

# Designer agriculture

## **Materials needed**

- Paper
- Pencils, markers
- Resource material or
- Internet access
- Optional: photos of farm animals and/or food crops

## **Objectives**

Make students aware of how technology changes their lives, and changes Alaska agriculture.

## **Suggested grade levels**

5-8 (see variations)

## **Alaska Content**

**Standards** Technology, E1-2, 5-8; Science A14; D2-5; Arts A1, 4; Language Arts A1-4; B1.



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## **Introduction**

Biotechnology in its modern form moves genes (the tiny parts of cells that make us what we are) from one organism to another. Biotechnology allows botanists to splice genes of a disease-resistant plant varieties into plants that are susceptible to the diseases. Bio-technology includes use of tissue culture to reproduce perfect specimens of plants, and biotechnology includes the process of cloning.

With the cloning of Dolly the Sheep in Britain in 1996 (she was born Feb. 24, 1997), scientists made an amazing breakthrough in the science of genetic engineering. While there are many controversies about cloning, especially the cloning of humans, there are advantages to using these modern technologies. They are used to make new varieties of crops that are better suited to various climates, disease, drought or insect resistant and that provide more yields.



## **Directions**

1. Just suppose that cloning and genetic engineering of animal species (not humans) was considered acceptable. Knowing that some animals are otherwise not suited for Alaska's climate, what sort of genetic engineering would you use to create the perfect farm animal for Alaska?

Describe the animal and/or draw a picture of it.

2. While such animals may still be more science fiction than fact, geneticists continually try to improve yields and disease resistance of plants. Many common food crops have been developed or improved through cross breeding, cloning, tissue culture and other scientific processes. The development of early (quick maturing) hybrids make it possible to grow more crops in Alaska. For example, if it were not for early hybrids, sweet corn could not be grown here. What sorts of crops might be specially adapted to Alaska?

Describe the plant and/or draw a picture of it.

## **Discussion points**

*Younger students*

- What are some farm animals that do well in Alaska's harsh climates? (possible answers include llamas, buffalo, elk and reindeer) Why? (they come from other areas with harsh winters)
- What are some farm animals that do well in Alaska, but might not do well in Florida? (same)

Terms to define

clone  
 disease-resistance  
 genes/genetic  
 biotechnology  
 genetic engineering  
 tissue culture  
 hybrid  
 botany/botanist  
 drought

**Designer agriculture***Older students*

- Why is genetic engineering and cloning controversial?
- Is there a difference from a moral standpoint between cloning a human and cloning a sheep?
- Could genetic manipulation help or hurt the agricultural industry?
- There are restrictions on processing genetically manipulated food crops for humans. Should there be?
- Will genetic manipulation be used to make humans better? Should it be?

**More investigation**

Dolly died in February 2003 at age 6 — about half the normal life span of a sheep. How might lack of longevity impact attempts to clone and/or genetically alter farm animals in the future? What other animals have been cloned? What countries are doing most of the cloning research?

**Other activities**

Have older students do a written and/or oral report on a specific branch of biotechnology, or a particular area of research. Use up-to-date printed and web sources in this fast-changing area of technology.

**Related websites**

<http://gslc.genetics.utah.edu/>  
<http://www.ansi.okstate.edu/breeds/>  
<http://fog.n4h.org/>  
<http://www.cals.cornell.edu/extension/nabc/resources.html>  
<http://www.whybiotech.com>

**Suggested Resources**

“Science in Your Shopping Cart,” USDA Agricultural Research Service publication

“Farm Facts,” American Farm Bureau, [www.fb.org](http://www.fb.org) or download “The Shared Benefits of Biotechnology” page at <http://www.fb.org/brochures/farmfacts/ff2000-2.html>



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