

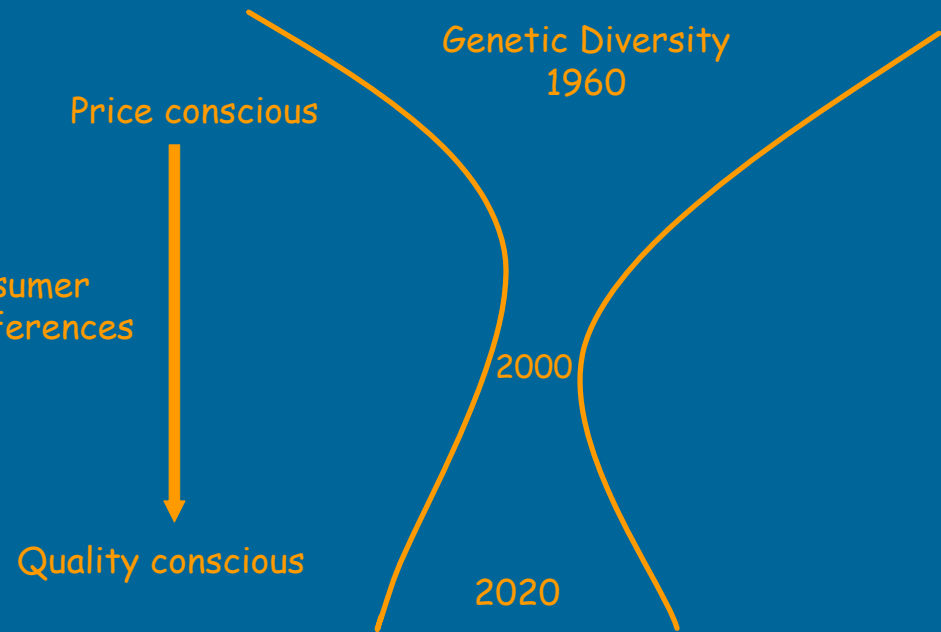
Technical/Biological Aspects of Delivering Animal Germplasm



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Market Forces - Impact Both Industrial & Minor Breeds

- Changing market forces
 - Consumer interest in heritage breeds
 - Locally produced products
 - Alternative production systems
 - Antibiotic use
- Depth of market trend is unknown



The Primary Challenge

- Access to diverse genetic resources to meet customer demands
- Conserve genetic resources for current and future industry, research and societal benefit
- Requires involvement of all segments of the industry
 - livestock breeders diverse

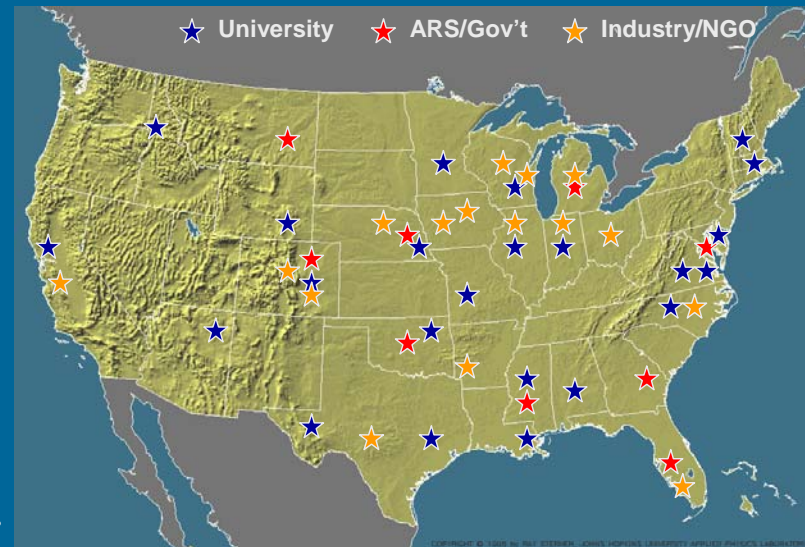


Photo by D. Harry

NAGP Established to Address Genetic Resource Issues

- Congressional legislation 1990
- NRC report 1993
- NAGP formed 1999
- Discover Conference 1999 - A Call to Action
- Discover Conference 2004 - The Next Steps

NAGP Species committee members



NAGP Primary Functions

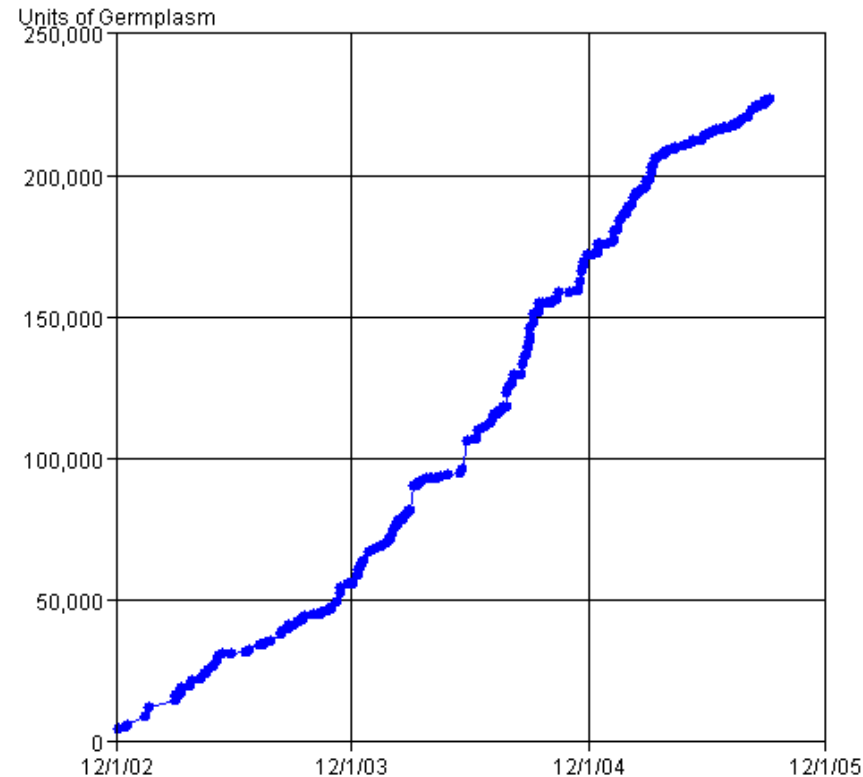
- Understanding genetic resources, providing information & cryopreservation
- Linkages with public/private sector for in-situ efforts
- Species committee assists with collection development and other activities



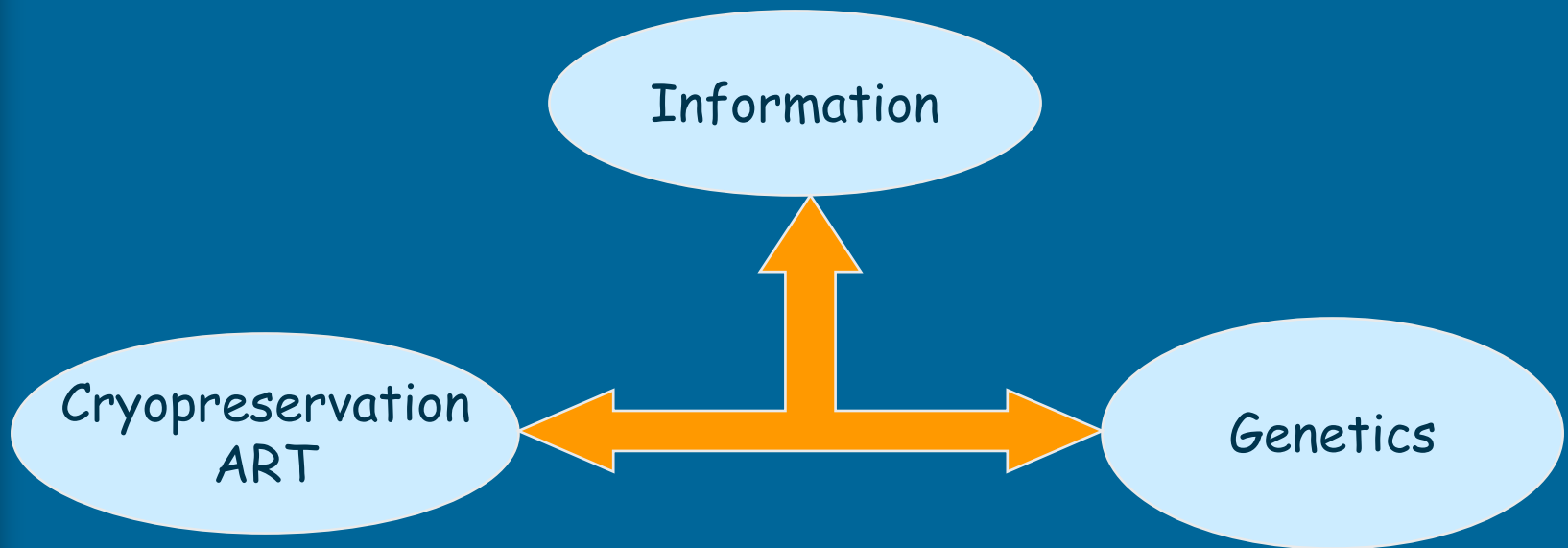
NAGP - Collection Status

- Populations
 - 103 breeds of cattle, sheep, goats, pigs
 - 59 chicken lines
 - 15 aquatic species
- 170 contributors in 2004-2005

NAGP Inventory Composition
Entire Inventory



Interfacing Technologies Needed To Maximize the Use of Genetic Resources



Primary Issues - Germplasm Delivery

- Information about genetic differences (within and between breeds)
- Matching genotype to production environment
- Movement of genetic resources
 - Facilitated by ART

Movement of Genetic Resources

- Movement of genetic resources serves to:
 - Momentarily depress inbreeding
 - Allows breeders in different regions to utilize various genetic resources
 - But information on genetic resources is important

Identification of Genetic Differences

- Phenotypic selection
 - most common
- Estimation of breeding values
 - Statistical approach that enables differentiation between animals for a trait. (Requires recording system)
- Molecular markers
 - For single gene traits can be extremely powerful; more complex traits require large populations to find useful markers and to establish confidence in their use

Genetic Environmental Interactions

- As management permits environmental conditions to vary, the potential for GxE increases.
- Presence of GxE impacts breed choice and selection decisions.

Movement of Germplasm

The ability to collect, hold and/or cryopreserve germplasm impacts utilization

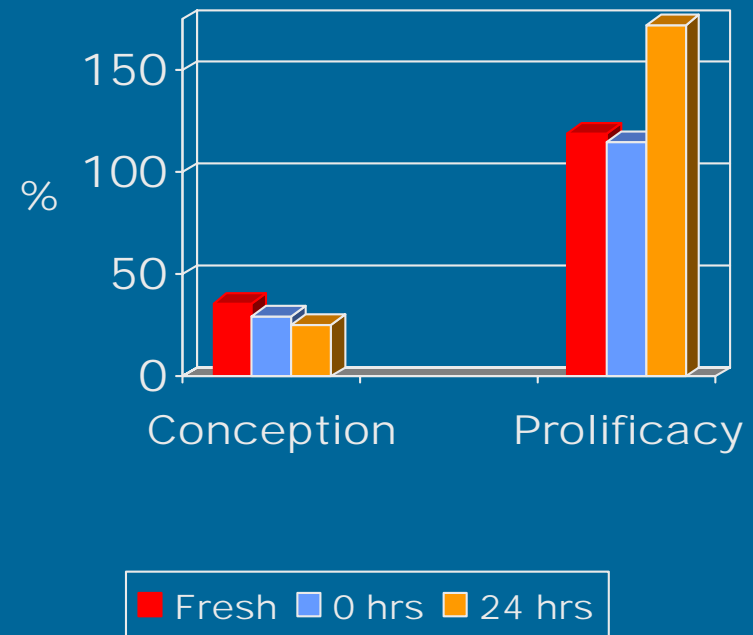
Challenges in using collected semen persist

	Fresh Semen	Frozen Semen	Embryos Oocytes	Insemination
Cattle	0/+	++++	+++	++++
Goats	0/+	+++	++	++
Sheep	0/+	++	++	+
Pigs	++++	++	+	++++
Chicken	++	+	0	+++
Turkey	++	+	0	+++

Cryopreservation - Mammals

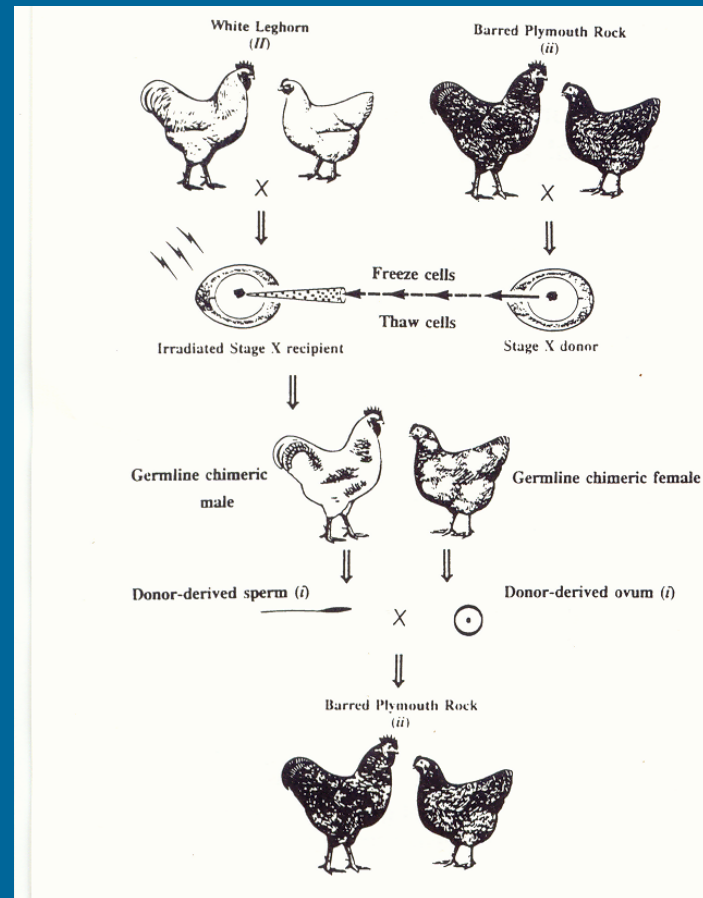
- Boars -
 - Conditioning of membrane
 - Genetics of freezing
- Rams - holding for 24hr before freezing vs fresh and immediate freezing
- Bulls
 - Post-thaw comparison of inbred semen - No effect

Fertility Measures for Treated Ram Semen



Cryopreservation - Poultry

- Overcoming negative effects of glycerol and conditioning sperm cells for cryopreservation
- Capturing mitochondrial and nuclear DNA
 - Primordial Germ Cells (transfer rate, % donor genome in offspring)
 - PGCs may be the most effective tool for minor/rare breeds



Information Systems

- Databases
 - Pedigrees, performance measures
 - Active breeders
- Tools for:
 - Managing inbreeding
 - Operating mating plans
 - Matching genotypes to environments

Socio-Economic Issues

- Evaluation of genetic resource policy needs careful attention
 - Valuation of genetic resources (as public and private goods)
 - Evaluation of how policy instruments may impact genetic resources and industry
 - Role of public institutions in maintaining and understanding genetic resources

Conclusions - Work to be Done

- Determine genetic distances between livestock breeds and populations
- Increase data recording capabilities for minor breeds
- Improve efficiency of germplasm storage and utilization
- Develop strategies to maintain genetic diversity while enhancing market potential