

*Facilitator Guide*

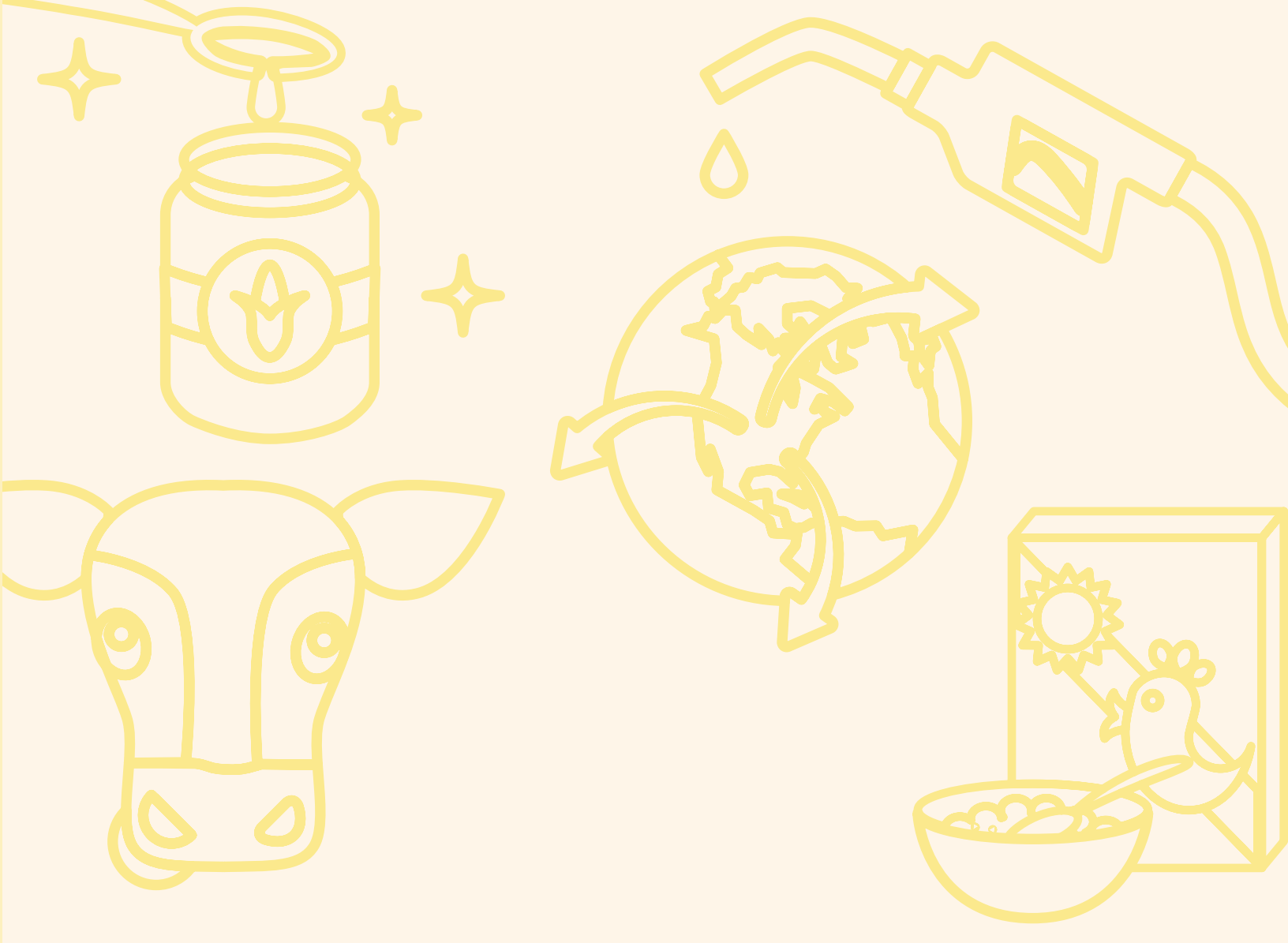


## 4-H Pledge

I pledge my **head** to clearer thinking,  
My **heart** to greater loyalty,  
My **hands** to larger service,  
and my **health** to better living,  
for my club, my community, my country, and my world.



The mission of the Nebraska Corn Board is to develop, carry out and participate in programs of research, education, market development and promotion to enhance profitability (viability) and expand the demand and value of Nebraska corn and value-added corn products.

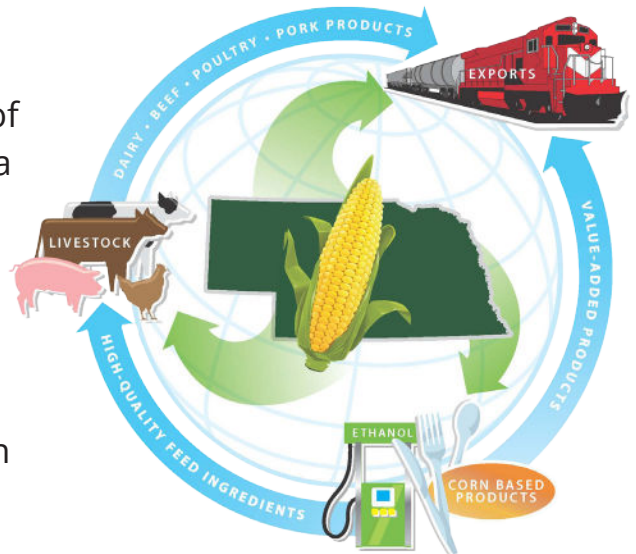


*LEARNING ACTIVITY 1*

# ***USES OF CORN***

# Overview

In this lesson youth will learn the variety of ways corn can be used and consumed in a fun, hands on activity. Youth will be given 100 corn kernels in a container and asked to divide the corn into groups based on the amount of corn used in each category. Ask youth to separate the corn based on what percentage is consumed in different categories.



## SUCCESS INDICATORS

Youth will understand that not all corn they see is used only for food. Youth will learn many other important purposes for corn as well.



## LEARNING OBJECTIVES

Explain the primary uses of corn.



## NEBRASKA SCIENCE STANDARDS

**Use of Earth's Materials:** SC5.4.2.c Identify how Earth materials are used (fuels, building materials, sustaining plant life).



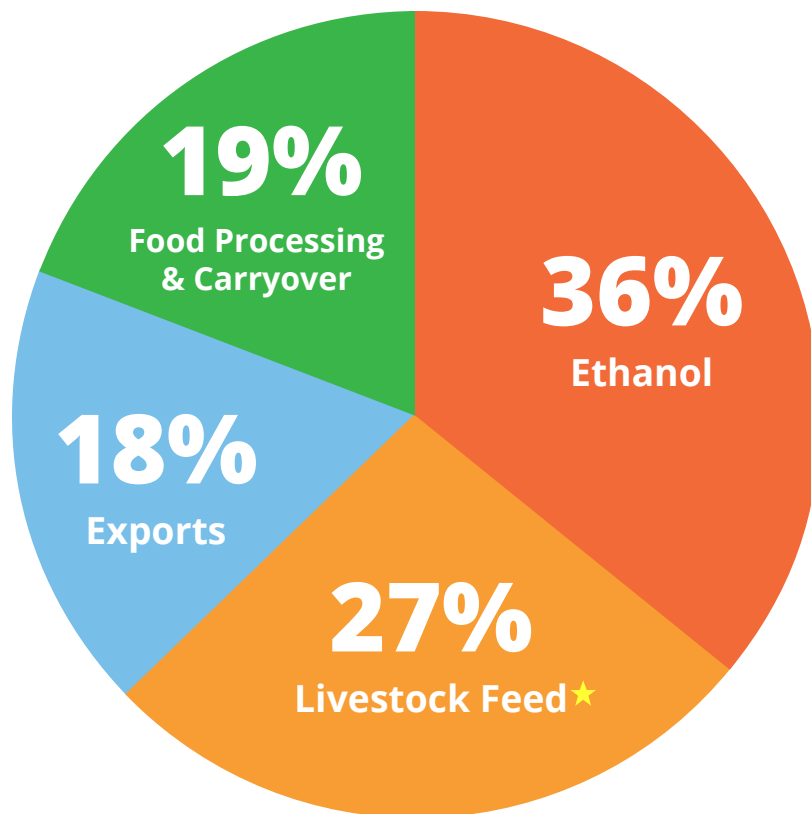
## SUPPLIES

- Field Corn Kernels (100 per group)
- Worksheets
- Laminated pictures of uses of corn (Appendix A)



## ACTIVITY

1. Divide youth into groups of 4-5 students.
2. Provide 100 kernels to youth groups and pictures of uses.
3. Instruct youth to divide the percentage of field corn used for each activity. Instruct students that the percentage is the amount in each hundred (so 10 out of 100 corn seeds is 10%).

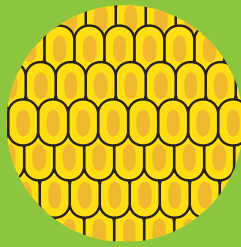


★ 73% beef, 21% hogs, 4% poultry, 2% dairy

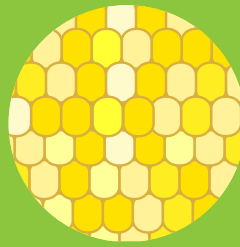


## DID YOU KNOW?

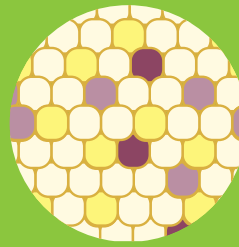
There are several commercial classifications of corn. Field corn (also called dent corn or cow corn) is fed to animals and also used to make ethanol fuel. Sweet corn is the kind we eat at the dinner table.



**FIELD CORN**



**SWEET CORN**



**POPCORN**



## THINK & DISCUSS

Take the time to go through these discussion questions with youth. Youth are encouraged to either write down answers, or discuss in groups with the class.

### REFLECT

1. Before this activity, did you know corn was used for more than just for food? What else did you know corn was used for besides food? Were you surprised to find out the many different uses for corn?
2. What are the two biggest uses for corn? Why do you think so much corn is dedicated to these uses?
3. Why is it important to learn about the many uses of corn?

### APPLY

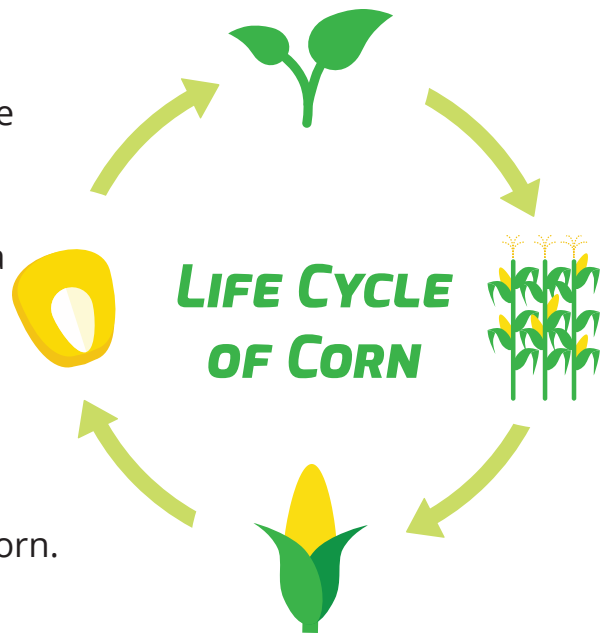
1. Why do you think corn can be used in so many different ways?
2. Can you think of any other ways the world uses corn?
3. Can you think of any new ways to use corn that haven't been thought of before?
4. List at least five foods at the grocery store that contain corn.



*LEARNING ACTIVITY 2*  
***LIFE CYCLE***  
***OF CORN***

# Overview

In this lesson youth will learn about the life cycle of the corn plant from the time it is planted to the time it is harvested and used in various ways. Youth will be given a timeline broken into months and be able to place different inputs onto the timeline for optimal corn growth. Youth will also learn about the food chain, while learning the terms farmers and consumers and applying these to the food ecosystem of corn.



## SUCCESS INDICATORS

Youth will be able to identify the life cycle of a corn plant including necessary inputs and at what time these inputs are necessary for optimal corn growth. Youth will be able to identify the farmers and consumers of the corn ecosystem.



## LEARNING OBJECTIVES

- Summarize the life cycle of corn
- Diagram where corn is on the food chain



## NEBRASKA SCIENCE STANDARDS

### Life Sciences:

- SC5.3.2.b Identify the life cycle of an organism
- SC5.3.3.b Diagram and explain a simple food chain beginning with the Sun





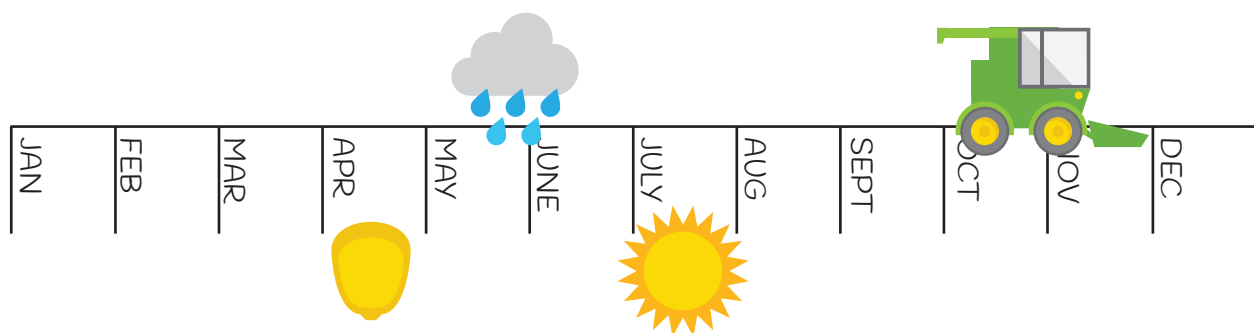
## SUPPLIES

- Laminated timeline
- Laminated pictures of inputs (Appendix B)
- Laminated food chain pyramid
- Images of food ecosystem (Appendix C)



## ACTIVITY 1

In this activity youth will work from a large printed time line broken down into months. Youth will place images of inputs along the timeline based upon what they think would be best for optimal corn growth. Discuss with youth the correct timeline for the optimal corn crop. Also discuss by taking away inputs like rain and the effects this has on the crop. (Answers below.)



## ANSWERS

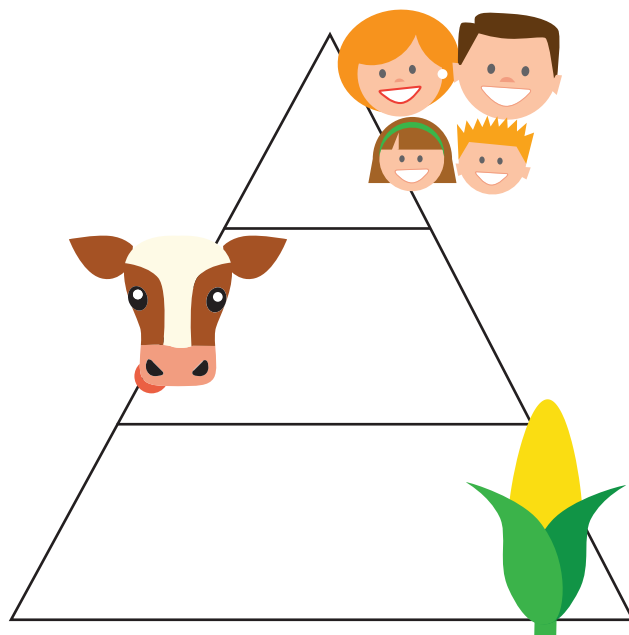
**Planting:** Corn crops are planted beginning in April and last into June.

**Harvest:** Corn is mainly harvested in October and is finished by the end of November. Harvest usually comes about 20 days after the silks appear



## ACTIVITY 2

Youth will work on a large printed food chain pyramid. In the same way as the time line, youth will arrange laminated images of the food ecosystem in order of farmers and consumers on to the laminated food chain pyramid. Discuss with youth the correct position for farmers and consumers on the food chain pyramid.





## THINK & DISCUSS

Take the time to go through these discussion questions with youth. Youth are encouraged to either write down answers, or discuss in groups with the class.

### REFLECT

1. Before this activity, did you know that farmers had to plant and harvest corn at a certain time? What surprised you about the timeline?
2. What role does the sun play in the corn timeline? What role does the sun play in the food chain pyramid?

### APPLY

1. What would happen if you took vital inputs away from the corn?  
Would the corn still grow if water/food/sunshine was taken away?
2. Do all crops follow the same timeline as corn? Do some crops have a different timeline? What would happen if you planted the corn earlier/ later in the year?
3. Can you think of other farmers and consumers in nature? Do all farmers and consumers fall in the same place on the food pyramid?



*LEARNING ACTIVITY 3*

***BUILDING A  
NON-NEWTONIAN FLUID***

# Overview

In this lesson youth will learn about the parts of the corn plant and recognize that starch is one of the important by-products of corn.



## SUCCESS INDICATORS

Youth will be able to recognize and identify the parts of the corn kernel and recognize the importance and vast usages of corn starch.



## LEARNING OBJECTIVES

- Know the parts of the corn plant
- Explain the primary uses of corn
- Know the difference between a Newtonian Fluid and a Non-Newtonian fluid



## NEBRASKA SCIENCE STANDARDS

- SC5.3.1.b Identify how parts of plants and animals function to meet the basic needs
- SC5.4.12c Identify how Earth materials are used



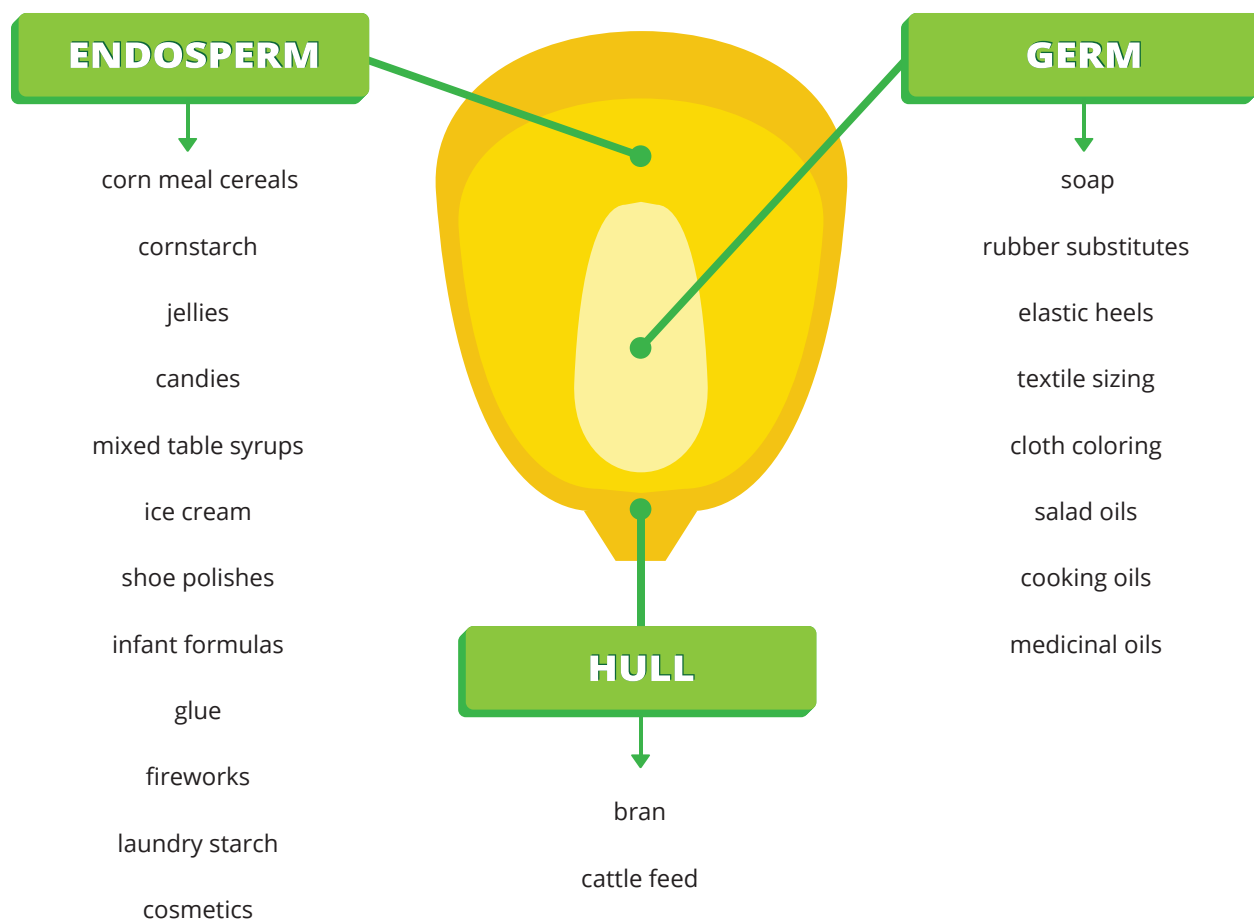
## SUPPLIES

- Corn models (Appendix D)
- Corn kernels
- Corn Starch
- Water
- Bowl
- Measuring cups



## ACTIVITY 1

Begin by diving youth into groups of 4 to 5. Give each group a large corn template. Go through each part of the corn explaining what each part is/does, and have youth label template along with you. After explaining each part, have youth discuss in groups what they think each part of the corn makes in terms of products. After groups discuss, explain what products each part of the corn plant is in, the importance of cornstarch in products, and the vast variety of products that have cornstarch in them.





## ACTIVITY 2

In the same groups, pass out cornstarch and water and a bowl. Have each group measure out  $\frac{1}{4}$  cup of dry cornstarch and pour in bowl. Have youth slowly add just enough liquid until cornstarch is in liquid form when you stir it slowly. Encourage youth to get the correct mixture of cornstarch by explaining that if you tap quickly on the liquid it should act like a solid, but while stirring slowly it should act like a liquid. Have youth grab a small ball of cornstarch and mold it into a ball. It should act like a solid when molding, but once youth's hands stop molding the cornstarch should appear to "melt" in youths hands. Explain that cornstarch is a "non-Newtonian" fluid, and explain the difference between Newtonian fluids and non-Newtonian fluids.



## DISCUSSION AID

### **Difference between Newtonian fluids and Non-Newtonian fluids:**

- A Newtonian fluid (named after Isaac Newton) will act like a liquid, no matter what type of pressure is exerted on it. Water and most other liquids are examples of Newtonian fluids.
- A non-Newtonian fluid, on the other hand, will sometimes act like a liquid and sometimes like a solid depending on the pressure exerted on it. Ketchup, Cornstarch and water, and Gravy are examples of Non-Newtonian fluids.



## THINK & DISCUSS

Take the time to go through these discussion questions with youth. Youth are encouraged to either write down answers, or discuss in groups with the class.

### REFLECT

1. Discuss the uses of the various parts of the corn kernel (endosperm, germ and hull).
2. Why do you think cornstarch acts as a solid when you touch it quickly, but a liquid when you touch it slowly? *Answer: Touching slowly allows cornstarch molecules to move out of the way, but when touched quickly, molecules do not have enough time to move out of the way, thus creating a solid.*
3. What is the difference between this liquid and other liquids such as water, pancake syrup, soup, etc.? Can you think of any other non-Newtonian fluids?

### APPLY

1. What do you think cornstarch does when it is added to foods when cooking/baking?
2. How can you apply what you have learned to quicksand? If quicksand acts like cornstarch and water, what is the best way to get out of quicksand?
3. Can you think of any other ways that corn is used?





*LEARNING ACTIVITY 4*

# ***REFINING PROCESS OF CORN STARCH***

# Overview

In this lesson youth will learn about the refining process of cornstarch. Youth will learn that cornstarch is not sweet at first, but after it has been refined (into high fructose corn syrup or corn syrup) it becomes much sweeter.



## SUCCESS INDICATORS

Youth will be able to discuss the refining process that corn goes through. Youth will be able to order 5 foods in order of sweetness using their own “sweetness scale”. Once foods are ordered, youth will be able to use their knowledge of the refining process of cornstarch to explain why some of their foods are sweeter than others.



## LEARNING OBJECTIVES

- Discuss the refining process of corn starch by making a poster
- Order foods on a “sweet scale”, and explain why some foods are sweeter than others



## NEBRASKA SCIENCE STANDARDS

- SC5.1.1a Ask testable scientific questions
- SC5.1.1.b Plan and conduct investigations and identify factors that have the potential to impact an investigation



## SUPPLIES

- Large poster paper (1 per group)
- Regular paper (1 per youth)
- Markers/crayons
- 5 foods broken into small servings (1 serving of each food per child) - corn starch, fruit, corn syrup, corn chips (plain), breakfast cereal, or other foods safe to serve youth participants
- Sweetness scale worksheet (Appendix E)



## ACTIVITY 1

In this activity youth will create a poster of the refining process of corn. Break children into groups of 4 and give each group a large piece of poster paper and various writing utensils (markers/crayons etc.). Discuss the refining process of cornstarch and have children create a flow chart on their poster that depicts how the cornstarch is refined.





## ACTIVITY 2

In this activity children will create a “sweetness scale” then taste test various foods and place them on their sweetness scale. Keep youth in previous groups, but give each child a piece of paper to make their own “sweetness scale” (for example: a scale from 1 to 10, 1 being the least sweet and ten being the sweetest). Once their scale is completed, give each youth a small portion of each type of food and allow children to taste each food one by one then rate each food in sweetness. Next, children will be able to order their food in order of sweetness using their “sweetness scale” ratings. Encourage groups to discuss with one another why some foods were sweeter than others using their chart. Once all groups are done, come back together as a large group and discuss why some foods were sweeter than others.



## THINK & DISCUSS

Take the time to go through these discussion questions with youth. Youth are encouraged to either write down answer, or discuss in groups with the class.

### REFLECT

1. Before this activity, did you know that cornstarch had to be refined to make it sweeter? What surprised you about this activity?
2. Why are some of your foods sweeter than others?

### APPLY

1. What foods do you regularly eat that are sweet? That are not sweet? Do any of these foods have cornstarch in them? Is the cornstarch refined in these foods?
2. What other foods at the grocery store contain food starch?



# ***APPENDICES***

# USES OF CORN

*Cut and laminate one set of images for each group*



**LIVESTOCK FEED**



**ETHANOL**



**EXPORT**

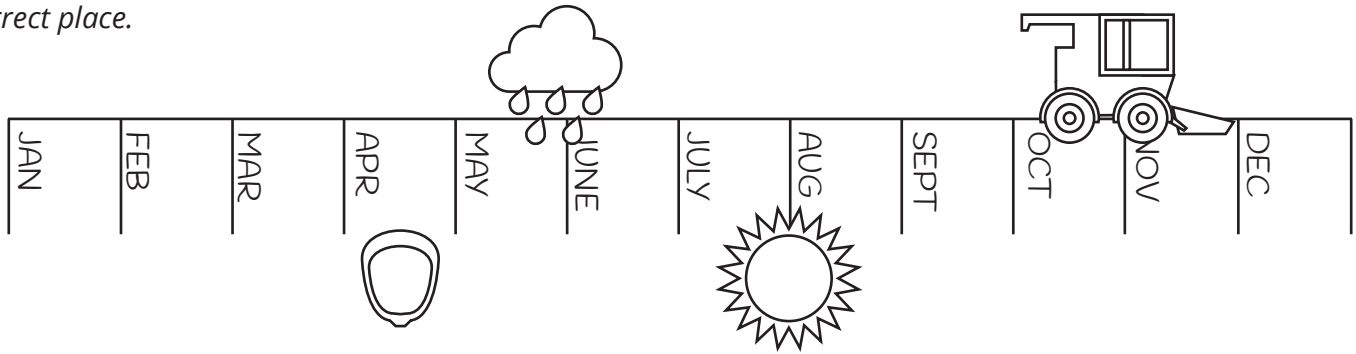


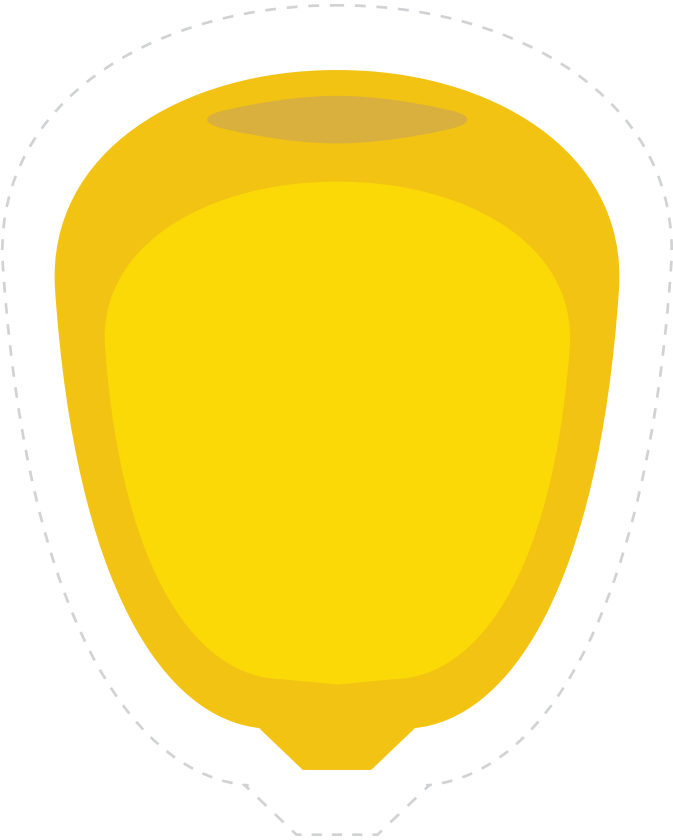
**FOOD PROCESSING & CARRYOVER**

# LIFE CYCLE OF CORN

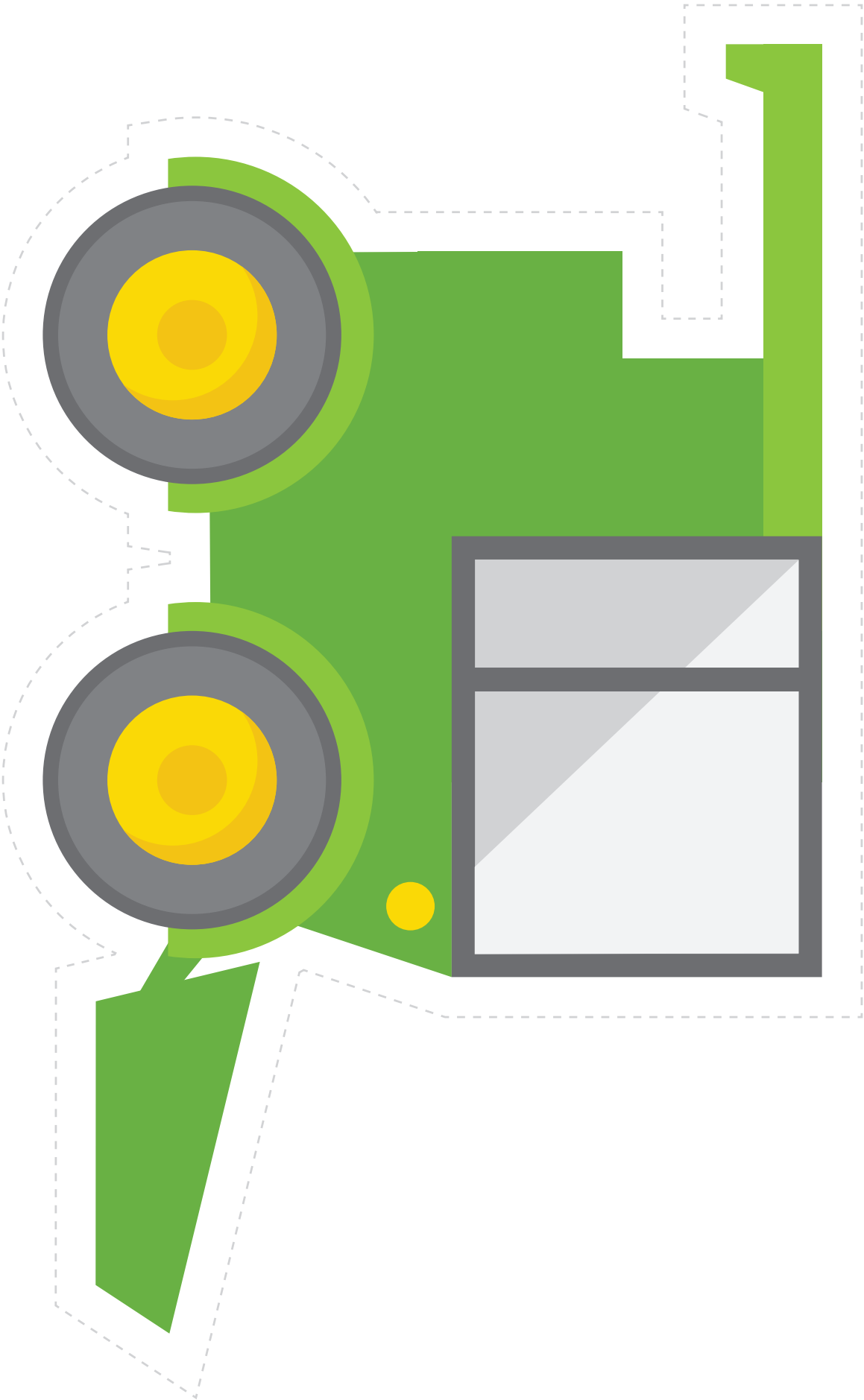
## ACTIVITY 1

Cut and laminate one set of images for the whole group. Draw a large 12-month timeline on the board, and have youth tape the inputs in the correct place.





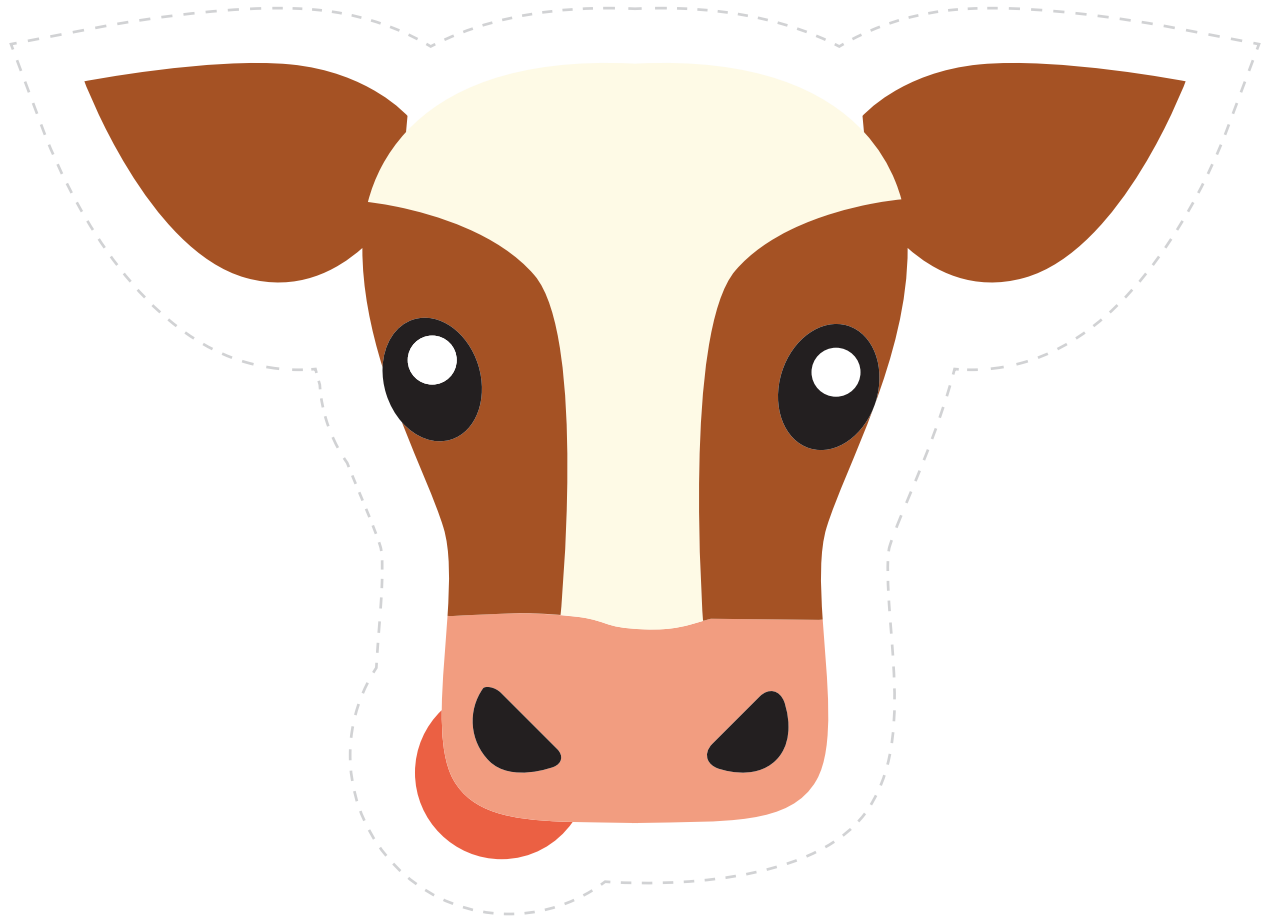
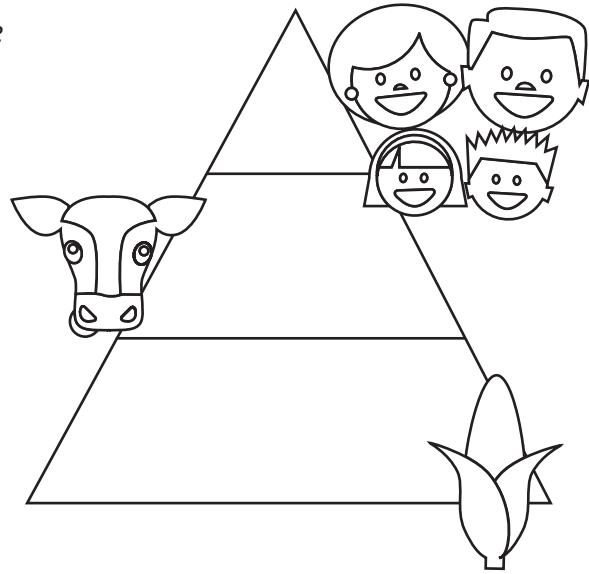


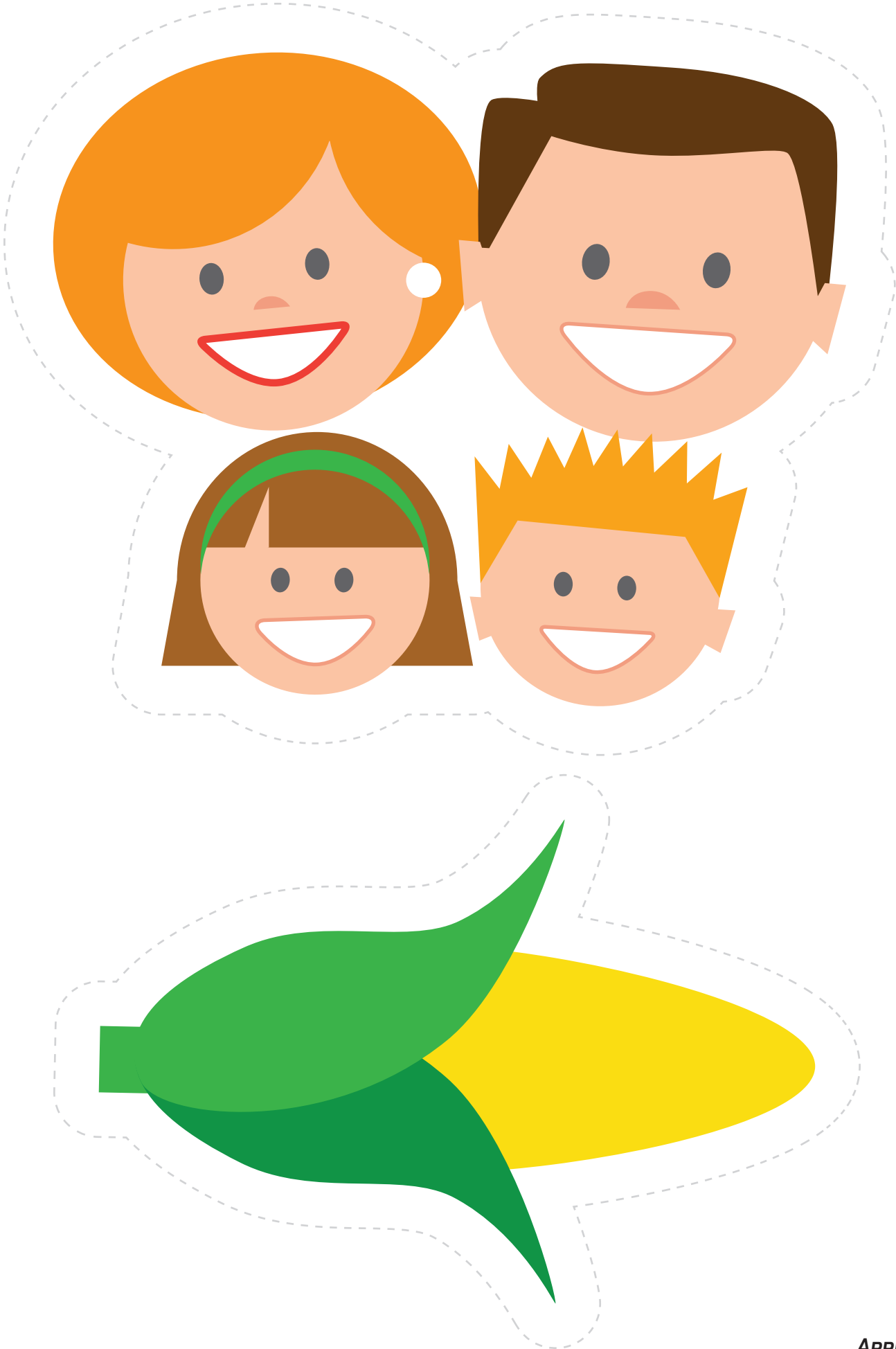


# LIFE CYCLE OF CORN

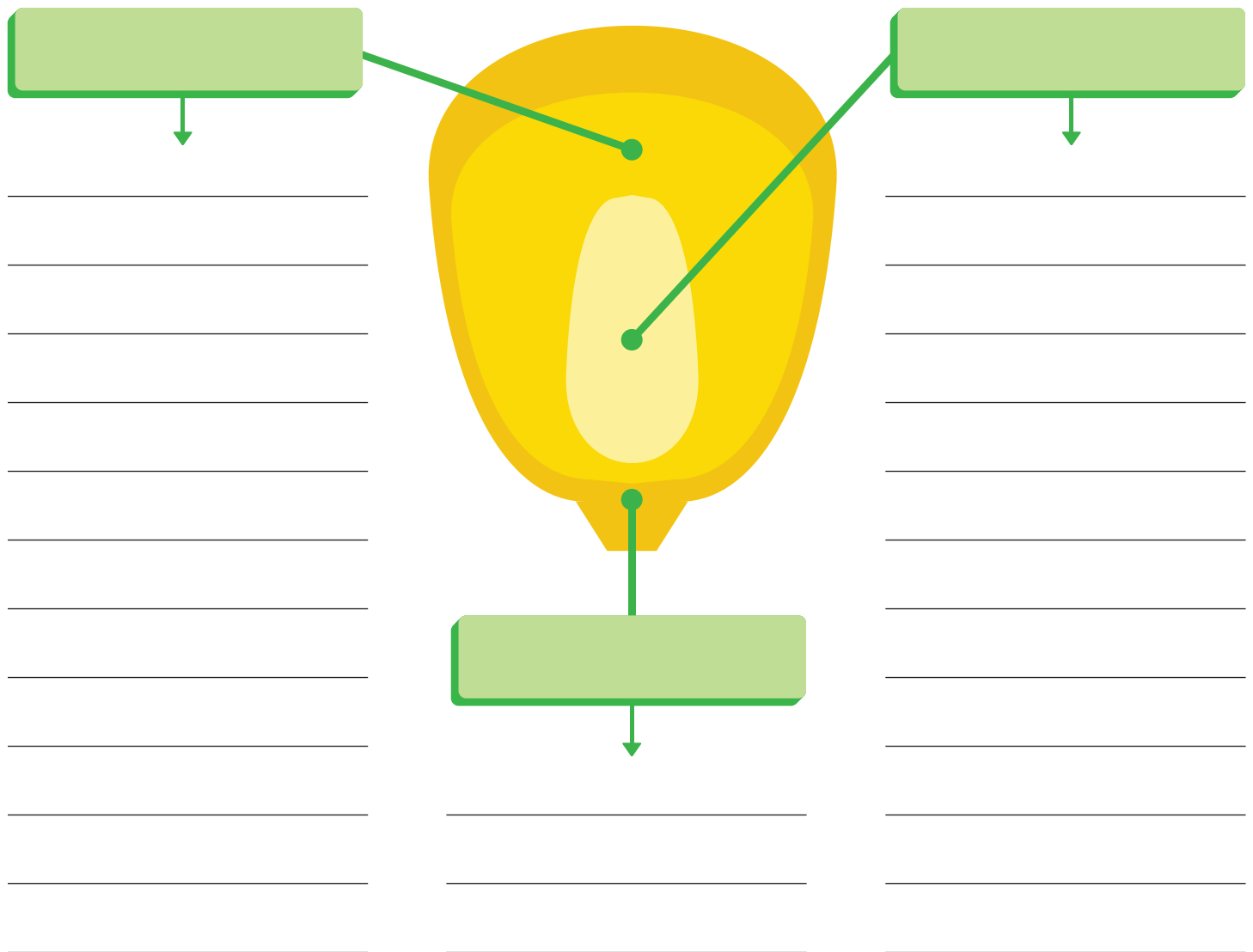
## ACTIVITY 2

Cut and laminate one set of images for the whole group.  
Draw a large pyramid on the board, and have youth tape the pictures in the correct place.



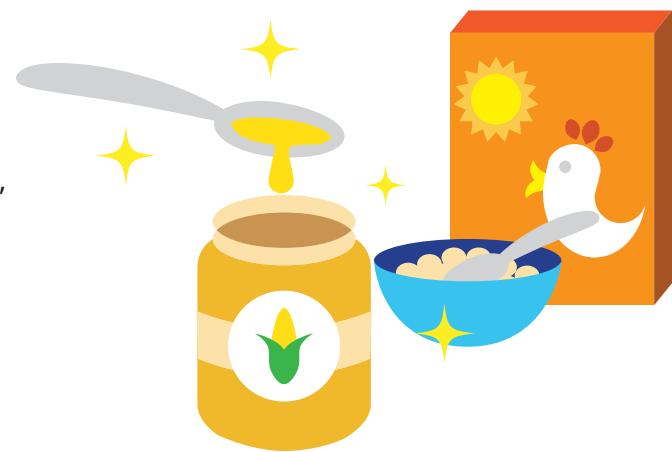


For this activity, label each part of the corn kernel. Then list the products that are made using each part of the kernel in the spaces below.



Name: \_\_\_\_\_

Taste each of the foods your instructor provides for you. Write down the name of each food, then rate its sweetness by circling a number on the scale from 1 to 10, 1 being not so sweet and 10 being very sweet.



	Not Sweet					Very Sweet				
1. _____	1	2	3	4	5	6	7	8	9	10
2. _____	1	2	3	4	5	6	7	8	9	10
3. _____	1	2	3	4	5	6	7	8	9	10
4. _____	1	2	3	4	5	6	7	8	9	10
5. _____	1	2	3	4	5	6	7	8	9	10