

# More than One Grain of Rice

**Purpose:** Students learn about the cultivation and parts of rice while also applying skills in the areas of geography, mathematics, economics and literature.

**Time:** 45-60 minutes

**Level:** 3-5

## Materials:

- Book: *One Grain of Rice: A Mathematical Folktale* by Demi  
ISBN 0-590-93999-8
- More Than One Grain of Rice Worksheet
- Calculators
- World wall map
- Sticky notes (20)
- 2 (2"x 2") pieces of 70-100 grit sand paper for each pair of students
- Brown rice



## Minnesota Social Studies Standards and Benchmarks

- 3.2.1.1.1 Identify possible short and long-term consequences (costs and benefits) of different choices.
- 3.2.3.5.1 Explain that producing any good or service requires resources; describe the resources needed to produce a specific good or service; explain why it is not possible to produce an unlimited amount of a good or service.
- 5.2.1.1.1 Apply a decision making process to identify an alternative choice that could have been made for a historical event; explain the probable impact of that choice.

## Minnesota Math Standards and Benchmarks

- 3.1.2.2, 4.1.1.5, 5.1.1.4 Solve real-world and mathematical problems requiring addition, subtraction, multiplication and division of multi-digit whole numbers. Use various strategies, including the inverse relationships between operations, the use of technology and the context of the problem to assess the reasonableness of results.
- 5.1.1.3 Estimate solutions to arithmetic problems in order to assess the reasonableness of results.

## Minnesota/Common Core Language Arts Standards and Benchmarks

- 3.1.2.2, 4.1.2.2, 5.1.2.2 Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text

## Background

World production of rice has risen steadily from about 200 million tons of paddy rice in 1960 to nearly 700 million tons in 2010. The top three producers in 2010 were China (28% of world rice production), India (17%) and Indonesia (9%). Six states produce nearly all of the rice grown in the United States: Arkansas, California, Louisiana, Mississippi, Missouri and Texas. Arkansas grows nearly 50% of the U.S. total rice production. More than 90% of the rice eaten in the U.S. is grown by U.S. farmers.

In the U.S., rice fields are leveled using computerized laser-guided leveling equipment to make sure the flooded field or “rice paddy” is level. Seeds are planted in early spring to an exact depth by grain drills pulled behind a tractor or cast over dry or flooded fields by airplane. Fields are flooded in April and May. By September or October, the rice is mature and ready for harvest. The fields are drained and then the rice is harvested using combines. The rice heads containing the edible rice are removed and the rice stem or straw is left. The straw is cut and baled later, just like wheat, barley and oat straw. The rice head is then transported to a dryer where moisture is slowly removed from each grain. Finally, the rice is sent to a mill for processing. Rice fields are part of North America’s most significant wildlife habitats for hundreds of species of birds, mammals and amphibians.

Rice is grouped by size: long, medium or short grain. Short grain rice tends to be sticky while long grain rice remains separate and is light and fluffy after

cooking. The seeds of the rice plant are first milled using a rice huller to remove the chaff (outer husks of the grain). This creates brown rice. This milling process may be continued removing the germ and the rest of the husk called bran, creating white rice. Rice is used in breakfast cereals, baby food, rice cakes, beverages and table rice.

It's believed that rice was first cultivated in ancient Asia and from there spread to Africa and Europe. Rice was later introduced to South and North America and Australia with the advent of sea voyage. Rice farming in California began in the early 1900s mainly in response to the increasing Chinese population during the Gold Rush.

More people around the world eat rice as the primary staple of their diet than any other single food. Rice is the world's third largest crop in production in the world, behind corn and wheat. Rice cultivation is well suited to countries and regions with low labor costs and high rainfall, as it is very labor intensive to cultivate without expensive machinery and requires plenty of water. Rice is a nutritious, affordable source of carbohydrates and is packed with vitamins and minerals including thiamin, riboflavin, niacin, phosphorus, iron and potassium.

### **Procedure**

1. Ask students if they would rather have \$10,000 right now or receive one penny today and double it every day for 30 days? Have students explain their answers.
2. Tell students that you think they may change their minds after they hear the story you are going to read about rice.
3. Give each student a sticky-note and ask them to place it on your world wall map in a country where they believe rice is grown. Again ask students to explain their answers.

### **Activity 1 – One Grain of Rice**

1. Read the book *One Grain of Rice* by Demi.
2. Ask students to figure out how much total rice Rani received from the Raja using the More Than One Grain of Rice Worksheet grid, but not using calculators.
3. Have students check their calculations using calculators and complete the additional questions about the doubling of a penny and a dozen eggs.
4. Ask students if any of them would like to change their answer to the very first question you asked – *Would you rather have \$10,000 right now or receive one penny today and double it every day for 30 days?*

### **Activity 2 – Brown Rice to White Rice**

In order for harvest rice to be edible, the hulls must be removed to reduce the amount of unusable materials and to prevent the rice kernels from germinating. White rice is obtained by milling further to remove the rice bran (see Rice Samples page). This leaves the rice with a soft texture which reduces cooking time. Hulled rice is difficult to find in grocery stores, however, brown rice is more common due to its nutritional benefits.

### *Turning brown rice into white rice:*

1. Have students form groups of two. Give each pair 2 pieces of sand paper.
2. Place six kernels of brown rice on a piece of sandpaper and instruct the students to lay the second piece of sandpaper on top.
3. Students will need to rub the two pieces of sandpaper (with the seeds in the middle) together for about 3-5 minutes or until the rice is white.
4. Ask students to observe the milled white rice and the removed bran. Eating the brown rice with the bran intact helps people get necessary dietary fiber and additional nutrients.

### **Activity 3- Rice Production**

1. Look at the world map and the sticky notes where students said rice was grown at the beginning of the lesson.
2. Read aloud, or have the students read the first two paragraphs in the **Background** information.
3. Add more sticky-notes to the map if needed.
4. Ask students to color in these areas on their More than Once Grain of Rice Worksheet – be sure to include the top 6 states in the U.S.
5. Ask students what the areas have in common.
  - a. *Wet conditions (rainfall or irrigation,)*
  - b. *Warm temperatures (tropical or Mediterranean)*
  - c. *Clay soils – to hold water*
6. Additional questions for discussion
  - a. In what food group does rice belong? (*grain*)
  - b. What good did the farmers in the story by Demi produce? (*rice*)
  - c. What choices are made by Rani and the other characters in the story? Do you agree with these choices?
  - d. Is rice a scarce good? (*Yes. It is a tangible item that people produce using production resources – natural, human, capital. Thus rice is not a free good. Like all scarce goods, it commands a price in the marketplace.*)
  - e. In the story, what happened when the famine occurred? (*The supply of rice decreased and the people had almost nothing to eat. Rice, which is already a scarce good, became more scarce.*)
  - f. When a good becomes more scarce. What typically happens to the price? (*it increases*)

### **Additional Activities**

- Create a mosaic using naturally and artificially colored rice.
- Research the various types of rice and their uses.
- Research the climatic and environmental characteristics necessary to grow rice and plant some in your classroom.
- *In accordance with the Americans with Disabilities Act, this information is available in alternative forms of communication upon request by calling 651/201-6000. TTY users can call the Minnesota Relay Service at 711 or 1-800-627-3529. The MDA is an equal opportunity employer and provider.*

# Rice Samples



## **Rough Rice**

*Also known as paddy rice, as it comes from the field. After harvesting, the rough rice must be dried to a suitable moisture level before storage. Rice straw, weed seeds and other field debris are removed by a series of cleaning machines prior to milling.*



## **Rice Hulls**

*The outer husks of the rice grains are removed by shelling machines. Ground hulls are used in animal feed and in the manufacture of chemicals and plastics. Some rice mills utilize hulls as a source of fuel in their operations.*



## **Parboiled Rice**

*Rough rice soaked in hot water, steamed under pressure and dried before milling. This process gives the rice a more separate appearance and firmer texture after cooking. It takes slightly longer to cook (25 vs. 20 minutes) than regular long grain rice.*



## **Brown Rice**

*Rice in its most natural and nutritious form, with only the hulls removed. Growing in popularity, brown rice requires longer cooking (45 minutes) compared to regular milled rice (20 minutes). The light brown color comes from the presence of the rice germ and seven bran layers. Rich in minerals and B-complex vitamins.*



## **Long Grain Rice**

*Rice after milling is completed. This long and slender shaped rice is enriched with vitamins and minerals to restore the nutritional value. When cooked, the grains tend to remain separate and are light and fluffy.*



## **Medium Grain Rice**

*Another variety of milled rice. It is shorter and thicker than long grain and has a soft, tender texture when cooked. Medium grain rice is preferred among certain regional and ethnic groups.*



## **Short Grain Rice**

*Sometimes referred to as a "round" grain. When cooked, the grains cling together. Short grain rice is preferred among certain regional and ethnic groups.*



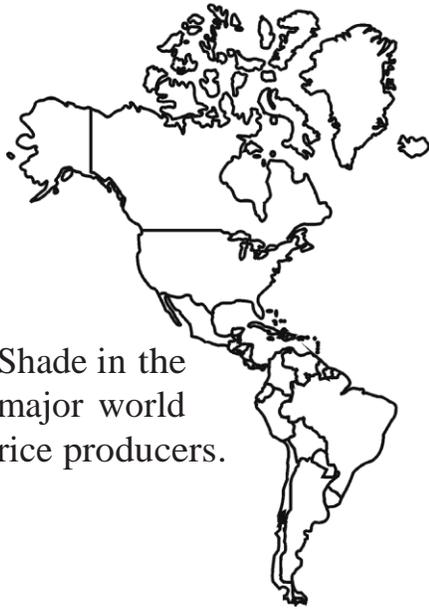
## **Instant Rice**

*Long grain white rice that has been precooked and dried. Instant rice is a convenience product requiring only 5 minutes preparation time. It has a light and separate cooked appearance.*

## ***Oryza sativa* L. Rice**



# More Than *One Grain of Rice* Worksheet



Shade in the major world rice producers.



What is your favorite rice dish?

## Complete the Doubling of *One Grain of Rice*

Day 1 <b>1</b>	Day 2 <b>2</b>	Day 3 <b>4</b>	Day 4	Day 5
Day 6	Day 7	Day 8	Day 9	Day 10
Day 11	Day 12	Day 13	Day 14	Day 15
Day 16	Day 17	Day 18	Day 19	Day 20
Day 21	Day 22	Day 23	Day 24	Day 25
Day 26	Day 27	Day 28	Day 29	Day 30

The rice you eat in Minnesota more than likely came from (country) \_\_\_\_\_

Shade in the six major rice producing states.



