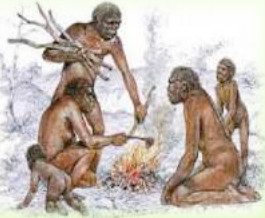


A HISTORY OF FARMING



TOPIC 1

The lives of humans before the development of farming.



TOPIC 5

The developments and consequences of the Agricultural Revolution.



TOPIC 2

The impact of the development of farming.



TOPIC 6

Settling and farming the Great Plains of the United States.



TOPIC 3

Farming in ancient and medieval Europe.



TOPIC 7

The debate between intensive and organic farming.



TOPIC 4

The Columbian Exchange between the Old and New Worlds

LIFE BEFORE FARMING

The ancestors of modern humans first evolved in Eastern Africa around 5 million years ago. At first these early humans had no tools and survived by eating fruits and nuts as well as small amounts of meat that they were able to savage from dead animals. Because of their limited diet early humans were often very small, standing just over 1.2 meters tall on average. Their brains were also much smaller with the largest being only 70% the size of that of a modern adult. Over the next 4.5 million years several important changes took place which eventually led to the appearance of a species known as Homo Sapiens – the species that all people belong to today. These changes were:

- The development of tools from simple stone hand axes to more complicated items made from wood and bone.
- The increase in the size of the human brain and the creation of the first spoken languages.
- The discovery of how to control and then make fire.

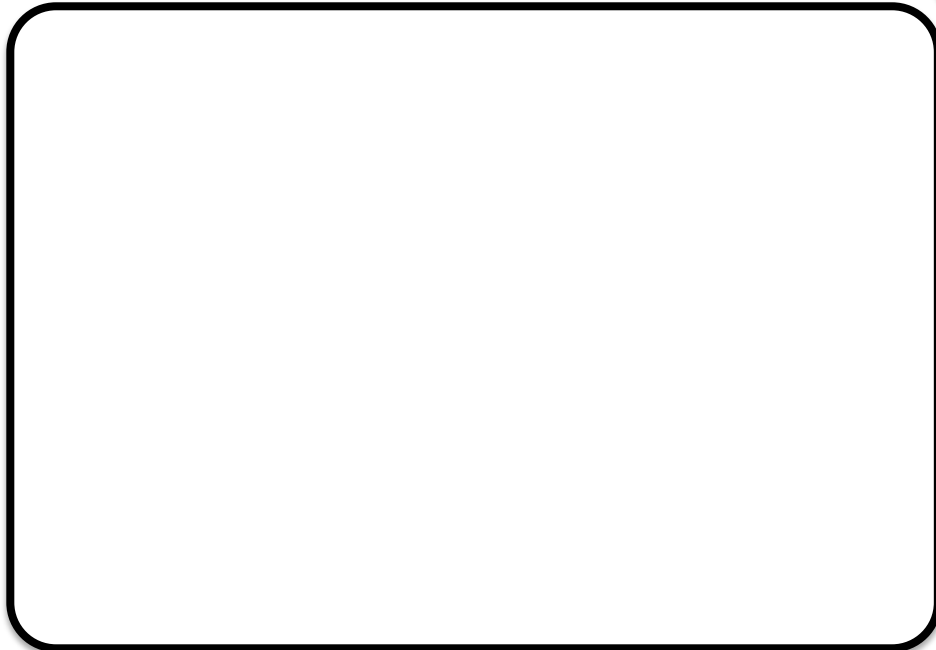
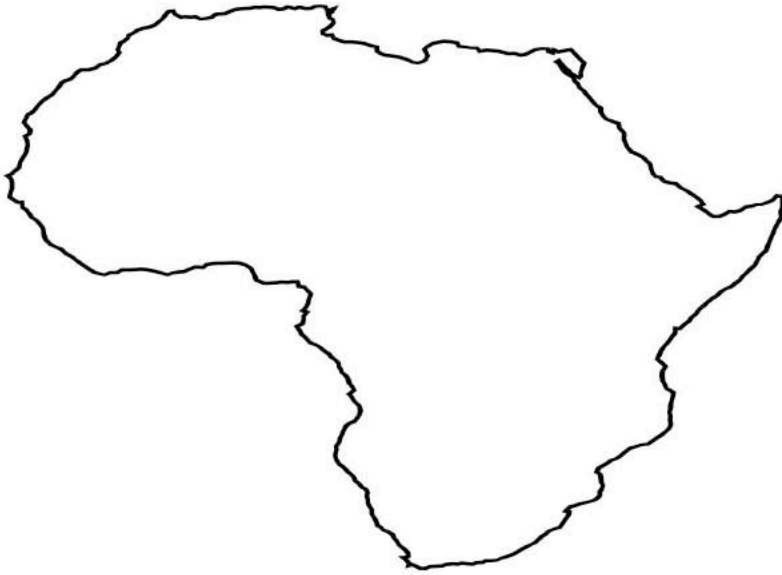
Around 100,000 years ago Homo Sapiens began spreading out of Eastern Africa to the Middle East and then into Europe and Asia where they began competing with earlier species of humans for land and food. Homo Sapiens won these competitions causing these earlier humans to become extinct. Homo Sapiens then continued to spread so that by 10,000 years ago they could be found in every part of the planet.

Early humans had no ability to grow their own food. Instead they spent their lives moving from place to place following herds of wild animals which the men hunted for their meat and other materials. To add to their diets women in these groups also gathered wild plants. This way of life was very hard and few humans lived beyond the age of 30 due to accidents, disease, or hunger. Women were also limited in the number of children they could have at any one time as only one could be carried at any one time. By 10,000 BC the entire human population of the planet may have been as low as one million people.

Use the information above to create a timeline chart showing and summarizing the history and lives of early humans.

5 Million Years Ago

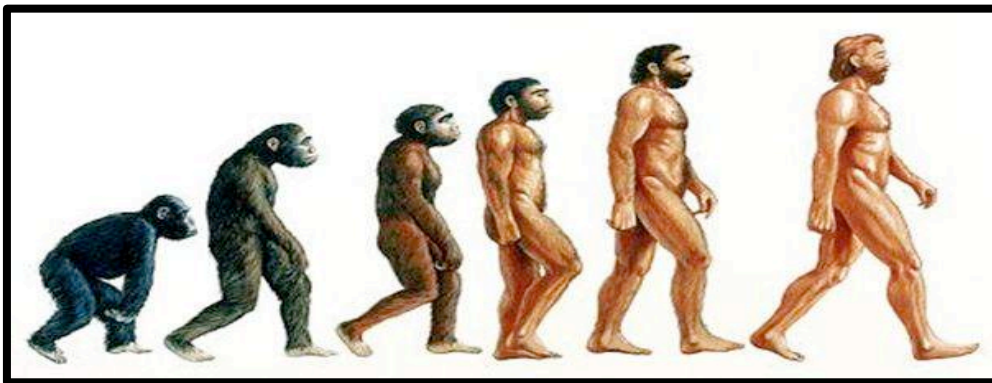
Changes – 5mya to 0.2 mya



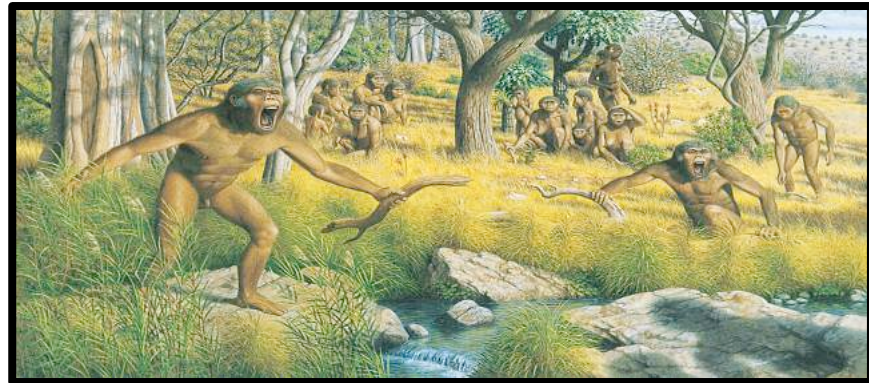
100,000 Years Ago

Lives of Hunter Gatherers





Evolution of mankind from Australopithecus to Homo Sapiens



Group of Australopithecus



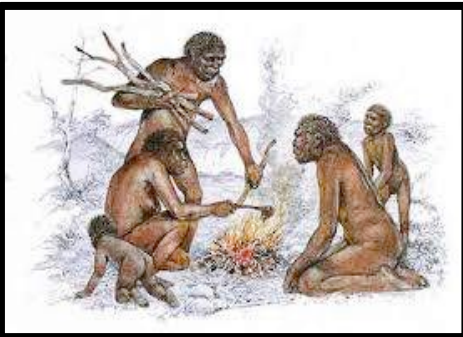
Australopithecus Skull



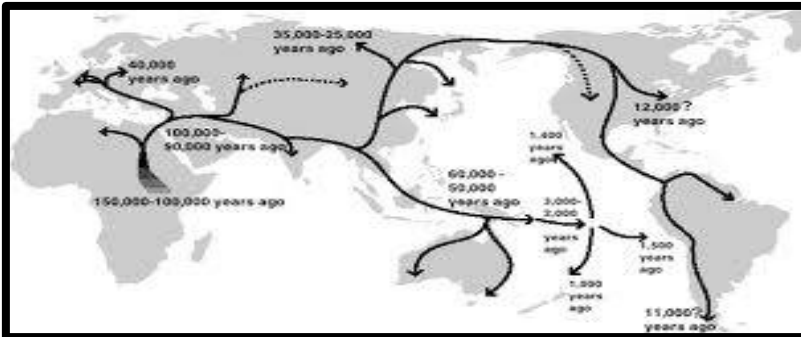
Hand Axes



Prehistoric Tools



Using Fire



Human Migration from Africa to Rest of World



Hunter Gatherers

THE FIRST FARMERS

Around 11,000 years ago the world began to emerge from a long ice age. Melting ice raised sea levels cutting off many parts of the world along with their human, animal, and plant populations. Climate change also began to affect many parts of the planet as weather patterns changed leading to longer and drier summers. Some human groups began moving into wetter regions often dominated by large river valleys or other reliable sources of water. It was in these areas, over the next 5,000 years, that humans developed the ability to grow their own food bringing an end to the hunter-gatherer era for most people.

In all regions farming began with the discovery of certain types of wild plants which provided more food than others. Over time humans began planting seeds from these plants starting a process of selection and breeding which resulted in larger and larger crops. Humans also began domesticating (taming) wild animals which could provide them with food, transportation, power, or other materials.



1) The Nile River Valley - The drying of the Sahara region forced many groups into the Nile River valley around 10,000 years ago. Each year the river would flood leaving behind a thick layer of fertile silt. The Egyptians began growing large amounts of cereals, especially Barley. Other important crops included wheat, beans, lentils, onions, garlic, radishes, lettuce, and parsley. Animals kept included sheep, goats, cattle, pigs, and geese.

2) The Fertile Crescent - The Tigris and Euphrates rivers created a region of wet land between the Mediterranean Sea and the Persian Gulf. Wheat was the primary crop although other foods grown included peas, figs, lentils, apples, and dates. Farmers kept similar animals to those kept in nearby Egypt but also raised large numbers of horses.

3) The Indus River Valley - The Indus River flows from the Himalaya Mountains into the Arabian Sea creating a wide, fertile valley. Wheat, barley, and jujube were the earliest crops grown while sheep, goats, and cattle were domesticated. Cotton was also grown to provide material for clothing. By 8,000 BC the elephant had also been tamed providing a valuable source of power. Chickens were first domesticated here and then spread to other regions.

4) The Yellow River Valley – Like other rivers, the Yellow River leaves behind thick layers of silt when it floods. Around 8,000 years ago people living along the river began growing millet and wheat followed quickly by the first rice crops. Sheep and goats were kept along with chickens.

5) Mesoamerica – Mesoamerica had few rivers but did experience almost year-round rainfall providing its people with a reliable source of water. Farming in Mesoamerica was dominated by maize which was developed from a wild plant called Teosinte. This crop could be stored for a long time or turned into flour. Squashes, beans, tomatoes, avocados, guavas, and peppers were also important food crops while rubber trees and cotton plants provided materials for clothes and other products. Cacao beans, the source of chocolate, were also grown and used as a type of money. Unlike other parts of the world, Mesoamerica had few animals that could be domesticated. Only ducks, dogs, and turkeys were tamed for food or feathers.

6) The Andean Region – Farming in the Andes was dominated by the cultivation of potatoes which were grown in hundreds of different varieties. To preserve their crops farmers would squeeze the water from their potatoes and then leave them out in the freezing mountain air creating a type of powder which would stay edible for many years. Andean farmers domesticated the llama which provided wool, milk, and meat although it was of little use for transportation or farm work.

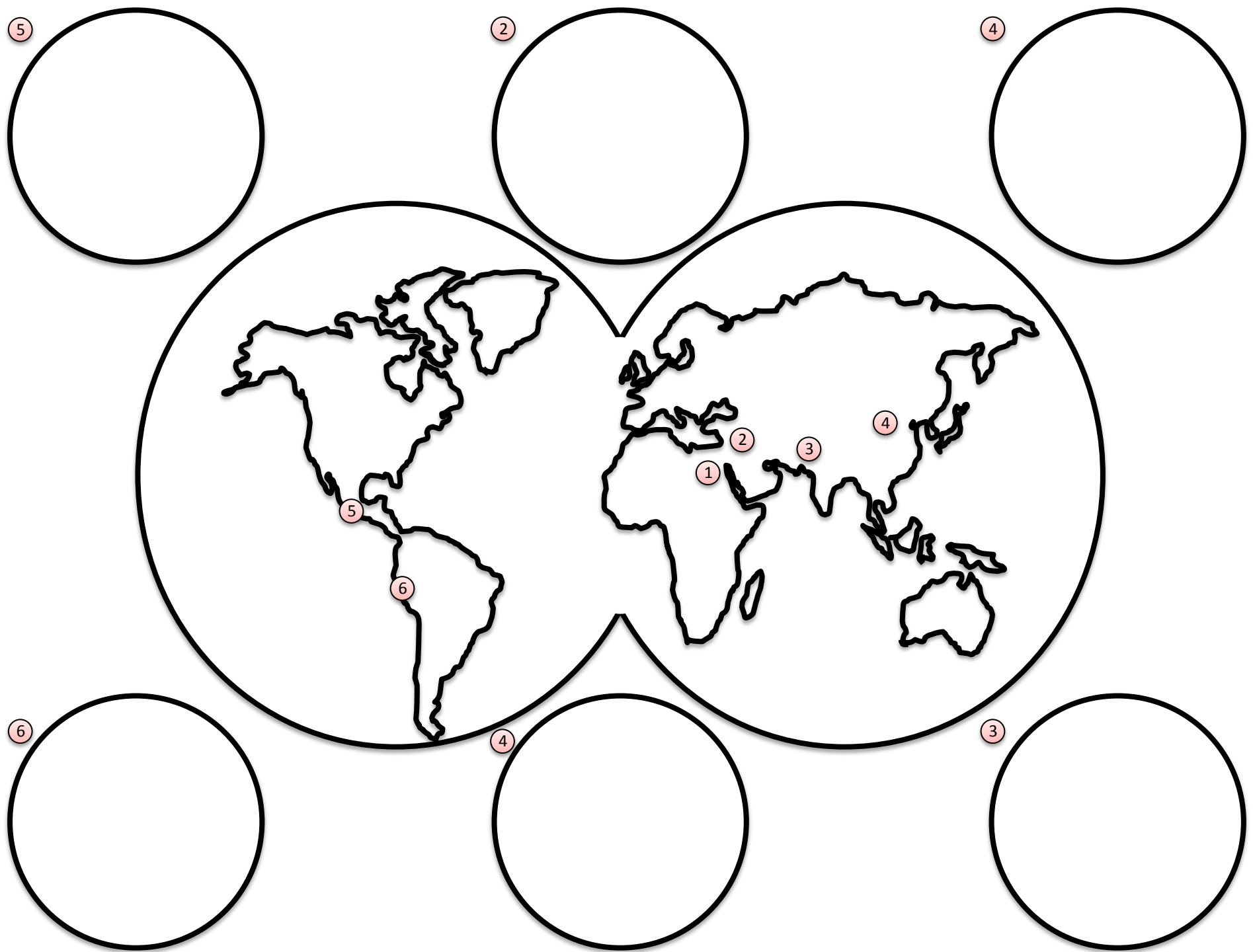
In every region the ability to grow food had a huge impact on the way that humans lived. Groups which had once had to be almost constantly on the move could now settle down in one place and begin building permanent settlements. Because of this, and a more reliable food supply, the population began to increase as women were able to have several young children at the same time. By around 3,000 BC the number of humans had grown to around 15,000,000. Villages began to turn into towns and some towns into the first cities.

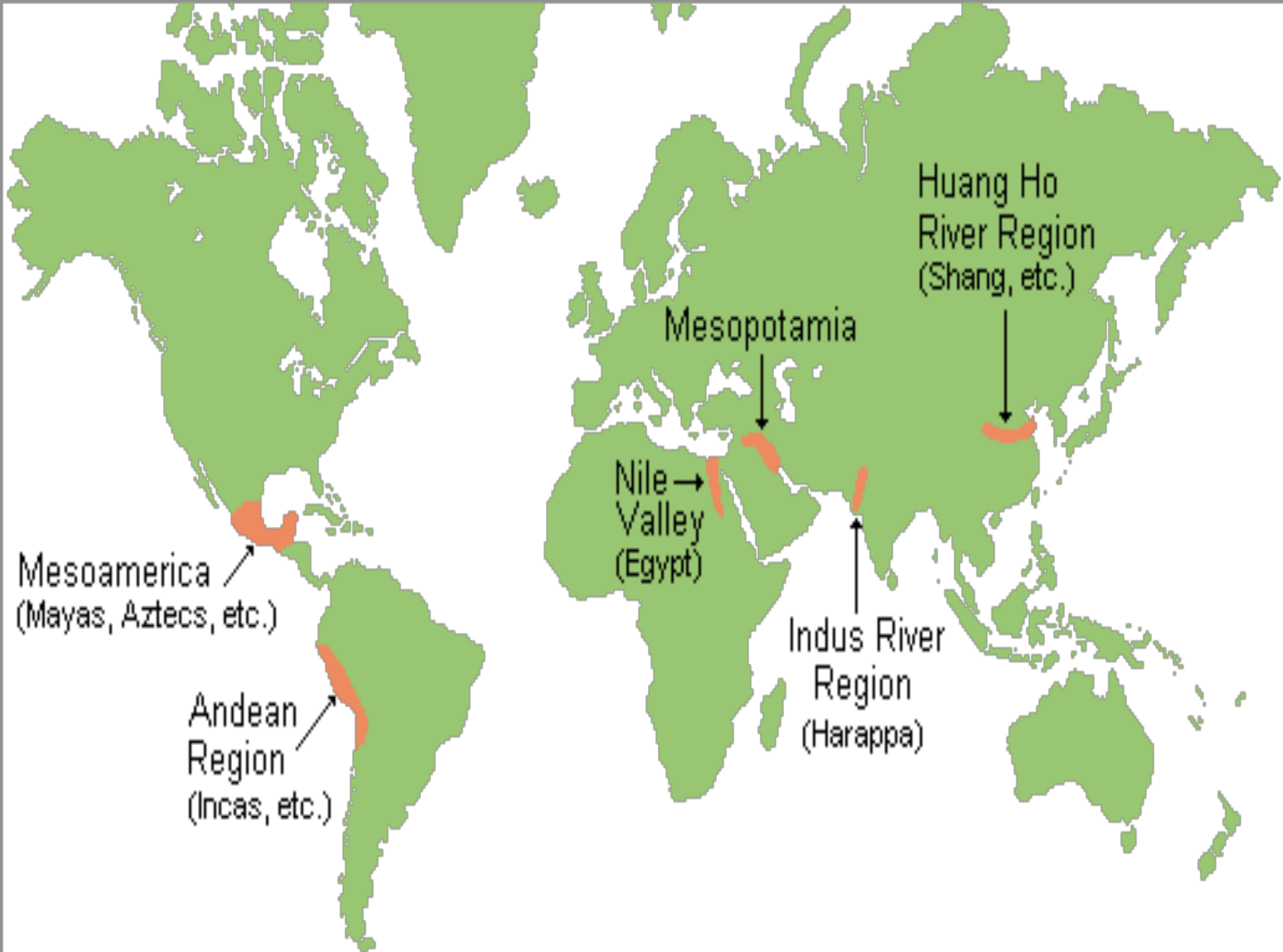
Farming also allowed new societies to emerge as people began organizing into larger and larger groups. In many places large construction projects were needed to help control the flow and storage of water. Organizing so many people required leadership which may have led to the first kings. Kings (or other hereditary leaders) may also have emerged from the need of farming communities to protect themselves from raiders wanting to take their crops.

In many places a single farmer could now grow enough food to support several other people leaving them free to develop other skills such as pottery, metalworking, or weaving. Many societies also began to create organized religions led by kings and/or priests who supported themselves by taxing farmers or craftspeople.

Despite these advances farming did have some drawbacks for humans. Living in close proximity to animals introduced new diseases to mankind which actually lowered life expectancy in many places. Humans also became shorter as they ate less meat compared to their hunter-gatherer ancestors. In many places farming required almost constant labor leaving little time for rest or relaxation.

Use the information to create a map showing the regions where farming first developed and what crops/animals were raised there.





THE IMPACT OF FARMING – BOOKLET INSTRUCTIONS

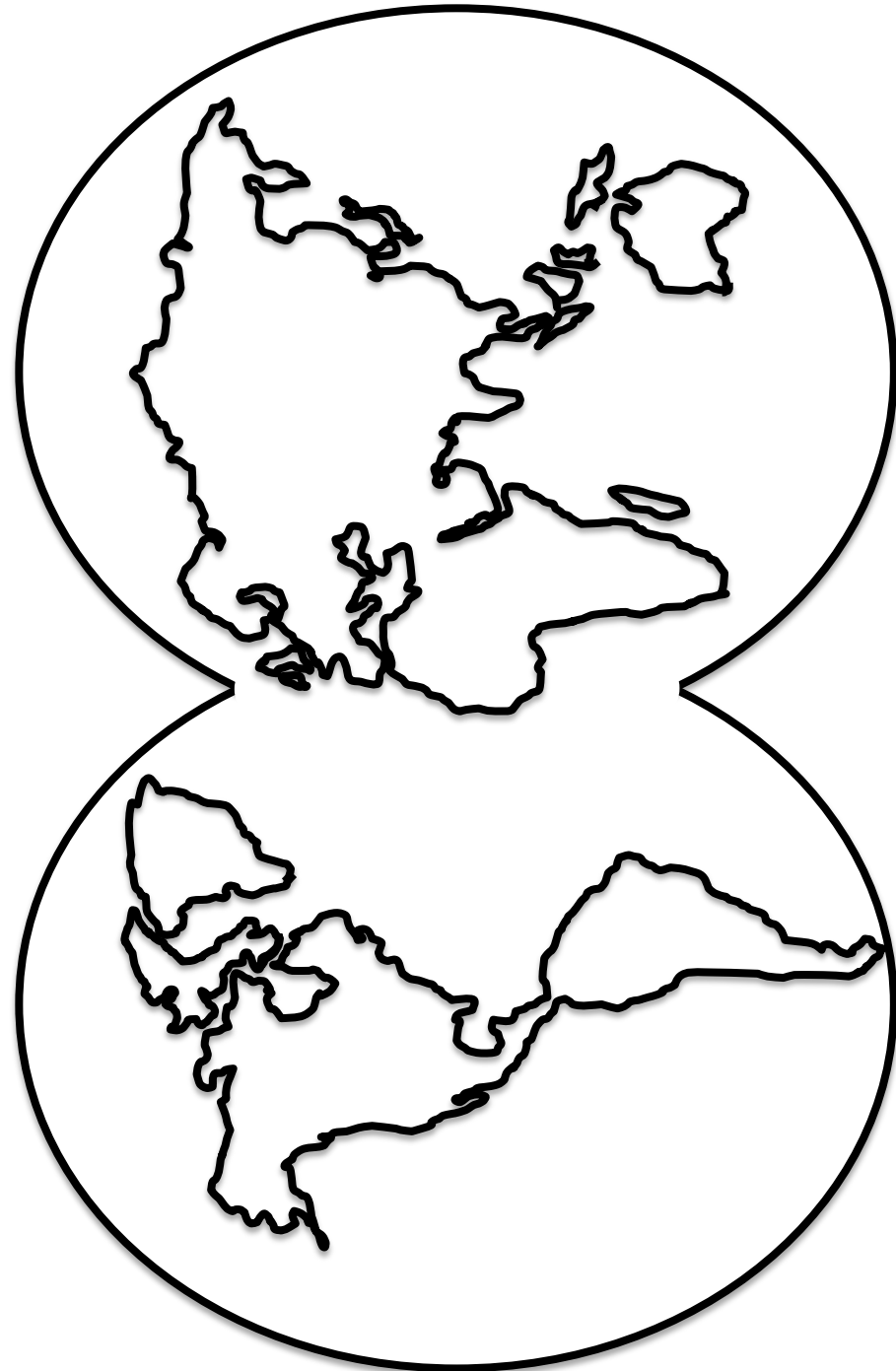
From the reading identify at least eight different impacts of the development of farming. Summarize them in the space below.

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- Additional)

Create a small booklet illustrating and summarizing these impacts. Use the pictures on the pages you've been given to help you.



NAME _____ CLASS _____



| |
|--|
| |
|--|

| |
|--|
| |
|--|

| |
|--|
| |
|--|

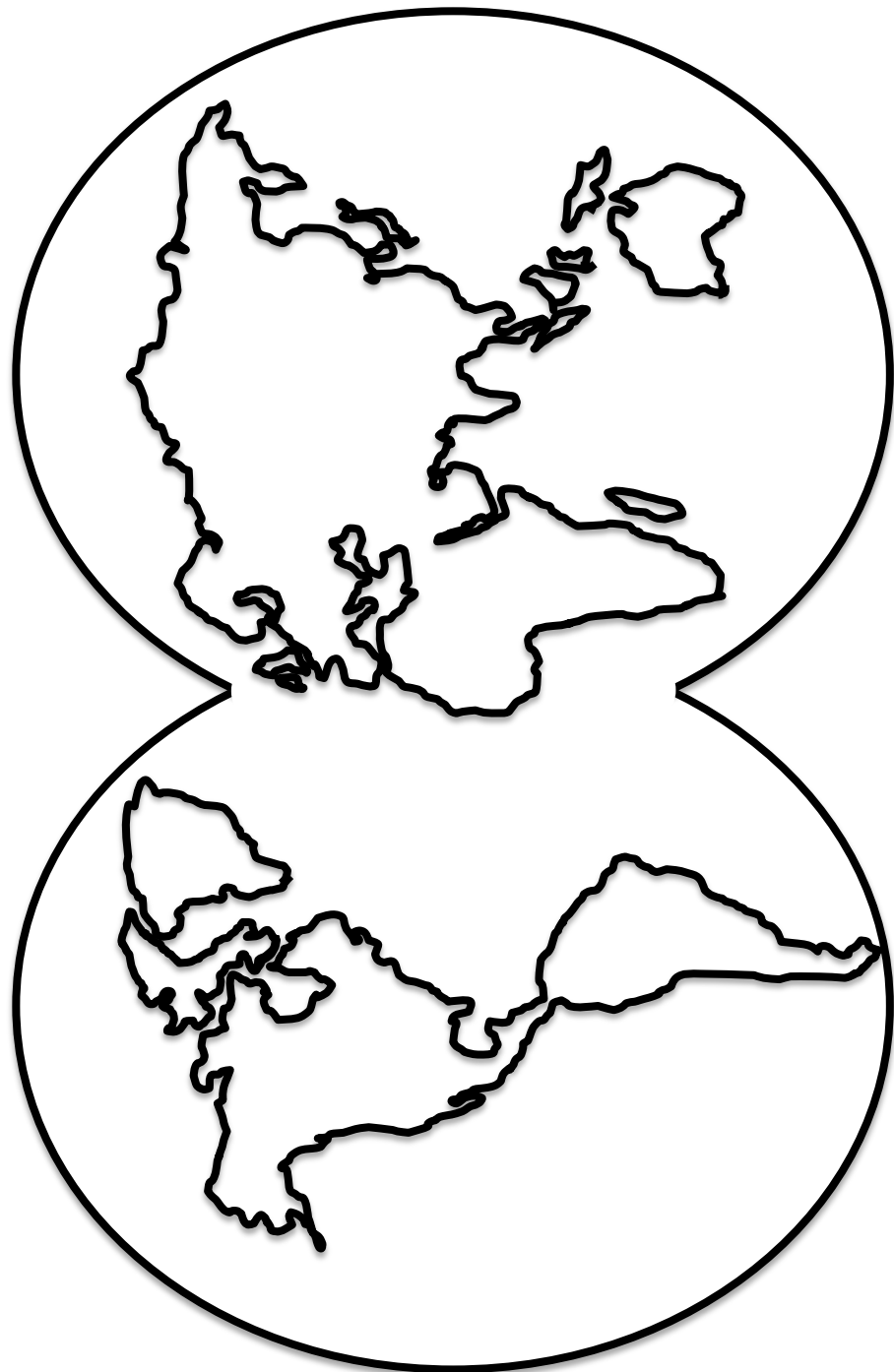
| |
|--|
| |
|--|

IMPACTS OF FARMING

NAME _____ CLASS _____

PERMANENT SETTLEMENTS

POPULATIONS



HEIGHT

TOWNS & CITIES

LIFESTYLES

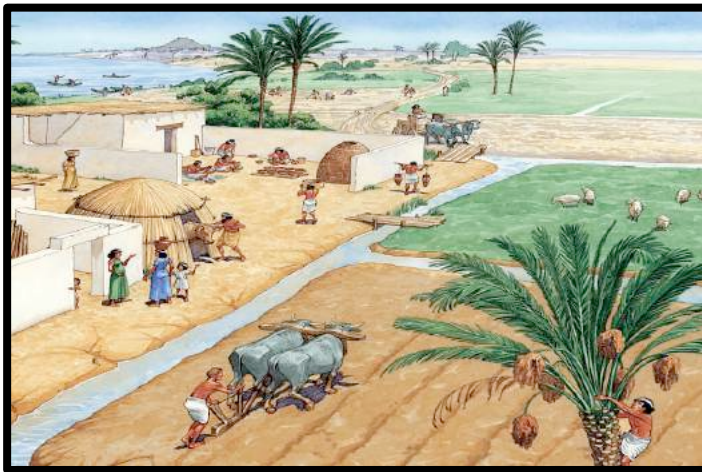
CONSTRUCTION PROJECTS

LEADERS

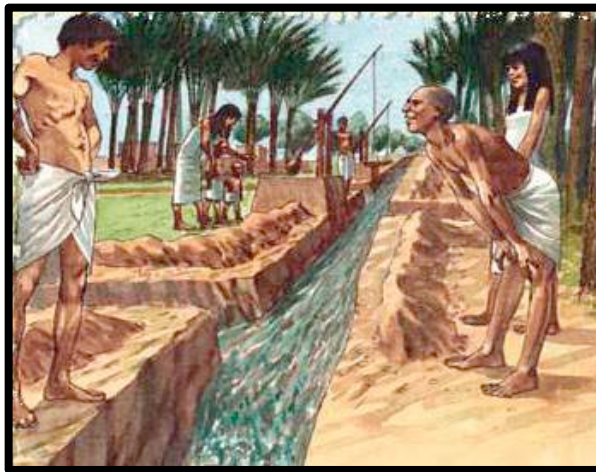
RELIGION

CRAFTSPEOPLE

DISEASES



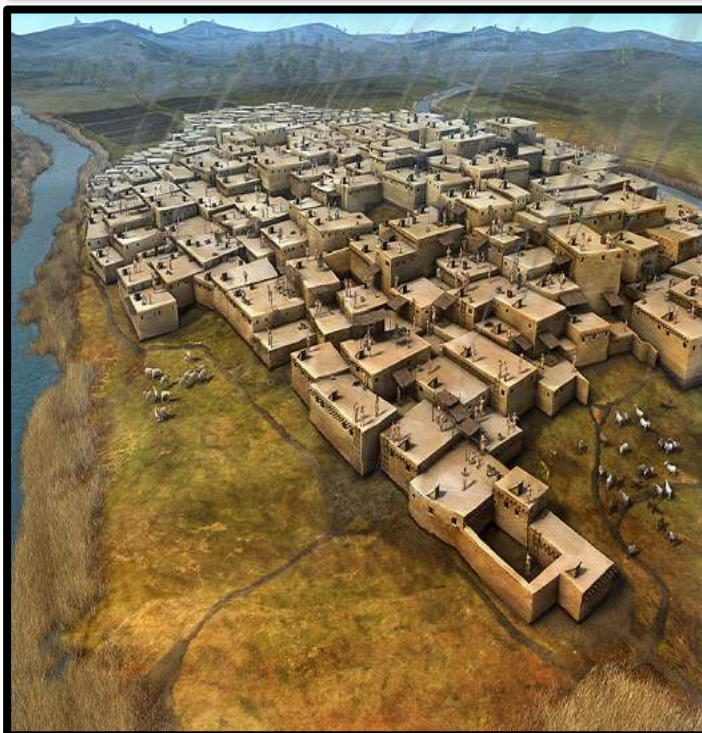
Farming in Mesopotamia



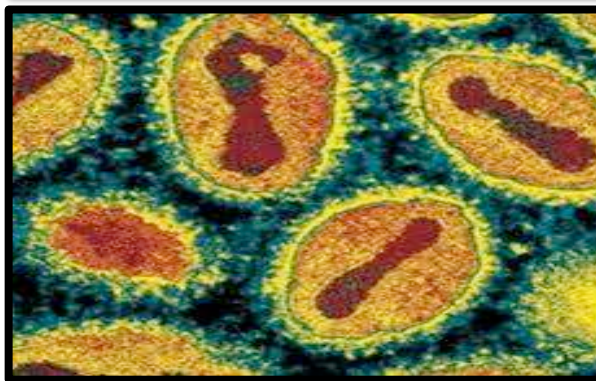
Irrigation System



Pottery



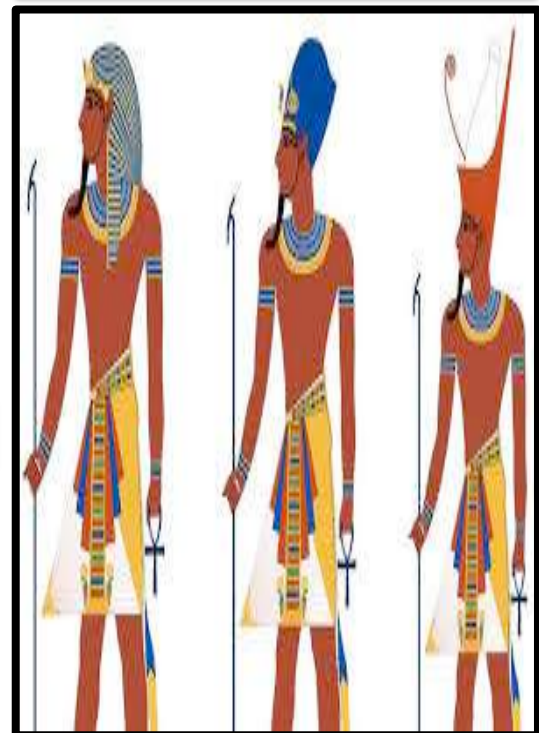
Early Town



Smallpox Virus



Mesopotamian Temple



Egyptian Pharaohs

FARMING IN EUROPE

Use the information below to create a chart summarizing farming in Europe during the Greek and Roman eras, how the manor system worked, and impact of climate change.

Farming began in Europe in Greece around 7000 BC from which it quickly spread – first to other Mediterranean countries and then into northern parts of the continent. Unlike other parts of the world Europe had a large number of rivers making it easier for information, goods, and people to travel. The climate, especially in the south, was also mild with less extremes of hot and cold, wet and dry, than were found in other parts of the world. Crops and animals that had first been farmed in the Fertile Crescent were common in most parts of Europe by 4000 BC.

In ancient Greece and Rome being a farmer was seen as the ideal way of life. Ownership of land was very important as the more a person controlled the more power and influence he would have in politics and government. Early on most people owned their own land but as the centuries passed more and more land came under the control of large landowners who used slaves to grow crops. In the Roman Empire different regions specialized in growing different crops such as olives, wheat, or grapes. These were then traded using ships or the large road system that the Romans built to link their cities and provinces.

After the Roman Empire collapsed in the late 400s AD Europe entered a period known as the Dark Ages. Trade collapsed and the quality of life for many people declined as crops grew smaller along with animals. A new way of living and farming developed – called the manor system – which aimed to create self-sufficient communities which would be able to provide for all their needs themselves.

The manor system was based on ancient laws which forced landless peasants (also called serfs) to work for landowners (also called lords). Landowners would divide their land between themselves and their serfs. In return for land the serfs would have to promise to work on the lord's land for a certain number of days per year. They might also have to promise to give some of their crops or animals to the lord. Each manor would have blacksmiths, carpenters, and millers to provide items needed by the lord or the serfs.

Between around 900 and 1250 AD Europe experienced considerable growth in food production due to a combination of new technologies and improved climate. The most important tools for farmers were new iron plows which cut deeper into the soil and harnesses that allowed horses to pull them more quickly than oxen. More food led to a boom in population and a revival in trade throughout the continent. Towns and cities began to grow while products from the Middle East and China began appearing for sale for the first time in almost 1,000 years. This period of prosperity however was not to last as a change in the climate brought colder and wetter weather to large parts of Europe. Crops began to fail causing starvation while at the same time a devastating disease called the Black Death began to spread through the continent along trade routes. In just a few years the disease (also known as the plague) killed around half of Europe's population.

The Black Death had a huge impact on the manor system. Many landowners had died leaving their surviving serfs free to manage their own lives. In other places the shortage of labor gave serfs the opportunity to demand money for their labor. Many serfs began moving into towns where they began to learn trades and skills.

FARMING IN EUROPE

Ancient Greece & Rome

Manor System

Climate Change

MEDIEVAL POPULATION

| LOCATION / YEAR | 500 AD | 650 AD | 1000 AD | 1340 AD | 1450 AD |
|-----------------|--------|--------|---------|---------|---------|
| TOTAL | 27.5 | 18 | 38.5 | 73.5 | 50 |
| SOUTHERN EUROPE | 13 | 9 | 17 | 25 | 19 |
| WESTERN EUROPE | 9 | 5.5 | 12 | 35.5 | 22.5 |
| EASTERN EUROPE | 5.5 | 3.5 | 9.5 | 13 | 9.3 |

Use the figures above to create a graph showing the population of Europe during the Middle Ages.

Which period saw the greatest total growth in population?

Which period saw the greatest total fall in population?

Which region saw the greatest percentage fall in population and when?

POPULATION (MILLIONS)

POPULATION OF EUROPE



TOTAL



SOUTHERN EUROPE



WESTERN EUROPE



EASTERN EUROPE

500 AD

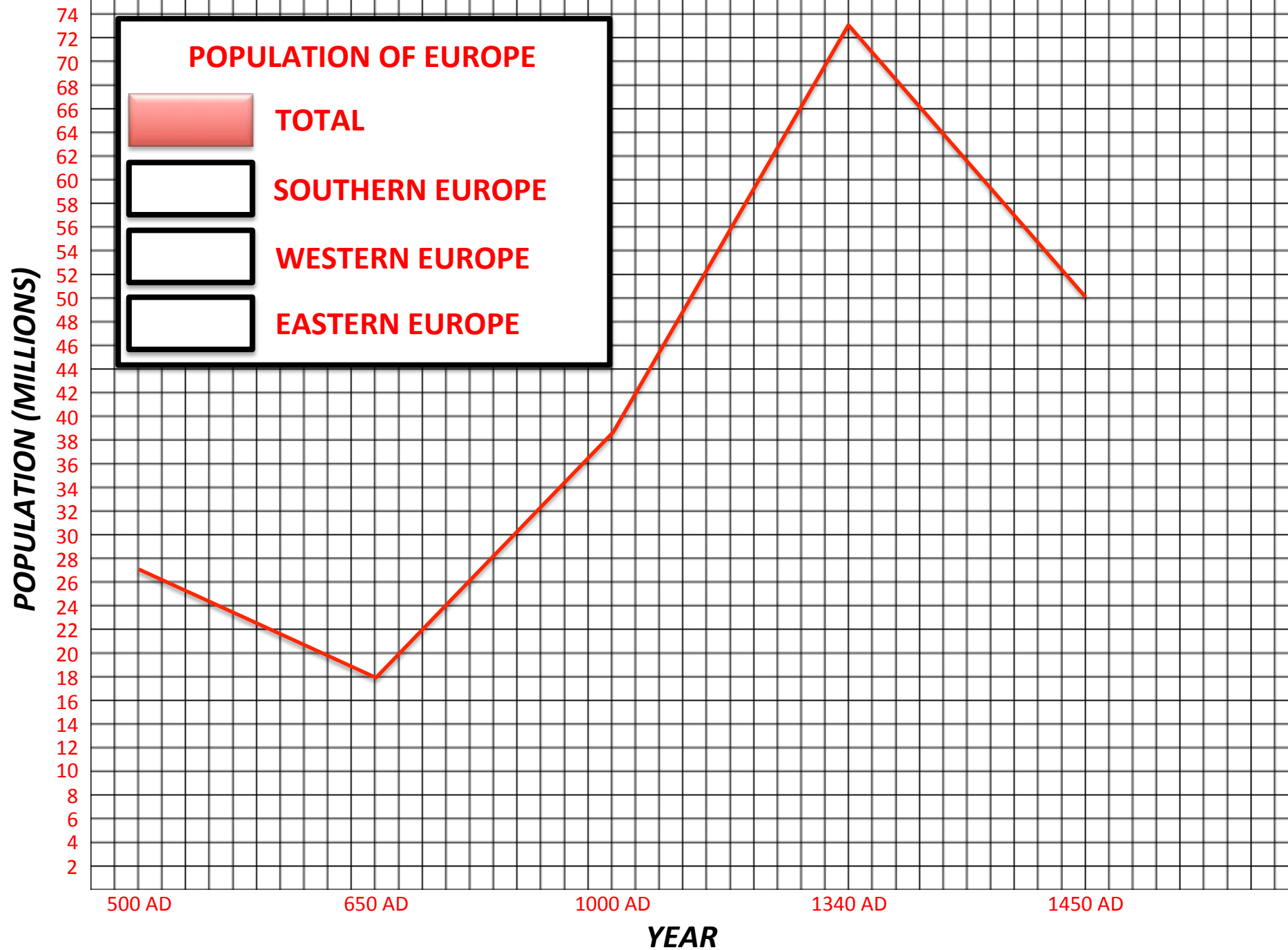
650 AD

1000 AD

1340 AD

1450 AD

YEAR



THE COLUMBIAN EXCHANGE

Use the information and materials to create a poster showing how the Columbian Exchange impacted the Old and New Worlds.

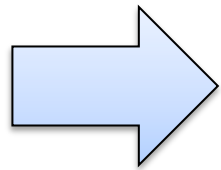
Since the end of the last ice age, around 11,000 years ago, North and South America (the New World) had been cut off from Asia, Africa, and Europe (the Old World) by the Atlantic and Pacific oceans. Plants, animals, people, and technologies from one region were completely unknown to people in the other. During the 1400s and 1500s this would change in an event known as the Columbian Exchange.

By the mid-1400s Europeans had begun to develop technologies that would allow them to cross the oceans and return home again. In 1492 Christopher Columbus made the first known landings in the Caribbean (although he thought he was in Asia) beginning the European conquest of North and South America. Although they were few in number the Europeans had one major advantage over the Native Americans – diseases. Because people in the Americas had few domesticated animals they had had no exposure (and thus no immunity) to the deadly diseases that they often carried. Europeans unknowingly brought these diseases with them when they sailed across the Atlantic. Within just 100 years over 90% of the Native American population would be wiped out.

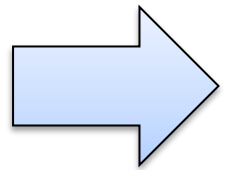
Along with diseases Europeans also brought large numbers of Old World plants with them to the Americas. Oranges, onions, apples, and lettuce all became important crops in different parts of North and South America. Europeans also brought their animals including cows, goats, sheep, pigs, horses, and chickens. Horses were particularly important as surviving Native American groups began using them for hunting and transport.

Europeans also brought back many American plants to Europe, Africa, and Asia. Potatoes became a major crop and resulted in a population explosion in many parts of Europe as, in some places, people ate as much as 20 pounds of them per day. Other American plants which became popular included tomatoes, maize, pineapples, and cacao. Turkeys also became a source of cheap meat.

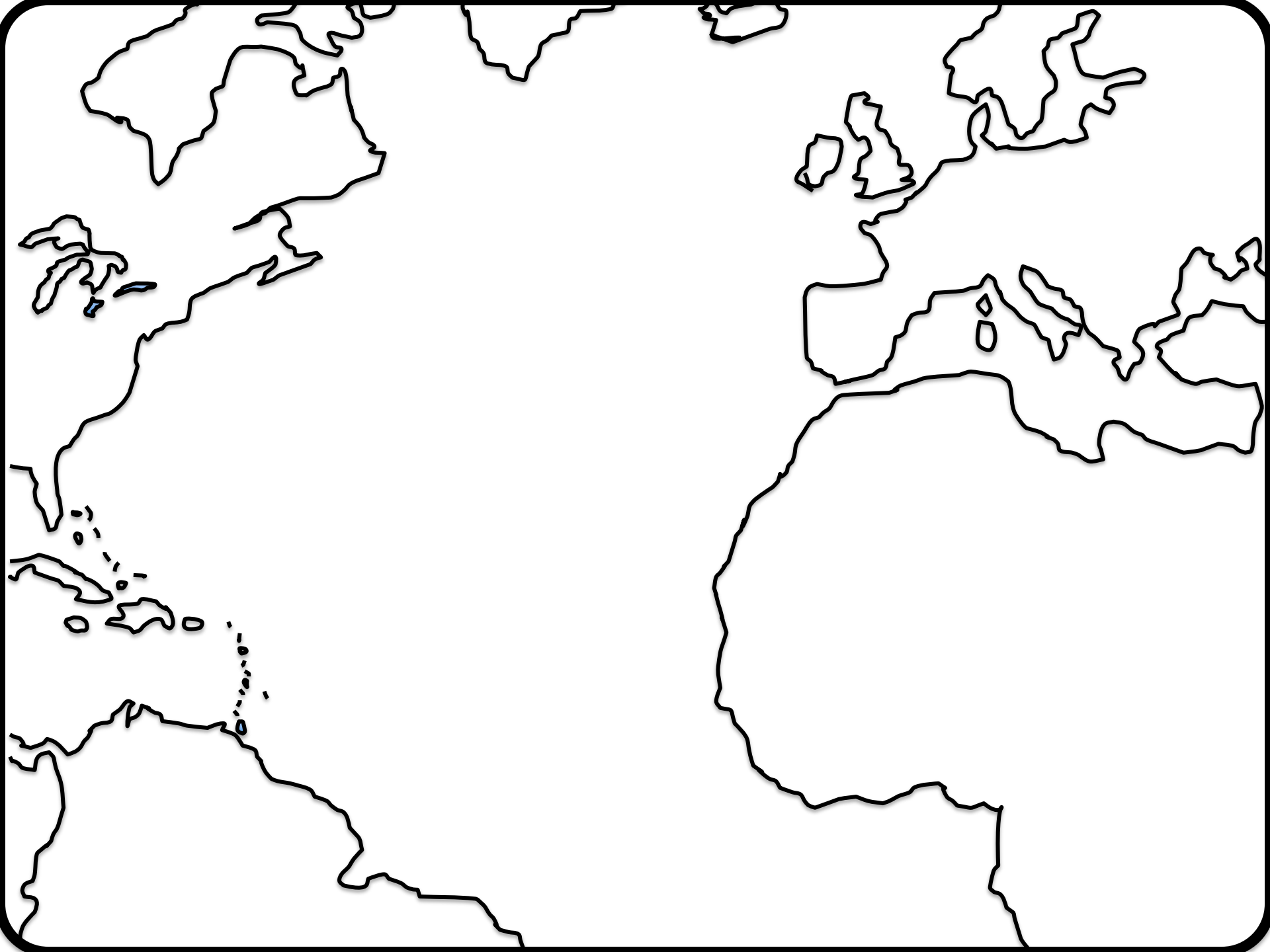
As Europeans began settling in the Americas they discovered that certain crops – sugarcane, tobacco, cotton, and coffee – grew well in the warm and humid climates of the Caribbean and parts of North and South America. These crops would sell for high prices back in Europe where they became luxury items. Because the native population of the Americas had almost been wiped out growers of these crops began importing millions of African slaves across the Atlantic. Between the 1500s and late 1800s around 12 million slaves were brought to the New World – most being sent to the Caribbean and Brazil where they worked and lived in terrible conditions. The demand for the products of slavery was so high that few people questioned it while slaveholders continued to make huge profits. Slavery was only banned in the United States in 1865 while in Brazil it remained legal until 1888.

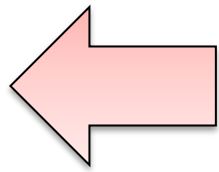


FROM THE NEW WORLD

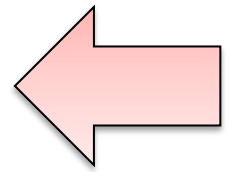


CHANGES IN THE NEW WORLD

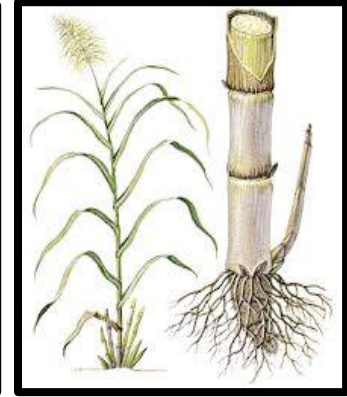


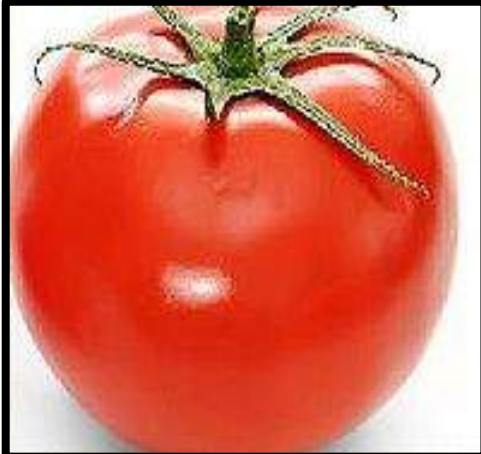
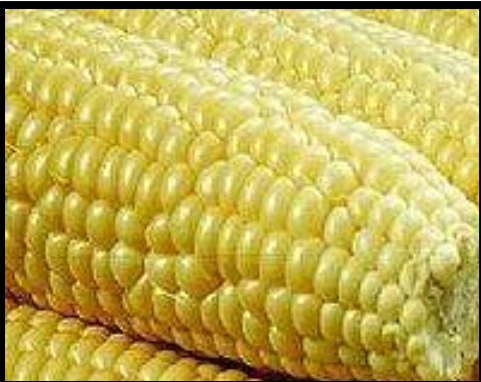


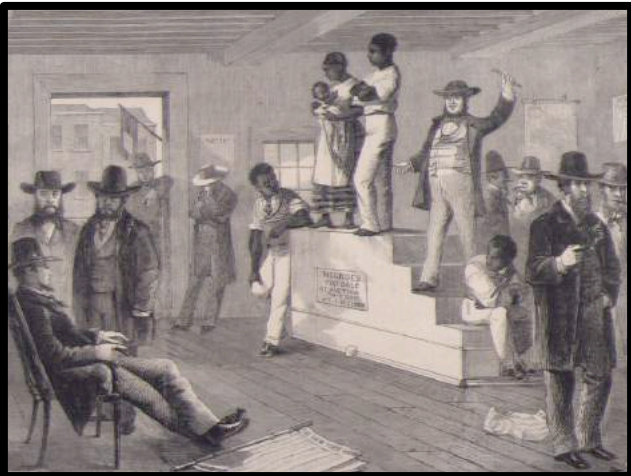
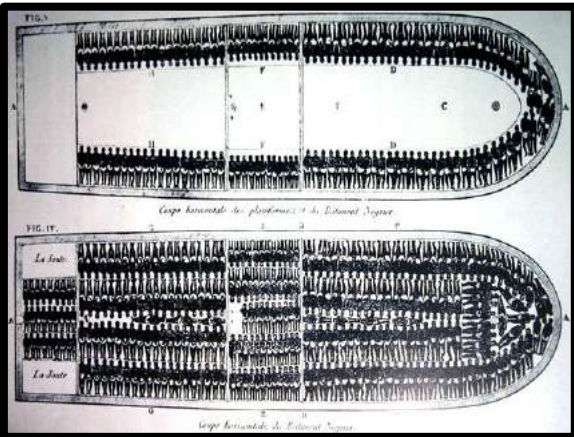
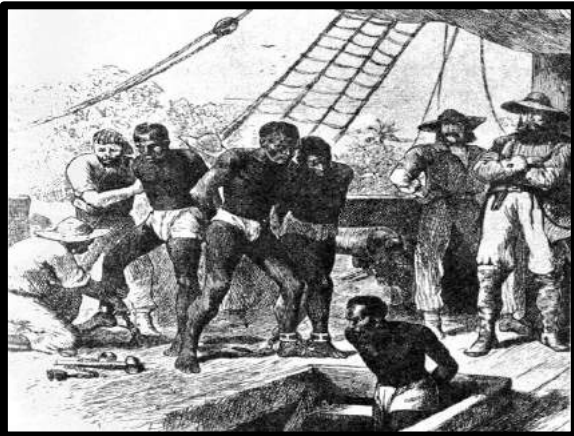
FROM THE OLD WORLD



CHANGES IN THE OLD WORLD







Charleston, July 24th, 1769.

TO BE SOLD,

On THURSDAY the third Day
of AUGUST next,

A CARGO
OF
NINETY-FOUR
PRIME, HEALTHY

NEGROES,

CONSISTING OF
Thirty-nine MEN, Fifteen BOYS,
Twenty-four WOMEN, and
Sixteen GIRLS.

JUST ARRIVED,
In the Brigantine DEMBIA, Francis
Bare, Master, from SIERRA-
LEON, by
DAVID & JOHN DEAS.

The Columbian Exchange



THE AGRICULTURAL REVOLUTION

Even with new crops the amount of food grown per acre of land in most parts of the world was still low with many farmers growing just enough to feed themselves and their families. Any difficulties such as poor weather or disease could create a famine which would kill large numbers of people – especially the young. Between the 1500s and 1800s new farming techniques and technologies were developed, especially in Britain, that dramatically increased crop yields resulting in a population boom and other important changes.

Crop Rotation

Growing any plant removed nutrients from the soil making it less able to grow future crop. During the Middle Ages farmers had tried to restore fertility to the soil by using a two-field rotation system in which one area of land was left fallow (unplanted) while another was used to grow crops. By the early 1700s farmers in Britain were using a four-field rotation system in which certain crops were grown in a certain order to restore nutrients. Especially important was clover which would add nitrogen to the soil. Other plants, such as turnips, could be used as feed for animals during winters. Farmers also began using higher-yield grains such as wheat.

Selective Breeding

In the Middle Ages farm animals were often slaughtered during the winter months as there was not enough food to feed them. New supplies of fodder, such as turnips, allowed farmers to hold on to their animals and also to start breeding them. Sheep began to develop much thicker wool coats while cattle began to be bred to produce larger amounts of milk and meat. In the early 1700s the average weight of a cow at sale was just 370 pounds. By the end of the century this had more than doubled to 840 pounds. Similar advances were made with pigs, goats, and chickens creating a larger supply of meat and other materials.

Enclosure

During the Middle Ages manor land was farmed in long, narrow strips while animals were grazed on open common land. This method was very inefficient as farmers would often have to travel long distances between different strips of land or spend a long time sorting their animals from those of their fellow farmers. During the Agricultural Revolution landowners began enclosing their lands into larger and larger units in order to grow a single crop in one field. Fences were also built to divide grazing land and the animals that it supported. With more efficient organization farmers began investing in improvements which further raised productivity.

Fertilizers

Animal manure had been used for thousands of years to help fertilize the soil however huge amounts were needed to restore a single field. Manure was also very inefficient as up to 40% of its nutrients were lost before it could be absorbed into the soil. During the 1800s new sources of fertilizers began to be discovered including saltpeter and animal droppings such as guano. Companies began mining these substances and transporting them thousands of miles before selling them to farmers. Combined with crop rotation these fertilizers helped to restore soil fertility and boost yields for many plants.

Machinery & Technology

During the 1700s British inventors began figuring out cheaper and faster ways to make iron and steel. These metals could then be shaped into many different kinds of farming tools. Most important were better plows which were lighter but stronger than earlier kinds making them easier to move through the soil. Many of these plows were pulled by new breeds of large, strong horses known as Shire horses. The 1700s also saw the creation of the first advanced farming machines which could help weed, furrow, and plant seeds far more quickly and efficiently than could be done by hand. Once crops were ready other machines were created which could cut down, harvest, and separate crops.

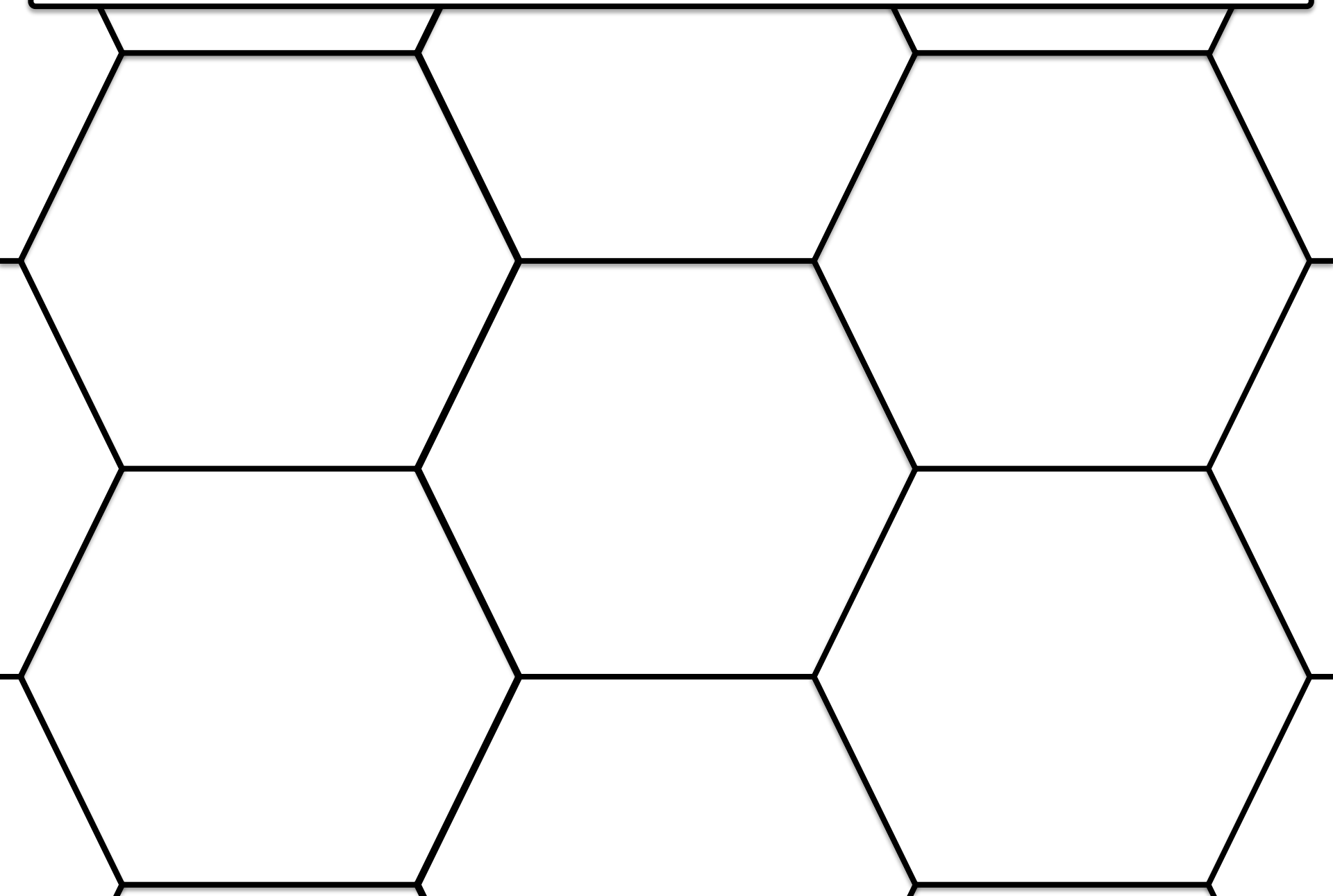
By the 1800s the population of Britain, and many other parts of Europe, had increased dramatically. The advances in farming however meant that fewer and fewer people were actually needed to work on the land. More and more people began moving into the growing towns and cities to find work rather than staying on their farms. In many cases people did not have the choice to move. A large number of landowners forced small farmers from their land in order to enclose it. These people had no place left to go but the urban areas where they often struggled to adapt.

At the same time that Britain was undergoing the Agricultural Revolution another huge change was taking place in manufacturing. In order to provide goods to the growing population inventors had begun to create machines which could produce items far more quickly than humans could. Many of these inventors built factories into which they placed hundreds or even thousands of machines. Many of those employed to run the machines were ex-farmers who were so desperate for work that they accepted very low wages.

By 1725 Britain had become the first country in the world to have more people living in urban than rural areas. With a population of just 5.2 million she was producing more manufactured goods than the rest of the world combined creating huge profits for factory owners. Before long other European countries were copying Britain's farming and industrial reforms. Industrialists, not landowners, became the driving forces of their nations' economies. Although aristocratic landowners still held important positions in government in many countries they were forced to share power with a growing middle class of factory owners, merchants, and other professionals. A landowning culture that had existed for nearly 6,000 years was beginning to come to an end.

Use the information you've just read to create a hexagonal chart showing and summarizing the changes to farming and other areas that occurred during the Agricultural Revolution.

THE AGRICULTURAL REVOLUTION - FACTORS



THE AGRICULTURAL REVOLUTION - CONSEQUENCES



THE AGRICULTURAL REVOLUTION - FACTORS

```
graph TD; A[THE AGRICULTURAL REVOLUTION - FACTORS] --- B[Crop Rotation]; A --- C[Enclosure]; A --- D[Selective Breeding]; A --- E[Fertilizers]; A --- F[Machinery/Tech]; B --- D; C --- D; D --- E; D --- F; E --- F;
```

Crop Rotation

Enclosure

Selective Breeding

Fertilizers

Machinery/Tech

THE AGRICULTURAL REVOLUTION - CONSEQUENCES

```
graph TD; A[THE AGRICULTURAL REVOLUTION - CONSEQUENCES] --- B[Population Growth]; A --- C[Migration]; A --- D[Industry]; A --- E[Power]; B --- F[Manufacturing]; C --- F; D --- F; E --- F;
```

Population Growth

Migration

Manufacturing

Industry

Power

CROP YIELDS PER ACRE

| CROP / YEAR | 1450 AD | 1550 AD | 1650 AD | 1750 AD | 1850 AD |
|-------------|---------|---------|---------|---------|---------|
| WHEAT | 6.4 | 7.9 | 11.3 | 17.2 | 26.7 |
| RYE | 13.9 | 9.2 | 14.1 | 17.9 | 26.2 |
| BARLEY | 8.5 | 8.4 | 12.5 | 21.8 | 23.8 |
| OATS | 5.9 | 7.9 | 10.8 | 21.0 | 31.3 |

Use the figures above to create a graph showing the growth in crop yields during the Agricultural Revolution

Which crop saw the greatest total increase in yield between 1450 and 1850?

Which hundred-year period saw the greatest total increase in crop yields.

Which crop saw the smallest total increase in yield between 1450 and 1850?

BUSHELS PER ACRE

CROP YIELDS PER ACRE OF LAND



WHEAT



RYE



BARLEY



OATS

37
36
35
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
09
08
07
06
05
04
03
02
01

1450 AD

1550 AD

1650 AD

1750 AD

1850 AD

YEAR

CROP YIELDS PER ACRE OF LAND



WHEAT



RYE



BARLEY



OATS

BUSHELS PER ACRE

YEAR

1450 AD

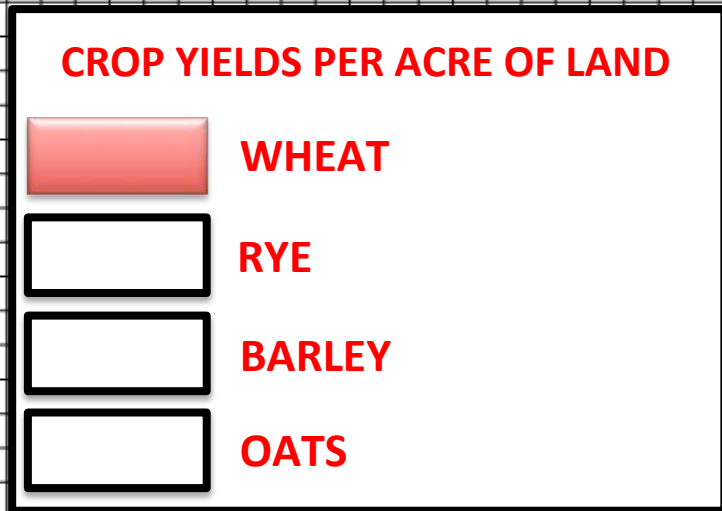
1550 AD

1650 AD

1750 AD

1850 AD

37
36
35
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
09
08
07
06
05
04
03
02
01



POPULATION OF BRITAIN

| POPULATION / YEAR | 1450 AD | 1550 AD | 1650 AD | 1750 AD | 1850 AD |
|-------------------|---------|---------|---------|---------|---------|
| TOTAL | 2.3 | 3.0 | 5.2 | 5.8 | 16.7 |
| URBAN | 0.3 | 0.7 | 2.25 | 3.16 | 12.86 |
| RURAL | 2.0 | 2.3 | 2.95 | 2.64 | 3.84 |

Use the figures above to create a graph showing the growth in crop yields during the Agricultural Revolution

Which was the last period in which rural dwellers outnumbered urban dwellers?

Approximately how many times did the population of Britain increase between 1450 and 1850?

What ratio of urban to rural dwellers existed by 1850?

POPULATION (MILLIONS)

POPULATION OF BRITAIN

TOTAL

CITY

URBAN

18
17
16
15
14
13
12
11
10
09
08
07
06
05
04
03
02
01

1450 AD

1550 AD

1650 AD

1750 AD

1850 AD

YEAR

POPULATION (MILLIONS)

POPULATION OF BRITAIN



TOTAL



CITY



URBAN

18
17
16
15
14
13
12
11
10
09
08
07
06
05
04
03
02
01

1450 AD

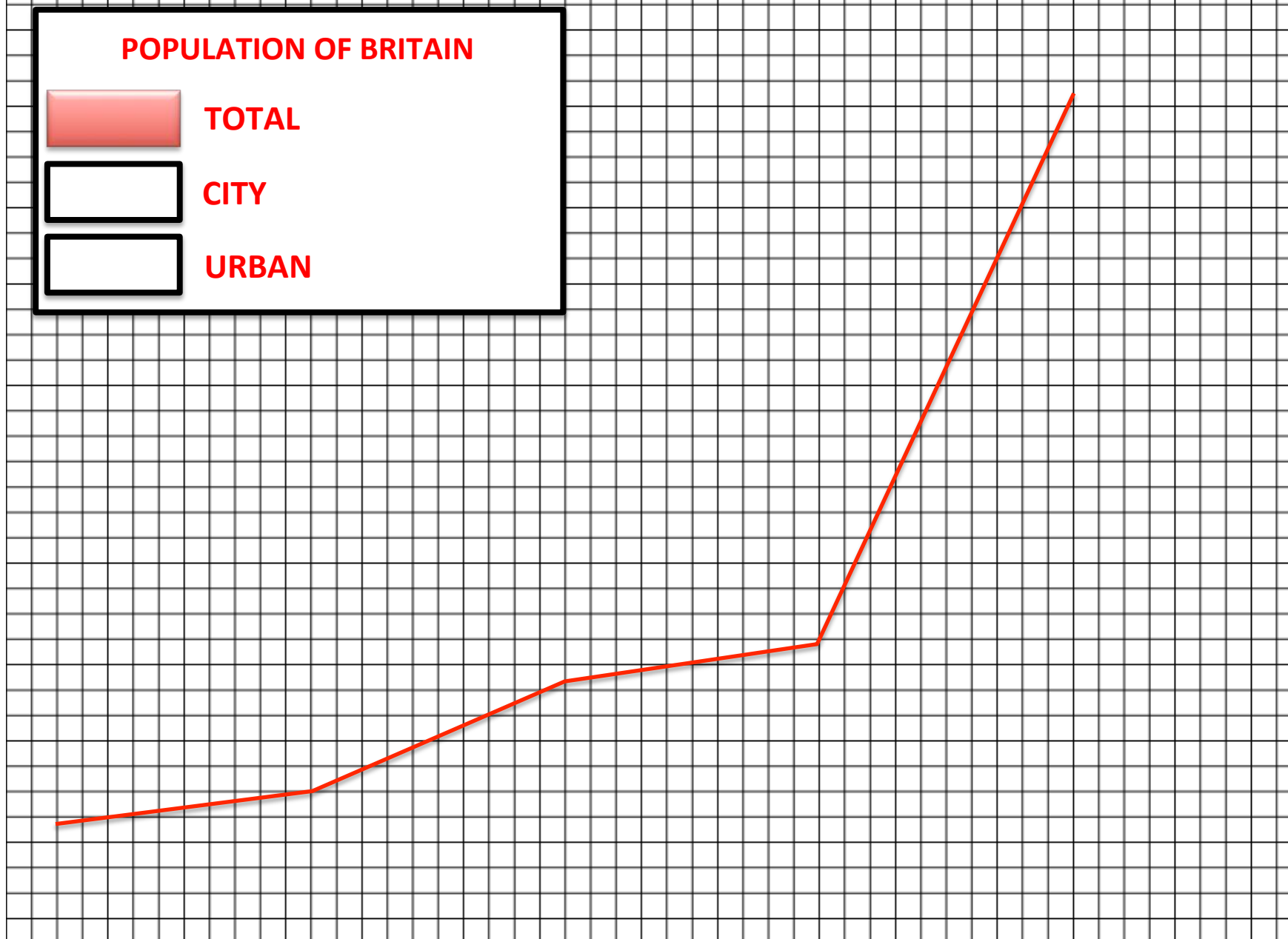
1550 AD

1650 AD

1750 AD

1850 AD

YEAR



SETTLING & FARMING THE GREAT PLAINS

By the mid-1800s life in Europe was becoming increasingly difficult for both small farmers and workers. Almost all the fertile land had been bought up while in the overcrowded and polluted cities people struggled to survive on low wages. Many poor Europeans began to look to the United States for the opportunity to start a new life. Between 1850 and the early 1900s more than 25 million people emigrated to the United States.

For a long time settlement and farming in North America had been restricted to a narrow belt of land bordered by the Atlantic Ocean to the East and the Appalachian Mountains to the West. Beyond these mountains lay the vast prairie of the Great Plains which many people believed would never be farmed or settled because of a lack of transportation, wood (for building and fuel), and the presence of Native Americans and the huge herds of Buffalo they hunted. At the time most Americans called this area the “Great American Desert” because there were so few people living there.

By the 1850s many of these problems no longer existed. Railroads had been constructed across large parts of the Great Plains providing the means to bring in supplies of wood and take out harvested crops. Many Native American groups had been wiped out along with their Buffalo with those that survived forced into reservations. In 1862 the U.S. Congress passed the Homestead Act which would give 160 acres of land free of charge to anyone who would stay on the land and improve it for a period of 5 years. At the same time several states began giving away land – often using races to decide who would own a particular piece of land.

Over the next 50 years millions of Americans and new immigrants would settle on the Great Plains where they began plowing up the grass to plant huge crops of grain. Other farmers used the huge grasslands to raise large herds of cattle which they would then drive north to the railheads connecting the Great Plains with cities back East using cowboys. This often led to conflict as farmers began to use the new invention of barbed wire to close off their land blocking the cattle’s path. Cattle ranchers responded by cutting the wire and attacking farmers in a series of what were called “Range Wars”. Ranch owners and farmers would often hire mercenaries to fight for them with shootings and lynchings commonplace before the U.S. army was able to restore order.

By the late 1800s the United States had overtaken Britain as the leading industrial nation in the world. American factories began producing new farming machines that saved farmers a huge amount of effort or time. New varieties of wheat were also introduced which could cope better with the extreme heat of the summer and cold of the winter. These new technologies and wheats resulted in an increase in production from 250 million bushels per year during the 1870s to over 750 bushels per year by the 1920s.

This huge increase in production however was not sustainable as farmers moved into lands (especially in Texas and Oklahoma) that were not really suitable for growing crops. A small change in climate during the 1920s led to a series of droughts that dried out the exposed soil. With no grass roots to hold it in place the wind soon picked the loose soil up creating huge dust storms that traveled as far as New York City.

Millions of farmers were ruined in an event that came to be known as the Dust Bowl. Many became refugees and headed for California where they had been told they could find farm work. When they arrived many were disappointed as few jobs were available and those that existed paid very low wages. Many of these farmers were forced to become landless workers or settled in the cities where they found jobs in factories.

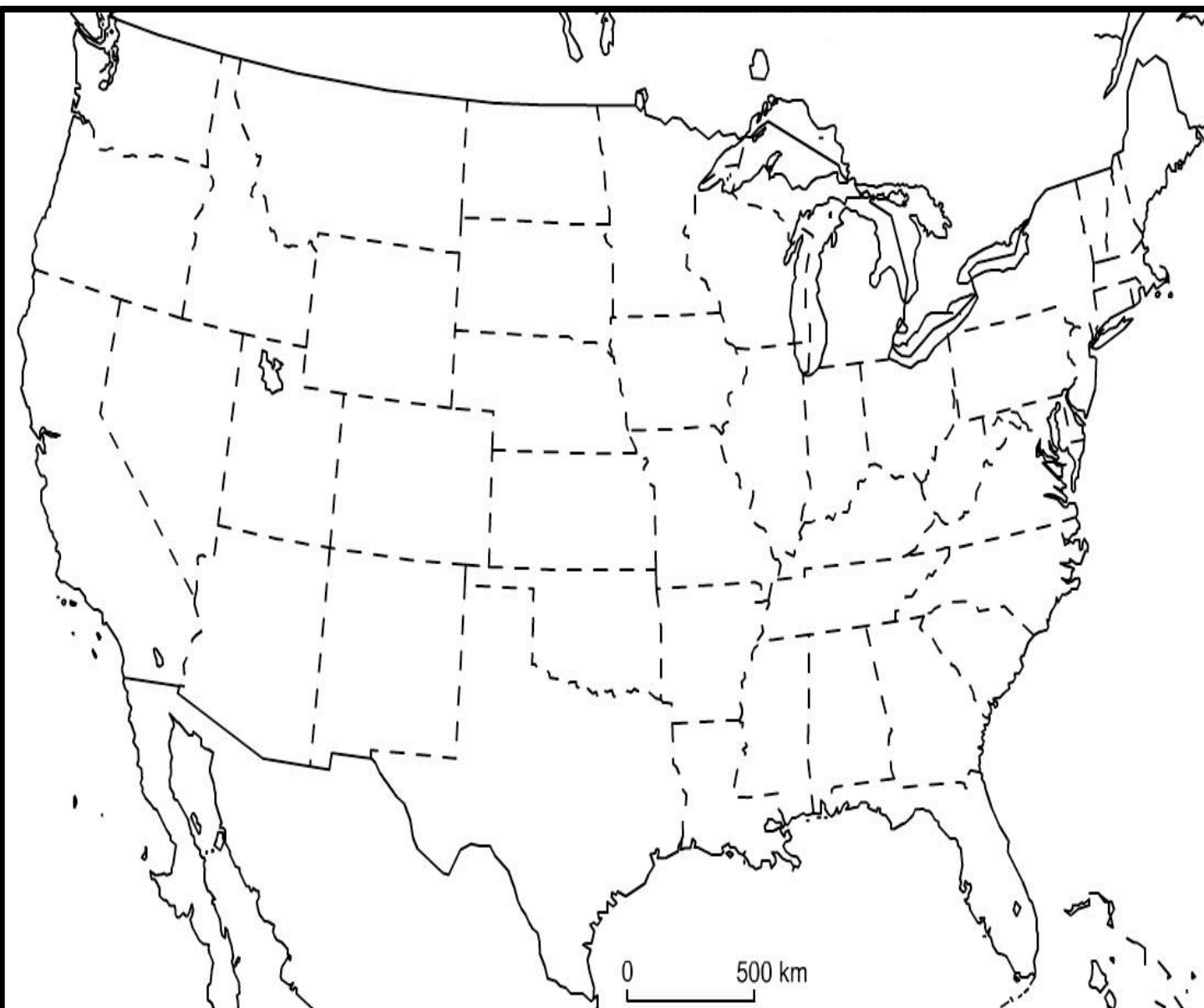
On the map shade in the areas covered by the Great Plains.

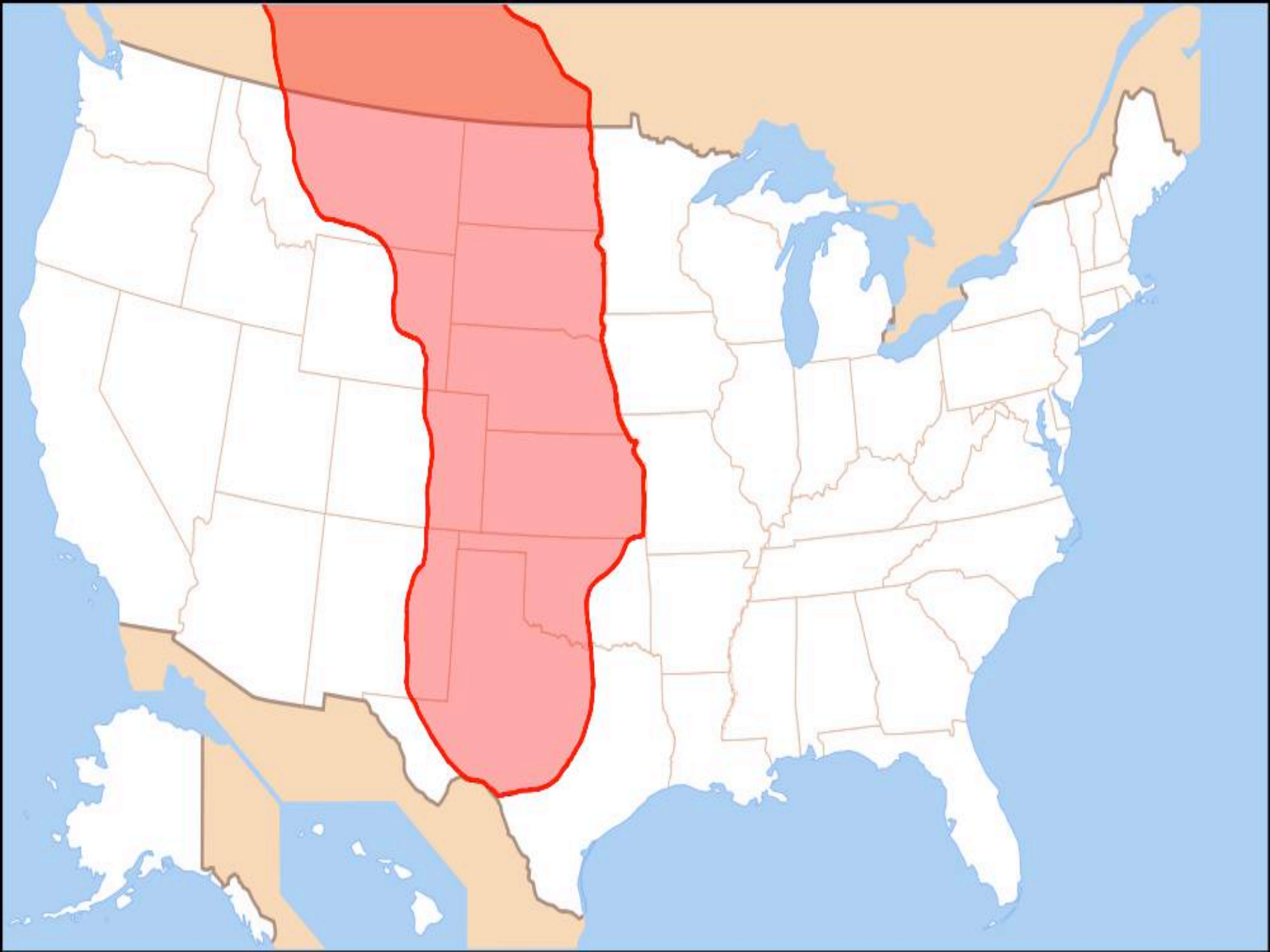
Extent of Great Plains

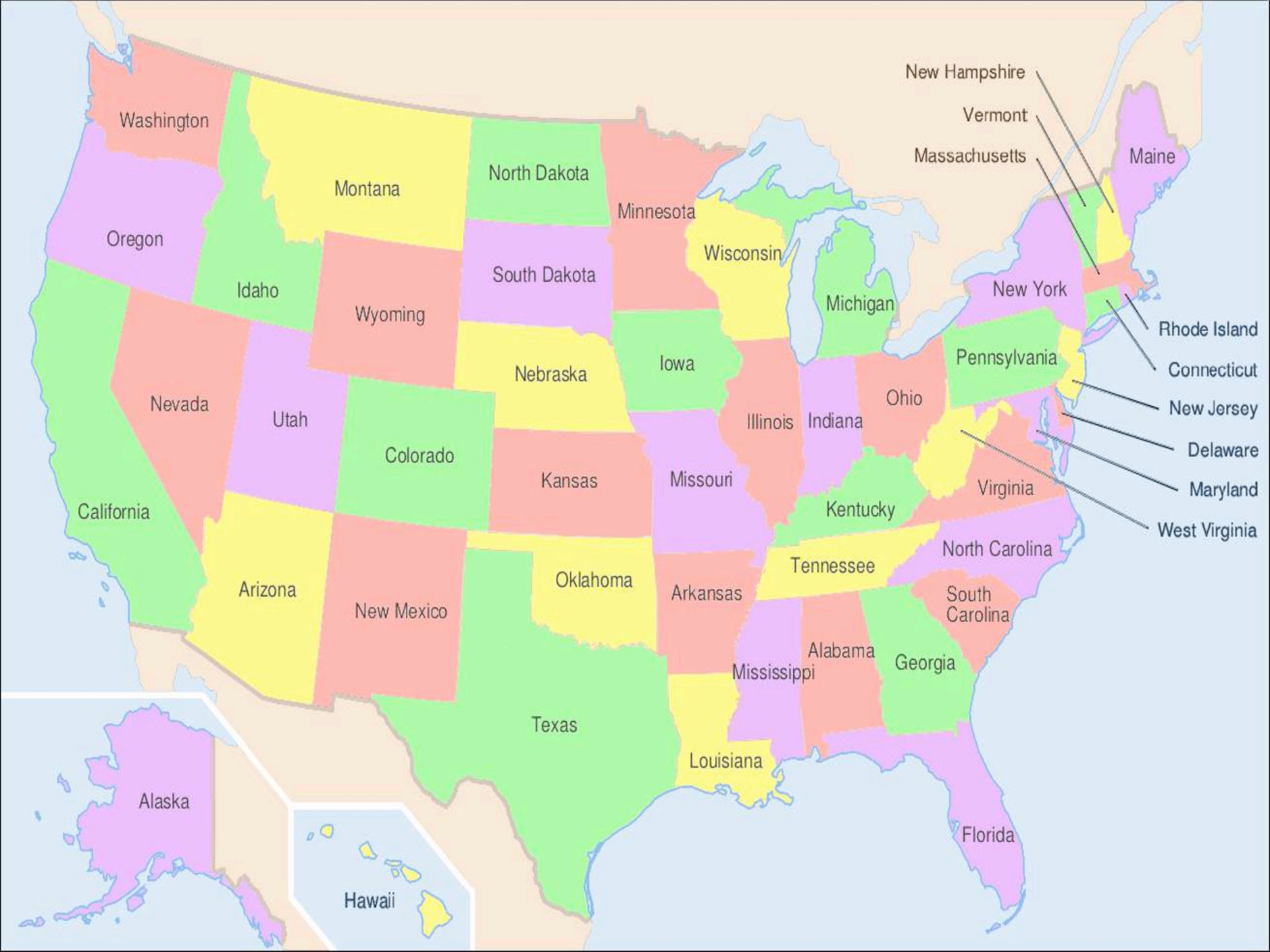
North Dakota
South Dakota
Nebraska
Kansas
Western Oklahoma
Northwest Texas
Eastern New Mexico
Eastern Colorado
Eastern Wyoming
Montana

Shade in other major crop producing areas.

Minnesota
Wisconsin
Iowa
Illinois
Indiana
Missouri
Michigan
Ohio







New Hampshire

Vermont

Massachusetts

Maine

New York

Rhode Island

Connecticut

New Jersey

Delaware

Maryland

West Virginia

Washington

Oregon

Idaho

Montana

North Dakota

Minnesota

Wisconsin

Michigan

Wyoming

South Dakota

Nebraska

Iowa

Nevada

Utah

Colorado

Kansas

Missouri

Illinois

Indiana

Ohio

Pennsylvania

Virginia

Kentucky

California

Arizona

New Mexico

Oklahoma

Arkansas

Tennessee

North Carolina

South Carolina

Alabama

Georgia

Mississippi

Texas

Louisiana

Florida

Alaska

Hawaii



Goodnight-Loving Trail

Western Trail

Chisholm Trail

Sedalia & Baxter Springs Trail



Meat Packing Center



Cattle Raising Area

CATTLE TRAILS



GEOGRAPHY SKILLS

INTERPRETING MAPS

1. Movement Describe how cattle made their way from Texas to markets in the north. Use the map key to help you.

2. Region Why were longhorns suited to this journey?

See **Skills Handbook**, p. H19



Texas longhorns are well named, sporting horns that can span four feet. Six million of these docile beasts made the long journey to market during the cattle boom.

THE DUST BOWL – PROJECT INSTRUCTIONS

DUST BOWL REGION

Southwest Kansas
Western Oklahoma
Northwest Texas
Northeast New Mexico
Southeast Colorado

Shade in the areas most affected by the
Dust Bowl on the map provided.

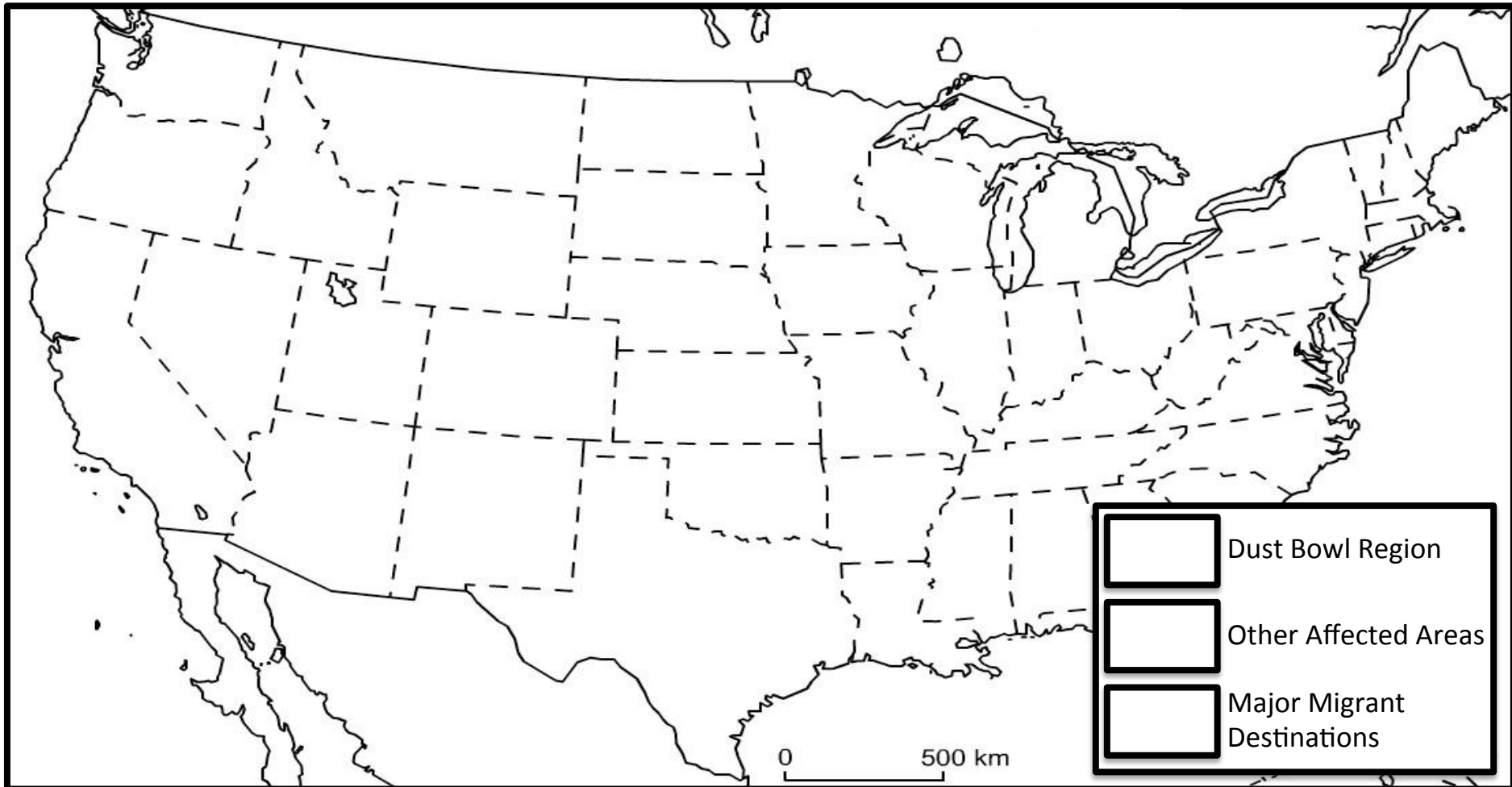
OTHER AFFECTED AREAS

North Dakota
South Dakota
Central & Western Nebraska
Western Kansas
Central Oklahoma
Western Texas
Southeast New Mexico
Northeast Kansas
Eastern Wyoming
Eastern Montana

MAJOR MIGRANT DESTINATIONS

California
Arizona
Oregon
Washington State.

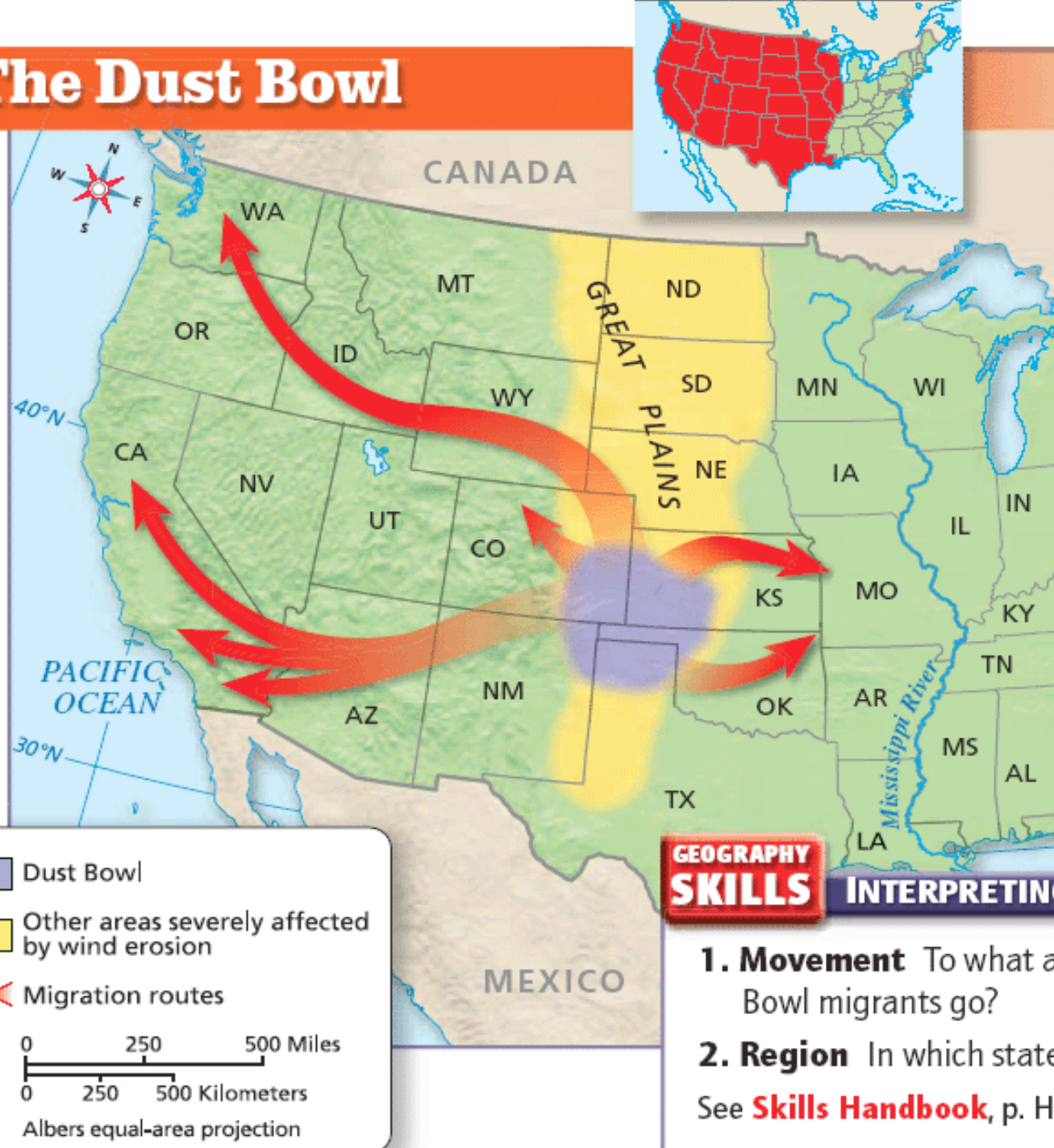
Write a short summary under the map of the causes and consequences of the Dust Bowl.



CAUSES OF THE DUST BOWL

CONSEQUENCES OF THE DUST BOWL

The Dust Bowl



1. Movement To what areas of the country did Dust Bowl migrants go?

2. Region In which states was it located?

See **Skills Handbook**, p. H18

INTENSIVE FARMING & THE GREEN REVOLUTION

The 1890s and early 1900s saw the development of the first practical gasoline-powered engines. In 1901 the first successful motorized tractor was placed on sale and within 20 years they had replaced animals as the major source of farm power in the wealthier nations of the Americas and Europe. Other farm machines such as plows, harvesters, spreaders, and threshers also began using gasoline powered engines leading to huge increases in crop production.

The period after 1910 also saw the first use of synthesized ammonium nitrate which had been invented by the German chemists Fritz Haber and Carl Bosch. This new fertilizer was much more efficient than earlier organic types allowing for the production of approximately four times as much food per acre of land than before.

Animal raising also began to change during the 20th century as farmers began using factory methods to produce large amounts of cheap meat and other materials. Animals began to be kept in large sheds and cages rather than outdoors in order to better control their weight or production of milk and eggs.

Despite these new technologies and methods many parts of the world still faced severe food shortages due either to overpopulation or poor government policies. An American scientist, Norman Borlaug, helped to lead a series of initiatives that used genetic manipulation to increase resistance to drought, disease, and pests while increasing their yields. These efforts came to be known as the “Green Revolution” and have been credited by some with saving over one billion lives.

Criticisms of the Green Revolution are mainly environmental. Amongst the major ones are:

- Loss of biodiversity and food quality – Many farmers now plant a very limited variety of crops which have been selected for their yields and sometimes appearance rather than their nutritional value. Dependence on such a limited number of crops also runs the risk of food shortages in the event that a disease should attack the crop.
- Fossil fuel dependence and pollution – Intensive agriculture is reliant on large amounts of fossil fuels both to run machinery and also to produce the man-made fertilizers. These fertilizers along with pesticides can be a major source of water pollution
- Land degradation – Soil can be heavily affected by the use of fertilizers. Bacteria and soil microbes can be killed off while soil is often eroded by irrigation. This can lead to the use of even more fertilizers to restore the soil's fertility.

Another major criticism involves the domination of agriculture by large seed and farm companies who have the financial resources to pay for the equipment and research needed for intensive farming. Many small farmers have been unable to compete and have lost their land.

Opponents of intensive farming argue that organic farming (farming without artificial fertilizers and pesticides) is a better strategy for feeding mankind. The claim that it is better in the long run for the land while the food produced is of better quality and nutrition. Supporters of intensive farming argue that feeding the current population (and projected) population of the planet would be impossible using organic techniques even if every possible piece of agricultural land were used. Other major criticisms of the organic movement include the high cost of the food it produces which critics claim will hurt poorer people. Norman Borlaug, the father of the “Green Revolution” argued that:

“Some of the environmental lobbyists of the Western nations are the salt of the earth, but many of them are elitists. They've never experienced the physical sensation of hunger. They do their lobbying from comfortable office suites in Washington or Brussels...If they lived just one month amid the misery of the developing world, as I have for fifty years, they'd be crying out for tractors and fertilizer and irrigation canals and be outraged that fashionable elitists back home were trying to deny them these things.”

The debate over intensive and organic farming is one that will continue to take place as the world's population continues to expand while pressure on natural resources necessary to farming (water, land, fuels) increases.

Read the text above then use the information to create a chart showing and summarizing the advantages and disadvantages of intensive and organic farming.

Complete the two graphs to show the growth in crop yields and human population over the last 60 years.

INTENSIVE AGRICULTURE

CLAIMED ADVANTAGES

CLAIMED DISADVANTAGES

ORGANIC AGRICULTURE

CLAIMED ADVANTAGES

CLAIMED DISADVANTAGES

Will Organic Food Fail to Feed the World?

Apr 25, 2012 |By David Biello

Food for hungry mouths, feed for animals headed to the slaughterhouse, fiber for clothing and even, in some cases, fuel for vehicles—all derive from global agriculture. As a result, in the world's temperate climes human agriculture has supplanted 70 percent of grasslands, 50 percent of savannas and 45 percent of temperate forests. Farming is also the leading cause of deforestation in the tropics and one of the largest sources of greenhouse gas emissions, a major contributor to the ongoing maul of species known as the "sixth extinction," and a perennial source of nonrenewable groundwater mining and water pollution.

To restrain the environmental impact of agriculture as well as produce more wholesome foods, some farmers have turned to so-called organic techniques. This type of farming is meant to minimize environmental and human health impacts by avoiding the use of synthetic fertilizers, chemical pesticides and hormones or antibiotic treatments for livestock, among other tactics. But the use of industrial technologies, particularly synthetic nitrogen fertilizer, has fed the swelling human population during the last century. Can organic agriculture feed a world of nine billion people?

In a bid to bring clarity to what has too often been an emotional debate, environmental scientists at McGill University in Montreal and the University of Minnesota performed an analysis of 66 studies comparing conventional and organic methods across 34 different crop species. "We found that, overall, organic yields are considerably lower than conventional yields," explains McGill's Verena Seufert, lead author of the study to be published in Nature on April 26. (Scientific American is part of Nature Publishing Group.) "But, this yield difference varies across different conditions. When farmers apply best management practices, organic systems, for example, perform relatively better."

In particular, organic agriculture delivers just 5 percent less yield in

rain-watered legume crops, such as alfalfa or beans, and in perennial crops, such as fruit trees. But when it comes to major cereal crops, such as corn or wheat, and vegetables, such as broccoli, conventional methods delivered more than 25 percent more yield.

The key limit to further yield increases via organic methods appears to be nitrogen—large doses of synthetic fertilizer can keep up with high demand from crops during the growing season better than the slow release from compost, manure or nitrogen-fixing cover crops. Of course, the cost of using 171 million metric tons of synthetic nitrogen fertilizer is paid in dead zones at the mouths of many of the world's rivers. These anoxic zones result from nitrogen-rich runoff promoting algal blooms that then die and, in decomposing, suck all the oxygen out of surrounding waters. "To address the problem of [nitrogen] limitation and to produce high yields, organic farmers should use best management practices, supply more organic fertilizers or grow legumes or perennial crops," Seufert says.

In fact, more knowledge would be key to any effort to boost organic farming or its yields. Conventional farming requires knowledge of how to manage what farmers know as inputs—synthetic fertilizer, chemical pesticides and the like—as well as fields laid out precisely via global-positioning systems. Organic farmers, on the other hand, must learn to manage an entire ecosystem geared to producing food—controlling pests through biological means, using the waste from animals to fertilize fields and even growing one crop amidst another. "Organic farming is a very knowledge-intensive farming system," Seufert notes. An organic farmer "needs to create a fertile soil that provides sufficient nutrients at the right time when the crops need them. The same is true for pest management."

But the end result is a healthier soil, which may prove vital in efforts to make it more resilient in the face of climate change as well as conserve it. Organic soils, for example, retain water better than those farms that employ conventional methods. "You use a lot more water [in irrigation] because the soil doesn't have the capacity to retrain the water you use," noted farmer Fred Kirschenmann, president of Stone Barns

Center for Food and Agriculture at the "Feeding the World While the Earth Cooks" event at the New America Foundation in Washington, D.C., on April 12.

At the same time, a still-growing human population requires more food, which has led some to propose further intensifying conventional methods of applying fertilizer and pesticides to specially bred crops, enabling either a second Green Revolution or improved yields from farmlands currently under cultivation. Crops genetically modified to endure drought may also play a role as well as efforts to develop perennial versions of annual staple crops, such as wheat, which could help reduce environmental impacts and improve soil. "Increasing salt, drought or heat tolerance of our existing crops can move them a little but not a lot," said biologist Nina Fedoroff of Pennsylvania State University at the New America event. "That won't be enough."

And breeding new perennial versions of staple crops would require compressing millennia of crop improvements that resulted in the high-yielding wheat varieties of today, such as the dwarf wheat created by breeder Norman Borlaug and his colleagues in the 1950s, into a span of years while changing the fundamental character of wheat from an annual crop to a perennial one. Then there is the profit motive. "The private sector is not likely to embrace an idea like perennial crop seeds, which do not require the continued purchase of seeds and thus do not provide a very good source of profit," Seufert notes.

Regardless, the world already produces 22 trillion calories annually via agriculture, enough to provide more than 3,000 calories to every person on the planet. The food problem is one of distribution and waste—whether the latter is food spoilage during harvest, in storage or even after purchase. According to the Grocery Manufacturers Association, in the U.S. alone, 215 meals per person go to waste annually.

"Since the world already produces more than enough food to feed everyone well, there are other important considerations" besides yield, argues ecologist Catherine Badgley of the University of Michigan, who

also compared yields from organic and conventional methods in a 2006 study that found similar results. Those range from environmental impacts of various practices to the number of people employed in farming. As it stands, conventional agriculture relies on cheap energy, cheap labor and other unsustainable practices. "Anyone who thinks we will be using Roundup [a herbicide] in eight [thousand] to 10,000 years is foolish," argued organic evangelist Jeff Moyer, farm director the Rodale Institute, at the New America Foundation event.

But there is unlikely to be a simple solution. Instead the best farming practices will vary from crop to crop and place to place. Building healthier soils, however, will be key everywhere. "Current conventional agriculture is one of the major threats to the environment and degrades the very natural resources it depends on. We thus need to change the way we produce our food," Seufert argues. "Given the current precarious situation of agriculture, we should assess many alternative management systems, including conventional, organic, other agro-ecological and possibly hybrid systems to identify the best options to improve the way we produce our food."

- What does this article reveal about the results of conventional and organic farming on crop yields?
- What problems does the article say are caused through the use of man-made fertilizers?
- What do supporters of conventional farming argue will improve crop yields?
- What does the article say is the real source of food shortages?
- What does the article suggest is the best way for humans to feed themselves in the future?

WORLD & REGIONAL POPULATION

| YEAR / REGION | TOTAL | AFRICA | ASIA | EUROPE | AMERICAS |
|---------------|-------|--------|------|--------|----------|
| 1950 | 2525 | 228 | 1395 | 549 | 339 |
| 1960 | 3026 | 285 | 1694 | 605 | 424 |
| 1970 | 3691 | 366 | 2128 | 657 | 519 |
| 1980 | 4449 | 478 | 2634 | 694 | 618 |
| 1990 | 5320 | 629 | 3213 | 723 | 727 |
| 2000 | 6127 | 808 | 3717 | 729 | 841 |
| 2010 | 6916 | 1031 | 4165 | 740 | 942 |

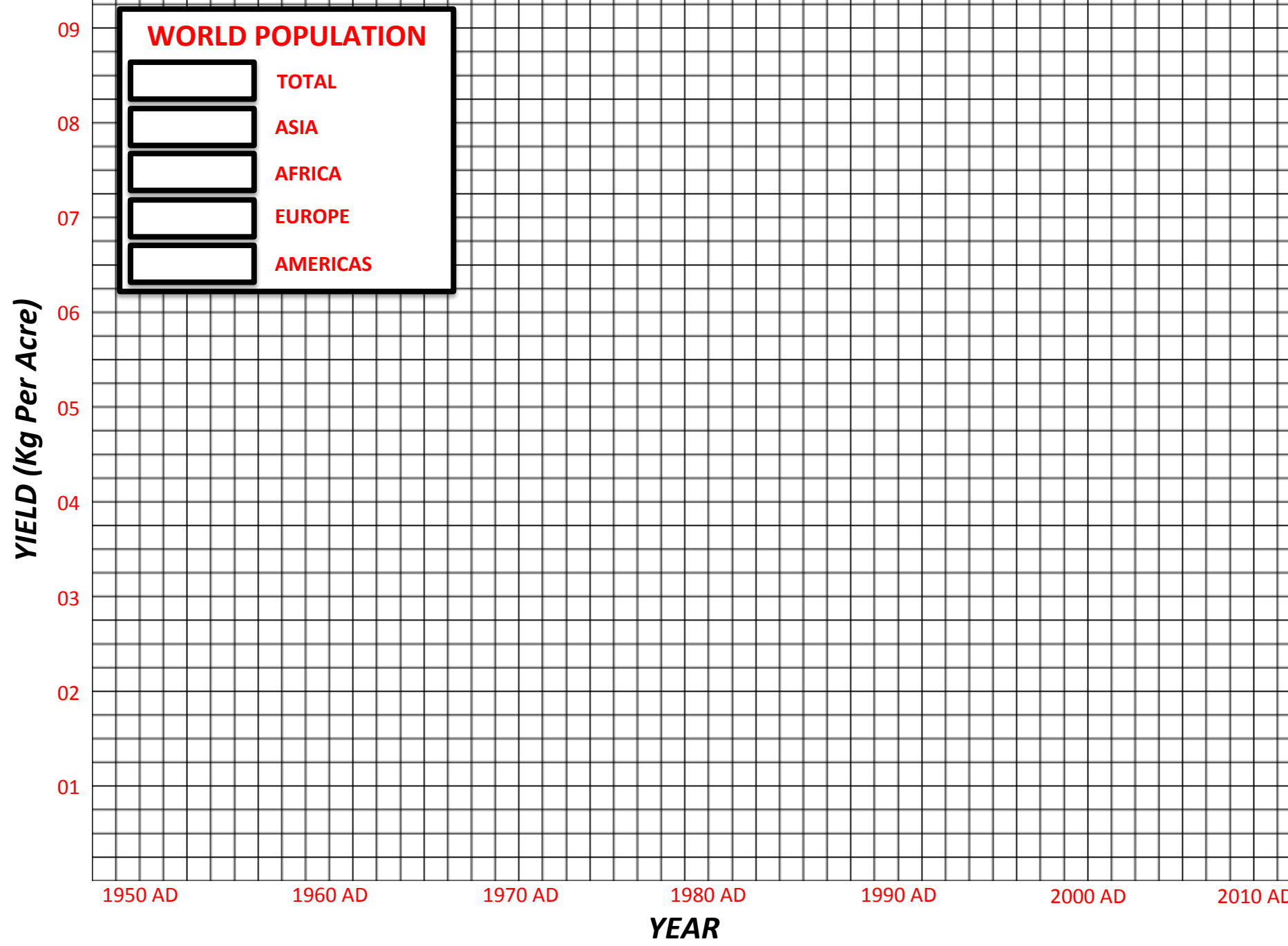
Figures in millions

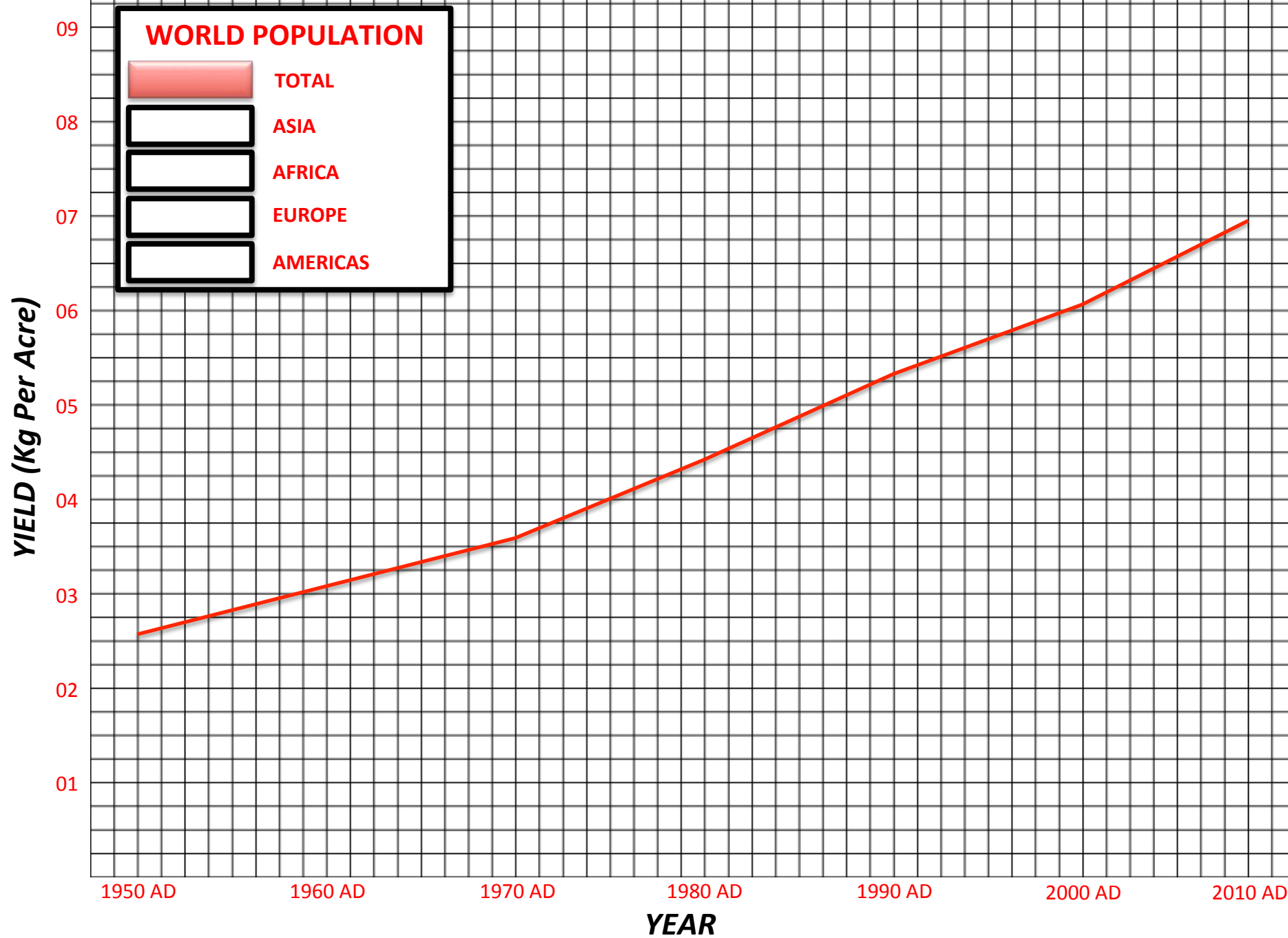
Use the figures above to create a graph showing the growth in crop yields during the Agricultural Revolution

Which region has experienced the biggest population growth in total numbers since 1950?

Which region has experienced the biggest percentage growth in population since 1950?

Which decade saw the biggest growth in total world population?





WORLD GRAIN PRODUCTION

| YEAR | PRODUCTION (Millions of Tons) | AREA OF CULTIVATION (Millions of Hectares) |
|------|-------------------------------|--|
| 1960 | 824 | 639 |
| 1970 | 1079 | 663 |
| 1980 | 1429 | 722 |
| 1990 | 1769 | 696 |
| 2000 | 1846 | 666 |
| 2010 | 2213 | 689 |

Use the figures above to create a graph showing the growth in crop yields during the Agricultural Revolution

Which ten year period saw the greatest increase in crop production?

Approximately how many times have crop yields increased since 1960?

What has happened to the area of land under cultivation since 1960?

GRAIN PRODUCTION



Total Production



Land Used

GRAIN YIELDS / HECTARE OF LAND USED (Millions)

2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100

1960 AD

1970 AD

1980 AD

1990 AD

2000 AD

2010 AD

YEAR

GRAIN PRODUCTION



Total Production

Land Used

