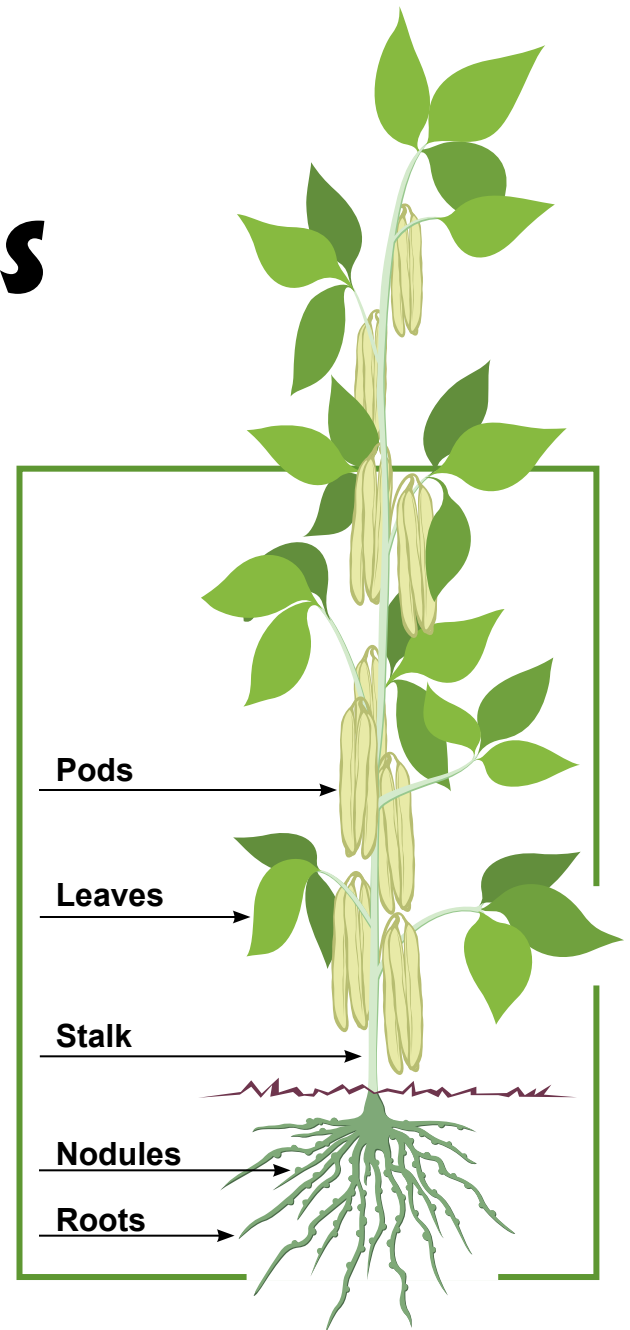


PULSE CROPS AND DRY EDIBLE BEANS

This issue of the Ag Mag focuses on the production, processing, distribution and consumption of pulse crops and dry edible beans. North Dakota ranks high in production of most pulse crops and dry edible beans, and #1 in several.

The Ag Mag's information and activities are geared primarily toward the state's third, fourth and fifth graders. The Ag Mag is distributed three times per year. Subscriptions are free, but if you're not on the mailing list or if you know someone who wants to be added, contact the North Dakota Department of Agriculture at (800) 242-7535 or ndda@nd.gov.

The magazine also is on the Web at www.ag.ndsu.edu/agmag/agmag.htm or through the North Dakota Agriculture in the Classroom website at www.ndaginclassroom.org. This magazine is one of the N.D. Agriculture in the Classroom Council activities that helps you and other K-12 teachers integrate information and activities about North Dakota agriculture across your curriculum in science, math, language arts, social studies and other classes. It's a supplemental resource rather than a separate program.



N.D. Agriculture in the Classroom Mission

To cultivate an understanding of the interrelationship of agriculture, the environment and people by integrating agriculture into K-12 education

PRODUCTION

Legumes

Legumes are plants that have nodules on their roots with bacteria that fix nitrogen. They also have seed pods that, when ripe, split along both sides. Pulse crops (peas, lentils and chickpeas) and edible beans are legumes.

The nitrogen-fixing capability of legumes is important because all plants need nitrogen to grow. Even after the crop is harvested, some of the nitrogen in the legume's roots stays in the soil to provide this nutrient to a crop in that soil the next year. The second crop probably will not be a legume, but instead something like wheat or corn that would use the nitrogen rather than produce more. This is an example of crop rotation, which reduces farmers' fertilizer costs.

Idea: Have students research other kinds of legumes. Their lists might include soybeans, peanuts and alfalfa.

Idea: Use the text structure web on page 11 to help students learn about pulse crops, dry edible beans and other legumes. Have students fill in the web as they read through the Ag Mag.

Idea: Define for students the difference between an annual plant, a biennial and a perennial. Sort various plants into the three categories.

Idea: Have students explore the Northern Crops Institute website at www.northern-crops.com/crops/crops.htm to learn more about crops grown in the northern U.S. Call (701) 231-7736 to schedule a tour of their facility on the North Dakota State University campus.

Idea: Gather the different kinds of pulse crops and classes of beans so students can see what they look like.

Idea: Grow a garden in a glove using pulse crops and beans. See the instructions at www.msichicago.org/online-science/activities/activity-detail/activities/grow-a-garden-in-a-glove-1.

Bean Graphs or Growth Charts

Materials:

Small plastic pots (left from plants purchased in the spring or margarine containers)

10 beans per week

Water sprayer

Growing medium

Procedure:

Plant two seeds each day in separate small pots. Label with date and keep moist. Remove extra seed from each pot when it becomes clear one is hardier than the other.

Keep a Record of Plant Growth:

Encourage students to devise their own methods for record keeping. "What can we do to help us remember what our seeds looked like as they grew?" Most children will think of drawing pictures and writing descriptions. Some may want to make a graph of growth. Younger students may measure the growing bean plant with a strip of paper. Cut the strip to the length of the plant, record the date and paste it on a sheet of paper.

Record keeping may include:

What I want to find out.

What I did.

What I observed.

Why I think that happened.

Suggestion:

As a variation to this experiment, leave some bean plants in a dark area and some in the light. Give some plants too much water and others not enough. Give some plants fertilizer and don't fertilize others. Have students record their observations daily. Develop a weekly summary to analyze the experiments.

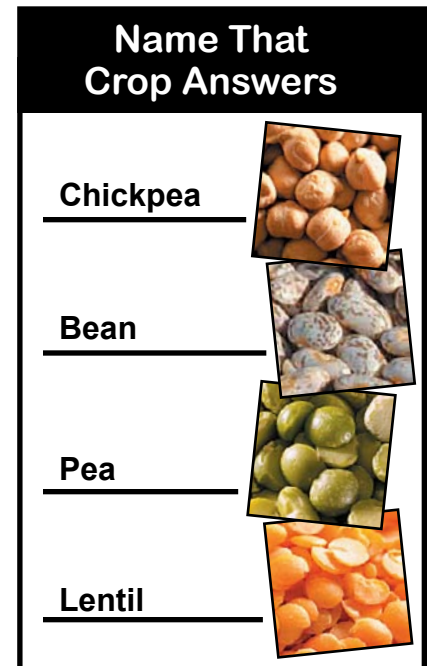
Beans Bingo Game

Copy the BEANS bingo card from the student worksheet (see page 10) and have students personalize their cards by randomly writing names of different bean classes from page 2 of the Ag Mag in squares on the cards. Give each student several beans from different classes to use as game markers. The teacher or a student leader calls out a letter – B, E, A, N or S – and a class of bean (for example, turtle, pinto, light red kidney, Great Northern, etc.) Students place a bean (preferably of the class called) on that square. The first student to get five beans in a row wins. The teacher or a student leader should write down which bean was called for which letter to check students' accuracy. Pulse crops could be used in addition to beans.

From the Field to the Fork Answers

- 1 The farmer plants the bean seed using special equipment called a drill or row planter.
 - 7 Trucks take the beans to a processing plant where the beans are tested to determine the quality and the price the farmer receives.
 - 3 When the plant has grown to its full height, small flowers begin to develop on the plant.
 - 2 With soil, sunlight and rain, the bean plant grows for 12-14 weeks.
 - 9 The beans are bagged and transferred into rail cars or trucks and sent to canners and packagers all around the world.
 - 5 The bean plant, including the pods, turns from a green color to yellow, indicating that harvest time is near.
 - 4 The flowers turn into pods and bean seeds begin to grow in the pods.
 - 8 The beans are sorted by color, size and quality at the processing plant.
 - 6 The farmer harvests the beans and augers them into trucks.
- Also, discuss with students what an auger is and how augers are used not just on farms but in other ways – for example, to dig holes for fence posts or holes for ice fishing.

Source: Northarvest Bean Growers Association



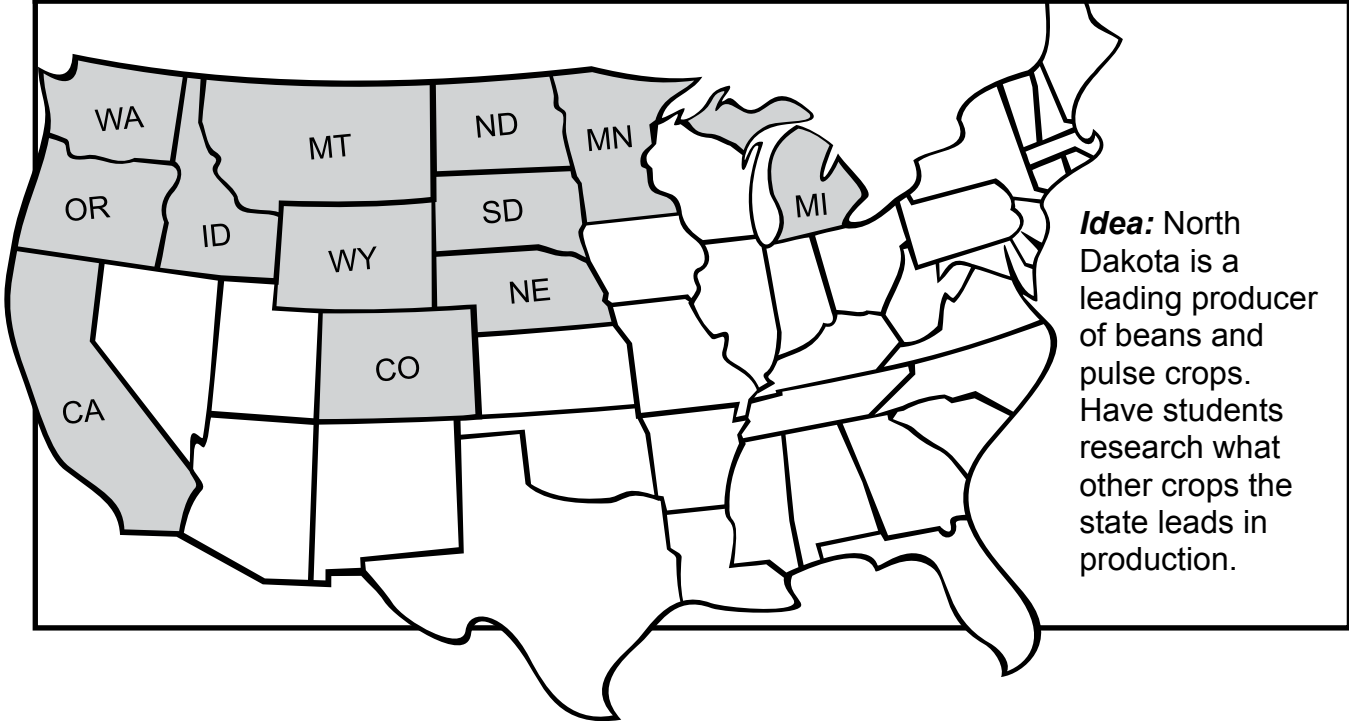
Idea: Show the “A Place called Northarvest Country” video from Northarvest Bean Growers Association. Go to www.beaninstitute.com, and click on Multimedia in the left column. Other classroom resources also are listed on this page.

Idea: Have students watch the Dan D. Pea Celebrates National Split Pea Soup Week at www.youtube.com/watch?v=T9N2v1qToms. This 1-minute video includes a cute character and illustrates split pea soup from farm to table.

Idea: Have students watch the 1-minute Harvesting Swathed Lentils video at www.youtube.com/watch?v=RPcPu1a0Tfg or the 1:43 Lentil Harvest on the Palouse at www.youtube.com/watch?v=cTkW3EK5q24.

Idea: Have students watch the 4-minute video on beans being grown hydroponically at http://teachertube.com/viewVideo.php?video_id=237296.

U.S. Pulse Production and U.S. Bean Production Answers



Idea: North Dakota is a leading producer of beans and pulse crops. Have students research what other crops the state leads in production.

Food from Way Back

Dry beans were important staple foods thousands of years ago in the Americas and Asia, especially China. In the Americas, the Mayans, Aztecs and Incas grew dry beans. They left behind pottery decorated with pictures of people holding dry beans. Various American Indian tribes grew different kinds of dry beans and then traded them. For example, the lima bean was first grown in Guatemala and then traded to Mexican Indians. These Indians traded lima beans to North American tribes in the Southwest, Virginia and the Mississippi Valley. Meanwhile, lima beans also were traded to Peru, where the natives developed the best, biggest variety. When Spaniards came, they named the bean "lima," after the capital of Peru.

Dry beans were called the "poor man's meat." People in Europe were much better fed after dry beans, potatoes and corn were brought from the New World. This better nutrition is one reason Europe's population grew between 1500 and 1900. In America, things were different. Settlers had much rich land to farm, so they could easily raise wheat, corn and livestock. They did not need to grow dry beans for protein because they had plenty of meat. Today people realize the benefits of eating beans as well as meat and dairy for protein.

Source: Northarvest Bean Growers Association

Where in the World Answers



Idea: Use National Geographic's MapMaker Interactive at <http://education.nationalgeographic.com/education/mapping/interactive-map> to have students create maps of Where in the World countries and complete other activities.

Idea: Have students identify trade routes that beans and other commodities might have taken from the New World.

Idea: Have students discuss importing and exporting, and then list food products that the U.S. exports and those that are imported.

PROCESSING

Canned vs. Dry Answers

1. $1 \frac{1}{2} \text{ cups} \times 2 = 3 \text{ cups water}$
2. $6 \text{ cups} / 2 \text{ cups} = 3 \text{ cups dry peas}$
3. $40 \text{ ounces} / 16 \text{ ounces} = 2 \frac{1}{2} \text{ cans}$
4. $3 / 1 \frac{1}{2} = 2 \text{ cans}$

Idea: Bring 1 pound each of dry peas, lentils and beans to class. Have students measure $\frac{1}{2}$ cup of each into three containers, nine containers in all. Add $\frac{1}{2}$ cup, 1 cup and $1 \frac{1}{2}$ cups of cold water to one of the three containers of peas, lentils and beans. Let them soak overnight, then drain each one, keeping the water left. Have students develop math problems to illustrate how much the peas, lentils and beans expanded and how much water was absorbed.

The Many Uses of Peas Answers

All 11 of these products may contain dry peas. They may be in foods, beverages or livestock feed to add protein, fiber or starch. Pea starch also may be used to make ethanol.

Source: Northern Pulse Growers Association

DISTRIBUTION

Idea: Have students research other career areas related to pulse or bean production, processing, distribution or consumption. Invite a farmer who grows pulse or bean crops to visit your classroom. Ask your county Extension agent for contacts.

Idea: Use the Trading Favorites lesson from Project Food, Land & People to help middle- and high-school students learn about imports and exports. Information about Project Food, Land & People teacher classes in on page 9.

CONSUMPTION

Protein Food or Vegetable? Answers

Cheese	Bread	V	Tomatoes
Rice	V	Potatoes	Grapes
Spaghetti	V,P	Lentils	Watermelon
P Chicken	V,P	Pinto Beans	Honey
Yogurt	P	Eggs	Oats
Wheat	V	Broccoli	V,P Dry Peas
V,P Turtle Beans	V	Carrots	P Fish
Milk	Cereal		

Source: Northern Pulse Growers Association

Idea: Brainstorm other foods that might fall into more than one category of MyPlate.

Idea: Have students go to www.chooseMyPlate.gov to estimate what and how much they need to eat, to track their eating and physical activity, and more.

Idea: Since pulses and dry edible beans are major food aid contributions to developing countries, have students carry out a service learning project to research donation programs and gather pulses and dry beans to donate.

Math Challenge Answers

1. $\$1.75 + \$1.75 = \$3.50$
 $\$3.50 - \$2.50 = \$1$
2. $\$2 + \$2 + \$2 = \6
3. $3 \times \$0.99 = \2.97
4. $\$2.50 + \$6 + \$2.97 = \11.47
5. 2 cans pinto beans,
1 can dark red kidney beans,
4 cans black beans,
3 cans navy beans,
1 can Great Northern beans,
1 can light red kidney beans

Estimation

Make copies of the student worksheet on the bottom of page 10, and give one worksheet to each group of students. Fill 4 containers with a class of dry beans or of a pulse crop, and label them for students to analyze.

After they complete the worksheet, ask the students how they arrived at their guesses. Determine how they could make a more accurate guess without counting all the beans. Lead to the idea of taking samples and estimating the total numbers from those samples.

Have five different students take a baby food jar sample of beans and count the number of beans in each jar. Have one student record the number in each jar. When all samples are counted, ask the recorder to average them.

Next, the students need to know how many sample jars will fill the large jar. Have one student fill baby food jars with beans and count how many jars it takes to fill the large jar. Talk about how an average of the samples taken times the number of jars it would take to fill the large container equals a fair estimate of the total number of beans.

Source: Northarvest Bean Growers Association

Bean and Pulse Crop Art

Rather than simply creating a picture using different dry beans and pulse crops like your students did when they were younger, have them try to replicate famous artwork, historical places, animals, instruments or other designs by gluing different colors and textures of the seeds on tag board.

Bean and Pulse Crop Border Frames

Cut out the center of the plate or shape. Design the outer edge of the plate or shape with beans and glue in place. Cut the tag board so it fits where the center of the plate or shape was, leaving enough of an edge to glue in place. On the tag board, write or draw something you learned about pulse crops or edible beans. Glue tag board or construction paper to the back side of the frame. When finished, hang them in the classroom to remind the students what they've learned.

Source: Northarvest Bean Growers Association

Teaching with Technology

Idea: Localize Oklahoma Ag in the Classroom SmartBoard lessons on Beans Around the World; A Field of Beans; Counting Beans; and Farmer, Farmer, Where Am I Grown? (mapping activities). Go to <http://exchange.smarttech.com> and search for those topics.

Idea: Incorporate other SmartBoard lessons into this and other curricula. Go to the <http://exchange.smarttech.com> site and search for nitrogen cycle, bean sprouting and other topics.

Idea: Create a Jeopardy game for students or have them create it using words related to pulse crops and beans. Go to <http://exchange.smarttech.com> and search for Jeopardy.

Idea: Though not specific to legumes, go to <http://exchange.smarttech.com> and search for lessons on the plant life cycle.

Idea: Make flashcards using the free iFlash Touch app for iPhone or iPod Touch or \$14.99 iFlash for the Mac.

Books

[From Seed to Plant](#) by Gail Gibbons

[Jack's Garden](#) by Henry Cole

[Beyond the Bean Seed: Gardening Activities for Grades K-6](#) by Rosanne Blass and Nancy A. Jurenka

[A Seed in Need](#) by Sam Godwin

[All in Just One Cookie](#) by Susan E. Goodman

[Harvest Year](#) by Chris Peterson

[How Plants Grow](#) by Angela Royston

[I Drive a Tractor](#) by Sarah Bridges

[One Generous Garden](#) by Anne Nagro

Find other books that are reviewed for accuracy and recommended at www.agfoundation.org under the Ag Literacy tab.

TEACHER AND STUDENT RESOURCES

Quizlet.com

Go to <http://quizlet.com/> and sign in using:

username: ndagmag

password: agriculture

This resource can be used for an online activity specifically developed to coordinate with this Ag Mag – or make your own quizlets.

Northarvest Bean Growers Association

50072 East Lake Seven Road

Frazee, MN 56544

Ph: (218) 334-6351

Fax: (218) 334-6360

Email: nhbean@loretel.net

www.northarvestbean.org or www.beaninstitute.com – “A Place called Northarvest” video online and one free poster per classroom with full-color photos and explanations of bean classes and uses

Northern Pulse Growers Association

1710 Burnt Boat Drive

Bismarck, ND 58503

Phone: (701) 222-0128

Fax: (701) 222-6340

Email: info@northernpulse.com

www.northernpulse.com – under Kids/Educators, see Super Foods Make Super Kids and Mind Your Peas & Q's

USA Dry Pea and Lentil Council

www.pea-lentil.com

U.S. Dry Bean Council

www.usdrybeans.com

Includes information about production and varieties, food aid, nutrition, the 12 key nutrients in beans and much more, plus photos

North Dakota State University

Beans: Agriculture to Health

– www.ag.ndsu.edu/pubs/yf/foods/fn602w.htm

Bean Coordinated Agricultural Project

– www.beancap.org/Extension.cfm

Choose MyPlate Resources

– www.ag.ndsu.edu/publications/food-nutrition/myplate-resources

Pulses: The Perfect Food

– www.ag.ndsu.edu/pubs/yf/foods/fn1508.pdf

University of Connecticut

www.cag.uconn.edu/nutsci/nutsci/outrch/pdf/beanmagic.pdf

Bean Magic 4-page kid-friendly handout with recipes

National Agriculture in the Classroom

www.agclassroom.org

Resources from educational programs from around the country

My American Farm

www.myamericanfarm.org

This website from the American Farm Bureau Foundation for Agriculture includes online games, e-comics, videos, activity pages and much more. The games Ag across America, Finders Keepers, Let's Make Something Tasty and Farmer's Market Challenge especially apply to the concepts in this pulse crops and beans Ag Mag.

NORTH DAKOTA AGRICULTURE IN THE CLASSROOM ACTIVITIES

This **Ag Mag** is just one of the North Dakota Agriculture in the Classroom Council projects. Each issue of the Ag Mag focuses on an agricultural commodity or topic and includes fun activities, bold graphics, interesting information and challenging problems. See past issues at www.ag.ndsu.edu/agmag/agmag.htm.

Send feedback and suggestions for future Ag Mag issues to:

Becky Koch
NDSU Agriculture Communication
(701) 231-7875
becky.koch@ndsu.edu

Another AITC teacher resource is **Project Food, Land & People** (FLP). Using the national FLP curriculum, N.D. Ag in the Classroom provides 600-level credit workshops for teachers to instruct them in integrating hands-on lessons that promote the development of critical thinking skills so students can better understand the interrelationships among the environment, agriculture and people of the world. Teachers are encouraged to adapt their lessons to include North Dakota products and resources.

FLP is a 55-lesson curriculum developed for K-12 educators to integrate easily into the classroom. The instructional units address core content and North Dakota state standards and benchmarks with inquiry-based learning activities.

Participants receive the entire curriculum on CD plus North Dakota materials.

See the schedule and syllabi at www.ndfb.org/edusafe/flp. Some stipends are available.

For information, contact:

Gail Bakko
N.D. Farm Bureau Foundation
(701) 371-0361
gails@ndfb.org

The N.D. Geographic Alliance conducts a two-day **Agricultural Tour for Teachers**. The tour includes farm and field visits, tours of processing plants and discussions with people involved in the global marketing of N.D. farm products.

For information, contact:

Marilyn Weiser
N.D. Geographic Alliance
(701) 858-3063
marilyn.weiser@gmail.com

Educators may apply for **mini-grants for up to \$500** for use in programs that promote K-12 agricultural literacy. Individuals or groups such as teachers, 4-H leaders, commodity groups and others interested in teaching young people about the importance of North Dakota agriculture may apply.

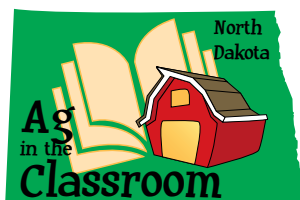
Examples of programs that may be funded: farm safety programs, agricultural festivals, an elementary classroom visiting a nearby farm and ag career awareness day. Grant funds can be used for printing, curriculum, guest speakers, materials, food, supplies, etc. More ideas and application information are at www.ndaginclassroom.org. Applications are due every year in early September.

For information, contact:

Beth Bakke Stenehjem
N.D. FFA Foundation
(701) 224-8390
bethbakke@btinet.net

North Dakota Agriculture in the Classroom Council

Kim Alberty – Agassiz Seed and Supply, West Fargo
Aaron Anderson – N.D. Dept. of Career and Technical Education
Nancy Jo Bateman – N.D. Beef Commission
Sheri Coleman – Northern Canola Growers Association
Kirk Olson – McKenzie County Farm Bureau
Wendi Stachler – North Dakota State University
Statutory Member: Superintendent of Public Instruction
Kirsten Baesler (Bob Marthaller, representative)



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701 328-2307 or 1-800-242-7535

kpinke@nd.gov
www.nd.gov/ndda
www.facebook.com/ndaginclassroom

B	E	A	N	S
		FREE BEAN		

ESTIMATION

Guess which container has the most beans. Container _____

Now, count the beans in each container.

Container A has _____ beans.

Container B has _____ beans.

Container C has _____ beans.

Container D has _____ beans.

Which container actually had the most beans? Container _____ had the most beans.

Observe the container that had the most beans. Why do you think that container had more beans in it than the other containers?

Identify the class of beans in each container:

A. _____

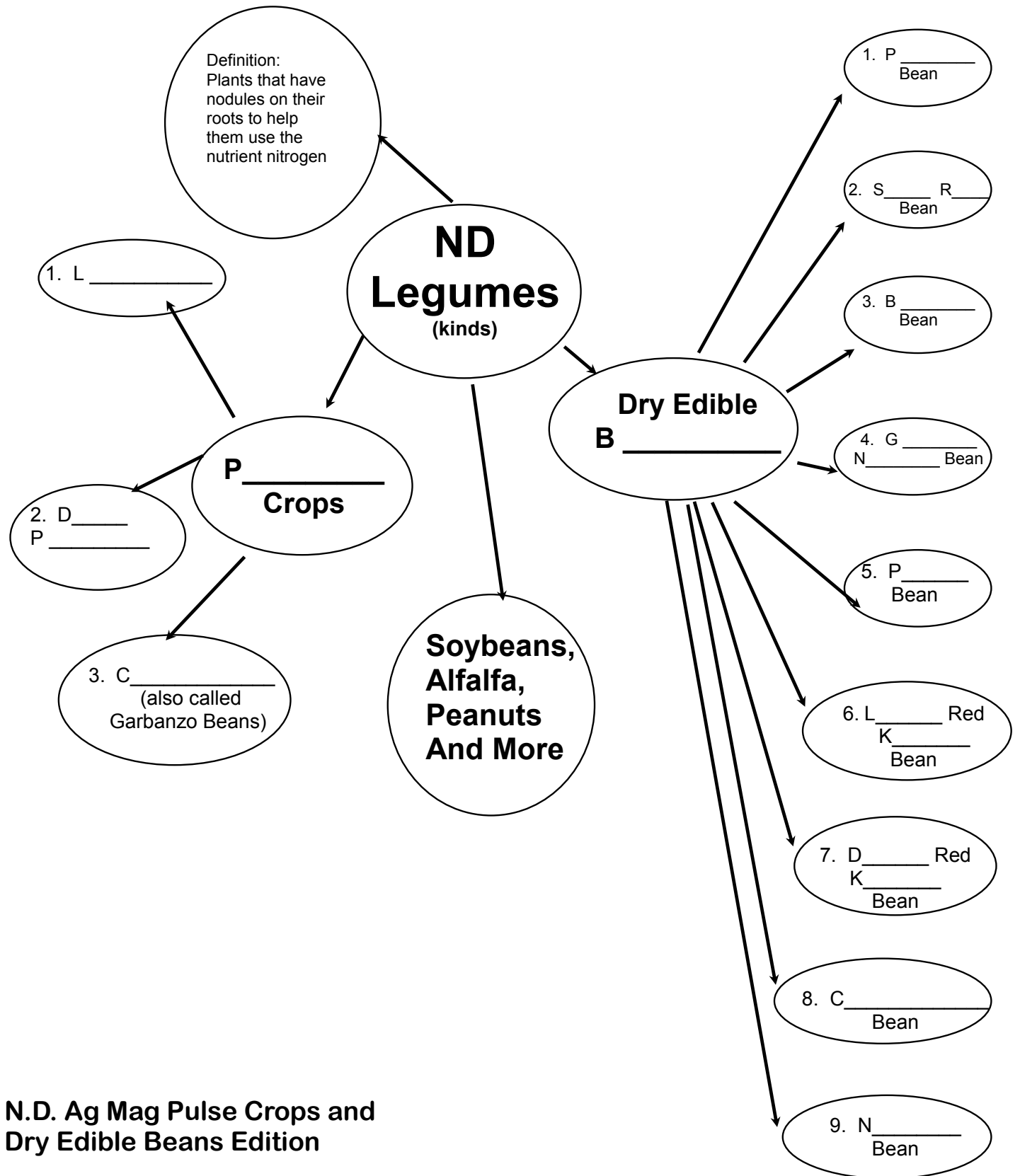
B. _____

C. _____

D. _____

Name: _____

TEXT STRUCTURE WEB



N.D. Ag Mag Pulse Crops and Dry Edible Beans Edition