Plant Biology: Gene Function and Regulation

Historical Program Goals

- To obtain a detailed understanding of the function of agriculturally important genes and the regulation of gene expression in agricultural plants to better use these genes for improved crop production and quality

Plant Biology : Gene Function and Regulation

Program Priorities for FY 2008

1. Functional analyses of agricultural important genes in plants, including development of improved mutational or gene silencing approaches

2. Regulatory mechanisms of gene expression (systems level studies encouraged)

Plant Biology : Gene Function and Regulation (56.0)

Program Statistics – FY 2008

- # of Proposals Submitted: 81
- # of Proposals Awarded: total 15 (standard research 11, AREA 2, conferences 2)
- % Success: 17.5%
- Average Award Size: $340,802 research (not counting conferences, postdoc, seed & sabbatical grants);
- Average Award Duration: 3 years

Plant Biology : Growth and Development
Historical Program Goals

- To develop crop models for studying plant developmental processes
- To provide detailed understanding of signal transduction mechanisms to improve performance of agricultural plants
- To enhance the ability to alter developmental processes of agricultural plants to improve plant characteristics

Plant Biology : Growth and Development
Priorities for FY 2008

- Developmental pathways leading to the formation of vegetative or reproductive structures
- Hormonal regulation of growth and development; cross-talk between signaling pathways using metabolomic tools is encouraged
- Characterization of cellular structures and processes crucial for plant development

Plant Biology : Growth and Development
Program Statistics – FY 2008

- # of Proposals Submitted: 78
- # of Proposals Awarded: total 17 (standard research 9, conferences 3, AREA awards 5)
- % Success: 15.4%
- Average Award Size: $369,596 (not counting conferences, postdoc)
- Average Award Duration: 3 years

Plant Biology : Environmental Stress

Historical Program Goals

- Increase fundamental knowledge of genetic, genomic, molecular, physiological, ecophysiological, and biochemical components involved in plant abiotic stress response and adaptation
- Develop approaches and tools to aid agricultural plant productivity in response to reduced inputs or increased environmental stresses
- Develop, through biotechnology and/or breeding, new plant lines or populations for improved abiotic stress-resistance or tolerance in agricultural plants

Plant Biology : Environmental Stress

Historical Program Priorities

Identify and characterize genes, proteins, processes, and/or networks pathways contributing to abiotic stress tolerance in the research priority areas of:

- Water stress
- Global change
- Temperature stress
- Nutrient stress

Plant Biology : Environmental Stress

Program Statistics – FY 2008

- # of Proposals Submitted: 77
- # of Awards: 18 (including conferences, AREA awards)
- % Success: 17.5%
- Average Award Size: $341,917 (not including conferences, postdoc, equipment)
- Average Award Duration: 3 years

Plant Biology : Biochemistry

Historical Program Goals

- Increase fundamental knowledge of biochemical pathways, processes, and mechanisms for improved utilization of genomics in agricultural plants
- Use plant biochemistry to enhance plant production, efficiency, protection, quality, and use
- Create improved agricultural plant lines or populations through use of basic biochemical knowledge and biotechnology
- Develop model agricultural species for biochemical studies

Plant Biology : Biochemistry

Historical Program Priorities

- Primary and secondary metabolism
- Plant cell wall structure, formation, and modification
- Photosynthesis and respiration
- Nitrogen fixation

Plant Biology : Biochemistry

Program Statistics – FY 2008

- # of Proposals Submitted: 76
- # of Awards: 24 (including conferences, AREA awards)
- % Success: 22%
- Average Award Size: $355,600 (not including conferences, postdoc, equipment)
- Average Award Duration: 3 years

Plant Biology : Plant Breeding and Education

Historical Program Goals

- To increase the number of students and scientists trained in plant breeding and in careers requiring plant breeding expertise
- To improve transfer of science-based knowledge to producers and consumers through breeding or breeding combined with biotechnology

Plant Biology : Plant Breeding and Education

Integrated Program Priorities for FY 2008

- Education and training in an academic setting to build expertise in plant breeding combined with research focusing on germplasm enhancement for abiotic environmental stress tolerance, with particular emphasis on drought tolerance.
- Education and training in an academic setting to build expertise in plant breeding combined with research focusing on germplasm enhancement for improved nutrient uptake and/or utilization, with particular emphasis on nitrogen.

Plant Biology : Plant Breeding and Education

Program Statistics – FY 2008

- # of proposals submitted: 8
- # of proposals awarded: 4 (including 1 bridge grant)
- % Success rate: 50%
- Average award size: $486,160 (excluding bridge grant)
- Average award duration: 2.75 years

Successful Plant Biology proposals

Integrated proposals

- Contain mutually dependent research and education components
  - Project should have both education and research expertise
- Describe clearly evaluation of the education component
  - Include personnel with expertise in evaluation
- Considers how the education component fits with existing curricula and how it will be maintained after the award is completed
- Utilize significant stakeholder input
- Includes a clear management plan with a process for effective communication among project team members.

Successful Plant Biology proposals

Research proposals

- Are hypothesis-driven and are not surveys or observational studies
- Connect research to agriculture
  - how will the results eventually lead to improvements in plant production or quality?
- Utilize “realistic” treatments
- Employ multidisciplinary approaches (genetic, molecular, cell biological, biochemical)
- For programs limiting the use of model species, clearly incorporate agricultural species into the research
  - Agricultural species studies should not appear as “add-on” to the model species research

Plant Biology
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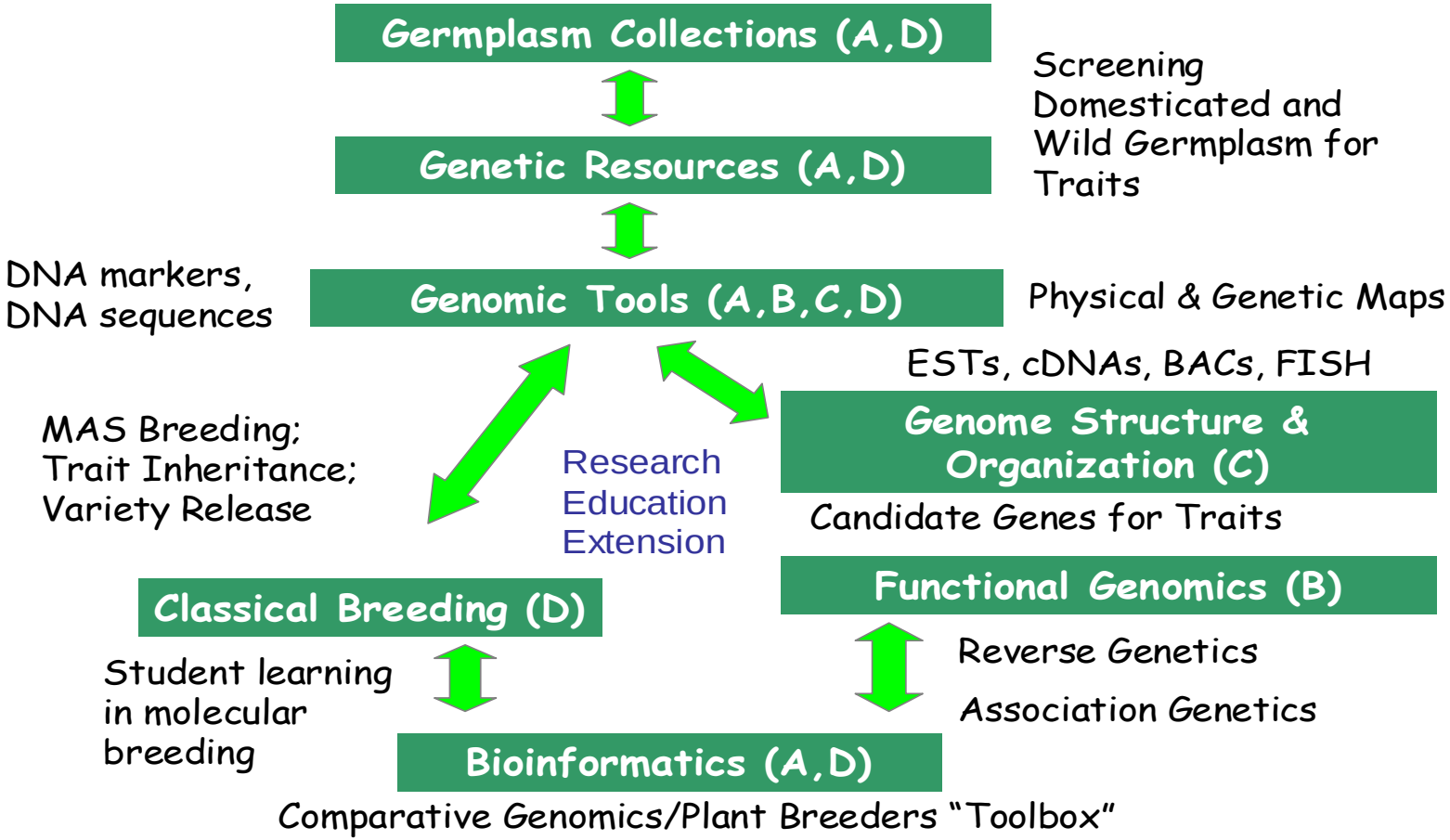
Historical Perspective: Genomics, Genetics and Breeding



Plant Genome Program: 4 program elements
(A): Tools, Resources and Bioinformatics
(B): Functional Genomics
(C): Genome Structure and Organization
(D): Applied Plant Genomics Coordinated Agricultural Project (CAP)

Plant Genome, Genetics and Breeding

Situation	Comprehensive analyses of crop and forestry genomes combined with comparative and functional genomics can provide a basis for understanding complex biological processes underlying the array of diverse and unique traits found in agriculturally significant plants. This program aims to maximize knowledge transferability among the breadth of plant species while concurrently developing key science-base genomic tools and resources to address issues of specific crops and regions. The program supports opportunities ranging from technology development to fundamental science and integrated practical application for crop or forestry improvement in the U.S. By conducting research and integrated work in plant genomics, genetics and breeding the ultimate goal of the program is to contribute knowledge about the biology of agriculturally important plant processes and traits, which can be used to improve plant characteristics with enhanced economic value and expanded utilities.
Inputs	•Stakeholders •CSREES NPLs •NSF, DOE, ARS and FS •Growers and producers •Societies of Plant Biology, Crop Science and Horticulture, International Community
Near-term Goals (1-3 years)	•Develop genomic tools and reagents useful to biologists and breeders •Use of genomic tools and reagents to understand genome wide function •Sequence agriculturally important genomes in a timely and cost effective manner •Bridge the gap between genome researchers and plant breeders
Mid-term Goals (5 years)	•Enabled high through-put technologies for mapping and functional analysis of genomes •Improved community bioinformatics •Insights into genome wide function and the affect on agricultural traits •Additional genomes sequenced and integrated with their physical and genetic maps •Complementary genomics research, education and extension activities •Enhanced partnerships with universities, industry and the international community
Long-term Goals (10 years)	•Increased fundamental knowledge of the structure, function and organization of plant genomes for U.S. crop and forestry improvement •Effective integration of modern molecular breeding technologies and traditional breeding practice for U.S. crop and forestry improvement •Improved U.S. varieties for agricultural growers and producers

Plant Genome, Genetics and Breeding Proposals

- Develop or improve the use of genome-wide high-throughput approaches for mapping and identification of important genes (e.g. physical maps, ESTs, cDNAs, BAC libraries, SNPs, FISH, micro-arrays, transformation technologies, etc.) including MAS and QTL analysis (e.g. biotic and abiotic tolerance, quality, yield, etc.) and comparative genomics (e.g. enabling cross-species markers, etc)
- Bioinformatics to enable genome-wide high-throughput cross-species comparisons and to link genomic data to agronomic and quality traits of economic value in agricultural plants

Plant, Genome, Genetics and Breeding Proposals (continued)

- Increase understanding of the biological role of genomic sequence, including regulatory and repeated sequences, and to link these sequences to physiological functions or agricultural and food processes (functional genomics)
- Increase understanding of genome structure and organization (e.g. sequence the gene space, etc)
- Application of genome-wide discoveries and technologies for U.S. crop or forestry improvement (CAP)

Funding Statistics
FY 2008

	Research: Tools, Resources and Bioinformatics; Functional Genomics; and Genome Structure and Organization	Integrated: Applied Genomics CAP
proposals submitted	43	4
proposals awarded	Research - 10 Strengthening - 2 Conferences - 2	1
% Success	Research - 27 Strengthening – 33 Conferences – 100	25
Average Award Size ($)	363K	5M
Average Duration (Years)	2.5	4

Plant Genome, Genetics and Breeding

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