

Appendix B

Glossary of Terms

- Acetolactate Synthase (ALS):** Enzyme essential for plant growth; the target site in pest plants for many new herbicides known as *ALS inhibitors*.
- Algorithm:** An unambiguous step-by-step procedure for solving a problem or modeling a process; commonly used as fundamental parts of computer programs.
- Allelochemicals:** Herbicides produced by plants.
- ALS inhibitor:** Herbicides that attack target plants by binding to and inactivating the ALS enzyme essential for plant growth.
- Amino acid:** Any of a group of molecules linked together in various combinations to form proteins. Specific sequences of amino acids makeup all known proteins, with each unique sequence coded for by DNA.
- Antibody:** Protein produced by specific white blood cells (i.e., B lymphocytes) in response to the presence of foreign antigens in the body.
- Antigen:** Any substance that elicits a defensive (immune) response.
- Antisense technology:** A technique for eliminating or reducing the expression of a gene in an organism, thus enabling scientists to study the organism's physiology and development.
- Arthropods:** A phylum of invertebrate animals that includes spiders, mites, and ticks; insects; centipedes and millipedes; and crustaceans (shrimp, barnacles, crabs).
- Assay:** Experiment, test or analysis.
- Augmentation approach (to biological pest control):** Increasing an existing population of indigenous pest enemies by periodically releasing small numbers of these natural enemies, or by releasing large numbers of these enemies at one time.
- Bacillus thuringiensis (Bt):** A spore-forming bacterium that produces insecticidal proteins. Different strains of Bt produce proteins toxic to different insects. Through genetic engineering, the insecticidal genes from different Bt strains have been incorporated into other organisms, including plants, which then produce the corresponding Bt toxin.
- Bacteria:** A diverse and ubiquitous group of one-celled organisms that lack a distinct nuclear membrane.
- Bacteriophage:** A virus whose host is a bacterium.
- Beltsville pig:** A pig, developed through research at the USDA in Beltsville, MD, into which extra growth hormone genes were inserted. The Beltsville pig provides a clear example of biotechnology that compromised an animal's well-being—the pig grew fast but became lame and lethargic, developed degenerative joint disease and a variety of other disorders, and clearly was under stress.
- Biological control (of pests):** Use of living natural enemies to reduce pest populations.
- Biopesticides:** Organisms or products containing organisms that are pesticidal in nature; used for the *biological control* of pests.
- Biotechnology:** Techniques, including recombinant DNA techniques, that use living organisms or substances from those organisms to make or modify a product, to alter the characteristics of plants or animals, or to develop microorganisms for specific uses.
- Bolistic method (of gene transfer):** A vectorless method of transferring genes using a particle gun to shoot high-velocity, DNA-coated microprojectiles into a plant cell.
- Bovine somatotropin (bST):** See *Somatotropin*.
- Broad leaf herbicides:** Herbicides that attack broad leaf plants or DICOTYLEDONS; will not harm grass plants (*monocotyledons*) such as corn.
- Broad spectrum herbicide:** Herbicide that can kill broad-leaf weeds as well as grasses.
- Cell culture:** The growth and maintenance of cells derived from multicellular organisms under controlled laboratory conditions. A sample of cells propagated in this way.
- Cellular techniques (for genetic modification of plants):** Use of tissue cell cultures to genetically modify plants, e.g., hybridization of two sexually incompatible plants via cell fusion.
- Chromosome:** A thread-like structure (of DNA molecules) carrying the genes that convey hereditary characteristics; in mammals chromosomes are contained in cell nuclei.
- Classical approach (to biological control of pests):** Generally involves searching the area of a pest's origin for its natural enemies and introducing these enemies into the environment in which the pest is to be controlled.
- Classical techniques (for genetic modification of plants):** Generally refers to the use of traditional plant breeding to develop plants with certain desired characteristics, such as insect or disease resistance, improved harvestability, cold tolerance, etc.
- Clone:** A group of genetically identical cells or organisms produced asexually from a common ancestor.
- Community ecology:** The study of the interactions of populations of different species in a habitat.
- Computer network:** A system of interconnected electronic channels linking computers over a wide area; allow rapid dispersal and sharing of information among computer users on the network
- Copyright:** The exclusive statutory right of authors, composers, playwrights, artists, publishers, and distributors to publish and dispose of their works for a specified period of time.
- Coordinated framework for the regulation of biotechnology:** *The* fundamental document that outlines the

- roles, responsibilities, and policies of the Federal Agencies involved in biotechnology and its regulation; and that sets forth premises for guiding future policy (49 FR 50856-50907).
- Cross-hybridization:** The crossing of two plants of different species to produce fertile offspring; a rare phenomenon in nature.
- Cultivar:** A strain or variety of cultivated plant that is distinguished from others by one or more characteristics reproduced in offspring.
- Deliberate release:** Refers to the purposeful introduction of genetically engineered organisms to the environment, either in a small-scale field test or on a large-scale commercial basis.
- Depository:** A facility that accepts, maintains, classifies, and distributes cultures of microorganisms, viruses, cells, and other biological material.
- Dicotyledon:** The class of plants distinguished by having two seed leaves within the seed.
- DNA (Deoxyribonucleic Acid):** The molecular building block of genes; repository of genetic information in all organisms. The information coded by DNA determines the structure and function of an organism.
- Domain knowledge:** The knowledge base of a computer program.
- Ecological risk assessment:** In the context of biotechnology, a prediction, based on available scientific evidence and experience, of how a genetically engineered organism will behave in the environment after its release. See also *Risk assessment*.
- Electrophoresis:** Technique by which an electric current is used to separate molecules in a mixture.
- Enzyme:** Any of a group of proteins that mediate the chemical processes of organisms without themselves being destroyed or altered.
- Estrus:** The period during which a female animal is most receptive to sexual activity.
- Estrus cycle:** Reproductive cycle; includes ovulation, egg maturation, and the preparation of the uterus to receive fertilized eggs. The cycle is under hormonal control.
- Evolutionary biology:** Study of the changes overtime in *genotype* and *phenotype* of populations.
- Exotics:** Species accidentally or deliberately released into a completely new environment.
- Expert system:** Two-component computer program that mimics the reasoning process of a human expert. The knowledge-base component contains the expertise for solving a problem, often in symbolic rather than numeric form; the *inference engine* component tells the program how to combine domain knowledge to do the task at hand. Expert systems are examples of *knowledge-based systems*.
- Food additive:** Any substance that becomes a component of food, or affects the characteristics of food; in the broadest sense, the definition would include new crop varieties developed either through traditional breeding or with biotechnology.
- Food grades:** Standards used to classify food products according to certain quality characteristics. Use of USDA *grade standards* is voluntary.
- Full-text retrieval systems:** A human-computer interface by which users can search a collection of documents for relevant information; especially useful for accessing a collection of documents by different authors who may use different wording to express the same thing.
- Fungi:** A group of simple plants without chlorophyll.
- Gene:** A discrete segment of a chromosome, made up of an ordered sequence of DNA molecules; the basic fictional unit of heredity.
- Gene flow:** The movement of genes in the environment. See *Gene transfer*.
- Gene probe:** A molecule of known structure and/or function used to locate and identify a specific region of a genome.
- Gene stability:** A measure of the effectiveness and persistence of a gene artificially introduced into an organism.
- Gene transfer:** The movement of a gene between different organisms. Natural processes of gene transfer include processes such as transformation (cellular uptake of naked DNA); transduction (virus-mediated transfer of a gene between bacterial strains); conjugation (direct genetic exchange between two bacterial cells); and pollen-mediated gene transfer. Concern exists that a gene artificially introduced into an organism with biotechnology could be passed to other organisms by one or more of these gene transfer mechanisms.
- Genetic engineering:** See *Recombinant DNA*.
- Genome:** The complete set of genetic material possessed by each organism, which is carried and passed to offspring in the germ (reproductive) cells.
- Genotype:** The hereditary makeup (genetic constitution) of an individual organism, as distinguished from its physical appearance (phenotype).
- Grass herbicides:** Herbicides that attack grass plants (monocotyledons); will not harm broad leaf plants (*dicotyledons*) such as soybeans.
- Hardware (computer):** The electronic and mechanical components of a computer, including keyboard and other input devices, the central processing unit, etc. In contrast to *software*.
- Herbicide-tolerant crops:** Crops that can grow in the presence of herbicides that destroy or harm non-tolerant plants.
- Hypertext:** A method of connecting related information multidimensionally, allowing access in a nonlinear fashion; analogous to footnotes.
- Ice-minus:** A bacterium from which a functional gene coding for a protein that promotes the formation of ice crystals has been deleted.

- Indigenous organism:** Organism native to an area; opposite of exotic.
- Inference engine:** See *Expert systems*.
- Integrated pest management (IPM):** A diverse array of pest control strategies, the integrated use of which is based on ecological principles and knowledge. IPM can be thought of as a crop management system whereby pest populations are maintained at levels below those causing economic crop loss. May include pest scouting, *biological control strategies*, chemical controls, crop rotations, etc.
- Integrated system:** A software system that allows users to access different decision support tools in the same environment. The tools accessed might be operationally independent (lowest level of systems integration) or logically linked, allowing the user to go from one application to another with the same user interface.
- Intellectual property law:** Statutes that protect works of the mind as personal property; examples include *patent, copyright, trade secret, and plant variety protection laws*.
- In vivo:** Within the living organism.
- In vitro:** Outside the living organism and in an artificial environment such as a test tube.
- Ketosis:** A metabolic disorder that occurs in dairy cows when the need for glucose exceeds the production of glucose.
- Knowledge-based systems:** Computer programs with the capability of dealing with symbolic data and/or of mimicking an expert's reasoning process. See *Expert systems*.
- Land-grant system:** An educational system established in 1862 with the passage of the Morrill Act, which made grants of land to States for creating universities that would fulfill the mission of providing higher education to the masses, with particular emphasis on the children of farmers and industrial workers.
- Large-scale release:** See *Deliberate release*.
- Mainframe computers:** Large, centralized computers with millions of logic circuits.
- Marker genes:** Genes coding for specific characteristics, the expression of which is used to distinguish genetically transformed cells or plants from untransformed cells or plants (i.e., antibiotic resistance gene).
- Mastitis:** An infection of the udder, the most common and one of the most important diseases affecting the milk cow.
- Mathematical modeling:** Construction of a mathematical framework to describe a process and predicts its outcomes.
- Mesocosms:** Contained walk-in chambers, the environmental parameters of which can be controlled to model ecosystems.
- Microbial contamination (of foods):** The presence/growth of microbial organisms in food; some food-borne organisms are toxic and may cause human illness or death.
- Microbial herbicides:** Microorganisms, or products containing microorganisms that are pathogenic to plant pests; used for the *biological control* of pests.
- Microcomputers:** Personal computers, sized for tabletop use.
- Microcosm (Soil):** A laboratory-based model ecosystem designed to mimic and used to study natural environmental processes.
- Microinjection:** A technique used to insert genes from one cell into another cell.
- Microorganisms:** Organisms that can be observed only with the aid of a microscope, e.g., *bacteria, viruses, protozoans*, some algae and fungi.
- Molecular techniques:** Refers here to the use of biotechnology to transfer selected genes between plant species.
- Monitoring:** Spatial and temporal tracking of an object or process. Monitoring of genetically engineered organisms and of their introduced genes contributes to risk assessment and management, and expands ecological databases.
- Monoclonal antibodies:** Identical antibodies that recognize a single, specific antigen and are produced by a clone of specialized cells.
- Monocotyledon:** The class of plants distinguished by having one seed leaf within the seed.
- Natural language interface:** A human-computer interface that allows users to query a database and retrieve relevant information using natural language rather than, for example, a hierarchical menu system.
- Nematodes:** A phylum of invertebrate roundworms.
- Object-oriented simulation system:** A type of knowledge-based system that explicitly models the structure, rather than the behavior of a real system; each component of the real system is represented in the simulation by a unit (object) consisting of self-descriptive data and procedures for manipulating that data.
- Organic food:** A term that generally designates foods produced without manufactured chemical inputs such as pesticides and synthetic fertilizers; however, no precise definition exists.
- Patent:** A grant issued by the U.S. Government that gives the holder right to exclude all others from making, using, or selling the patented invention within the United States, its territories, and possessions during the term of the patent.
- Pest resistance:** Characteristic of certain crop cultivars allowing them to tolerate *pests* that harm or destroy nonresistant cultivars.
- Pesticidal plants:** Plants that are pathogenic and hence resistant to one or more plant pests.
- Pesticide residue:** Trace amounts of pesticides in food products; foods with pesticide residues above federally determined tolerances cannot be marketed.
- Phenotype:** The physical characteristics of an organism.

Plant pest: Defined in the Federal Plant Pest Act as any living stage of: any insects, mites, nematodes, slugs, snails, protozoa or other invertebrate animals; bacteria, fungi, or other parasitic plants or reproductive parts thereof; viruses, or any organisms similar to or allied with any of the foregoing; or any infectious substances that can directly or indirectly injure or cause disease or damage in any plants or parts thereof, or of processed manufactured or other products of plants.

Plasmid: A circular piece of DNA found in the cytoplasm (rather than in the chromosomes), and able to replicate independently of the chromosomes. Bacterial plasmids are used as vectors in techniques of genetic engineering.

Pleiotropic effects: Multiple changes in metabolism that result from a single genetic change.

Polymerase chain reaction: An enzymatic process for rapidly generating large amounts of genetic material from a trace amount.

Population ecology: The study of the dynamics and growth of populations.

Population genetics: The analytical study of the properties of genes and changes in gene frequency overtime.

Porcine somatotropin (pST): See *Somatotropin*.

Primary gene product: A protein directly coded for by a gene; may be the final active product or may act as an enzyme or hormone that mediates the production of secondary gene products.

Prior art: That which is already known or available; one of the criteria used in evaluating patent applications.

Promoters: Regulatory genes that control the functioning of other genes.

Protozoa: A phylum of unicellular or acellular microorganisms widely distributed in aquatic and wet terrestrial habitats; includes many parasites.

Recombinant DNA: A broad range of techniques involving the manipulation of the genetic material of organisms, including technologies by which scientists isolate genes from one organism and insert them in another organism. The term is often used synonymously with genetic engineering, and to describe DNA sequences isolated from and transferred between organisms by genetic engineering techniques.

Restriction enzymes: Certain bacterial enzymes that recognize specific short sequences of DNA and cut the molecule at these sites; used to isolate specific genes of interest.

Restriction fragment length polymorphism (RFLP): A technique for mapping approximately where on the genome a specific gene(s) of interest resides.

Risk assessment: A scientific analysis of the potential risks and risk levels (quantitative or qualitative) associated with a particular action; includes estimates of possible health, environmental and other effects, and of the degree of uncertainty in these estimates. See also *Ecological risk assessment*.

Risk management: In this report, scientific and agonomic methods used to minimize the ecological risks

potentially posed by deliberate releases of genetically modified organisms into the environment.

Robotics: Computerized machines that can be programmed to perform a variety of labor-intensive tasks i.e., harvesting in agriculture.

Science-based regulations: Regulations (for genetically engineered organisms) based on scientific assessments of the risks posed by releasing such organisms into the environment.

Secondary gene product: A compound the production of which is mediated by primary gene products.

Sensor technology: Means by which some electronic systems monitor the environment combined with knowledge-based decision support systems, a potentially important management tool for farmers.

Small-scale field tests: See *Deliberate release*.

Software (computer): The programs and data in a computer. In contrast to *hardware*.

Somatotropin: A protein hormone produced by the mammalian anterior pituitary gland that affects growth and other physiological processes (i.e., lactation in dairy cows). Species limited Examples include human *somatotropin*, *bovine somatotropin*, *porcine somatotropin*, and *ovine somatotropin*. Natural levels of Somatotropins in agricultural animals can be elevated using genetic engineering techniques to increase production.

Suicide genes: Genes that effectively cripple or kill recombinant DNA-modified organisms following their intended use; a means of containing such organisms such that they cannot become established and spread.

Superovulation: The shedding of abnormally large numbers of eggs.

Systematic: The analysis of variation of different levels of taxonomic organization, with the ultimate goal of taxonomic classification; also used to monitor biotic diversity.

Tissue culture: A technique in which portions of a plant or animal are grown on an artificial culture medium.

Trade secret: Protection for information used in one's trade or business that provides a competitive business advantage over those lacking the information.

Transgenic animal (plant crop): Animal (plant, crop) whose hereditary DNA has been augmented by the addition of DNA from a source other than parental germplasm using genetic engineering techniques.

Vector: A carrier or agent used to introduce foreign DNA into host cells. Plasmids, bacteriophages, and other forms of DNA commonly are used as vectors in genetic engineering.

Veterinary biologics: Living organisms or their parts used by veterinarians to prevent disease and/or promote animal health, e.g., sera, vaccines, veterinary growth hormones.