Lesson Number: MS.PS.3.2

From Farm to Fork: Plant Product Pathways

Middle School Food and Agricultural Literacy Curriculum

Precepts

F. Continuous Improvement

F5. Acquire new knowledge.

National Standards

PS.03.05.04.c Evaluate techniques for grading, handling and packaging plants and plant products.

CS.01.06.06.a. Describe the value of being a life-long learner and the need for continuous development.

NL-ENG.K-12.12 – Applying Language Skills

NS.5-8.6 – Science in Personal and Social Perspectives

Student Learning Objectives

As a result of this **unit** the students will…

Discuss the importance of plant science on fiber production.

As a result of this **lesson** the students will …

Construct a plant product pathway.

Content Outline

Objective 1. Construct a ***plant product pathway***.

I. A *plant product pathway* depicts the path an agricultural commodity takes from the time it is planted in the field, harvested, processed, shipped, stored, and marketed.

A. *Production Agriculture*

Production agriculture is the field of agriculture that involves the planting and harvesting of raw agricultural commodities such as row crops, animals, and greenhouse plants. Plant crops such as apples and oranges are grown on large orchards in rows of trees.

Other plant products such as cotton, peanuts, strawberries, potatoes, corn, wheat, and soybeans are grown in large fields in rows.

Time

Instruction time for this lesson: 45 minutes.

Resources

America's Heartland. (2008) Episode 118. Whole Cloth. From: — http://www.americasheartland.org/episodes/episode_118/denim.htm# — Georgia Cotton Commission. (2006). Cotton the Story. Retrieved August 25, 2009, from — http://www.georgiacottoncommission.org/images/E0010401/CottonTheStorySUNBELTFINAL.pdf. — National FFA Organization. (2009). LifeKnowledge Online. Retrieved July 9, 2009, from http://agedlearning.org — National FFA Organization. (2003). LifeKnowledge Precepts and Signs of Success.

Tools, Equipment, and Supplies

Overhead projector/transparencies
Computer with Internet Connection
TV or Projector to show online video
Pictures of orchards, fields, ***processing*** plants, refrigerated tractor trailers, railroads, etc.
MS.PS.3.2.AS.A – one per student
MS.PS.3.2.AS.B – one per student pair
MS.PS.3.2.ASSESS.A – one per student
"The Story of Cotton" – one per student pair, print from Georgia Cotton Commission

Key Terms

The following terms are presented in this lesson and appear in ***bold italics:***

Plant Product Pathway

Production Agriculture

Processing

Marketing

Today several plant products (such as tomatoes, strawberries, and ornamental plants) are commonly grown in sterile greenhouse environments. Each plant product is planted and harvested in a different way. Some plants may be planted from seeds, while others will be planted from young plants, called cuttings, that have been grown in a lab. Plants also differ in the amount of time it takes the plant to produce mature food.

For example, from the time corn is planted it takes only two or three months to have delicious corn on the cob. However, planting pecan or apples trees is a long-term investment as it may take from three to eight years to produce marketable products. Once the plants reach maturity, the fruits, nuts, and vegetables are harvested in different ways.

Some fruits, such as apples, are commonly picked by hand while cotton and peanuts are harvested using large machinery.

B. Plant Product *Processing*

Rarely does food ever travel directly from the farm to your plate. Food, especially plant products, goes through intense ***processing*** to create the ideal product for the consumer. For example, food that is canned or frozen must first go through a process of boiling, pressurization, pasteurization, or even radiation before being placed in an airtight container with chemical preservatives such as salt. Often fresh fruits and vegetables are used to make processed foods such as jellies, peanut butter, baby foods, and juices. And plant products are processed even further and added to make foods such as frozen pies, dried products, pastries, cereals, and candies.

C. Transportation

Transporting raw plant products to ***processing*** plants and then finished products to the supermarket is an important and often overlooked part of any ***plant product pathway***.

Food is commonly transported using tractor trailers, railroad cars, ships, and even airplanes. It is very important that fruits and vegetables maintain their freshness and visual appeal while being transported. Therefore, cargo containers and trailers are often suited with climate control equipment and refrigerators to control temperature, humidity, and ethylene gases (gases released by plants as they ripen that will hasten the ripening and rotting of other fruits that come in contact with the gas).

Because of America's strong and extensive infrastructure of roads, airports, and railroads, we are able to enjoy fruits and vegetables from all over the world at all times of the year.

D. Marketing

Marketing includes packaging, distributing, advertising, and selling agricultural products. Packaging for plant products such as fruits and vegetables is chosen with two main concerns: product freshness and customer appeal.

Marketers use several methods to advertise their products including radio ads, television commercials, billboards, magazines, product coupons, free trials, and posters displayed at supermarkets. To market their products, marketers first determine what the customers value such as: cost, health, taste, and appearance. Even the way products are placed on the shelves or arranged in the produce bins is meant to encourage passing customers to stop and purchase.

Interest Approach

Begin this lesson by encouraging the students to think about where their most recent meal came from. Help students to see beyond their refrigerator, pantry, local supermarket, and fast food restaurants and begin to ponder how the foods got to their table from the fields, farms, and orchards they originated in.

Close your eyes and think about this morning's breakfast. Did you have warm fluffy pancakes, a sweet crunchy pop tart, or maybe even a soft ripe banana? Now you are probably thinking about this food on your plate. But think about where this food came from before it was on your plate. Where do you or your parents get the food before it reached your house?

Your food probably came from a grocery store, supermarket, or farmer's market. Picture your breakfast on the shelves of the produce section in a box in the dry good section. That's very good, we have pictured the food on our plates, the grocery store shelves, now think back even further…. How did your breakfast get to the grocery store shelves, McDonalds, or convenience store?

If you ate an apple, imagine the large apple orchards. Picture the dairy farm with the large lazy cows getting ready to provide your fresh cold milk. Or imagine the forest where your warm maple syrup used to flow through hundreds of trees.

Allow 30 to 60 seconds for students to visualize these thoughts. You may choose to enhance the activity by using pictures of specific lunch or breakfast food and a few pictures of raw fruits and vegetables in fields and orchards.

Now open your eyes – who will share the steps in which your breakfast this morning got to the plate?

Allow one person to describe the steps and move on.

Thanks for sharing!

From Farm to Fork: Plant Product Pathways

Summary of Content and Teaching Strategies

Objective 1. Identify fiber-based agricultural products.

Before class, make sure you have enough student copies of **MS.PS.3.2.AS.A** and **MS.PS.3.2.AS.B** as well as "The Story of Cotton." Also have a projector and **MS.PS.3.2.TM.A** prepared for use. If available, ensure that the Whole Cloth video is ready to be shown through the website via computer and projector or TV. In this lesson, students will complete a *Go-With-The-Flow e-Moment®* by constructing a ***plant product pathway*** that shows the path cotton travels from the farm to the mall shelves.

There are four main steps a raw fruit or vegetable must go through before reaching your table. As we discuss these steps, take notes using your student handout titled "Class Notes." Notice that there are four shapes, one for each step. In the space provided, record a description of each step and a few of the interesting facts we are soon to discover.

Hold up a copy of **MS.PS.3.2.AS.A** and point out each of the four shapes for student notes. Then, display **MS.PS.3.2.TM.A** using a projector. Begin a classroom discussion of each of the four steps. Also, have available pictures of row crops, fruit orchards, ***processing*** plants, and packaged foods to share with the students as you discuss the steps. This part of the lesson should take about ten minutes.

All of our food begins in the hands of a hard working farmer. This step is called ***production agriculture***. ***Production agriculture*** is the field of agriculture that involves the planting and harvesting of raw agricultural commodities such as row crops, animals, and greenhouse plants.

Remind students to record this definition on their handout and allow time for them to do so.

Now class, where do plants come from?

Seeds

Very good! Many plants are planted from seeds, while others will be planted from young plants, called cuttings that have been grown in a lab. Just as each plant may be planted differently from another, they are also grown differently.

Plant crops such as apples and oranges are grown on large orchards in rows of trees. Other plant products such as cotton, peanuts, strawberries, potatoes, corn, wheat, and soybeans are grown in large fields in rows. Today several plant products (such as tomatoes, strawberries, and ornamental plants) are commonly grown in sterile greenhouse environments.

Show students pictures of orchards (such as apple, pears, or peaches); greenhouses (tomatoes and ornamental plants); and row crops (peanuts, cotton, and strawberries).

Plants also differ in the amount of time it takes the plant to produce mature food. For example, from the time corn is planted it takes only two or three months to have delicious corn on the cob. However, how long after planting an apples seed do you have to wait to enjoy a fresh apple?

Take suggestions from the class.

Planting apple trees is a long-term investment as it may take from three to eight years to produce marketable products. Once the plants reach maturity, the fruits, nuts, and vegetables are harvested in different ways. Some fruits, such as apples, are commonly picked by hand while cotton and peanuts are harvested using large machinery.

Rarely does food ever travel directly from the farm to your plate. Food, especially plant products, goes through intense ***processing*** to create the ideal product for the consumer. For example, food that is canned or frozen must first go through a process of boiling, pressurization, pasteurization, or even radiation before being placed in an airtight container with chemical preservatives such as salt.

Often fresh fruits and vegetables are used to make processed foods such as jellies, peanut butter, baby foods, and juices. And plant products are processed even further and other ingredients added to make foods such as frozen pies, dried products, pastries, cereals, and candies. Fiber products such as cotton and twine also go through special processes before they become clothes. In a few minutes, we will discover the exact path cotton follows.

OK, we have talked about some of the different ways plant products are grown, harvested, and processed. What do you think is the next step?

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Take suggestions from the class for a few moments. If students have a hard time coming up with thoughts, ask them questions to spur thought. A sample question: "How far away do you think the ***processing*** plants are from the supermarket?"

The next step is the movement of raw materials from the farm to the ***processing*** plant and from the ***processing*** plant to supermarkets and stores all over the world. Transporting is an important and often overlooked part of any ***plant product pathway***. How do you think food is transported?

Take suggestions from the class for a few moments.

Food is commonly transported using tractor trailers, railroad cars, ships, and even airplanes. It is very important that fruits and vegetables maintain their freshness and visual appeal while being transported. Therefore, cargo containers and trailers are often suited with climate control equipment and refrigerators to control temperature, humidity, and ethylene gases (gases released by plants as they ripen that will hasten the ripening and rotting of other fruits that come in contact with the gas).

Show the class several examples of specially equipped trailers and freight cars using pictures.

Because of America's strong and extensive infrastructure of roads, airports, and railroads, we are able to enjoy fruits and vegetables from all over the world at all times of the year.

The final step in the ***plant product pathway*** is the ***marketing*** of the products.

Marketing includes packaging, distributing, advertising, and selling agricultural products.

Show students several examples of product packaging that is really appealing.

Take a look at these plant product labels. What do you like about them? Do they make you want to buy the product? Why do you think these packages are made like they are? Share your thoughts with your neighbor.

Allow students a few minutes to share with their neighbor.

Packaging for plant products such as fruits and vegetables is chosen with two main concerns: product freshness and customer appeal.

Marketers use several methods to advertise their products including radio ads, television commercials, billboards, magazines, product coupons, free trials, and posters displayed at supermarkets.

Think about a commercial you recently saw for some type of food or fiber product. What caught your eye? Did the commercial make you want to buy the product or visit the restaurant?

Allow three to five students to share their thoughts with the class.

To market their products, marketers first determine what the customers value such as: cost, health, taste, and appearance. Even the way products are placed on the shelves or arranged in the produce bins is meant to encourage passing costumers to stop and purchase.

Very good, class! By this time, you will have all four shapes on your handout filled in with information and interesting examples. Now we will apply what we have just learned.

Utilize the Go-With-the-Flow e-Moment.

For the next part of class, we will work to create an actual ***plant product pathway*** as we discover just how cotton becomes the t-shirt and blue jeans you love to wear. Use the back of your handout with the blank product pathway to record how cotton is grown and harvested, processed, transported and stored, and then how the product is marketed, packaged, and placed on the store shelves for you and I to purchase and enjoy.

You will use the booklet titled "The Story of Cotton" to complete this activity. Remember to read your handout carefully to make sure you really understand each step in growing cotton and producing cotton fabric. Just as in most cases, by reading carefully, working closely with your group members, and asking questions if you do not understand, you will acquire new knowledge. You will have 20 minutes to complete this assignment. What questions are there? Let's review.

How long will you have?

20 minutes

Where will you record this information?

On the back of the student handout (**MS.PS.3.2.AS.B**)

Very good! Now get into groups and will be ready to begin when I say GO.

Place the students in groups of two (or no more than three) students by having them count off and then move into the groups corresponding with their number. Or assign students to groups before the lesson to ensure students work with other students who will complement their strengths and weaknesses.

GO!

Monitor student progress as they work cooperatively to complete their ***plant product pathway***s. Be available to assist groups that may be struggling to find the information in the booklet.

Review/Summary

End the activity with at least five to eight minutes left in the class for a review activity. To review, show students the video depicting the process cotton travels from the fields to the mall racks. Stop the video at key points to discuss the four main steps in the process. If video or Internet is not available, simply review the **MS.PS.3.2.AS.B** as a class.

If you can hear me, clap once.

Clap

If you can hear me, clap twice.

Clap, Clap

That was a great activity! Thank you for working so diligently. By now everyone should have a much better understanding of how cotton is grown, processed, transported, and sold. Let's watch a video to really see this pathway in motion. As the video plays, we will discuss our answers as a group. This activity requires everyone to listen quietly and play very close attention to details.

Stop the video periodically and discuss the following answers (found in "The Story of Cotton")

Planting and Harvesting

Cotton farmers prepare for planting in several ways. Producers who plant using no-till or conservation tillage methods use special equipment designed to plant the seed through the litter that covers the soil surface. Producers who employ conventional tillage practices plow or "list" the land into rows forming firm seed-beds for planting. Producers in south Texas plant cotton as early as February. In Missouri and other northern parts of the Cotton Belt, they plant as late as June.

Seeding is done with mechanical planters which cover as many as 10 to 24 rows at a time. The planter opens a small trench or furrow in each row, drops in the right amount of seed, covers them and packs the earth on top of them. The seed is planted at uniform intervals in either small clumps ("hill-dropped") or singularly ("drilled").Machines called cultivators are used to uproot weeds and grass, which compete with the cotton plant for soil nutrients, sunlight, and water.

About two months after planting, flower buds called squares appear on the cotton plants. In another three weeks, the blossoms open. Their petals change from creamy white to yellow, then pink and finally, dark red. After three days, they wither and fall, leaving green pods which are called cotton bolls. Inside the boll, which is shaped like a tiny football, moist fibers grow and push out from the newly formed seeds. As the boll ripens, it turns brown. The fibers continue to expand under the warm sun. Finally, they split the boll apart and the fluffy cotton bursts forth. It looks like white cotton candy.

Processing

Cotton goes to the gin stand where circular saws with small, sharp teeth pluck the fiber from the seed. From the gin, fiber and seed go different ways. The ginned fiber, now called lint, is pressed together and made into dense bales weighing about 500 pounds each. At the textile mill, the bales are opened by machines, and the lint is mixed and cleaned further by blowing and beating. The mixed and fluffed-up cotton goes into a carding machine which cleans the fibers some more and makes them lie side by side. The combing action of the carding machine finishes the job of cleaning and straightening the fibers and makes them into a soft, untwisted rope called a sliver (pronounced sly-ver).

Modern looms work at great speeds, interlacing the lengthwise yarns (warp) and the crosswise yarns (filling). The woven fabric, called gray goods, is sent to a finishing plant where it is bleached, pre-shrunk, dyed, printed, and given a special finish before being made into clothing or products for the home. Other machines make knits for use in shirts, sweaters, or blankets.

Transportation

Specially designed trucks pick up modules of seed cotton from the field and move them to the gin.

Marketing

Today the world uses more cotton than any other fiber, and cotton is a leading cash crop in the U.S. At the farm level alone, the production of each year's crop involves the purchase of more than $5.3 billion worth of supplies and services. This stimulates business activities for factories and enterprises throughout the country. ***Processing*** and handling of cotton after it leaves the farm generates even more business activity. Annual business revenue stimulated by cotton in the U.S. economy exceeds $120 billion, making cotton America's number one value-added crop.

Cotton is a part of our daily lives from the time we dry our faces on a soft cotton towel in the morning until we slide between fresh cotton sheets at night. It has hundreds of uses, from blue jeans to shoestrings. Clothing and household items are the largest uses, but industrial products account for many thousands of bales.

End the video and ask students if they have any questions about this particular ***plant product pathway*** or cotton and cotton products.

Our time is up for class today but I am so proud that we learned so much. From now on, remember each time you slip that favorite cotton t-shirt on or slide into those perfect pair of worn out denim jeans, that a farmer worked very hard to grow and harvest the cotton, factory workers worked long hours to blend and bleach the fabric, truck drivers drove thousands of miles. And marketers came up with hundreds of new ideas to turn the cotton in the fields into the t-shirt on your back!

Application

Extended classroom activity:

To extend further study of ***plant product pathway***s, assign each student a specific product. Using computers, magazines, or resources prepared by the teacher, students will independently construct ***plant product pathway***s for their products. Then students will create a five-slide presentation visually depicting the product pathway.

FFA activity:

Have students present a demonstration at the next FFA meeting on how a product is produced from the farm to the table.

SAE activity:

This lesson can be used to introduce the many opportunities students have to pursue a Supervised Agricultural Experience Program in plant science and fiber production. Students could do a research SAE around food and fiber ***processing***.

Evaluation

MS.PS.3.2.ASSESS.A

Answers to Evaluation

1. B
2. D
3. A
4. C

Objective 1. Construct a plant product pathway.

A plant product pathway depicts the path an agricultural commodity takes from the time it is planted in the field, harvested, processed, shipped, stored, and marketed.

A. Production Agriculture:

Production agriculture is the field of agriculture that involves the planting and harvesting of raw agricultural commodities such as row crops, animals, or greenhouse plants. Plant crops such as apples and oranges are grown in large orchards in rows of trees. Other plant products such as cotton, peanuts, strawberries, potatoes, corn, wheat, and soybeans are grown in large fields in rows. Today, several plant products (such as tomatoes, strawberries, and ornamental plants) are commonly grown in sterile greenhouse environments. Each plant product is planted and harvested in a different way. Some plants may be planted from seeds, while others will be planted from young plants, called cuttings, which have been grown in a lab. Plants also differ in the amount of time it takes the plant to produce mature food. For example, from the time corn is planted it takes only two or three months to have delicious corn on the cob. However, planting pecan or apples trees is a long-term investment as it may take three to eight years to produce marketable products. Once the plants reach maturity, the fruits, nuts, and vegetables are harvested in different ways. Some fruits, such as apples, are commonly picked by hand while cotton and peanuts are harvested using large machinery.

B. Plant Product Processing:

Rarely does food ever travel directly from the farm to your plate. Food, especially plant products, goes through intense processing to create the ideal product for the consumer. For example, food that is canned or frozen must first go through a process of boiling, pressurization, pasteurization, or even radiation before being placed in an airtight container with chemical preservatives such as salt. Often fresh fruits and vegetables are used to make processed foods such as jellies, peanut butter, baby foods, and juices. And plant products are processed even further and ingredients added to make foods such as frozen pies, dried products, pastries, cereals, and candies.

C. Transportation:

Transporting raw plant products to processing plants and then finished products to the supermarket is an important and often overlooked part of any plant product pathway. Food is commonly transported using tractor trailers, railroad cars, ships, and even airplanes. It is very important that fruits and vegetables maintain their freshness and visual appeal while being transported. Therefore, cargo containers and trailers are often suited with climate control equipment and refrigerators to control temperature, humidity, and ethylene gases (gases released by plants as they ripen that will hasten the ripening and rotting of other fruits that come in contact with the gas). Because of America's strong and extensive infrastructure of roads, airports, and railroads, we are able to enjoy fruits and vegetables from all over the world at all times of the year.

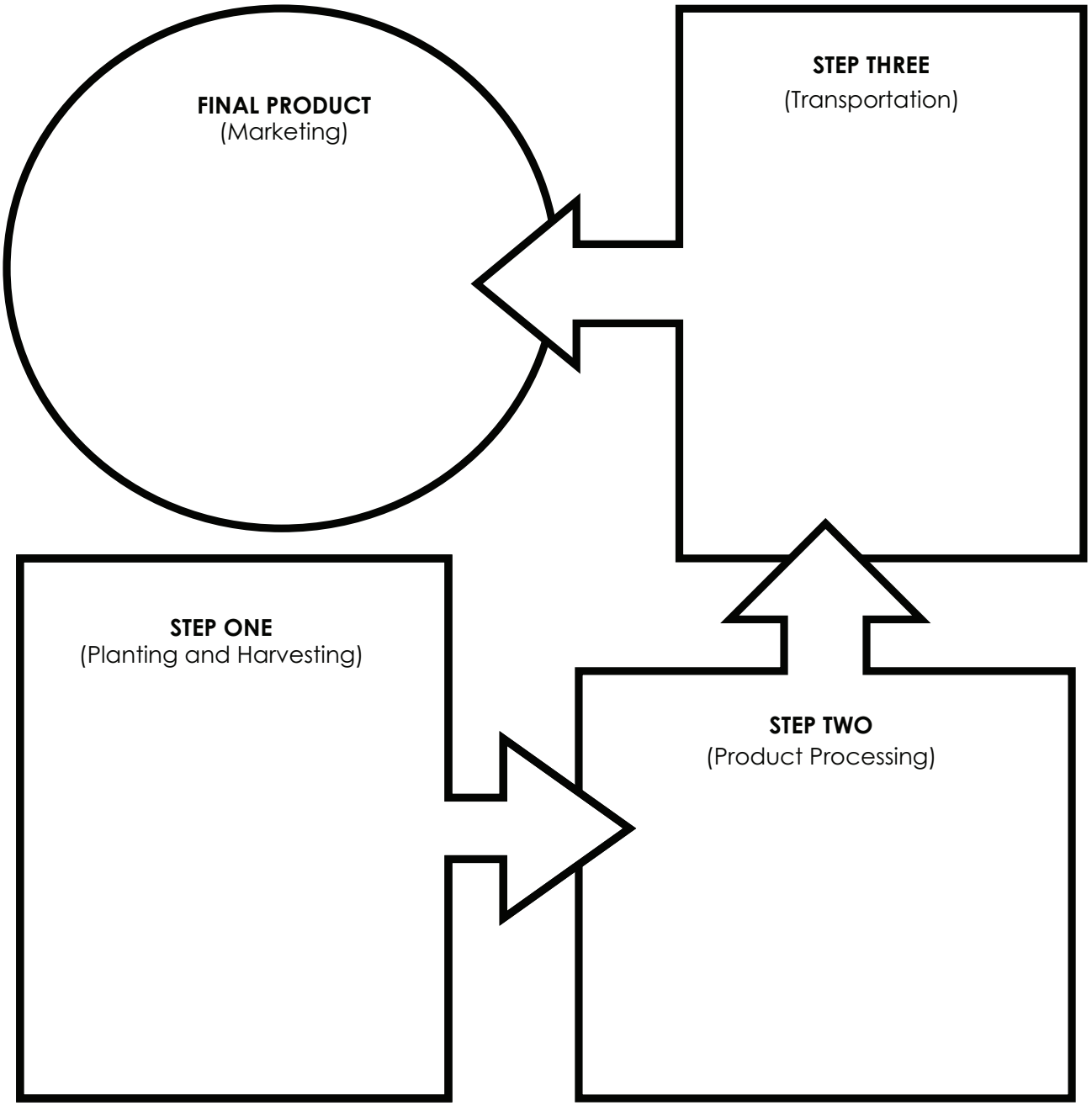
D. Marketing:

Marketing includes packaging, distributing, advertising, and selling agricultural products. Packaging for plant products such as fruits and vegetables is chosen with two main concerns: product freshness and customer appeal. Marketers use several methods to advertise their products including radio ads, television commercials, billboards, magazines, product coupons, free trials, and posters displayed at supermarkets. To market their products, marketers first determine what the customers value such as: cost, health, taste, and appearance. Even the way products are placed on the shelves or arranged in the produce bins is meant to encourage passing costumers to stop and purchase.

CLASS NOTES

Name: _____

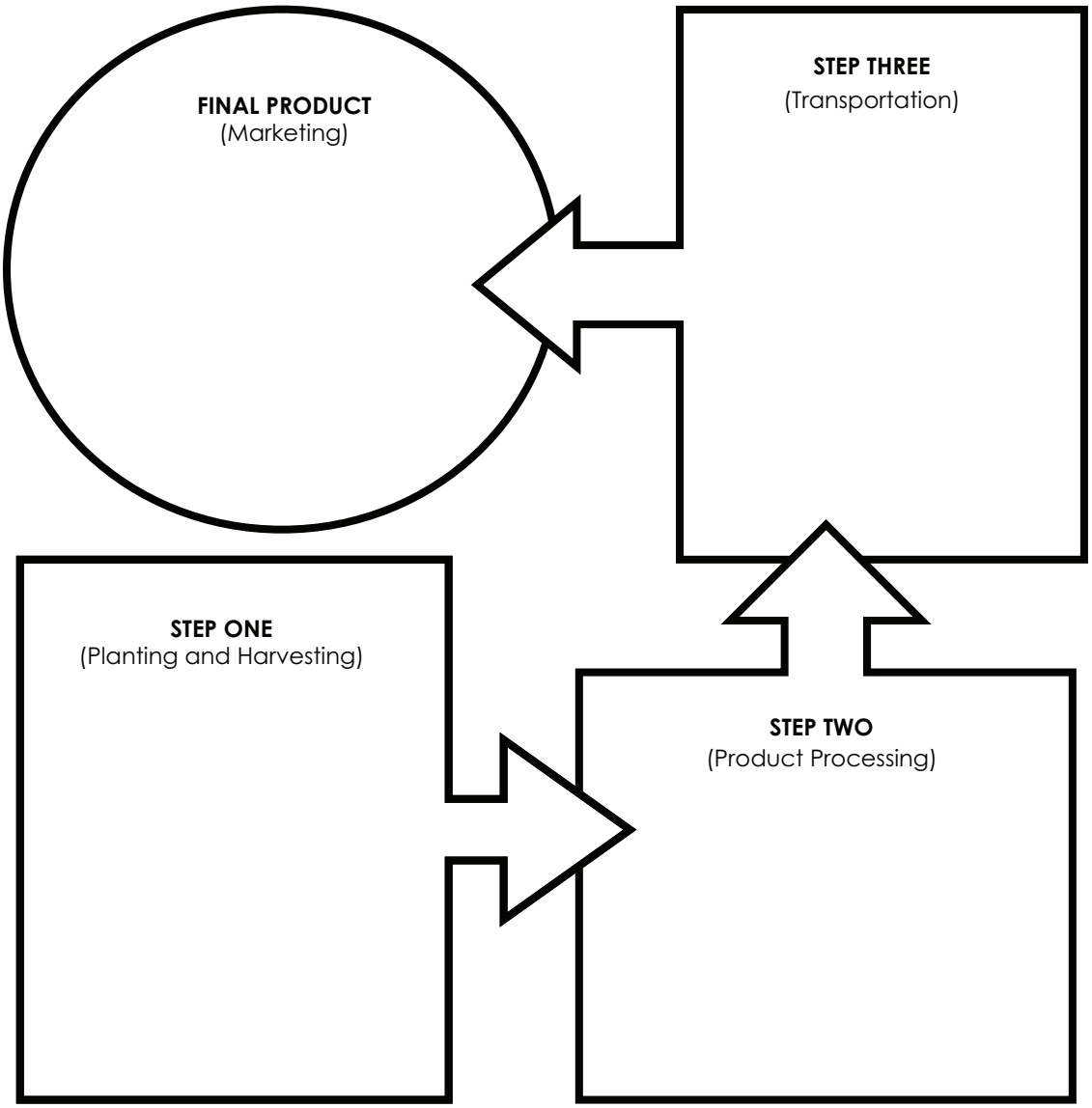
Directions: As we discuss the four steps in most plant product pathways, use the graphic organizer below to take notes.



Name: _____

PRODUCT NAME: _____

Directions: Use the flowchart below to describe and artistically depict the process of growing and raising the food and fiber products we rely on today. You will listen to your classmates' presentations and record this information below.



Name _____

Directions: Match each of the four steps in a plant product pathway to the description on the right.

_____1. Production Agriculture	**A. Moving raw products from the farm to processing plants to our supermarkets by plane, cargo ships, railroads, and tractor trailers.**
_____ 2. Processing	**B. The first step in a plant product pathway that includes the planting and harvesting of fruits and vegetables.**
_____ 3. Transportation	**C. Includes packaging, advertising, distributing, and selling finished products.**
_____ 4. Marketing	**D. Converting the raw fruits and vegetables that are harvested from the fields and orchards into the frozen, canned, and fresh products we enjoy from the supermarket.**