

Glossary and abbreviations

A

abiotic stress

Environmental factor limiting crop yield not caused by a pest or disease, including drought, salinity, acidity, aluminium toxicity, nutrient deficiency, extreme temperature or submergence; (antonym) biotic stress.

accession

Sample of a crop landrace or cultivated variety in a gene bank.

Agricultural Production System Simulator

Computer module designed to model complex cropping systems and their management.

agronomy

Science of land cultivation, soil management and crop production.

allele

One alternative form of a gene.

allele mining

Searching for valuable alleles in a germplasm collection.

allelic imbalance assay

Testing the influence of factors such as drought stress on the expression of alleles.

amphidiploid

Plant derived from doubling the chromosome number of an interspecific first-generation hybrid.

anchor

Group of tightly linked SSR markers that facilitates comparisons across breeding populations of genes and QTLs.

antioxidant

Compound that slows the rate of oxidation reactions and the formation of tissue- and DNA-damaging free radicals.

applied research

Scientific enquiry (usually downstream) conducted with specific objectives for its use; (antonym) basic research.

APSIM

Agricultural Production System Simulator

APSRU

Agricultural Production Systems Research Unit, which produces the APSIM.

Arabidopsis

Genus of flowering plants one of whose members, *A. thaliana*, is used in research as a model plant because its small genome is fully sequenced and easy to work with.

Arachis duranensis

Wild peanut species thought to be a parent of domesticated peanut.

Arachis hypogaea

Domesticated peanut or groundnut.

Arachis ipaensis

Wild peanut species thought to be a parent of domesticated peanut.

B

backcrossing

Breeding hybrid progeny with one of its parents.

basic research

Scientific enquiry (usually upstream) conducted to expand knowledge for its own sake; (antonym) applied research.

BC

Backcross.

Belenus

Component of the Generation information platform that looks up from domain models to connect with viewers and analytical software; Celtic sun god and guardian of livestock.

benzothiadiazole

Synthetic plant activator

BioCASE

Biological Collection Access Service distributed data delivery mechanism.

BioClipse

Open source collaboration to be launched by CP, CIMMYT and IRRI in 2006 to enhance the utility of the Eclipse framework and extend accessible visualisation and analytical tools to biologists.

bioinformatician

Bioinformatics specialist.

bioinformatics

Creation, collection, storage and efficient use of data from genomics and other areas of molecular biology.

BioMOBY

Client-server framework that allows clients to place requests by data type without knowing specific databases.

biotechnology

Broadly, the use of biological systems, living organisms or their derivatives to make or modify products or processes for specific use; narrowly, molecular biology technologies.

biotic stress

Crop or yield loss caused by diseases and (usually insect) pests.

blast

Fungal disease of rice that causes leaf and panicle lesions.

broad cast seeding

Spreading seed on the ground or paddy surface, in contrast to labour-intensive burying seed or transplanting rice seedlings.

broad-spectrum resistance

Ability to withstand attack from multiple races of a pathogen or pest.

brown plant hopper

Insect pest of rice.

C

central data registry

Generation facility for centrally registering and distributing data resources held and curated at the original source site (and, where necessary on a stopgap basis, stored centrally in Generation databanks).

CERAAS

Centre d'Etude Régional pour l'Amélioration de l'Adaptation à la Sécheresse (Regional Centre for Studies on the Improvement of Plant Adaptation to Drought), Senegal.

Ceres

Domain model implementation of the Generation information platform; Roman goddess of plants.

CGIAR

Consultative Group on International Agricultural Research, parent organization of the Generation Challenge Programme.

challenge programme

Ongoing collaboration established under a CGIAR initiative to bring together a range of institutions, both inside and outside the CGIAR, to focus and coordinate agricultural research to address complex problems of global or regional significance that are highly likely to respond to this approach.

chromosome

Discrete units of the genome found in the nucleus of every plant and animal cell.

chromosome region

Chromosome segment containing genes of interest.

chromosome segment substitution line

Crossbred breeding lines with which researchers can find genes of interest by creating a library of several hundred introgression lines that ideally contain the entire genome of a donor.

CIAT

Centro Internacional de Agricultura Tropical (International Centre for Tropical Agriculture), a CGIAR centre in Colombia.

CIMMYT

Centro Internacional de Mejoramiento de Maíz y Trigo (International Maize and Wheat Improvement Centre), a CGIAR centre in Mexico.

CIP

Centro Internacional de la Papa (International Potato Centre), a CGIAR centre in Peru.

CIRAD

Centre de coopération internationale en recherche agronomique pour le développement (French Agricultural Research Centre for International Development), France.

CMTV

Comparative Map and Trait Viewer.

coding region

Protein-coding region of a gene.

comparative genomics

Genomic investigations across species that take advantage of synteny and co-linearity to predict the location of a gene in the genome of one species on the basis of its location in a related model species.

Comparative Map and Trait Viewer

Computer module that allows users to define genetic data by numerous parameters and retrieve comparisons viewed on so-called heat strips that indicate by colour the degree of correlation.

core collection

Subset of gene bank accessions deemed to be of particular interest in genomics and/or plant breeding.

CropWiki

Web server carrying Generation collaborative platforms.

CSIRO

Commonwealth Scientific and Industrial Research Organization, Australia.

CSSL

Chromosome segment substitution line.

CSSL Finder

Computer program that helps select the best several dozen CSSLs from a library of hundreds.

D

Demeter

Domain and Environment Model Engineering and Terminology (domain models interconnecting the Generation information platform); Greek goddess of agriculture.

DNA

Deoxyribonucleic acid, the chemical basis for genes.

DNA nucleotide

Adenine (A), cytosine (C), guanine (G) and thymine (T), the building blocks of DNA and the letters of the genetic code.

domain modelling

Extracting central concepts and relationships in scientific data to develop a common semantic and formatting blueprint for connecting different tools and databases without losing information.

downstream research

Latter stages of the value chain of research, where final products are developed; (anonymous) upstream research.

downy mildew disease

Fungal disease that affects pearl millet and other crops.

DREB/CBF

Dehydration response element-binding protein/C-repeat binding factor, a transcription factor related to the expression of drought, salinity and cold tolerance in plants.

dry weight

Measure of growth vigour based on the weight of the above-ground parts of a plant when dried.

E

ear head

Panicle of finger millet.

ecophysiology

Science of the structure and function of organisms in their environment.

elite line

Phenotypically superior plant in a breeding programme.

EMBRAPA

Empresa Brasileira de Pesquisa Agropecuária (Brazilian Agricultural Research Corporation), Brazil.

expressed sequence tag

DNA sequence about 200 base pairs long that is used to label a gene of interest.

F

false smut

Fungal disease of rice.

Future Harvest centres of the CGIAR

Fifteen research centres joined by membership in the CGIAR: Africa Rice Centre (WARDA) in Benin, International Centre for Tropical Agriculture (CIAT) in Colombia, Centre for International Forestry

Research (CIFOR) in Indonesia, International Maize and Wheat Improvement Centre (CIMMYT) in Mexico, International Potato Centre (CIP) in Peru, International Centre for Agricultural Research in the Dry Areas (ICARDA) in Syria, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India, International Food Policy Research Institute (IFPRI) in USA, International Institute of Tropical Agriculture (IITA) in Nigeria, International Livestock Research Institute (ILRI) in Kenya and Ethiopia, International Plant Genetic Resources Institute (IPGRI) in Italy, International Rice Research Institute (IRRI) in Philippines, International Water Management Institute (IWMI) in Sri Lanka, World Agroforestry Centre (ICRAF) in Kenya, and WorldFish Centre in Malaysia.

G

GCPWiki

Generation collaborative web platform for capturing and using knowledge, in which contributions from scientists result in the joint development of protocols, standards and a record of experiences that is unified and comprehensive.

gene bank

Collection of genetic material in the form of seeds, tissues or reproductive cells.

gene expression

Conversion of the genetic information within a gene into an actual protein or cell process that exerts the gene's effect on the phenotype of an organism.

gene mapping

Constructing a genetic map either localized around a gene or covering the genome or some intermediate portion of it, or determining the location of a gene or genetic marker on a chromosome.

gene tag

One of several different kinds of labels used in molecular genetics.

genetic bottleneck

Passage of the genetic heritage of a species through a generation with few individuals and therefore little genetic diversity, which limits diversity in subsequent generations.

genetic conservation

Preservation of diverse germplasm *ex situ* in gene banks and/or *in situ* in farmer's fields or natural habitats.

genetic diversity

Heritable variation within and among populations.

genetic drag

Unintended transfer of undesirable traits from a donor to the background cultivar.

genetic resources

Genetic material of actual or potential value.

genome

Complete complement of hereditary material present in each cell of an organism, which guides its development and life processes.

Genomics Revolution

Sum of recent advances in biotechnology, computing power and telecommunications.

geographic information systems

Computer systems capable of capturing, storing, analyzing and displaying geographically referenced information.

germplasm

Individual, group or clone representing a genotype, variety, species or culture held in a collection.

GIS

Geographic information systems.

H

heading

Onset of flowering.

heterosis

Hybrid vigour.

HHB 67-2

New version of 1990-vintage pearl millet variety HHB 67 that resists downy mildew disease.

hoja blanca

Viral rice disease (white leaf) common in tropical America.

homolog

Gene closely related to another gene by constituent sequence, location and/or descent.

hybrid vigour

Tendency of a hybrid individual to outperform its parents with respect to one or several traits.

I

ICAR

Indian Council of Agricultural Research, India.

ICARDA

International Centre for Agricultural Research in the Dry Areas, a CGIAR centre in Syria.

ICRISAT

International Crops Research Institute for the Semi-Arid Tropics, a CGIAR centre in India.

indica

One of two main subspecies of domesticated rice, grown mainly in the tropics.

intermediate breeding

Developing breeding lines with desirable traits not as cultivars for release to farmers but for breeding those traits into popular cultivars.

interspecific

Combining or between two or more species.

introgression line

Elite germplasm with introduced exotic allele(s) or gene(s) that is repeatedly backcrossed to eliminate all donor genes except the desired one(s).

IR29, IR64

Popular tropical rice cultivars developed at IRRI.

IRD

Institut de recherche pour le Développement (public research institute for overseas development), France.

IRMBN

International Rice Molecular Breeding Network.

IRRI

International Rice Research Institute, a CGIAR centre in the Philippines.

J

japonica

One of two main subspecies of domesticated rice, grown mainly in the temperate zone.

K

KARI

Kenya Agricultural Research Institute.

Kasalath

Traditional indica rice variety that tolerates phosphorus deficiency.

L

landrace

Mixture of locally adapted genotypes of an inbred crop.

LIMS

Laboratory information management system.

M

maintenance breeding

Ongoing introduction into a popular cultivar of resistance traits against emerging pests and diseases.

mandated crop

One of 22 crops on which Generation conducts or will conduct research. The phase 1 crops are barley, cassava, chickpea, cowpea, common bean, maize, *Musa* (banana and plantain), potato, rice, sorghum and wheat. The others are coconut, groundnut (peanut), lentils, pearl millet, finger millet, pigeonpea, soybean, sweet potato, yam, grass forage and legume forage.

marker

Sequence of DNA that is easily traced and almost always associated with a certain trait and so can be used to mark a location on a chromosome and increase the speed and efficiency of genotyping and breeding.

MDR

Multiple disease resistance.

meristem

Plant tissue in which the cells are capable of active division and differentiation into specialized tissues such as shoots and roots.

metabolite

Intermediate enzyme-produced biological compound.

microarray

Large set of cloned DNA molecules used to test a single biological sample for a variety of attributes.

microsatellite

Pieces of a small DNA sequence repeated typically 5-50 times adjacent to a specific gene and so marking that gene.

mini-core collection

More selective version of a core collection.

molecular biology

Science entailing the study and manipulation of genetic processes at the molecular level to make plant breeding faster and more precise.

N

NARS

National agricultural research system.

NCGR

National Centre for Genome Resources, USA.

NERICA

New Rices for Africa produced by the Africa Rice Centre, a CGIAR centre in Benin.

NIAB

National Institute of Agricultural Biology, UK.

NIAS

National Institute of Agrobiological Sciences, Japan.

Nipponbare

Popular japonica rice variety.

O

Orisis

Component of the Generation information platform that looks down from domain models to connect with data sources Egyptian god of agriculture and the underworld.

orphan crop

Crop that has been largely neglected by the research community.

ortholog

Gene in model species common to other species.

Oryza glaberrima

Cultivated rice species in Africa.

Oryza sativa

Species of most domesticated rice.

P

Pantheon

Query tool in the Generation information platform.

passport data

Basic identification of a germplasm sample, including its source location, maturity class, height, genotype, etc.

pathway

Series of sequentially dependent chemical reactions by which a trait becomes fully expressed.

phenotype

Outward appearance or other visible characteristics of an organism reflecting genotype interaction with environment.

phenotyping

Tracking the external, or visible, characteristics of an organism.

Pokkali

Traditional rice cultivar from India that exhibits moderate salt tolerance.

pre-breeding

Intermediate breeding.

primary gene pool

Genetic variety that exists in a single biological species, in which members breed and cross easily, their genes segregating normally to create fertile offspring.

promoter

Regulatory part of a gene that is responsible for the expression of the protein-coding region.

proof of concept

Abbreviated realization of a method or idea demonstrating its feasibility.

protein-coding region

Part of a gene that carries the code for making the proteins that fuel plant growth and functions.

public good

Benefit to society unlikely to arise from private enterprise and made available to all.

Pup1

Rice gene on chromosome 12 that improves the plant's uptake of the essential nutrient phosphorus.

Q

qualitative trait

Trait such as pest or disease resistance that arises from the effect of one gene or a few genes.

quantitative trait

Trait such as tolerance to such abiotic stresses as salinity, acidity, aluminium toxicity, nutrient deficiency extreme temperatures, submergence or drought that arises through the combined effects of several genes.

quantitative trait locus

Location on a chromosome where allelic variation is associated with variation in a quantitative trait.

QTL

Quantitative trait locus.

QTL dissection

Using recombination breeding and other genetics techniques to take QTLs apart, identify specific genes within them, and test them to determine their functions.

QuCIM/QuLine

Breeding module based on QuGene and geared to wheat.

QuGene

Software platform that allows scientists to define gene effects and build breeding modules to compare breeding strategies.

R

rainfed

Grown without irrigation and so dependent on rainfall.

regulatory region

Part of a gene that turns it on or off and so is responsible for the expression of the protein-coding region.

rice stripe necrosis

Viral disease of rice.

S

SAG

Stress-associated gene.

Saltol

Rice gene on rice chromosome 1 that confers salinity tolerance.

secondary gene pool

Genetic diversity of a set of species including those that can be wide-crossed or hybridized only with difficulty for example crop species and their wild relatives.

sheath blight

Fungal rice disease.

SHN

SHINE, a gene first found in *Arabidopsis* that confers drought resistance by reducing the density of leaf pores and thereby limiting moisture loss to the air.

silver bullet

Straight forward and infallible solution to a persistent problem.

simple sequence repeat

Microsatellite sequence in a DNA molecule that can be used as a molecular marker in genetic maps.

SP4

Generation's Subprogramme 4: Genetic Resources, Genomic and Crop Information Systems, and Bioinformatics

SSR

Simple sequence repeat.

stomata

Leaf pores.

Sub1

Rice gene on chromosome 9 that confers submergence tolerance that allows some rice plants to survive completely underwater for up to 2 weeks.

synteny

Conservation of gene order among related species.

T

tagged gene

Gene marked with one of several molecular markers.

template

Blank document with a clearly defined format and precise semantics and ontology that meet a set of minimum requirements agreed by the research community.

tertiary gene pool

Genetic diversity that encompasses species for which hybridization requires such extreme measures as embryo rescue, ovule culture or grafting.

traditional plant breeding

Non-molecular breeding based on achieving desirable phenotypes.

transgressive segregation

Hybrid progeny that display traits more strongly than the trait's donor.

U

upstream research

Early stages of the value chain of research, where the focus is on basic discoveries; (antonym) downstream research.

UQ

University of Queensland, Australia

V

value chain

Series in which different actors receive intermediate products, improve them or bring them closer to completion, and pass them on for further improvement or completion.

varietal improvement

Modern breeding of crop cultivars with desirable agronomic traits such as high yield and durability.

W

Wiki

Open source software like that used on the Wikipedia web encyclopedia, or a website using that software (*wiki* means "quickly" in Hawaiian).

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