

The Science and Politics of the GMO

Course Glossary

- **Abiotic** - Physical rather than biological; not derived from living organisms.
- **Adenine** - A compound that is one of the four constituent bases of nucleic acids. A purine derivative, it is paired with thymine in double-stranded DNA.
- **Agriculture** - The science and business of producing crops and/or livestock that provides food, fabric, and fuel.
- **Agrobacterium tumefaciens** - A soil bacterium used in biotechnology to transfer genes to plant cells as a result of its ability to naturally transfer DNA into a plant host.
- **Allele** - An alternative version, or variant, of a given gene.
- **Artificial insemination** - The injection of semen into the vagina or uterus other than by sexual intercourse.
- **Bacillus thuringiensis (Bt)** - A soil microorganism that is used as a biological insecticide by farmers—including organic farmers—to control pests. Additionally, the cry gene from this microorganism has been engineered into some crops to confer insect resistance.
- **Backcross** - Cross (a hybrid) with one of its parents or an organism with the same genetic characteristics as one of the parents.
- **Biofortification** - To engineer or alter the metabolism of a plant to produce higher levels of a specific nutrient.
- **Biotechnology** - The practice of using tools from cellular biology, molecular biology, genetics, and biochemistry to improve genetic attributes of plants, animals, and other organisms.
- **Biotic** - Of, relating to, or resulting from living things, especially in their ecological relations.
- **Breeding** - The human-facilitated mating of plants or animals with the objective of genetic improvement through selection.
- **Central dogma of molecular biology** - The classic view of the central dogma of biology states that "the coded genetic information hard-wired into DNA is transcribed into individual transportable cassettes, composed of messenger RNA (mRNA); each mRNA cassette contains the program for synthesis of a particular protein (or small number of proteins)."
- **Chromosome** - Determines the inheritance of traits; made up of proteins and a molecule of DNA combined in a long, threadlike structure.
- **Cisgenics** - Transfer of gene(s) from one plant line to another using recombinant DNA technology—but only using sequences from sexually-compatible species.
- **Classical breeding** - Classical plant breeding uses deliberate interbreeding (crossing) of closely or distantly related individuals to produce new crop varieties or lines with desirable properties. Plants are crossbred to introduce traits/genes from one variety or line into a new genetic background.
- **Cloning** - Creating a genetic replica of DNA (be it a fragment or an entire organism) without sexual reproduction.
- **Conventional agriculture** - Crop production from elite plant lines, maximized with inputs such as insecticides, herbicides, or fertilizers.
- **Cytosine** - a compound found in living tissue as a constituent base of nucleic acids. It is paired with guanine in double-stranded DNA.

- **Deoxyribonucleic acid (DNA)** - Carries genetic information in living systems. The molecule's characteristic double-helix structure is made up of four base proteins and a sugar-phosphate backbone.
- **Domestication** - The genetic selection of wild species by humans over generations of time to serve human and animal needs better than ancestors.
- **Dominant gene** - One that produces an effect (the phenotype) in the organism regardless of the state of the corresponding allele. An example of a trait determined by a dominant gene is brown eye color.
- **Externalities** - The impacts of an economic decision on parties not directly involved in making the economic decision. This is generally a cost or benefit to others that the decision-maker ignores when deciding on which action to take.
- **Gene** - The functional unit of heredity, found on a chromosome. The "blueprint" in DNA that encodes information leading to cellular structure and function.
- **Gene silencing** - The use of recombinant DNA technology to precisely decrease or eliminate the expression of a specific gene.
- **Genome** - The complete genetic material found in the chromosomes of a particular organism.
- **Genome selection** - A form of marker-assisted selection in which genetic markers covering the whole genome are used so that all quantitative trait loci (QTL) are in linkage disequilibrium with at least one marker.
- **Guanine** - A compound that occurs in guano and fish scales, and is one of the four constituent bases of nucleic acids. A purine derivative, it is paired with cytosine in double-stranded DNA.
- **Hazards** - Any potential cause of harm irrespective of how likely or unlikely that potential harm.
- **Health halo** - Consumers perceiving a food to be healthy based on a (potentially unrepresentative) set of healthy attributes.
- **Herbicide** - Specialty crop chemicals used for the control of weeds. This is a class of pesticide.
- **Herbicide tolerance** - Genetic adjustment of plant structures or metabolism that interferes with action of compounds toxic to plants. One can therefore apply the specific herbicide directly to the field without damaging crop.
- **Heuristics** - A mental shortcut one uses to make decisions that involve complicated factors.
- **Hybrid** - The offspring resulting from the cross of two parental lines chosen by desired traits or a potentially likely benefit from mixing of genetics.
- **Hybrid seed** - Most commonly, the seed resulting from mating two elite plant lines with the intention of moving all positive traits into a common background.
- **Inheritance** - The process by which genetic information is passed on from parent to offspring.
- **Insecticide** - Specialty crop protection chemicals used for the control of insects. This is a class of pesticide.
- **Linkage drag** - The transfer of something, which is not desirable/required along with the gene of interest.
- **Marker-assisted breeding (MAS)** - An indirect selection process where a trait of interest is selected based on a marker (morphological, biochemical, or DNA/RNA variation) linked to a trait of interest (e.g. productivity, disease resistance, abiotic stress tolerance, and quality), rather than on the trait itself. This process is used in plant and animal breeding.
- **Meiosis** - Cell division leading to the production of specialized cells required for transmission of genetic material upon mating.
- **Mitosis** - Cell division leading to the production of two identical cells from one ancestor.

- **Molecular breeding** - The application of molecular biology tools, often in plant breeding. The areas of molecular breeding include QTL mapping or gene discovery, marker assisted selection and genomic selection, and genetic engineering.
- **Molecular markers** - In genetics, a molecular marker (identified as genetic marker) is a fragment of DNA that is associated with a certain location within the genome. Molecular markers are used in molecular biology and biotechnology to identify a particular sequence of DNA in a pool of unknown DNA.
- **Molecular scissors (restriction enzymes)** - An enzyme produced chiefly by certain bacteria, having the property of cleaving DNA molecules at or near a specific sequence of bases.
- **Mutation breeding** - Sometimes referred to as "variation breeding," is the process of exposing seeds to chemicals or radiation in order to generate mutants with desirable traits to be bred with other cultivars. Plants created using mutagenesis are sometimes called mutagenic plants or mutagenic seeds.
- **Mutations** - The changing of the structure of a gene, resulting in a variant form that may be transmitted to subsequent generations, caused by the alteration of single base units in DNA, or the deletion, insertion, or rearrangement of larger sections of genes or chromosomes.
- **Natural selection** - The process where a given trait increases in prevalence in a population due to its positive effect on an organism, conferring an advantage to reproduce.
- **Nucleases** - An enzyme that cleaves the chains of nucleotides in nucleic acids into smaller units.
- **Organic agriculture** - Crop production techniques that exclude the use of synthetic insecticides, herbicides, and fertilizers, and forbid use of plants possessing genetically engineered traits. An official label indicates certification by the United States Department of Agriculture regulatory body.
- **Pest resistance** - Plants with an inherent structural or chemical deterrent to insect, arthropod, or fungal pests as a result of specific breeding or genetic engineering techniques.
- **Pesticide** - Including insecticides, herbicides, fungicides, and rodenticides, pesticides are used to rid of specific pest organisms.
- **Precautionary principle** - The philosophy requiring the elimination of potential hazards when there is little information about potential bad outcomes.
- **Progeny** - A descendant or the descendants of a person, animal, or plant; offspring.
- **Protein** - Any of a class of nitrogenous organic compounds that consist of large molecules composed of one or more long chains of amino acids and are an essential part of all living organisms, especially as structural components of body tissues such as muscle, hair, collagen, etc., and as enzymes and antibodies.
- **Recessive gene** - One that produces an effect in the organism only when it is transmitted by both parents, i.e., only when the individual carries two copies of the same recessive gene. Otherwise recessive genes may be masked by dominant ones.
- **Recombinant DNA** - DNA that has been formed artificially by combining constituents from different organisms.
- **Ribonucleic acid (RNA)** - A nucleic acid present in all living cells. Its principal role is to act as a messenger carrying instructions from DNA for controlling the synthesis of proteins, although in some viruses RNA rather than DNA carries the genetic information.
- **Rosalind Franklin** - Franklin, Rosalind Elsie 1920-1958. British x-ray crystallographer whose diffraction images, made by directing x-rays at DNA, provided crucial information that led to the discovery of its structure as a double helix by Francis Crick and James D. Watson.

- **Rules of thumb** - A guide or approximation used to simplify decision-making in complex circumstances.
- **Selective breeding** - Human-directed identification and breeding of plants or animals that possess useful traits compared to their ancestors.
- **Substantial equivalence** - The concept that two genetically-different plant lines are deemed the same based on composition and safety.
- **Superweed** - A colloquial, derogatory term referring to a plant pest resistant to an herbicide.
- **Teosinte** - A Mexican grass that is grown as fodder and is considered to be one of the parent plants of modern corn.
- **Thalidomide** - A drug that was originally marketed as safe and effective for treating nausea. The drug was later found to cause severe birth defects.
- **Thymine** - A compound that is one of the four constituent bases of nucleic acids. A pyrimidine derivative, it is paired with adenine in double-stranded DNA.
- **Trait** - a genetically determined characteristic.
- **Transgene** - Of, relating to, or denoting an organism that contains genetic material into which DNA from an unrelated organism has been artificially introduced.
- **Ug99 fungus** - A specific race of wheat stem rust that was first identified in Uganda (Ug) in 1999 (99). Wheat stem rust is a disease of wheat as old as wheat. It is one of the most devastating diseases of wheat and is thought to be the cause of one of the biblical plagues.
- **Uncertainty** - A circumstance in which an individual decision maker is not aware of all possible outcomes of their decision and/or the probabilities with which those outcomes may occur given their decision.
- **Utility** - The level of satisfaction one obtains from a particular experience. Economists assume that individuals make choices in order to achieve the greatest level of utility.