# Gene Banks for Animal Genetic Resources: the FAO Perspective

Paul Boettcher
FAO-AGAG
Rome, Italy

# Global Plan of Action and Interlaken Declaration

FAO position on the importance of AnGR and their proper management (including conservation is summarized in the *Global Plan of Action for AnGR* and the *Interlaken Declaration*

- AnGR critical for food security, sustainable livelihoods and human well-being
- Resulted from generations of actions by diverse stakeholders
- Provide benefits to the environment, humanity and cultural heritage
- Their erosion would compromise efforts to achieve food security, human nutrition and rural development
- Prompt action for conservation is needed

# Global Plan of Action

- *Global Plan of Action* is internationally agreed framework for management of AnGR
- *Conservation* one of the Strategic Priority Areas
  - 5 Strategic Priorities:
    - (1) to establish national conservation policies (SP7)
    - (2 and 3) to establish or strengthen *in situ* (SP8) and *ex situ* (SP9) conservation programmes
    - (4) to develop and implement regional and global long-term conservation strategies (SP10)
    - (5) to develop approaches and technical standards for conservation (SP11)

# National Conservation Policies

- National governments have the main responsibility for management of their AnGR
- FAO recommends the development (updating) of National Strategies and Action Plans for management of AnGR
  - Including national goals and objectives for conservation
- Currently ~50 countries are actively developing or implementing NSAP
  - High priority for 25 others

# FAO Guidelines for Conservation

- FAO Guidelines for Cryoconservation of AnGR
  - Endorsed by 13th CGRFA in 2011
  - Currently in press
  - Available Summer 2012
- FAO Guidelines for *In Vivo* Conservation of AnGR
  - To be presented to 7th session of ITWG in October 2012
  - Endorsement foreseen at 14th by CGRFA (April 2013)
  - Publication foreseen in Summer 2013

# *In Situ* vs. *Ex situ* Conservation

- Two possibilities for conservation of AnGR
  - *In situ*
    - Conservation on farm by farmers
  - *Ex situ*
    - Conservation away from the production environment
      - genetic material in gene banks
      - animals on agricultural parks or government farms
- *In situ* is generally preferred for sustainability
  - Genetic diversity of animals evolving with environment
  - Agro-ecosystem
- *Ex situ* is complementary
  - Primary in special cases

# National Gene Banks

- Establishment of national gene banks for AnGR is highly recommended
- Ideal system will depend on the country
- Influencing factors:
  - Conservation objectives
  - Existing infrastructure and technical capacity
  - Species
  - Funding
- Ideally NSAP should be in place first
  - Do not wait with highly endangered AnGR!

# National Gene banks

- Various stakeholders should be involved
  - Farmers
  - Breeders' associations
  - Government ministries
  - Universities and research institutes
  - AI and other breeding companies
  - National Coordinator for management AnGR
- Conservation objectives
  - Breed reconstitution / insurance
  - Management of diversity of live populations
  - Gene introgression

# Genetic Material

- Semen is the most common material
  - Low cost collection and use
  - Requires moderate technical capacity across species
  - Cannot reconstruct genome at 100%
- Embryos are an option for some species/situations
  - Involves greater costs and technical capacity
  - Some species limitations
  - Can reconstruct entire genome
- Somatic cells are an attractive option for low-cost protection against extinction
  - Utilization is difficult and expensive

# Genebank Costs

- Establishing gene banks "from the ground up" requires significant expenditures
  - Collection and freezing equipment
  - Laboratory buildings
  - Animal housing and holding facilities
- Costs can be decreased significantly if existing facilities can be used
  - ~10,000 € for the basic equipment
- AnGR are valuable and costs should be amortized over a long time horizon

# Security and Sanitation

Valuable AnGR must be protected from disease and disaster

- Employ the maximum level of sanitation possible
  - Follow OIE guidelines
    - especially for AnGR to cross national borders
- It may be necessary to balance sanitation and collection of valuable AnGR
  - Field collection
  - Samples should be stored separately
- Storage of duplicate collections in separate geographic locations is highly recommended!

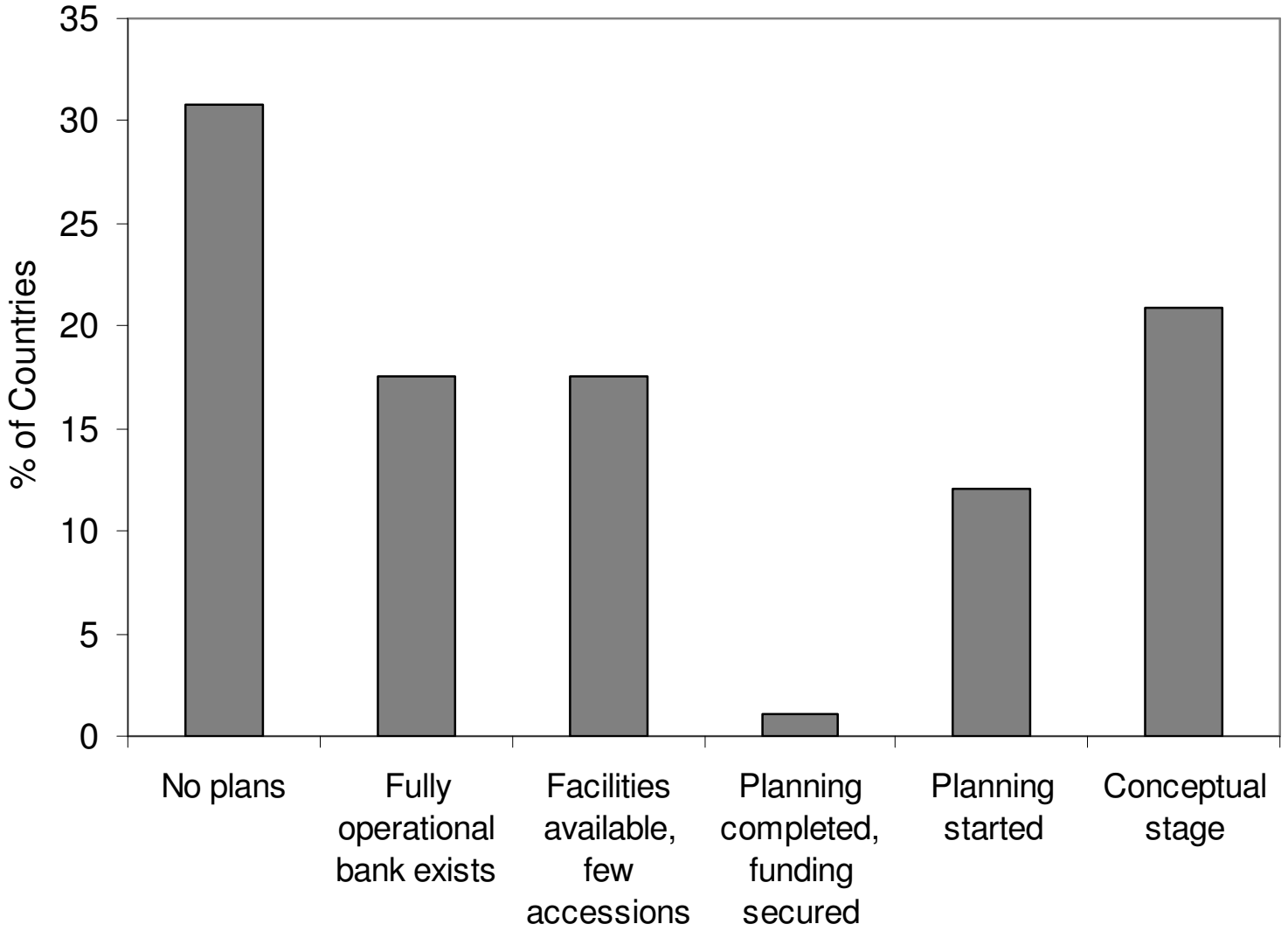
# Data and Databases

- Accurate data management is absolutely necessary
  - Performing routine operations
    - quality control
    - evaluation of stored genetic diversity
  - Managing use of stored material
- Minimum information
  - Sample ID, type, date
  - Animal ID, breed, pedigree
  - Supplier information
- Available software
  - Cryoweb – Germany
  - Animal GRIN – US, Canada, Brazil

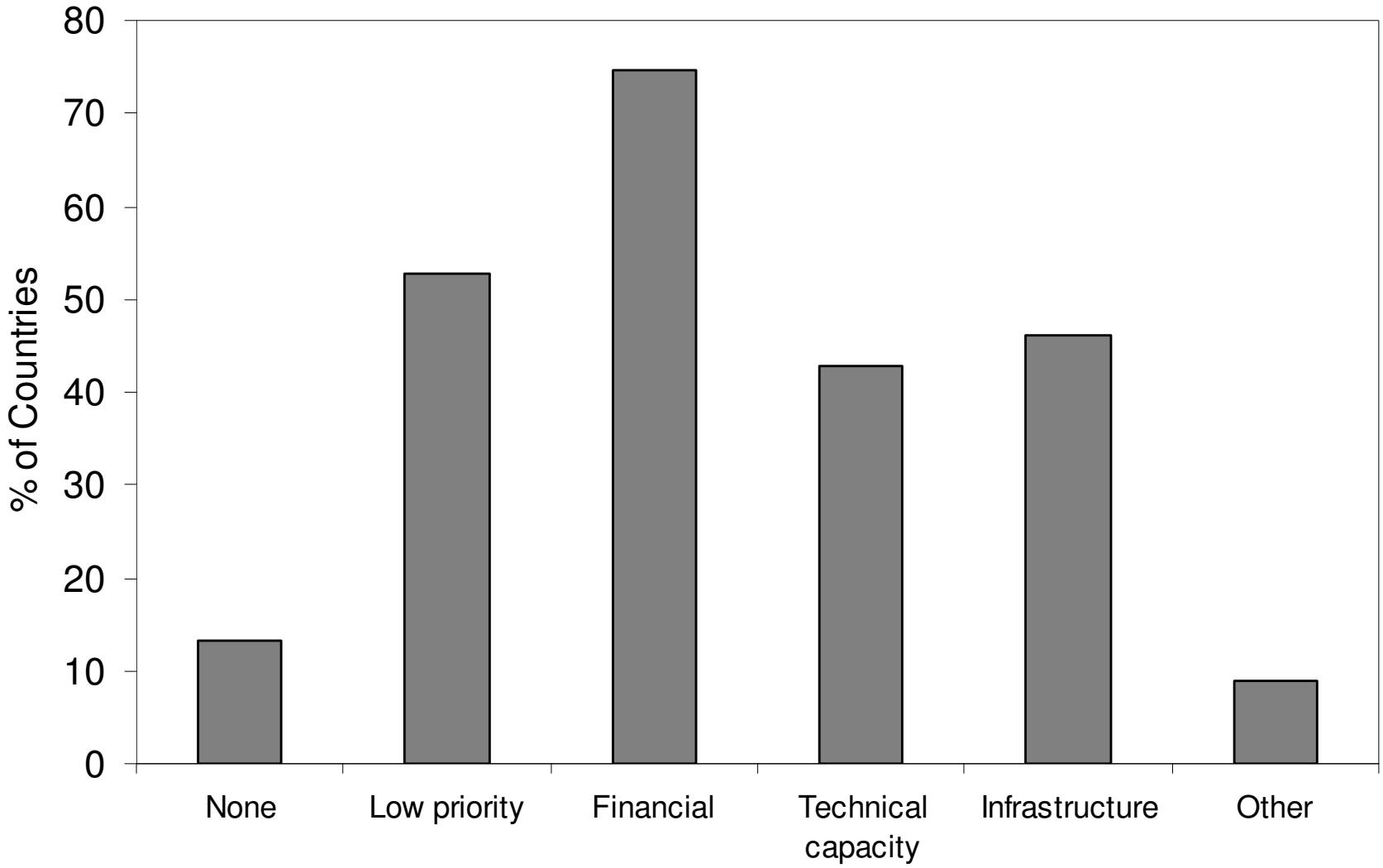
# Legal Issues

- Owner of animal and owner of gene bank are usually not the same
  - Who is the owner of the stored germplasm?
- Terms should be outlined in MAA
  - Owner of germplasm
  - Costs associated with acquisition
  - Conditions of germplasm use
- Utilization of material often involves third party
  - Another MTA is needed
  - Procedure for accessing samples
    - ensure integrity of remaining collection

# Current Status of National Gene Banks



# Constraints to Gene Banking



# National Conservation Activities

| Species | Type of conservation | | |
|---|---|---|---|
| | *in situ* | *ex situ* *in vivo* | cryo |
| | ----------(%)---------- | | |
| Buffalo | 22 | 11 | 11 |
| Camelids | 14 | 7 | 2 |
| Cattle | 73 | 40 | 49 |
| Chicken | 48 | 34 | 10 |
| Goat | 58 | 31 | 30 |
| Equines | 41 | 21 | 20 |
| Pig | 37 | 24 | 20 |
| Rabbit | 23 | 17 | 6 |
| Sheep | 63 | 30 | 31 |

# International Gene Banks

- FAO supports the concept (SP10)
- International banks could play various roles:
  - 1) to provide cryoconservation facilities for countries lacking national gene banks
  - 2) to provide back-up storage for national gene banks
  - 3) to store material from transboundary breeds
- Presently there is little multi-country gene banking
  - Sanitary regulations are a constraint
- Material Transfer Agreements will be critical
  - Nagoya Protocol

# Conclusions

- Gene banking can play an important role in a national programme for AnGR management
  - Based on NSAP
  - Complementary to *in situ* conservation
- Each country should develop its own plan based on needs and capabilities
- National gene banks are the first priority, but international banks would be a valuable tool

Promoting diversity

# Thank you!