Committee for the Evaluation of Growing Genetically Engineered Crops in San Luis Obispo County

GLOSSARY OF SELECTED TERMS RELATED TO BIOTECHNOLOGY AND GENETIC ENGINEERING

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The FAO Glossary was developed because of the difficulty of communicating effectively in discussions at intergovernmental level {sic}. On various occasions, simple differences of interpretation of terminology have threatened to de-rail negotiations of international importance. The Glossary is intended to provide a consolidated, comprehensive and accessible list of terms and acronyms that are used regularly in biotechnology for food and agriculture and that represent a convenient reference source for researchers, students and technicians.

biotechnology "Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use" (Convention on Biological Diversity).

genetically engineered organism (Abbreviation: GEO). Occasional alternative term for **genetically modified organism**.

genetically modified organism (Abbreviation: GMO). An organism that has been transformed by the insertion of one or more **transgenes**.

transgene An isolated **gene sequence** used to transform an **organism**. Often, but not always, the transgene has been derived from a different species than that of the recipient.

Other terms of importance not included in FAO Glossary:

gene flow Gene flow is the spread of genes from one breeding population to another (usually) related population by migration, thereby generating changes in alelle frequency.

California Certified Organic Farmers working definition of genetic engineering is:

Genetic engineering is the transfer of genes from one organism to another through means that do not occur in nature, but through human intention. This involves moving genes within and without different species by recombinant DNA techniques and other manipulation of the genetic construct outside the traditional practices such as sexual and asexual breeding, hybridization, fermentation, in-vitro fertilization and tissue culture. Genetically modified organisms are the living and dead biological products of this technology.

Additional Definitions of Interest from FAO Glossary:

base pair (Abbreviation: bp). The two separate strands of a nucleic acid **double helix** are held together by specific hydrogen bonding between a **purine** and a **pyrimidine**, one from each strand. The **base** A pairs with T in **DNA** (with U in **RNA**); while G pairs with C in both **DNA** and **RNA**. The length of a nucleic acid molecule is often given in terms of the number of base pairs it contains.

breeding The process of **sexual reproduction** and production of offspring.

cell fusion Formation *in vitro* of a single **hybrid cell** from the coalescence of two cells of different species origin. In the hybrid cell, the donor nuclei may remain separate, or may fuse, but during subsequent cell divisions, a single **spindle** is formed so that each daughter cell has a single **nucleus** containing complete or partial sets of chromosomes from each parental line. *Synonym*: **cell hybridization**.

centromere The eukaryotic **chromosome** structure, which appears as a constriction in **karyotype** analysis, to which the **spindle** fibres attach during mitotic and meiotic division. Composed of highly **repetitive DNA**.

conjugation 1. Union of **gametes** or **unicellular** organisms during fertilization. 2. The unidirectional transfer of **plasmid DNA** from one bacterium cell to another, involving cell-to-cell contact. The **plasmid** usually encodes the majority of the functions necessary for its own transfer. 3. Attachment of sugar and other polar molecules to less polar compounds, thus making them more water soluble.

DNA Abbreviation for deoxyribonucleic acid, former spelling desoxyribonucleic acid. A long chain polymer of **deoxyribonucleotides**. **DNA** constitutes the genetic material of most known organisms and organelles, and usually is in the form of a **double helix**, although some viral genomes consist of a single strand of **DNA**, and others of a single- or a double-stranded **RNA**. *See*: **base pair**, **genetic code**.

deletion A **mutation** involving the removal of one or more **base** pairs in a **DNA** sequence. Large deletions are sometimes microscopically visible in **karyotype** analyses. (*For gene deletion*)

diploid The status of having two complete sets of **chromosome**s, most commonly one set of paternal origin and the other of maternal origin. **Somatic** tissues of higher plants and animals are ordinarily diploid in chromosome constitution, in contrast with the **haploid gametes**.

encapsulation Any method packaging an **enzyme** or bacterium and maintaining its normal functions. Used to immobilize cells in a bioreactor.

eukaryote One of the two major evolutionary clades, characterized by having the **nucleus** enclosed by a membrane, and possessing chromosomes that undergo **mitosis** and **meiosis**. Eukaryotic organisms include animals, plants, fungi and some algae. *See*: **prokaryote**.

exon A segment of a eukaryotic gene that is transcribed as part of the primary **transcript** and is retained, after processing, with other exons to form a functional **mRNA** molecule. Many eukaryotic genes are composed of a **mosaic** of exons and **introns**.

fermentation The **anaerobic** breakdown of complex organic substances, especially carbohydrates, by micro-organisms, yielding energy. Often misused to describe large-scale **aerobic cell culture** in specialized vessels (fermenters, bioreactors) for secondary product synthesis.

gamete A mature reproductive cell which is capable of fusing with a cell of similar origin but of opposite sex to form a **zygote** from which a new organism can develop. Gametes normally have a **haploid** chromosome content. In animals, a gamete is a **sperm** or **egg**; in plants, it is **pollen**, spermatic nucleus, or **ovum**.

genetic engineering Modifying genotype, and hence phenotype, by **transgenesis**.

genetic code The correspondence between the set of 64 possible **nucleotide triplets** and the **amino acids** and **stop codons** that they specify.

genetic pollution Uncontrolled spread of **genetic information** (frequently referring to **transgenes**) into the genomes of organisms in which such genes are not present in nature.

haploid A cell or organism containing one of each of the pairs of **homologous** chromosomes found in the normal **diploid** cell.

hybridization 1. The process of forming a **hybrid** by **cross pollination** of plants or by mating animals of different types. 2. The production of **offspring** of genetically different parents, normally from sexual reproduction, but also asexually by the fusion of **protoplasts** or by **transformation**. 3. The **pairing** of two **DNA** strands, often from different sources, by hydrogen bonding between **complementary** nucleotides.

intron A segment of the primary **transcript** of a eukaryotic gene, removed (before the mature **mRNA** is translated) in a process known as intron **splicing**. Some eukaryotic genes contain a large number of introns, which make up the bulk of the **DNA** sequence of the gene. Introns are also found in genes whose **RNA** transcripts are not translated, namely eukaryotic **rRNA** and t**RNA** genes. In these cases the intron sequence does not appear in the functional **RNA** molecule.

***in vitro* fertilization** (Abbreviation: IVF). A widely used technique in human and animal science, whereby the **egg** is fertilized with **sperm** outside the body before re-implanting into the uterus.

karyotype The chromosome constitution of a cell, an individual, or of a related group of individuals, as defined both by the number and the morphology of the **chromosome**s, usually in mitotic metaphase; chromosomes arranged in order of length and according to position of **centromere**; also, the abbreviated formula for the chromosome constitution, such as 47, + 21 for human trisomy-21 (Down's syndrome).

ligate, ligation The joining of two linear **double-stranded DNA** fragments by the formation of phosphodiester bonds.

meiosis The two-stage process in sexual reproduction by which the **chromosome** number is reduced from the **somatic** to the **haploid** number. The first division, in which **homologous** chromosomes pair and exchange genetic material, is followed by amitotic division. The nucleus divides twice, but the chromosomes only once, generating haploid nuclei, which develop into the **gametes** (**egg** and **sperm** in animals; **egg** and **s** in plants).

mitosis Splitting of replicated chromosomes, and the division of the **cytoplasm** to produce two genetically identical daughter cells. On the basis of the appearance of the **chromosome**s, it is separated into five stages: **interphase**, **prophase**, **metaphase**, **anaphase** and **telophase**.

organism An individual living system, such as animal, plant or micro-organism, that is capable of reproduction, growth and maintenance.

plasmid A circular self-replicating non-chromosomal **DNA** molecule found in many bacteria, capable of transfer between bacterial cells of the same species, and occasionally of different species. **Antibiotic resistance genes** are frequently located on plasmids. Plasmids are particularly important as **vectors** for genetic engineering.

prokaryote A member of the large group of organisms, including bacteria and blue-green algae, in which the **chromosome** is not enclosed within a **nucleus**, but instead exists as a linear or circular strand. Prokaryotes do not undergo **meiosis** and do not have functional **organelle**s such as mitochondria and **chloroplas**ts. *See*: **eukaryote**.

recombinant DNA The result of combining **DNA** fragments from different sources.

recombinant DNA technology A set of techniques for manipulating **DNA**, including: the identification and **cloning** of genes; the study of the expression of cloned genes; and the production of large quantities of **gene** product.

spindle An intracellular fibrous structure, involved in the control of **chromosome** movement in **mitosis** and **meiosis**.

splicing 1. During the maturation of eukaryotic **mRNA**, the process that removes **intron** sequences and covalently joins **exon** sequences. *Synonym*: editing. 2. In **recombinant DNA** technology, the term refers to the **ligation** of two fragments of **DNA** together. (for gene splicing)

tissue culture The *in vitro* culture of **cell**s, **tissue**s or **organ**s in a nutrient **medium** under **sterile** conditions.

transgenesis The introduction of a **gene** or genes into animal or plant cells, which leads to the transmission of the input gene (**transgene**) to successive generations.

transgenic An individual in which a **transgene** has been integrated into its **genome**. In transgenic eukaryotes, the transgene must be transmitted through **meiosis** to allow its **inheritance** by the **offspring**.

zygote The **diploid** cell formed by the fusion of two **haploid gamete**s during **fertilization** in eukaryotic organisms with sexual reproduction.

Terms not found in this glossary

Gene doubling
Introducing a foreign gene
Changing gene position
Macro- or Microencapsulation (see encapsulation)