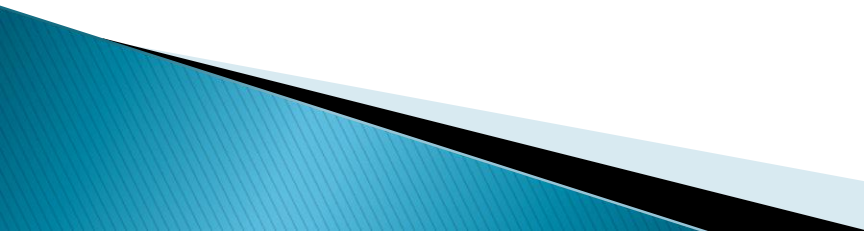


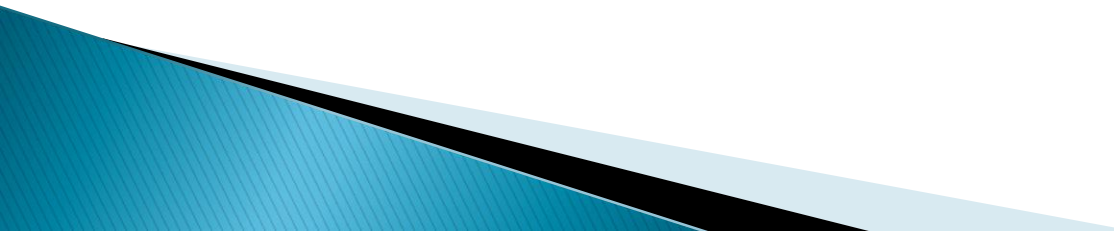
The Impact of Climate Change on Animal Genetic Resources

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What's the Problem?

- ▶ Mean global temperature to rise by 2–3°C by 2050 and possibly by 4.8°C by 2100
 - ▶ Compare to rise from end of Ice Age to now
 - ▶ More heat waves 'commonplace'
 - ▶ More short term weather events
 - ▶ Less precipitation in arid areas
 - ▶ Major sufferers are developing countries and, within country, the poor
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What's the Problem?

- ▶ 3°C rise will cause extensive biodiversity loss
 - ▶ 9.3 billion to feed by 2050; 11 billion by 2100
 - ▶ All need full and adequate nutrition
 - ▶ 70% of human population will live in cities by 2130
 - ▶ 570 million farms – 500 million are smallholders – 87% are in Asia
 - ▶ 72% under 1 hectare, 1% over 50 hectares
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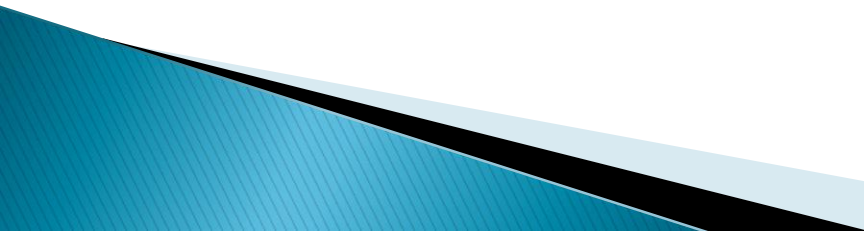
The Problems

- ▶ **Heat stress:** many high output breeds of all species are not good at coping with heat
- ▶ **Pests and diseases:**
 - will move geographic areas and be exposed to ‘new’ breeds
 - will survive better as less exposure to cold
 - short-term weather event can trigger disease
- ▶ **Water availability:**
 - renewable water reduces by 20% for additional 7% world population
 - consumption by animals will increase to cope with heat
 - sudden weather events will increase (e.g. flooding)

The Problems – indirect

- ▶ **Crop yields:** likely to reduce (wheat, maize, soybean probably by 5–10%) while predicted demand increase of 14% per decade!
- ▶ **Crop quality:** high temperatures will increase lignification (movement from C3 to C4 plants) – growing season will lengthen so more yield – so large amounts of low quality dry matter
- ▶ **Crop risk:** will increase due to more sudden weather events
- ▶ **Plant breeding will hold a major key to the effects of CC on livestock production systems and animal genetic resources**

What are the Criteria for Solutions?

- ▶ **Carbon?** UNFCCC now considering agriculture 'C/GHG' easily understood but far too simplistic for Livestock production systems
 - ▶ **Efficiency?** For what? Tolerance of heat and concomitant stresses? Present or future feeds and systems? Including use of by-products and alternative feeds? **Use of non human feeds?**
 - ▶ **Other options?** E.g. Organic
 - ▶ **Species and breed substitutions**
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Likely General Impacts

- ▶ **Controlled Environment systems** less affected – mainly pigs and poultry, dairy in some areas but will incur higher costs (economics?)
- ▶ **Feed availability and cost** – nutritional value, feeding systems – affect high output breeds more
- ▶ **Health problems** – likely to be greater for all given the likely spread of pests/diseases
- ▶ **Management systems** – feed changes, water availability, especially large intensive units
- ▶ **IPCC** – HY breeds at risk, developing country breeds more tolerant of heat and poor feeds

Potential Genetic Impacts

- ▶ **Genetic variation** for most traits – feed use; methane emissions; nitrogen excretion & retention; heat stress.
- ▶ **How to select for heat stress tolerance etc within breed? What rates of change are possible?**
- ▶ To date, almost no breeding schemes for local breeds!! Why no support before now?
- ▶ Use existing breeds from other areas – many examples of known adaptations
- ▶ **BUT is the relevant information available?**

What else is needed for AnGR?

- ▶ **Breed information – Interlaken Declaration and the Global Plan of Action** were adopted in 2007 and binding on all FAO members.
- ▶ **FAO DAD-IS** – the formal intergovernmental data system **BUT under 50% complete (10yrs)**
- ▶ **FAO BUDGET** – very little for AnGR; PGR about 4 times greater and for 4 times longer!
- ▶ **No formal monitoring of members** – National Coordinators report as they feel fit – many are part-time on AnGR.

What else is needed for AnGR?

- ▶ **Production Environment Descriptors (PEDs)** – without environmental data, breed production and characterisation data almost irrelevant.
- ▶ First proposed in 1996, Workshop in 1998, next workshop in 2008 **BUT NOT YET IN USE**
- ▶ **Has Never been discussed by CGRFA**
- ▶ **If PEDs available**, could identify species/ breeds for the predicted environments with a view to genome sequencing and trying to link some sequences with environmental adaptations.
- ▶ **R & D** still very limited for local breeds


What else is needed for AnGR?

- ▶ **Conservation aspects** to be reconsidered
 - *in-situ* at direct risk while *ex-situ* fails to account for environment. Cryogenic stores fail to adapt at all to changing climate
- ▶ **Full and proper attention paid to international commitments by countries and agencies and a means of identifying those failing to honour such commitments**

Other criteria for future of ANGR

- ▶ **Competition for 'human' foods** – meat demand suggests more feed needed but becoming more of a political problem
- ▶ **GHG/Carbon** – beef is more under scrutiny than others.
- ▶ **Reconsideration of role of animal products** – is it desirable to satisfy predicted demand? Adverse effects of high consumption are known and are costly. Compare to likely global benefits to climate, health, animal welfare and economics.
Industry needs to act responsibly

CONCLUSIONS

- ▶ **Climate Change** will impact seriously on AnGR – which breeds will be most affected unclear
 - ▶ **IPCC Report** suggests more reliance on local breeds but political clout lies with intensive units and companies in that value chain
 - ▶ **Niche Markets** more relevant to benefit local breeds
 - ▶ **Policy Decisions and Actions** at all levels have never been more crucial
 - ▶ **Animal Genetic Diversity** has never been more important than now if future generations are to be fed adequately
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THANK YOU

