

Unit D: Production of Field Crops

Lesson 3: Cereal Crops: Rice, Millet, Barely, and Rye

Student Learning Objectives: Instruction in this lesson should result in students achieving the following objectives:

1. Describe rice and wild rice and discuss their value
2. Describe millet and discuss its value
3. Describe barley and discuss its value
4. Describe rye and discuss its value

Recommended Teaching Time: 2 hours

Recommended Resources: The following resources may be useful in teaching this lesson:

- A PowerPoint has been developed for use with this lesson plan.
- <http://www.hort.purdue.edu/newcrop/Crops/Barley.html>
- http://www.gramene.org/species/secale/rye_intro.html
- <http://chetday.com/millet.html>
- <http://en.wikipedia.org/wiki/Rice>

List of Equipment, Tools, Supplies, and Facilities:

Writing surface
PowerPoint Projector
PowerPoint Slides
Transparency Master
Variety of seeds

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide 2):

- Grain length
- Lowland rice
- Continuous flood
- Upland rice
- Crop rotation
- Proso millet

Interest Approach: Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Show students samples of the seeds covered in this lesson. Have students compare the seeds to each other and to others covered in previous lessons. Ask students to explain how the seeds are alike and different. Ask students to think of products made from these crops. Continue with the lesson.

Summary of Content and Teaching Strategies

Objective 1: Describe rice and wild rice and discuss their value.

(PowerPoint Slides 3 and 4)

- I. It is believed that rice cultivation began simultaneously in many countries over 6500 years ago. The first crops were observed in China (Hemu Du region) around 5000 B.C. as well as in Thailand around 4500 B.C.

(PowerPoint Slide 5)

Rice is a cereal grain grown on land flooded with shallow water. It is an important plant in Asia and Indonesia and is a source of food for half the world's population. Almost all rice is grown in Asia with some being grown in Africa and the United States.

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Around the world, Rice is grown on nearly 1,214,056.9 hectares each year and the average yield per one-half hectare is 3,137.75 kilograms. Rice is milled to remove the outer hull and polished into the white form we commonly see.

(PowerPoint Slide 7)

- A. Rice is classified according to its grain length and cultural method.
- B. **Grain length** is the classification of rice by the length of the kernel. Short-grained rice is less than half a centimeter long and is grown in milder climates. Medium-grained rice is somewhere between 0.5 to 0.64 centimeters long and is also grown in milder climates.

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Long-grained rice is 0.64 to 0.79 of a centimeter long and is grown in tropical climates. It has more starch, which makes it more light and fluffy when cooked.

(PowerPoint Slide 9)

- C. Cultural method refers to how the rice is grown. **Lowland rice** is grown in large, flat fields that are flooded by irrigation and surrounded by dikes that direct the flow of water.
- D. **Upland rice** is grown in small fields on the sides of hills known as rice paddies.

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- E. Rice is planted so that the grain is formed during late summer. This helps reduce problems caused by slowed grain production on hot days.

(PowerPoint Slide 11)

- F. Rice can be planted by drilling the seed into a dry seedbed, broadcasting onto a dry seedbed, or broadcasting into standing water. The dry seedbeds are flooded shortly after planting.

(PowerPoint Slide 12)

- G. The time to plant rice depends more on the air temperature than the soil temperature. Shallow water warms quickly. Rice is planted in temperatures from 18.3° C to 21.1° C and from April to early July depending on the area in Afghanistan.

(PowerPoint Slide 13)

- H. Rice can also be started in the nursery during the spring and then transplanted during the summer months. When the seeds have germinated they are transplanted by hand to the wet rice paddies. Depending on the environment and type of rice, this transplantation may occur from 20 to 80 days after planting the seeds.

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- I. Rice is seeded at 51 to 56.75 kilograms per half a hectare when drilling or 68 to 85 kilograms per one half hectare when water seeding.
- J. All rice seedbeds need to be level. When dry seeding, large clods are removed. In water seeding, clods are left or grooves are made to ensure seed placement.
- K. During the growing phase the plant flowers and begins to develop four or five tillers along its main stem. Each tiller has a head, or panicle, that actually produces the grains of rice.

(PowerPoint Slide 15)

- L. Water management is necessary in rice production and varies with the soil texture. Wells and pumps are used to maintain adequate water levels.

Continuous flood is when the rice field is flooded throughout the growing season. Less water is needed when the field is continuously flooded.

(PowerPoint Slide 16)

- M. Soil testing should be performed on rice fields at least every three years.
Nitrogen is the most important nutrient in rice production. Fertilizers should be added when the fields are dry.

(PowerPoint Slide 17)

- N. Rice has a number of pest problems including small aquatic animals. Crop rotations, chemicals, flooding the fields, and planting resistant varieties can help reduce the more common plant pest such as armyworms, grasshoppers, molds, and rots.

(PowerPoint Slide 18)

- O. When the rice is ready to be harvested, the paddies must be completely drained and the field allowed to dry. Harvesting has several steps: cutting the plants, moving the crop to another location, threshing (separating the grain from the rest of the plant), cleaning, and storage.

(PowerPoint Slide 19)

While harvesting can be accomplished using machinery, in many areas it is also carried out by hand in the traditional methods that have been used for generations. Rice kernels are harvested at 18 to 22 percent moisture.

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- P. Rice that we eat is actually a grain that is found inside the seed hull. During milling, the hull, or outside layer is removed, leaving brown rice. White rice is the result of more processing that removes the outer layers of bran until it is a translucent white grain.

(PowerPoint Slide 21)

- Q. Wild rice is a crop grown in shallow lakes and rivers. The plants grow to 61 to 71 centimeters tall and mature in 120 days. Wild rice is susceptible to a number of pests including small land and water animals. The cultural methods of wild rice are similar to those of common rice. Wild rice is considered a gourmet food in other parts of the world.

****Bring to class a variety of rice types. Have students compare the rice kernels and make observations. Discuss the students' observations. Ask who in the class grows rice. Encourage them to talk about their rice operation. PowerPoint Slides 22-28 show pictures of some steps in planting rice. Go through these pictures and explain to the student how it is done in your area.**

Objective 2: Describe millet and discuss its value.

(PowerPoint Slides 29 and 30)

II. Millet is a cereal grain used for grain and summer forage.

- A. Both the wild ancestor and the location of domestication of proso millet are unknown, but it first appears as a crop in both Transcaucasia and China about 7000 years ago, suggesting that it may have been domesticated independently in each area.

(PowerPoint Slide 31)

- B. **Proso millet**, the only variety of millet grown for grain. It has stout, erect stems that grow about 1.2 meters tall. The grain heads are similar to those of grain sorghum. The ripened grains are ovate and rounded.

(PowerPoint Slide 32)

There are four forage millets commonly grown: pearl millet, brown top millet, foxtail millet, and Japanese millet. Pearl millet can grow up to 4.6 meters tall and has a grain head that looks like a cattail. Some species of foxtail millet are grown for birdseed.

(PowerPoint Slide 33)

- C. If frost is an issue, millet is planted after the last frost. It should be seeded at the a rate of 11.3 to 13.6 kilograms per 0.4 hectare in humid areas and 4.5 to 6.8 kilograms per 0.4 hectare in drier areas. Most millet is planted in prepared seedbeds and can be drilled or broadcast.

(PowerPoint Slide 34)

- D. Weed control need to be practiced in planting the millet crop even before sowing so that the plants grow without any weed competition from germination onwards. That means the first weed control activity starts even before sowing millet. Manual weeding is a very common practice to control weeds in the millet crop.

(PowerPoint Slide 35)

Timely weeding is important than the frequency of weeding. It is necessary to keep the crop free during the first month of its growth through manual weeding or by using a hoe.

(PowerPoint Slide 36)

- E. Soil testing is needed to determine the need for N, P, and K. Millet used for hay is harvested while still in the growing stage. Millet used for grain is harvested after the heads have matured. To reduce shattering, millet is often mowed, raked, and combined in other parts of the world.

****Ask who in the class grows millet. Encourage them to talk about how they grow millet. What are the uses for millet in your area? Bring in millet seed to show the class.**

Objective 3: Describe barley and discuss its value.

(PowerPoint Slides 37 and 38)

III. Barley is one of the oldest known grain crops. People first began to farm barley (instead of picking it wild) around 10,000 BC in West Asia. Barley is a crop that does well throughout the more temperate regions of the world, and is one of the most widely distributed of all cereals. Barley ranks fourth among major world crops.

(PowerPoint Slide 39)

- A. Barley is used as a grain and for forage. Some barley is used for making malt and livestock feed. It can be substituted for maize in livestock rations. The grain comes in five colors: Red, White, Black, Purple, and Blue.
 - 1. Barley generally makes best growth after a ***crop rotation*** of a cultivated crop such as maize, sugar beets or potatoes. Crop rotation means not planting the same plant in a given spot twice in a row.

(PowerPoint Slide 40)

- B. Barley looks like wheat and has the same growth requirements. Barley prefers a well-drained light soil. Barley is grown in cool climates and can be planted for winter or spring growth.

(PowerPoint Slide 41)

Winter barley is planted in the fall. Spring barley should be planted as early as possible. In Afghanistan 80% of barley is spring-planted, with only 20% fall-planted, as barley varieties are less cold-tolerant.

(PowerPoint Slide 42)

- C. A distance of one-half a meter between the rows is ample for barley. Appropriate thinning for all kinds of barley is advisable. Do not permit plants to crowd one another in the row. Barley is seeded into prepared seedbeds at 54.5 kilograms per hectare.

(PowerPoint Slide 43)

- D. Barley responds well to fertilizers. Also, barley varieties grown are early-maturing, about 25 days before wheat harvest. Fall-planted barley, especially, is early, so birds attack it and can cause heavy damage.

(PowerPoint Slide 44)

- E. After the heads have dried, barley crops are harvested by hand tools such as sickle, scythe or just hand pulling, tractor mounted mower and combine.

****Ask who in the class grows barely. Encourage them to talk about how they grow barley. What are the uses for barley in your area? Bring in barley to show the class.**

Objective 4: Describe rye and discuss its value

(PowerPoint Slides 45 and 46)

IV. Rye is a cereal grain crop used for grain, hay, pasture, or as a cover crop. The major uses are for livestock feed and to make flour for baking.

(PowerPoint Slide 47)

Cultivated rye is believed to have originated from a wild rye in southwestern Asia somewhere around 1800-1500 BC.

A. Rye is similar to barley but has lower yields. It is hardier than other small grains, can be planted in the fall or spring, and grows much like wheat.

(PowerPoint Slide 48)

B. Rye is planted in prepared seedbeds by hand or in some countries rye is planted with drills or broadcast. Nitrogen should be topdressed in early spring. Rye heads tend to shatter easily.

C. Rye is also beneficial to the environment. It is used as a cover crop to reduce soil erosion, enhance soil water retention, contribute a green manure, and to reduce weed growth (reducing the need for herbicides).

****Ask who in the class grows rye. Encourage them to talk about how they grow rye. What are the uses for rye in your area? Bring in rye to show the class.**

Review/Summary: Summarize the lesson by asking students to explain the content of each objective. Reinforce the key terms and concepts.

Application: Students can apply the information learned in this lesson

Evaluation: Student comprehension of these objectives can be measured with the attached test.

Answers to Sample Test:

Part One: Matching

1 = b, 2 = a, 3 = c

Part Two: Completion

1. Lowland rice
2. Upland rice
3. Proso Millet
4. Rye

Part Three: Short Answer

Answers will vary. Use the information given for the lesson.

Sample Test

Name_____

Test

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Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- a. Grain length b. Continuous flood c. Crop Rotation

- _____ 1. Flooding a rice field throughout the growing season.
_____ 2. The classification of rice by the length of the kernel.
_____ 3. Not planting the same plant in a given spot twice in a row.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. _____ is grown in large, flat fields that are flooded by irrigation and surrounded by dikes that direct the flow of water.
2. _____ is grown in small fields on the sides of hills known as rice paddies.
3. _____ is the only variety of millet grown for grain.
4. _____ is a cereal grain that can be used as a cover crop

Part Three: Short Answer

Instructions. Provide information to answer the following questions.

Other than rice, list two cereal crops talked about in this lesson and describe their uses and the cultural practices used to raise them.