Cloning

The definition of a clone as explained by Encyclopaedia Britannica is a cell or living thing, an organism, that is "genetically identical to the original cell or organism" from which it comes. The word itself comes from the ancient Greek word "klon," which means twig. Single-cell organisms like some yeasts and bacteria naturally reproduce clones of parent cells via budding or binary fission. Individual body cells within plants and animals are clones that occur during a cell-reproduction process called mitosis. There are no federal laws against cloning in the United State. However, seven states prohibit it altogether, and 10 states only allow it for biomedical research. While more than 30 countries formally ban cloning for reproductive purposes, China, England, Israel, Singapore and Sweden do allow cloning for research, but disallow reproductive cloning.

Cloned Animals

In 2017, scientists in Shanghai succeeded in cloning two genetically identical long-tailed macaques, small brown and black monkeys with body lengths of 16 to 28 inches. The last successful cloning of a primate was in 1998, but scientists have also cloned about 20 different types of animals including dogs, pigs, frogs, mice, cows and rabbits since the first cloned animal in 1996.

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The First Cloned Animal: Dolly the Sheep

The first successful animal cloning occurred over 22 years ago, after a Scottish Blackface sheep surrogate mother gave birth to Dolly on July 5, 1996, at the Roslin Institute, part of the University of Edinburgh. Cloned from a six-year-old Dorset sheep, scientists analyzed her DNA at her first birthday and discovered that the telomeres at the end of her DNA strands (think eraser on a pencil head) were shorter that they should be for her age. As animals and humans age, these telomeres become shorter. The average age for sheep runs between six to 12 years. Dolly died when she was six, and though she had shortened telomeres, she lived an average life and produced multiple offspring through natural methods, but she also developed diseases in her later years.

Human Cloning Pros and Cons

The pros or advantages of human cloning include:

* **Infertility:** Infertile people could have children made from cloned cells.
* **Organ replacement:** A clone, like in the movie, "The Island," could be a source for transplant organs or tissue. (There are ethical issues that arise from this, however.)
* **Genetic research:** Cell cloning could assist scientists in gene editing and research.
* **Selective human traits:** After editing or removing bad genes, cloning could lead engineered humans for specific traits.
* **Human development:** Cloning could enhance and advance human development.

The cons or disadvantages of human cloning raise moral, ethical and safety issues:

* **Reproductive cloning:** The negatives of human cloning including the making of designer babies.
* **Human cloning:** Could be a violation of the clone's individual human rights.
* **Embryonic cloning:** Cellular degradation occurs when too many clones are made from embryos.
* **Unique identities:** Cloning raises the question of a moral or human right to an exclusive identity.
* **Societal impacts:** Human cloning could produce psychological distress for the clone and society.

Effects of Cloning

While the purpose of cloning is to create an exact replica – if scientists cloned a human that appears identical to the original – it raises the questions as to whether the cloned human is an individual separate from the original and is due the same rights as any other human. Human cloning research and techniques could subject the clone to unacceptable risks such as a shortened life, bad health or other unknown problems. In the end, legalizing cloning on a wide-scale basis could lead to a disrespect for human life and the individual worth of a person, which might ultimately diminish all humans in the end.

Selective Breeding

If you are running a farm, wherein crops and livestock are your primary source of income, then it is highly important for you to find the best way to boost your efficiency. Take note that natural or organic farming does not always ensure best results, but there is one very good agricultural method for higher production—selective breeding.

Selective breeding is used to hereditarily encourage beneficial characteristics on both animals and plants. Basically, it is performed through controlled breeding. But like any other agricultural method (though they are supposedly designed to offer advantages for society), it also has its own set of disadvantages. If you are thinking of applying selective breeding into your crops and livestock, weigh them down to come up with a decision whether it is a great option for you.

**List of Advantages of Selective Breeding**

**1. It requires no company patent.**
Any person who works in agriculture can start selective breeding whenever they want. It is a way for them to naturally earn more income each year as they can breed specific characteristics into animals and plants to make them produce more over generations in the future, which is good for business. And since it is free, they just needs to be well-equipped and knowledgeable of the process to get the best outcome.

**2. It allows for higher profit.**
Selective breeding allows the encouragement of plant and animal characteristics that are more beneficial to farmers. For example, if they have selectively bred cows, these livestock can produce more milk than those typically bred, and the gene can be passed on to their offspring. When the method is used on crops, they will also grow more than the typical crops. Promoting these advantages is surely going to increase the market value of their products. For farmers who are in for a big business, selective breeding is definitely a perfect option for them.

**3. It can create new varieties of good crops.**
With this farming method, people will be able to produce higher amounts of crops. They can also produce plants with higher resistance to pests and diseases, not to mention the shorter period of time for harvest.

**4. It does not have any issue of safety.**
Unlike the process of creating genetically modified (GMO) crops, selective breeding allows for the natural evolutionary process to take place. It just happens at an accelerated rate as we manipulate it. However, the DNA sequences are not being tampered to create changes, such as genetic modifications.

**5. It helps eliminate diseases.**
One big advantage of selective breeding is its capability to eliminate animal and plant diseases. Studies revealed that identifying and pre-screening particular diseases allows farmers to control them. Thus, sooner or later, genetic diseases in plants and animals in the future will be eliminated.

**6. It influences the production of food coming from plants in a positive way.**
In plants, this agricultural method has the potential to positively influence the production of food around the world, in a way that it improves quality of seed grains and increase protein levels in forage crops. Selective breeding is also beneficial by giving plants the ability to grow on lands that are previously not suitable for farming. This means that farming businessman can get a variety of plants to grow and eventually more food.

**7. It can provide a sustainable food chain.**
With the projected world population to hit a mark of about 10 billion by 2050, it is more important than ever for world leaders to start planning a food chain system that would allow for the production of sufficient calories globally each year, so that people can be fed effectively, gradually eliminating hunger.

**8. It allows for the creation of high-quality products.**
Selective breeding has been a comfortable option on farming for many people, as it assures a process that will completely gave them superior types of products that are of high quality.

**9. It can produce fitter and stronger animals.**
the method of selective breeding can produce fitter and stronger animals that provide higher yields of meat, milk or eggs. For example, some cows have been bred to produce more meat. This should also be good as farmers can produce animals that are better suited to survive in marginal conditions or poor climates, preserving human food supplies and saving life. Moreover, this farming method can protect animals from developing diseases or deformities.

**List of Disadvantages of Selective Breeding**

**1. It can lead to loss of species variety.**
The main objective of selective breeding is to create enhanced farm yields or items, which ultimately means that species variety is going to be compromised for the sake of a higher level of productivity and may lead to limited opportunities for the continuance of the evolutionary expansion in the future from the reason that only positive traits would remain.

Usually, this method of farming requires in-breeding of animals and plants, which can be the cause of genetic variety to decrease. And as this would happen, living organisms may express the same vulnerability to certain pathogens. If it happens that a group of animals or plants with the same genetic traits are attacked by a particular pathogen, their entire population would certainly suffer. This is the main reason why meticulous analysis and monitoring are needed in order to assess if selective breeding is risky for certain types of diseases.

**2. It does not have control over genetic mutations.**
Selective breeding might be able to hasten the good traits of the evolutionary process, but it can do nothing when it comes to the bad traits. The method will not able to control the creation of genes that might be inherited by the offspring. Taking this theory into consideration, error in the process would be evident, which may affect the organism that is undergoing the selective breeding process. Also, there is high possibility that random genetic mutations happen, which may automatically decrease the effectiveness of the crops that are being grown because most mutations do not provide any benefits.

**3. It brings about discomfort to animals.**
Breeders who are wanting to formulate particular animal traits might accidentally reproduce characteristics that are damaging to animal health. For instance, cows are only able to produce large amounts of milk if they have large udders. So, we can just think that such a product of selective breeding may find it its udders heavy, causing it discomfort.

**4. It can create offspring with different traits.**
Due to the fact that this farming technique can create offspring that have different traits, the previous or permanent trait they have before undergoing the process would be completely lost.

**5. It could create a genetic depression.**
As organisms start to become similar genetically, they also start to experience a depression in gene diversity, which can lead to a rise in negative mutations. This phenomenon is proven by evidence seen in human populations, particularly in the Eastern European Jews, Cajun communities of Louisiana and some Old World population in the northeastern US.

**6. It poses some environmental risks.**
Selectively bred organisms are at risk of some diseases and environmental changes simply because of the same breeding process from which they are a product.

**7. It can change the evolution of species.**
As previously mentioned, selective breeding would risk changing the evolution of the species. Because humans are breeding different species for a particular trait, this can lead to a risk of losing some of the other genes from the genetic pool, which is altogether very difficult to bring back. Taking crops for example, selective breeding could cause environmental problems in a way that they would have a different requirement for the amount of water they have to consume. If these plants use more water, other plants around them would dry out, causing them to die and eventually taking away food and shelter for birds and insects. Not only this, but selective breeding would also alters which traits are exhibited in subsequent plant generations by allowing only the plants with desired traits to breed, which would also cause other plants to be extinct.

The science behind selective breeding allows living organisms to be bred selectively, so their best features and characteristics can be sent along to the next generations. It is an active process that is seen in plants and animals today, but is said to be even possible for humans as well. Animals can become leaner and plants can become bigger for the desired outcome of better products along the food chain.

This method is helping make animals healthier, fruits tasting better and vegetables growing bigger. So, it is considered very important, especially by people who are into the agricultural business, to enhancing and increasing the quantity of crops they are going to harvest. Although there are some limitations that come with selective breeding, it is still producing great results. By weighing the advantages and disadvantages listed above, you can come together to find a solution that helps the world with meeting its needs into the future.

Genetic Modification/Gene Therapy

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| Selective breeding techniques have been used to alter the genetic makeup of plants for thousands of years. More recently, genetic engineering has allowed for DNA from one species to be inserted into a different species to create genetically modified organisms (GMOs). [[1](https://www.procon.org/headline.php?headlineID=005447#1)][[2](https://www.procon.org/headline.php?headlineID=005447#2)]Examples of GMOs include apples that don't turn brown and disease-resistant papayas. [[3](https://www.procon.org/headline.php?headlineID=005447#3)] [[4](https://www.procon.org/headline.php?headlineID=005447#4)] At least 26 countries, including the United States, grow genetically modified crops, while 19 of 28 European Union nations have partially or fully banned GMOs. [[5](https://www.procon.org/headline.php?headlineID=005447#5)] [[6](https://www.procon.org/headline.php?headlineID=005447#6)] Food and ingredients from genetically engineered plants have been in our food supply since the 1990s. [[7](https://www.procon.org/headline.php?headlineID=005447#7)]In the United States, the health and environmental safety standards for GM crops are regulated by the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the US Department of Agriculture (USDA). [[44](https://www.procon.org/headline.php?headlineID=005447#44)] Since 1985, the USDA has approved over 17,000 different GM crops for field trials, including varieties of corn, soybean, potato, tomato, wheat, rapeseed (canola) and rice, with various genetic modifications such as herbicide tolerance, insect resistance, flavor or nutrition enhancement, drought resistance, and fungal resistance. [[45](https://www.procon.org/headline.php?headlineID=005447#45)]On Jan. 1, 2020, the National Bioengineered Food Disclosure Standard will be implemented in the United States, requiring that all foods with GMO ingredients must be "appropriately disclosed" through labeling or other measures. [[46](https://www.procon.org/headline.php?headlineID=005447#46)]Is genetic modification a helpful application of technology that makes plants resistant to pests and disease while improving nutritional value, or an unnatural tinkering with our food supply that lacks sufficient regulation and oversight? |

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| Should Genetically Modified Organisms (GMOs) Be Grown?  |  |
| Pro 1**Genetically modified (GM) crops have been proven safe through testing and use, and can even increase the safety of common foods.**Over the past 30 years of lab testing and 15 years of field research, there has not been a single health risk associated with GMO consumption. [[8](https://www.procon.org/headline.php?headlineID=005447#8)] Martina Newell-McGoughlin, PhD, Director of the University of California Systemwide Biotechnology Research and Education Program, said that "GMOs are more thoroughly tested than any product produced in the history of agriculture." [[8](https://www.procon.org/headline.php?headlineID=005447#8)]Over 2,000 global studies have affirmed the safety of GM crops. [[10](https://www.procon.org/headline.php?headlineID=005447#10)] Trillions of meals containing GMO ingredients have been eaten by humans over the past few decades, with zero verified cases of illness related to the food being genetically altered. [[11](https://www.procon.org/headline.php?headlineID=005447#11)]GM crops can be engineered to reduce natural allergens and toxins, making them safer and healthier. Molecular biologist Hortense Dodo, PhD, genetically engineered a hypoallergenic peanut by suppressing the protein that can lead to a deadly reaction in people with peanut allergies. [[12](https://www.procon.org/headline.php?headlineID=005447#12)] |  |
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| Pro 2**GMO crops lower the price of food and increase nutritional content, helping to alleviate world hunger.**The World Food Programme, a humanitarian organization, estimates that 821 million people in the world are chronically undernourished, and one in nine people face hunger. [[13](https://www.procon.org/headline.php?headlineID=005447#13)] Population growth, climate change, over-farming, and water shortages all contribute to food scarcity. [[14](https://www.procon.org/headline.php?headlineID=005447#14)] GMOs can help address those problems with genetic engineering to improve crop yields and help farmers grow food in drought regions or on depleted soil, thereby lowering food prices and feeding more people. [[15](https://www.procon.org/headline.php?headlineID=005447#15)] [[16](https://www.procon.org/headline.php?headlineID=005447#16)]David Zilberman, PhD, Professor of Agricultural and Resource Economics at UC Berkeley, said that GMO crops have "raised the output of corn, cotton and soy by 20 to 30 percent, allowing some people to survive who would not have without it. If it were more widely adopted around the world, the price [of food] would go lower, and fewer people would die of hunger." [[17](https://www.procon.org/headline.php?headlineID=005447#17)]To combat Vitamin A deficiency, the main cause of childhood blindness in developing countries, researchers developed a GMO ‘Golden Rice’ that produces high levels of beta-carotene. [[18](https://www.procon.org/headline.php?headlineID=005447#18)] [[19](https://www.procon.org/headline.php?headlineID=005447#19)] A report by Australia and New Zealand’s food safety regulator found that Golden Rice "is considered to be as safe for human consumption as food derived from conventional rice." [[20](https://www.procon.org/headline.php?headlineID=005447#20)] |  |
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| Pro 3**Growing GMO crops leads to environmental benefits such as reduced pesticide use, less water waste, and lower carbon emissions.**The two main types of GMO crops in use today are engineered to either produce their own pesticides or to be herbicide-tolerant. [[21](https://www.procon.org/headline.php?headlineID=005447#21)] More than 80% of corn grown in the US is GMO Bt corn, which produces its own Bacillus thuringiensis insecticide. [[22](https://www.procon.org/headline.php?headlineID=005447#22)] This has significantly reduced the need for spraying insecticides over corn fields, and dozens of studies have shown there are no environmental or health concerns with Bt corn. [[23](https://www.procon.org/headline.php?headlineID=005447#23)]Drought-tolerant varieties of GMO corn have been shown to reduce transpiration (evaporation of water off plants) by up to 17.5%, meaning less water waste. [[24](https://www.procon.org/headline.php?headlineID=005447#24)]Herbicide-tolerant (Ht) GMO soy crops have reduced the need to till the soil to remove weeds. [[26](https://www.procon.org/headline.php?headlineID=005447#26)] Tilling is a process that involves breaking up the soil, which brings carbon to the surface. When that carbon mixes with oxygen in the atmosphere, it becomes carbon dioxide and contributes to global warming. [[25](https://www.procon.org/headline.php?headlineID=005447#25)] Reduced tilling preserves topsoil, reduces soil erosion and water runoff (keeping fertilizers out of the water supply), and lowers carbon emissions. [[27](https://www.procon.org/headline.php?headlineID=005447#27)] [[28](https://www.procon.org/headline.php?headlineID=005447#28)][[29](https://www.procon.org/headline.php?headlineID=005447#29)] The decreased use of fuel and tilling as a result of growing GM crops can lower greenhouse gas emissions as much as removing 12 million cars from the roads each year. [[30](https://www.procon.org/headline.php?headlineID=005447#30)] |  |

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Con 1

**Genetically modified (GM) crops have not been proven safe for human consumption through human clinical trials.**

Genetically modified ingredients are in 70-80% of food eaten in the United States, even though there haven’t been any long term clinical trials on humans to determine whether GMO foods are safe. [[31](https://www.procon.org/headline.php?headlineID=005447#31)] [[32](https://www.procon.org/headline.php?headlineID=005447#32)]

Scientists still don’t know what the long-term effects of significant GMO consumption could be. Robert Gould, MD, a pathologist at the UC San Francisco School of Medicine, said, "the contention that GMOs pose no risks to human health can't be supported by studies that have measured a time frame that is too short to determine

the effects of exposure over a lifetime." [[33](https://www.procon.org/headline.php?headlineID=005447#33)]

According to the Center for Food Safety, a US-based nonprofit organization, "Each genetic insertion creates the added possibility that formerly nontoxic elements in the food could become toxic." The group says that resistance to antibiotics, cancer, and suppressed immune function are among potential risks of genetic modification using viral DNA. [[34](https://www.procon.org/headline.php?headlineID=005447#34)]

Con 2

**Tinkering with the genetic makeup of plants may result in changes to the food supply that introduce toxins or trigger allergic reactions.**

An article in *Food Science and Human Welfare* said, "Three major health risks potentially associated with GM foods are: toxicity, allergenicity and genetic hazards." The authors raised concerns that the GMO process could disrupt a plant's genetic integrity, with the potential to activate toxins or change metabolic toxin levels in a ripple effect beyond detection. [[35](https://www.procon.org/headline.php?headlineID=005447#35)]

A joint commission of the World Health Organization (WHO) and the Food and Agriculture Organization of the UN (FAO) identified two potential unintended effects of genetic modification of food sources: higher levels of allergens in a host plant that contains known allergenic properties, and new proteins created by the gene insertion that could cause allergic reactions. [[36](https://www.procon.org/headline.php?headlineID=005447#36)]

The insertion of a gene to modify a plant can cause problems in the resulting food. After StarLink corn was genetically altered to be insect-resistant, there were several reported cases of allergic reactions in consumers. The reactions ranged from abdominal pain and diarrhea to skin rashes to life-threatening issues. [[37](https://www.procon.org/headline.php?headlineID=005447#37)]

Con 3

**Certain GM crops harm the environment through the increased use of toxic herbicides and pesticides.**
Since herbicide-resistant GM crop varieties were developed in 1996, an "epidemic of super-weeds" has developed resistance to the herbicides that GM crops were designed to tolerate. [[38](https://www.procon.org/headline.php?headlineID=005447#38)] Those weeds are choking crops on over 60 million acres of US croplands, and the solution being presented to farmers is to use more herbicides. [[39](https://www.procon.org/headline.php?headlineID=005447#39)] This has led to a tenfold increase in the use of the weed killer Roundup, which is made by Monsanto, the largest GMO seed producer. [[33](https://www.procon.org/headline.php?headlineID=005447#33)][[38](https://www.procon.org/headline.php?headlineID=005447#38)]

The increased use of the weed killer glyphosate can harm pollinating insects and potentially create health risks for humans ingesting traces of herbicides used on GM crops. [[41](https://www.procon.org/headline.php?headlineID=005447#41)] When glyphosate is used near rivers, local wildlife is impacted. The use of Roundup, whose active ingredient is glyphosate, can lead to higher mortality rates among amphibians. [[42](https://www.procon.org/headline.php?headlineID=005447#42)] Scientists blame Roundup for a 90% decrease in the US monarch butterfly population. [[38](https://www.procon.org/headline.php?headlineID=005447#38)]

A report from the Canadian Biotechnology Action Network found that "GM crops have also had a number of impacts on biodiversity. Herbicide-tolerant crops reduce weed diversity in and around fields, which in turn reduces habitat and food for other important species." [[43](https://www.procon.org/headline.php?headlineID=005447#43)]