



Interface of Animal Genetic Resources, Biodiversity and Climate Change

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Outline

- The Need for Livestock Biodiversity
 - » What role will Biodiversity play in helping the world's poorest people?
- The Need for National and International Frameworks
 - » What must government do?
- The Need for Research and Development
 - » What are the new opportunities?

1. The Need for Livestock Biodiversity





Drivers for Change

- Livestock are a focal point for
 - » Lifting people out of poverty into sustainable livelihoods



Drivers for Change

- Livestock are a focal point for
 - » Lifting people out of poverty into sustainable livelihoods
 - » More than products, transport, power etc
 - consumption smoothing
 - saving
 - insurance
 - social integration
 - management of climatic uncertainty



Drivers for Change

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 - » Lifting people out of poverty into sustainable livelihoods
 - » Satisfying global demands for livestock products
 - » Promoting international trade
- Production must
 - » Respond to new patterns of demand
 - » Reduce impact on environment
- Broad conclusion: need for sustainable intensification!!!



Policy Drivers for Livestock

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Change!



Breed Erosion

- Change creates new market pressures on breeds
 - » changing economics of inputs and outputs
 - » changing market demands
 - » breeds survive if 'fit for purpose' else ...
- Current markets favour breeds of high inputs with high outputs
 - » these breeds survive
- Other breeds decline and become vulnerable
- Vulnerable breeds are lost
 - » conflict, disease, flood, drought

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**Breed Variation is
Disappearing!**



How Severe is Breed Erosion?

Risk Status	Actual %
At Risk	20
Not at Risk	35
Unknown	36
Extinct	9

State Of The World Report

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- Likely status of 'unknown'
 - » 40% 'at risk' !

How Severe Is Breed Erosion?

Risk Status	Actual %	Predicted %
At Risk	20	34
Not at Risk	35	56
Unknown		
Extinct	9	10

- > 1 in 3 breeds are predicted to be 'at risk'
- ~ 1 in 10 'extinct'
- ~ 1 in 2 'secure'



Is This A Problem?

- No ... not with certainty and stability



Is This A Problem?

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- We have rapidly changing demands and markets
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- Now there is a scientific consensus:
 - » climate change is happening
 - » we should expect a rapid global warming
 - » humans have contributed and continue to do so
 - Intergovernmental Panel on Climate Change 2007

Is This A Problem?

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**Change not
stability!**



How Much Change?

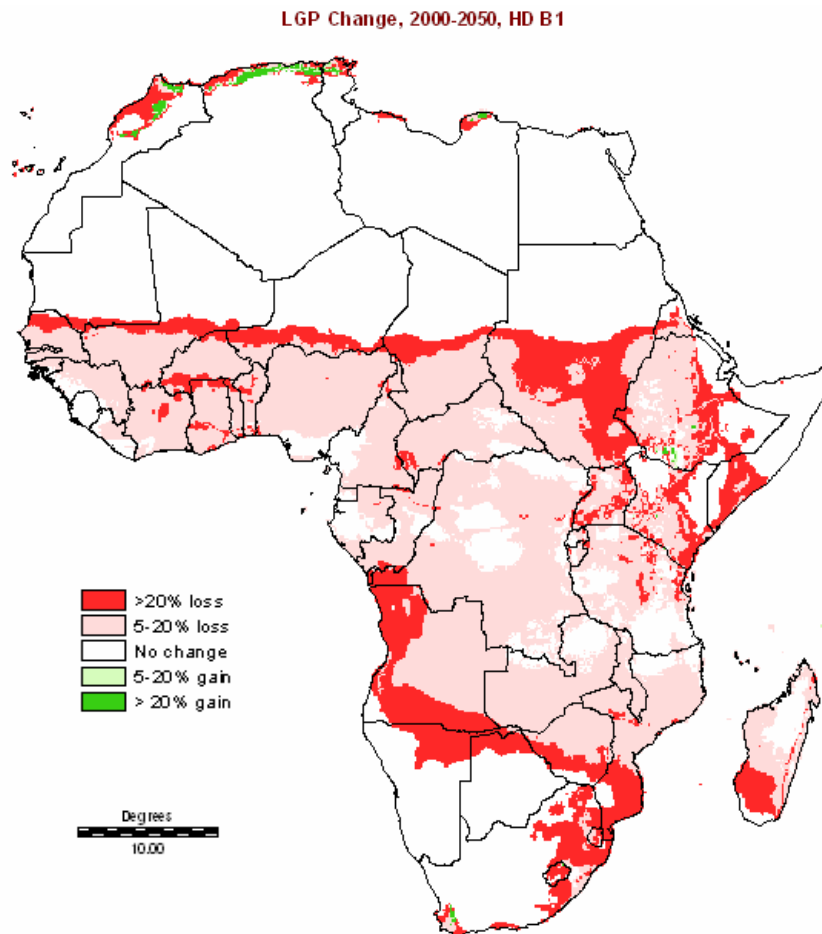
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Some Predictions

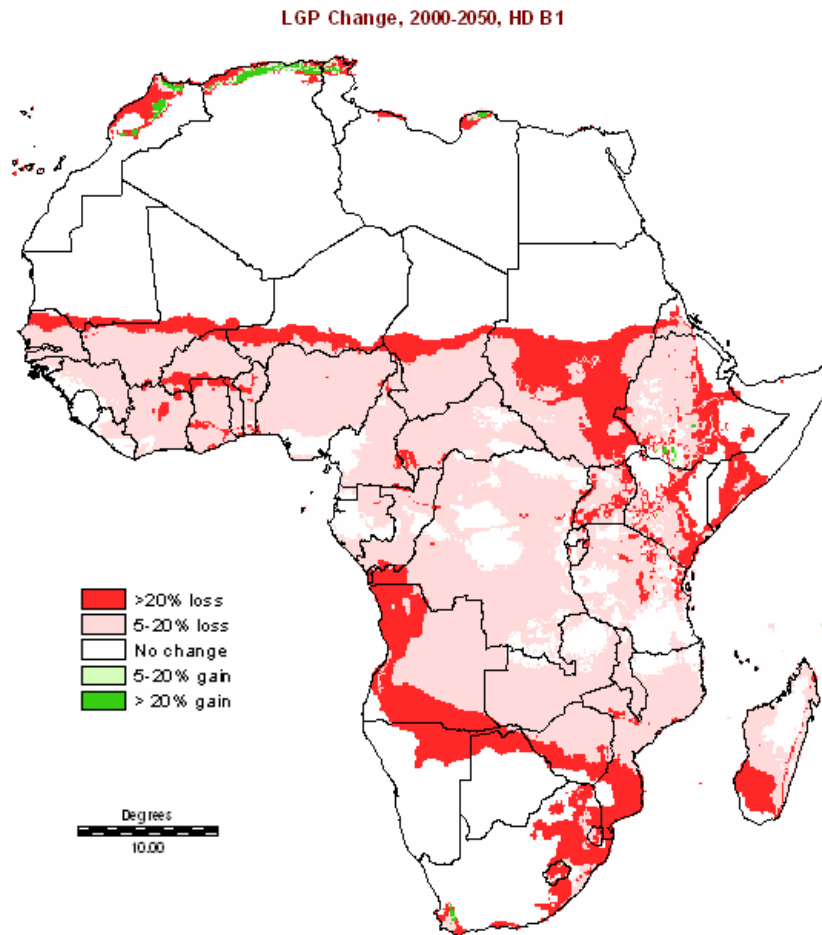


Length of Growing Season

- expectations for Africa
- widespread reduction predicted

Thanks to CGIAR for map.

Some Predictions



Length of Growing Season

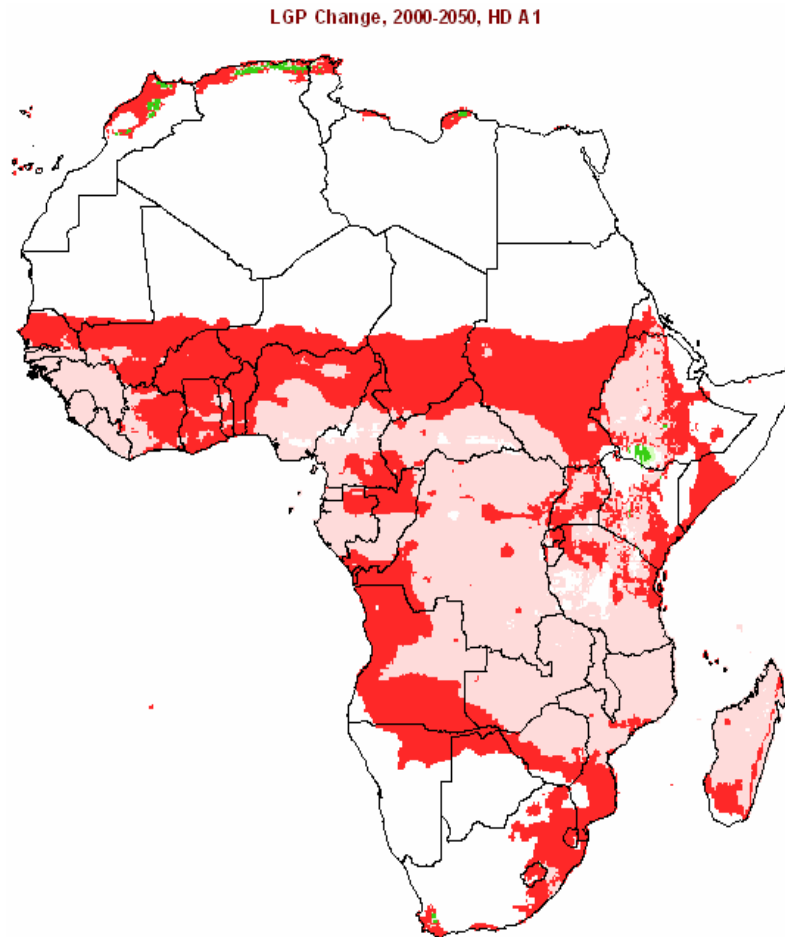
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BUT

- model assumes global cohesive response

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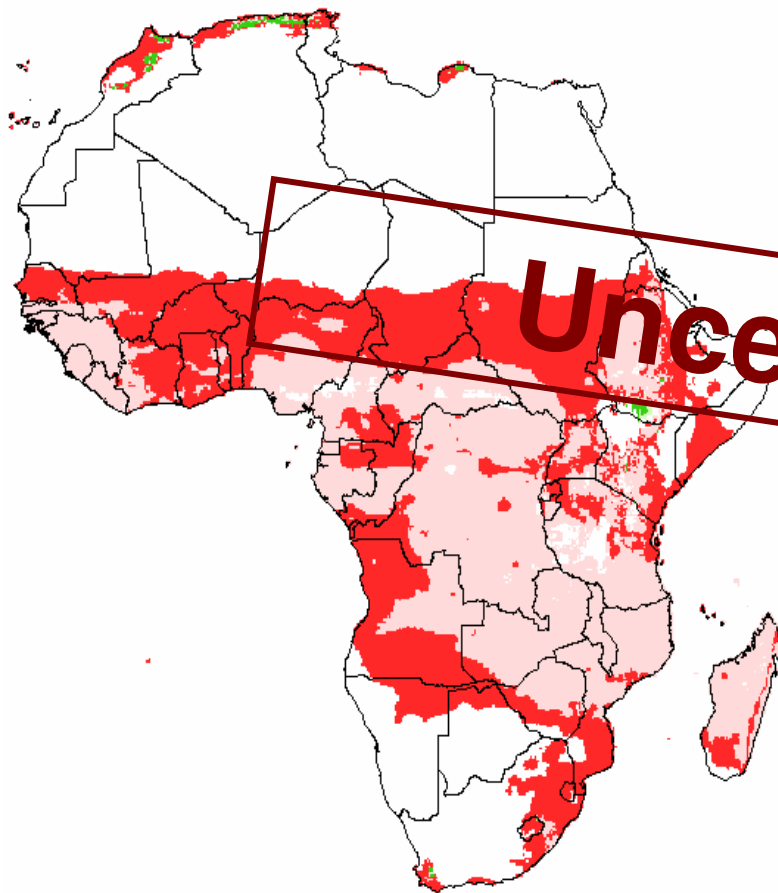
Length of Growing Season

- this model assumes less cohesion

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Some Predictions

LGP Change, 2000-2050, HD A1



Length of Growing Season

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Uncertainty!

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What Will Be Required of Livestock?

- Other implications of climate change
 - » production systems will change to meet the trends
 - e.g. crops for bio-fuels
 - » changes in market values
 - » cause of conflict for resources



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Meeting the Needs of our Children

- What will be required of our livestock?
- Need full range of genetic diversity to secure the needs of tomorrow
 - » a coherent risk management strategy
 - » risk is not theoretical !



Breed Variation is Vital

- In livestock diversity lies both within and between breeds
- Commonly held that 50% of variation is between breeds
- For fitness and adaptation, scientific evidence is > 50%
- Within breed variation is
 - » important but limited
 - » cannot be selected fast enough
- Breed variation
 - » major source for fitness & adaptation
 - » can be deployed quickly
 - paradoxically same reason that underlies much of breed loss!

Breed Variation & Climate Change

- Climate change increases chance of catastrophic events
- Recovery from catastrophes depends critically on adaptation
 - » Simple example ... ½ herd lost due to drought

Reproductive rate	1.05	1.10	1.20	1.5
Recovery time	15	8	4	2

- Breed performance in extreme often more important than average performance



Breed Variation & Climate Change

- Range of options for using livestock genetic resources to manage uncertainty
 - » not only purebreeding and crossbreeding
 - » e.g. multiple breed strategies
 - maintaining mix of breeds
 - breeds of high productivity to capitalise on good times
 - breeds of high adaptation to buffer bad times
- Livestock diversity adds resilience to agricultural production systems

Breed Variation is Vital

- Commonly held at 50% of variation is between breeds
- For fitness and adaptation, scientific evidence is >90%
- Within breed variation is
 - » limited
 - » cannot be selected fast enough
- Breed variation
 - » major source
 - » can be deployed quickly
 - paradoxically same reason that underlies much of breed loss!

**Breed variation IS
important to future
food security !**

Summary

- Time of rapid change
- Uncertain future
 - » needs, markets, production environments, production systems
- Breed variation hold important variation
- Breed variation is being selectively lost
 - » towards a single 'basket' suited only for current needs
- Need for breed conservation strategy now that is
 - » comprehensive
 - » global
- Breed variation mitigates climate change, adds resilience

2. The Need for Frameworks





International Frameworks

- Agrobiodiversity should be made a basic component of climate change adaptation strategies
- No co-ordination of international agreements

Dr Belgis Osman-Elasha

- » UN Framework Convention on Climate Change
- » Convention on Biological Diversity
- » International Treaty on Plant Genetic Resources



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September 2007



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- » Needs to be implemented!



National Framework

At community level

- Social issues dominate over environmental
- What is government doing?

Dr Trevor Hill



National Framework

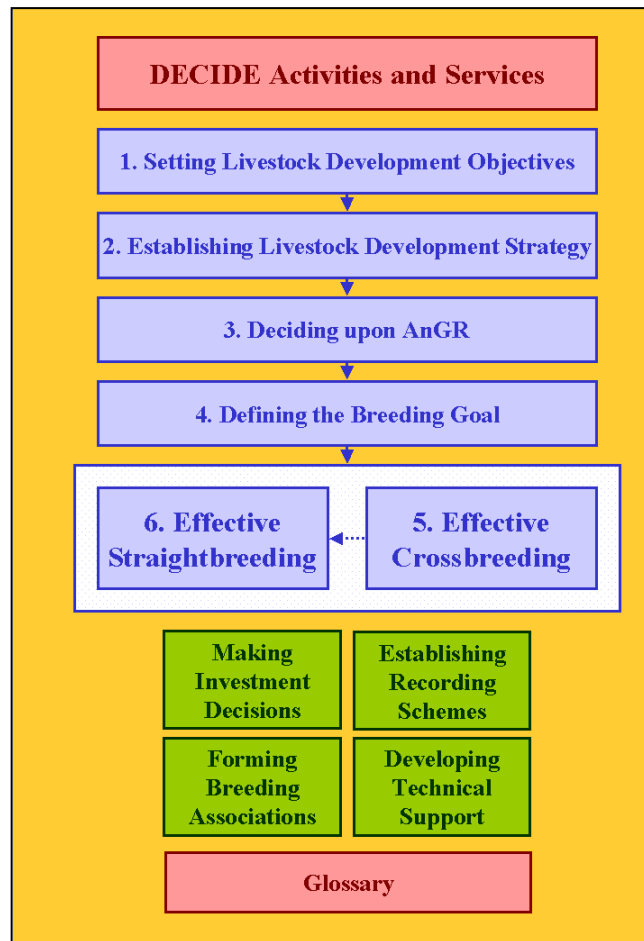
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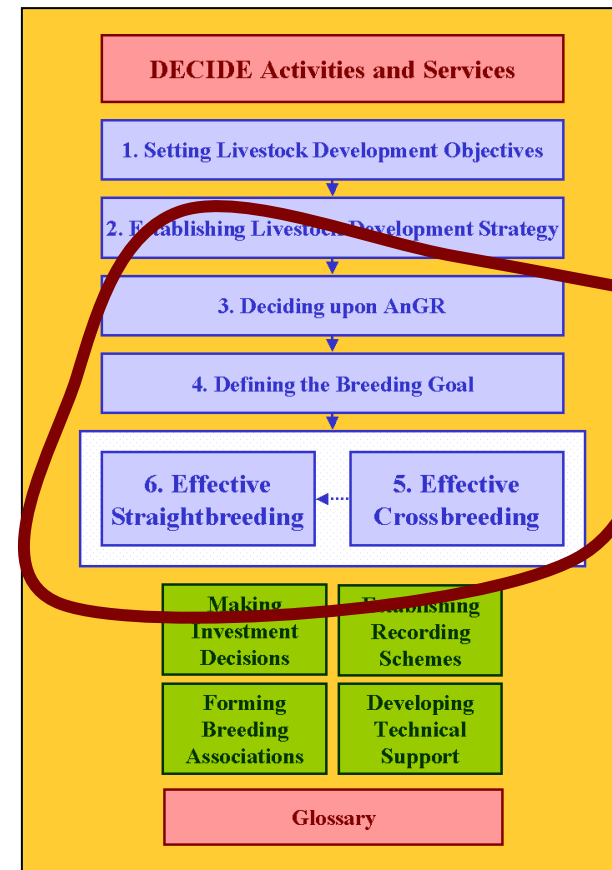
- Need for
 - » development direction to be understood
 - » enabling policies in place
 - » cohesive policies
 - » support services

Development of Breeding Guidelines



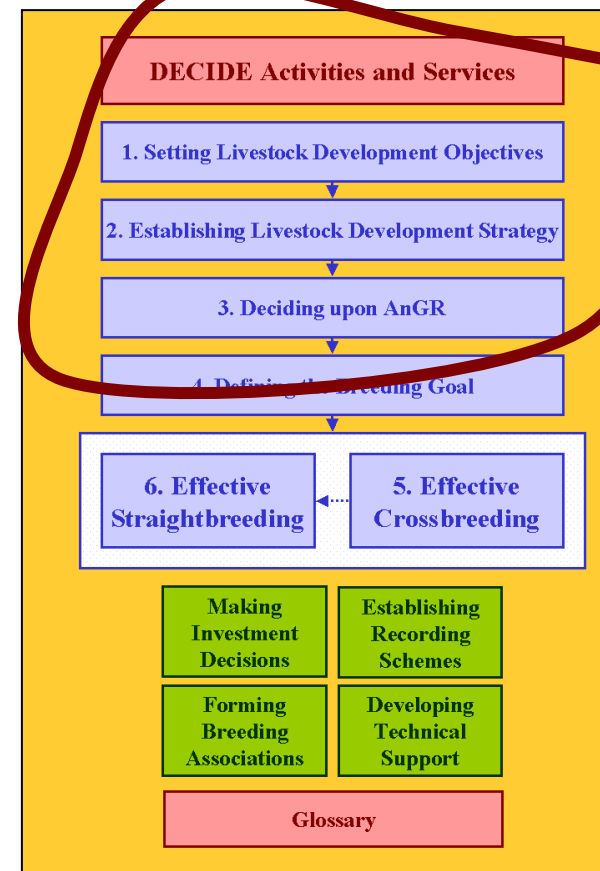
Development of Breeding Guidelines

- Here are the traditional 'breeding activities'



Development of Breeding Guidelines

- Major part of Guidelines involve Governments
 - » Setting Livestock Development Objectives
 - » Establishing Livestock Development Strategy
 - » Deciding upon AnGR
- It is here that Biodiversity, Climate Change Adaptation & Mitigation needs to be addressed nationally!





Summary

- Need to integrate global plan of action with other international frameworks
- Need to implement Global Plan of Action
- Need to encourage coherent national development objectives and livestock development strategies

3. Research and Development Needs





Research and Development Needs

- Wide area!
- Focus on just one aspect, genomics



Research and Development Needs

- Technology is developing very, very rapidly
 - » 10 years ago biodiversity study with 30 loci was 'state of the art'
 - » today 50,000 loci genome wide is cheaper, quicker, less error prone
 - » can look within genomes for patterns of diversity
- FAO's MoDAD provided guidelines for genetic diversity studies
 - » gave such studies scientific credibility
 - highly successful initiative
 - » require revision to guide application of new technology



Research and Development Needs

- Disease is a continual challenge
- Climate change is expected to create additional challenges
 - » e.g. Bluetongue
- New technology offers new approach to using variation to increase resistance
 - » selection within breeds
 - » identified QTL introgressed between breeds
 - » reduced requirement for pedigree, long-term phenotyping
 - » need to have proof of principle studies
 - » John Williams will give more details

4. Conclusions





Conclusions

- Livestock provide a route for sustainable livelihoods
- Livestock diversity has an essential role in mitigating climate change, and adding resilience
- Need integration of international frameworks, including Interlaken Declaration and Global Plan of Action
- Need implementation of Global Plan of Action
- Need governments to develop coherent livestock strategies
- Need to take advantage of new scientific opportunities arising from the technological revolution in genomics