

Global Precipitation Measurement Mission

Expert Group- Growing Wheat

Wheat, a grain that we eat regularly, is actually a member of the grass family. More than 17,000 years ago, humans gathered wheat seeds from the plants and used them for food. Wheat is believed to have originated in the Tigris and Euphrates river valley, near what is now Iraq. This valley is sometimes referred to as the “Cradle of Civilization”.

The United Nations believes that at least 20% of all calories consumed by humans are from wheat. The complex carbohydrates in grain-based foods provides essential fuel for our bodies. Wheat is used to make white bread, pastries, pasta, and pizza- and has been a very important crop all over the world since the 18th century. It was first introduced to America by the early English colonists and it quickly became the main cash crop of farmers. Today, wheat is the primary grain used in U.S. grain products- as about three-quarters of all U.S. grain products are made from wheat flour. It is grown in 42 states across the U.S., with Kansas being the biggest wheat producer and North Dakota coming in second.

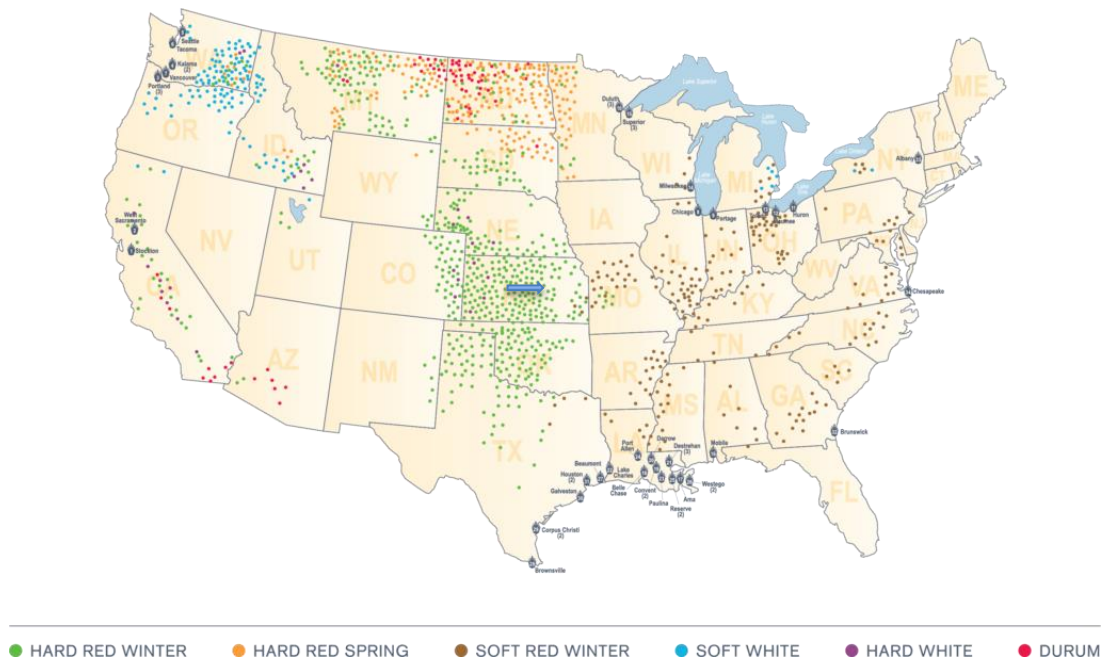


Figure 1: Wheat Grown By Region/ Image Credit: National Association of Wheat Growers

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Want to see how wheat grows? Watch [this](#) short video (2:30) called “*How Wheat Grows*” from the National Association of Wheat Growers. What do you think farmers need in order to grow wheat? What kind of weather conditions does a wheat crop need to be successful?

There are many different varieties of wheat. Wheat yield and quality is determined by the genetic potential of the variety of wheat interacting with the environment in which it is planted. All varieties of wheat grow best in a well-drained loamy soil. A loamy soil is one that is composed mostly of sand, silt, and a smaller amount of clay. In both Kansas and Pakistan, most farmers use winter wheat varieties.

Winter wheat are varieties of wheat that are planted in autumn to germinate and develop into young plants that go dormant, or stop growing but don't die, during the winter. They resume their growth in the spring when the weather warms up. In Kansas, the winter wheat is planted between September and November, and is harvested in June or July. In Pakistan, winter wheat is planted in November or December and is harvested earlier, in April or May, as the weather becomes too hot during the summer months. Farmers in both locations need to remain alert to the changing weather conditions as well as changes in climate which might impact their wheat growing season. Planting wheat too early can result in increased disease and insect problems.

There is research being conducted all over the world to try to improve the quality of wheat crops. This research includes better understanding the diseases, insects, and even looking closely at the biochemical, molecular, and genetic properties of wheat seeds. You can learn more about some of the research being conducted in the U.S. [here](#).

In the U.S., farmer produce about 1.9 billion bushels of wheat every year. A bushel is equal to 60 pounds of wheat grain, which is enough to bake 90 loaves of bread. There are several different varieties of wheat which are grown in the U.S. For this activity, we are focusing on the variety of wheat that is being grown in central Kansas. Looking at the map in figure 1, which variety of wheat is grown in Gypsum? If you said “hard red winter” wheat, you are correct! HRW (hard red winter) wheat

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accounts for more than 41% of the wheat that is produced in the U.S. Winter wheat is planted to the fall and grows until early winter, when it then goes dormant. When the weather gets warm in the early spring, it begins to grow again. You can learn more about this wheat variety [here](#).

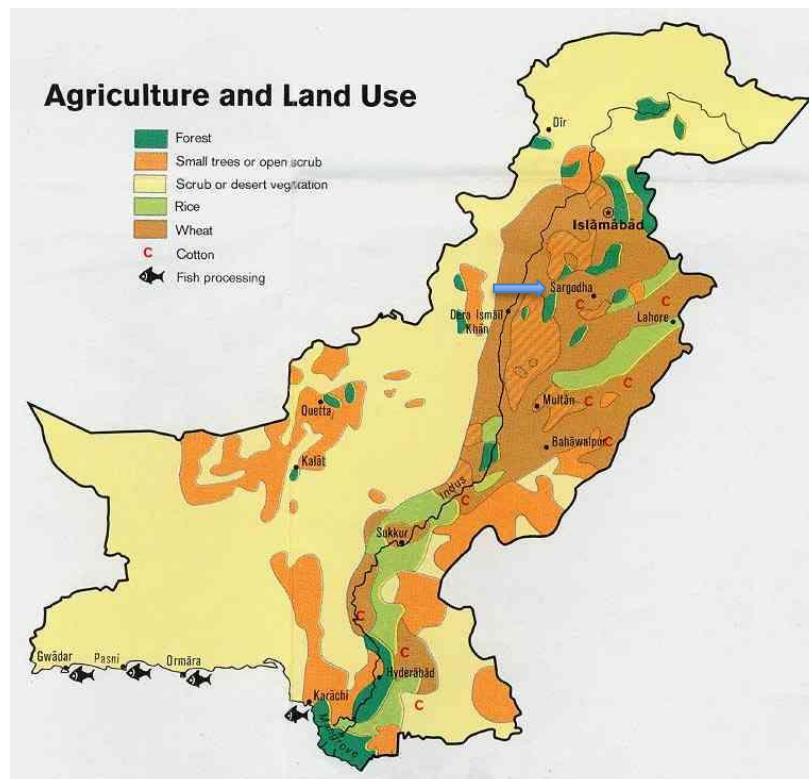


Figure 2: [Agriculture and Land Use in Pakistan](#)

Let's compare and contrast the type of wheat and the wheat growing season for our other location in Sargodha, Pakistan. The map above shows the way that the land is used for agriculture and other land uses in Pakistan. Sargodha is located in the northeast in the Punjab region, and we can see that it is in the heart of the wheat growing region.

Pakistan also grows its wheat crop during the winter. The wheat is planted, or sowed, in November and December, and it also goes dormant when the weather is cold. The harvesting in the Punjab district takes place in April and May, as it gets too hot for wheat to grow effectively after May. In Punjab, wheat is mostly grown on irrigated land. Wheat production from rainfed areas is only about 10 % of the

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total wheat crop. Therefore weather causes year-to-year fluctuations in crop production, and good rainfall means a good wheat crop.

As you might imagine, freshwater is an essential natural resource that is needed to produce wheat. The USGS (United States Geological Survey) says that it takes about 731 liters/193 gallons of water to produce a one-pound loaf of bread, and about 80% of that water (~584 liters/154 gallons) went into growing the wheat. During the period of 1996-2005, global wheat production used about 15% of the total water “footprint” being used to irrigate all kinds of crops around the world. Another way to think about it is that wheat needs about 31 to 38 centimeters/12 to 15 inches of water per growing season to produce a good crop.

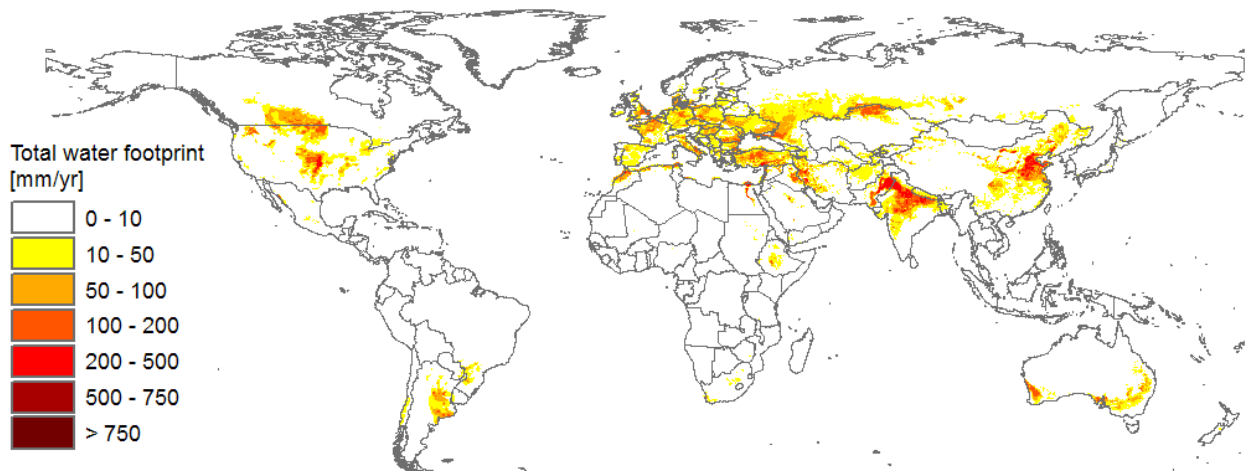


Figure 3: Global Water Footprint for Wheat Production/ Image credit: [Mekonnen and Hoekstra \(2010\)](#)

Wheat grows best when the temperatures are warm, around from 21° to 24° C/ 70° to 75° F, but are not too hot. Wheat also needs a lot of sunshine, especially when the grains are beginning to fill out.

Wheat grows best in temperatures between 21°C/70°F and 24°C/75° F. The minimum temperature that wheat can handle during its growth cycle is about 4°C/ 40°F. Wheat does not grow well if temperatures exceed 35°C/95° F.

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Resources:

- [National Association of Wheat Growers](#)
- [USGS](#)
- [Britannica Kids: Wheat](#)
- [Wheat Fact sheets](#)
- [Wheat Facts- Kansas wheat](#)

