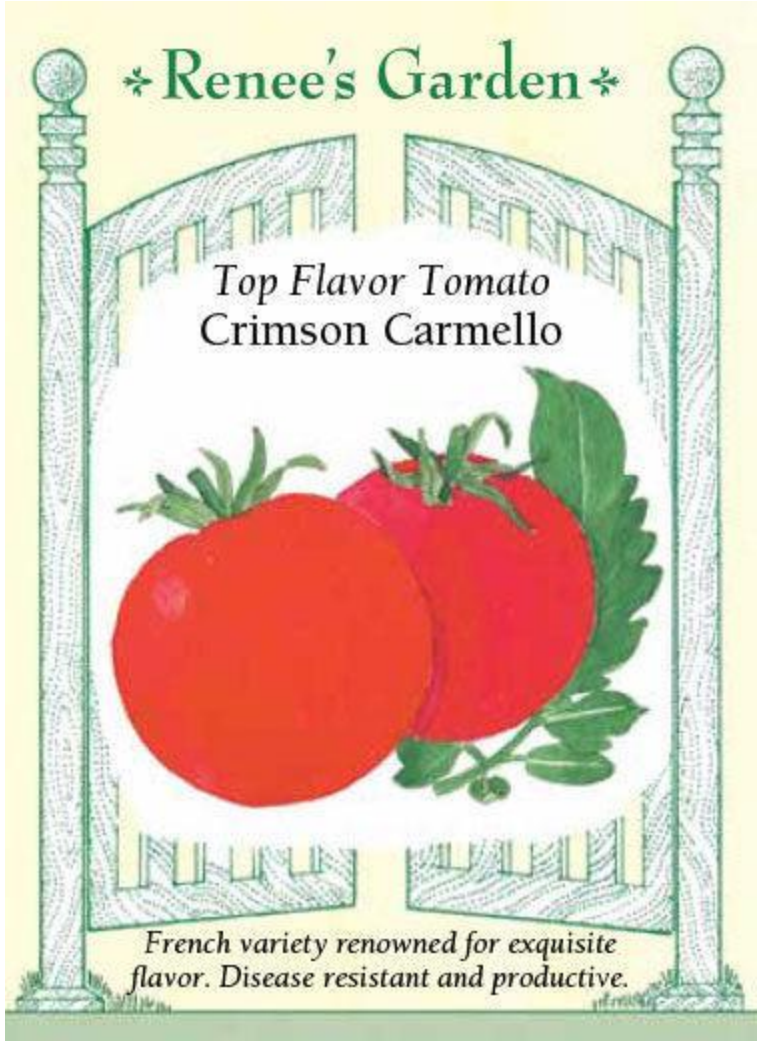
ADAPT

ORGANIC FERTILIZERS

ADAPT

PERENNIAL CROPS

ADAPT



RESISTANT PLANTS

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GOOD BUG CROPS

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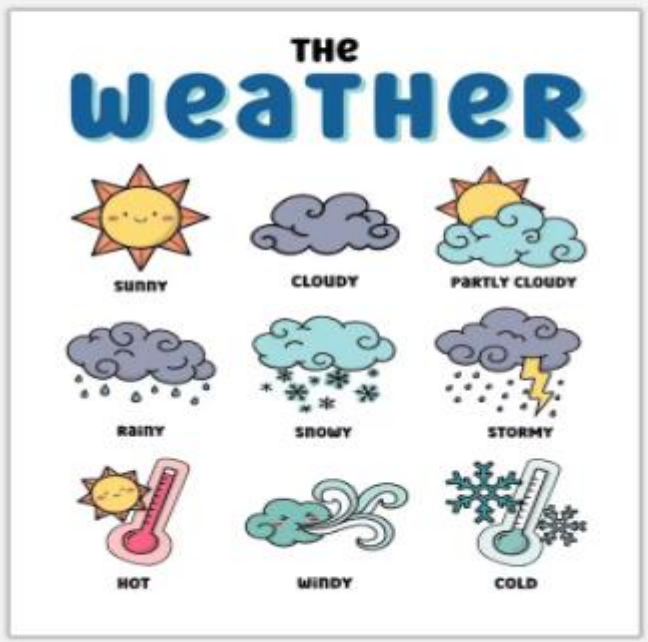
Which crops grow best for you in each season?

Which crops grow best for you no matter the weather?



OBSERVE & LEARN