Economics of brucellosis

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Workshop: An Integrated Approach to Controlling Brucellosis in Africa, Addis Ababa, 29-31 January 2013

Content

1. Brucellosis research at CSRS
2. Urbanisation of brucellosis
3. Socio-economics of brucellosis
4. Cases studies
5. Area of capacity building
6. Conclusions

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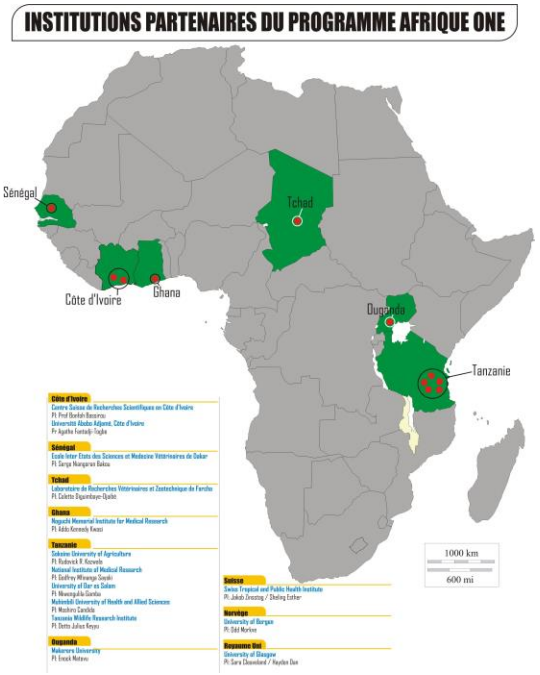

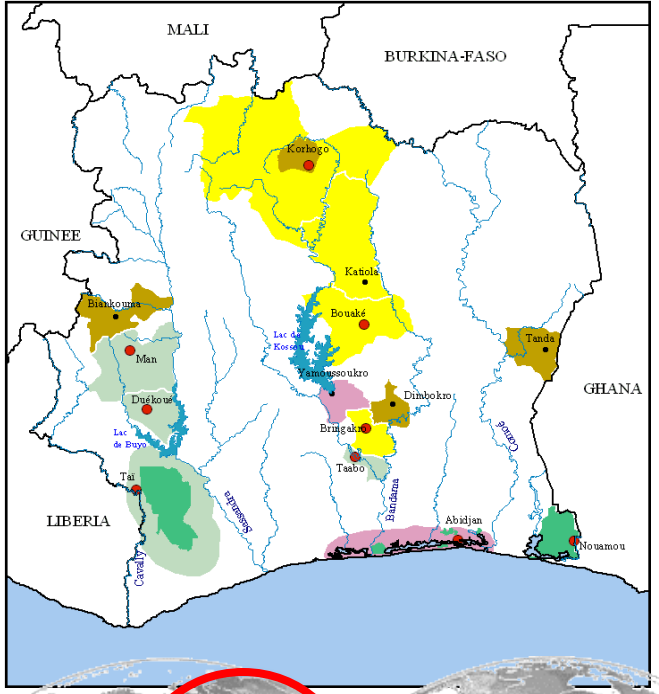

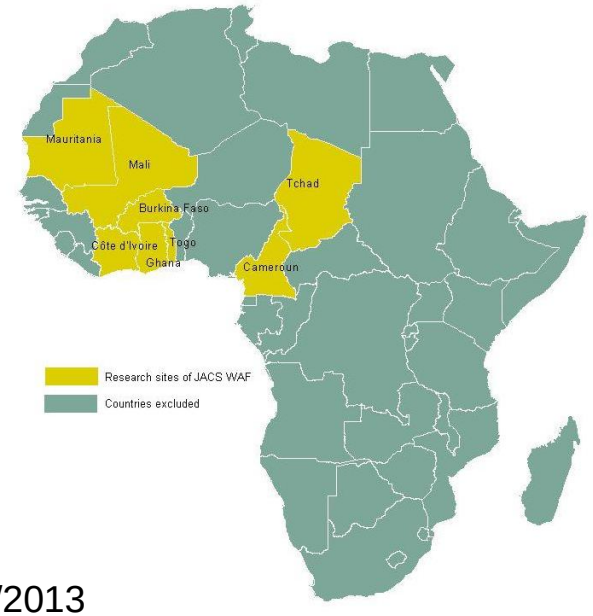

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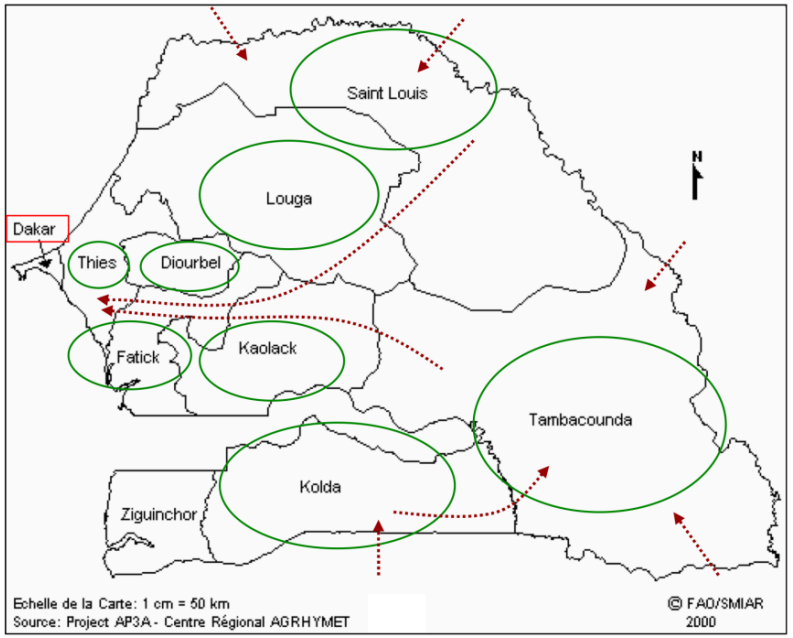
Brucellosis studies

- Brucellosis control (mass vaccination)
  - Mongolia, Kirghizstan
- Brucellosis surveillance system (abattoir)
  - Senegal
  - Kirghizstan
- Joint human-animal seroprevalence
  - Sahelian zone: Mali, Senegal
  - Humid zone: Togo, Côte d'Ivoire
- Brucella strain mapping in West Africa



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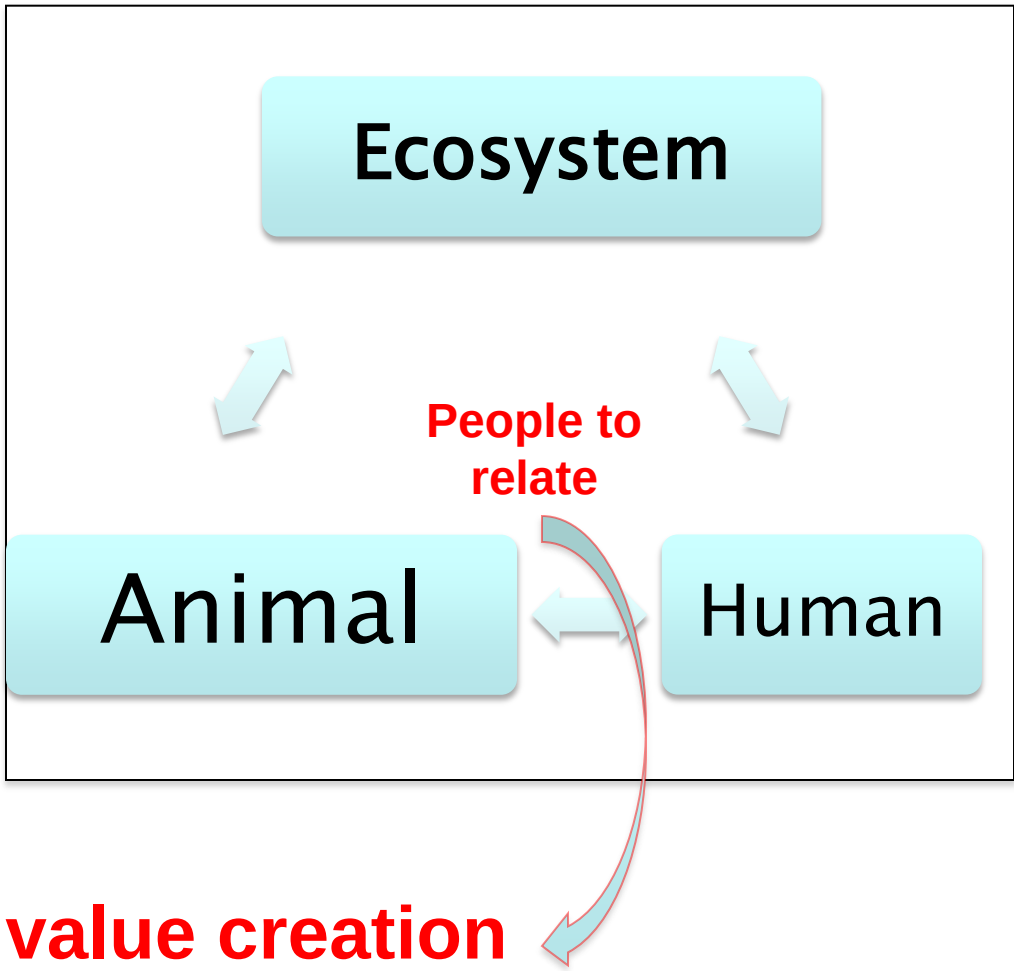
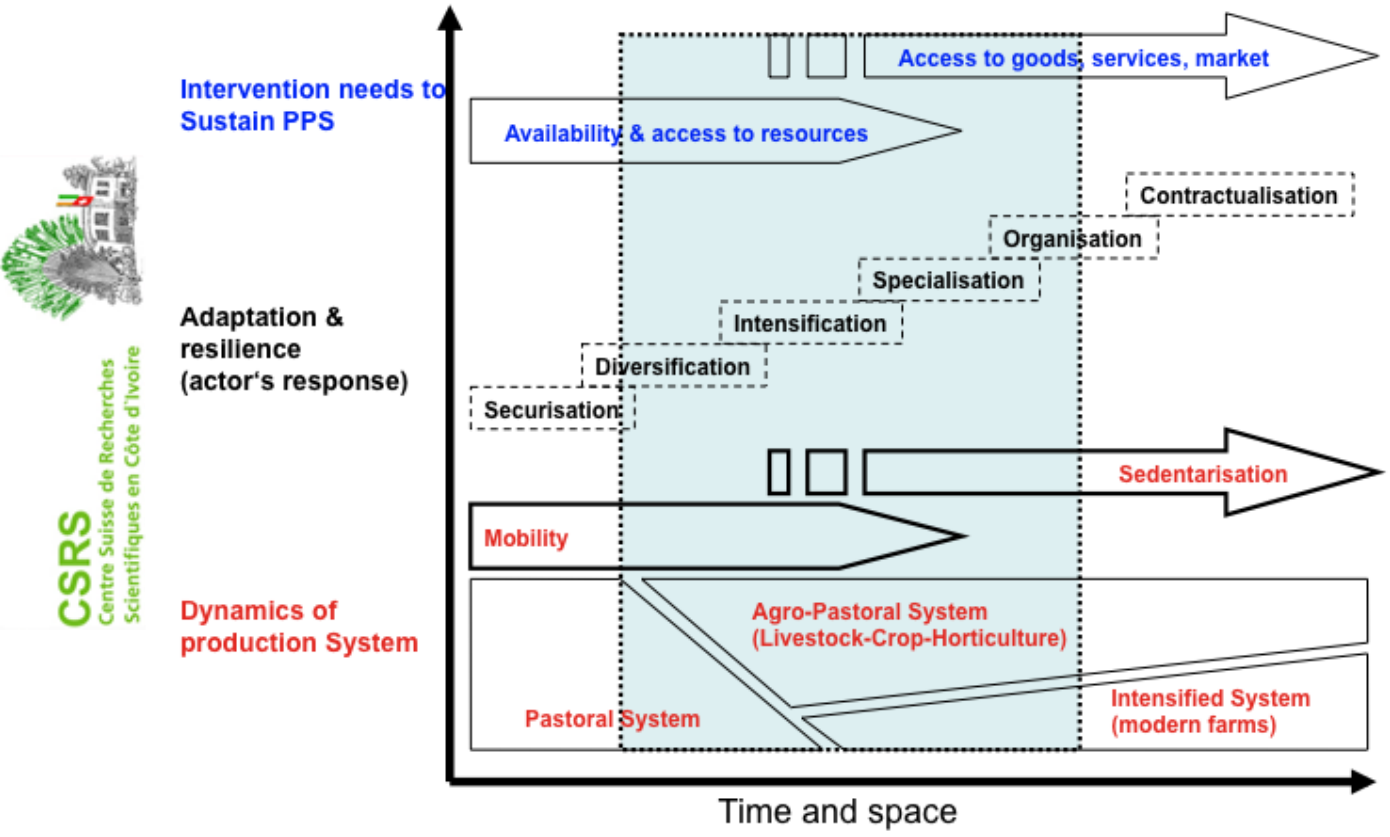
Evidence in value added for decision

Tackling health complexity with discipline & Knowledge fragmentation



Transformation of production system

Transformation of livestock production system



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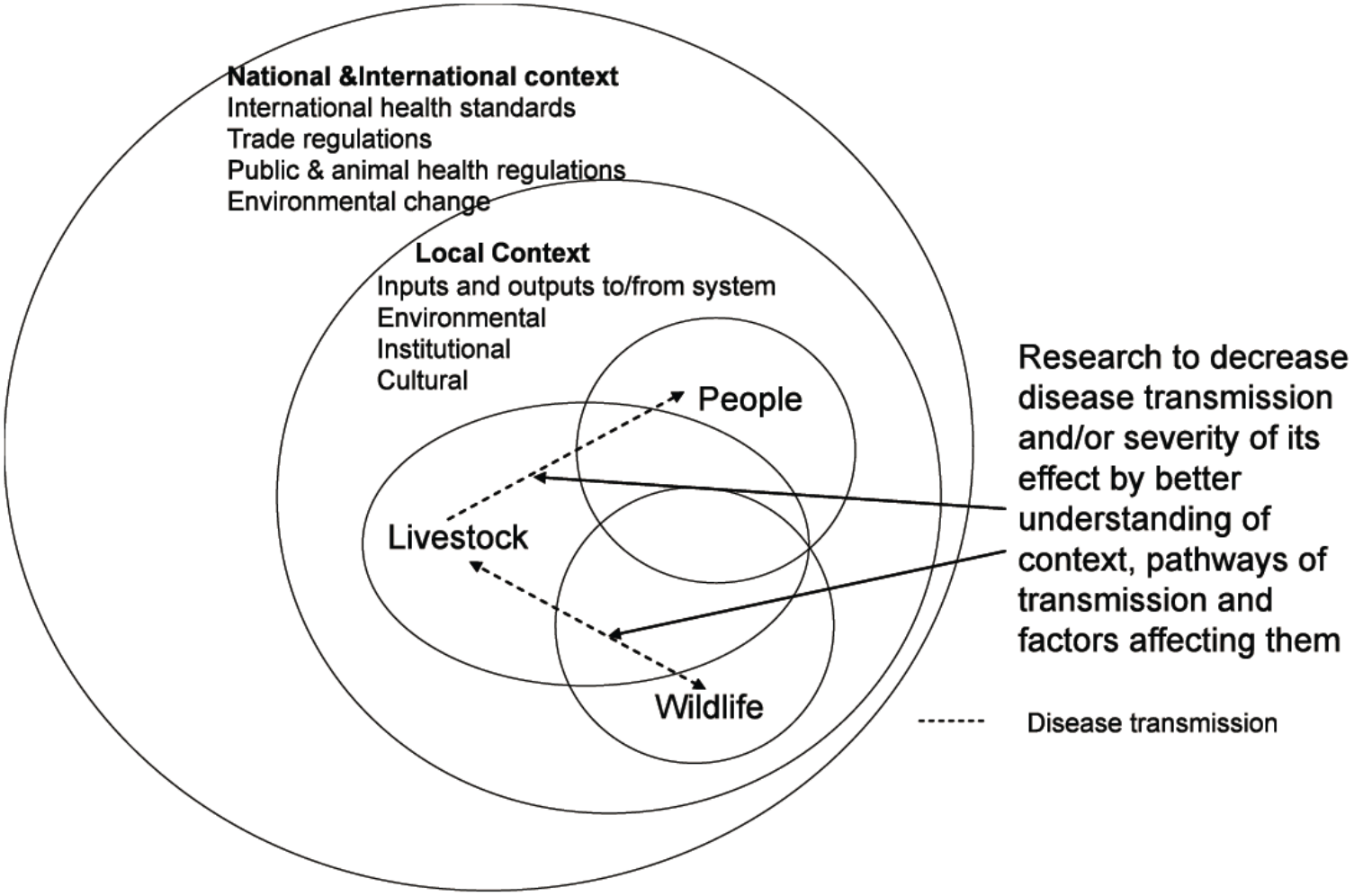
- Herding
- Marketing
- Consumption patterns
- Legal aspects
- Genetic improvement
- …

Context and institution matter



Urbanisation of brucellosis in Africa

- In Africa, livestock is a faster way to get the population **out of poverty** (Alive, 2012)
- Livestock is also a contreverse as far as green gas emission and soils/ **pasture degradation** are concerned (Livestock long shadow)
- Demand in protein is increasing due **population growth and income** generation..
- Livestock while contributing to **food security and livelihoods** of the population can spill out **diseases** (majority of zoonoses are from animal origin).
- The control is possible in the reservoir but there is **imbalance resource** allocation…unknown true burden.

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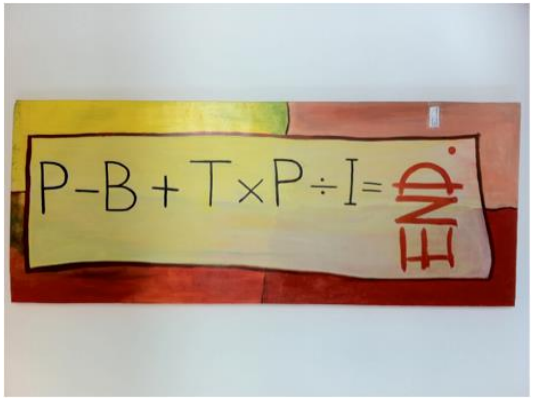
Socio-economics of brucellosis

What is the burden?

Public health of economic perspective

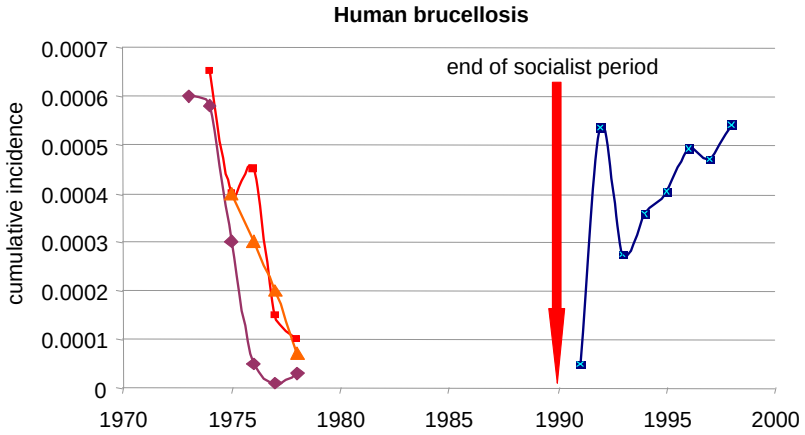


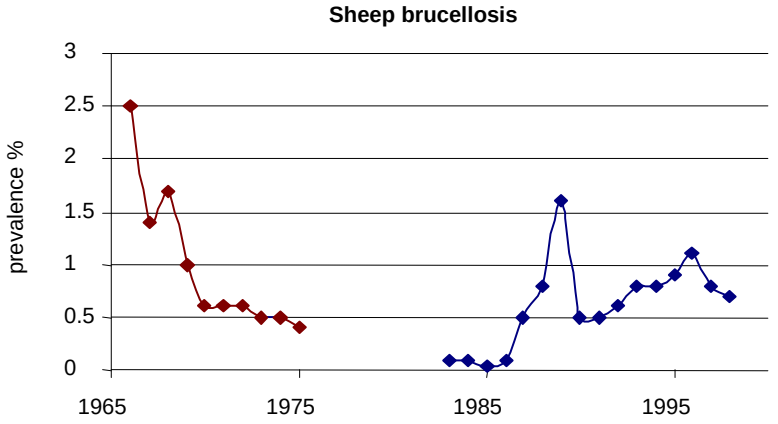
Is brucellosis a priority? Is there evidence for intervention decision ?

- Contact network and interfaces
- Estimates and data quality
- Targeting intervention with epidemiological parameters (age groups, species, zones, …)
- Cost of the disease, cost-effectiveness
- Benefit sharing
- Incentives (services) for actors

Intervention in Mongolia

- Test & slaughter 1960; Vaccination 1970/80
- 1990: Privatisation stop of surveillance
- 1996-98 WHO planned vaccination campaign





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Objectives of economics

1. Estimate the damage of Brucellosis
2. Cost effectiveness analysis to human population
3. Estimate economic gain from all flock vaccination

Methods and data collection

Methodology

- patient based household survey
- Inventory of existing data
- Delphi study on human Brucellosis
- Delphi study on animal Brucellosis
- Theoretical deterministic model of animal to human Brucellosis transmission in Vensim®
- development of @Risk ® -LDPS(FAO)-EXCEL ® spreadsheet (Ecozoo)

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Selection of alternatives

- Current test an slaughter practice (non compulsory culling of positive animals, no state compensation)
- Whole herd vaccination program developed (scenarios of 30-80% effectiveness)
- 2 years all animals then only young ones: Rev1, S19

Modelling: Epidemiologic and Economical considerations

- Animal to animal transmission dynamics
- Simulation of interventions
- Animal to human transmission
- Need for underlying transmission model
- Data quality
  - survey and reported data
  - method standardisation
- Linkage of disease prevalence to
  - livestock productivity
  - health cost
  - linkage to prices

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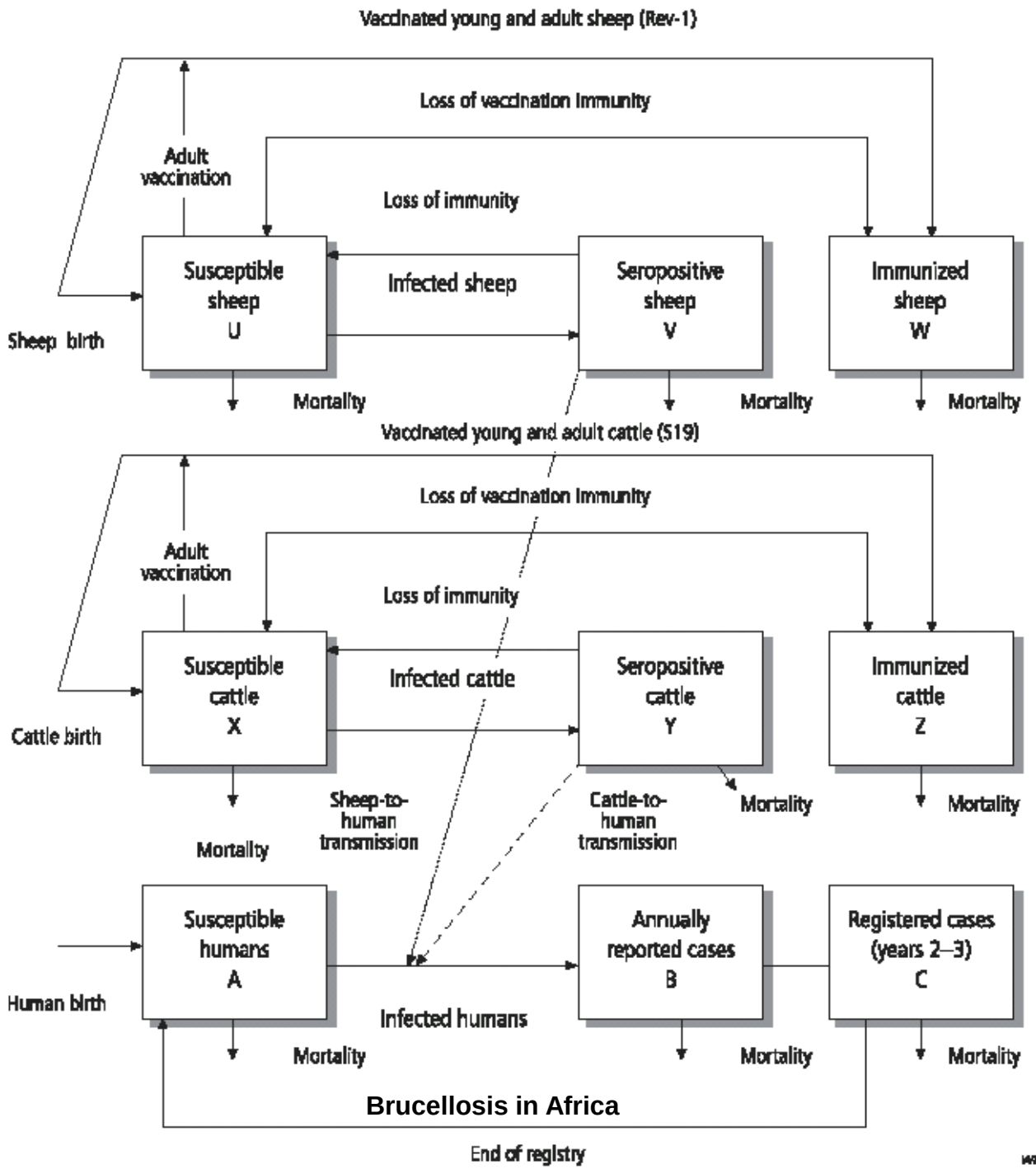

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Link of disease data to livestock production and human health cost

- Human Health
  - Number of cases = Population * Exposure constant * Cumulative Incidence
- Livestock productivity (only fertility and milk production)
  - Baseline Fertility: annual number of offspring per breeding female
  - Fertility= baseline fertility * (1 – (Beta-Pert (10%; 15%; 50%) * Prevalence))

ECOZOO V 1.0: outline*

*disease transmission simulation is not included

Tables

Disease Intervention

Human Health

Animal Production

Economics

Graphs

Livestock production simulations

Cattle Productivity without intervention

Cattle Productivity with intervention

Sheep Productivity without intervention

Sheep Productivity with intervention

Goat Productivity without intervention

Goat Productivity with intervention

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Summary of human health cost

Inpatient costs
Outpatient costs
Out of pocket expenses for health care
Informal Treatment costs
Loss of income
Coping costs

Outcomes of Household study

Estimation of parameters

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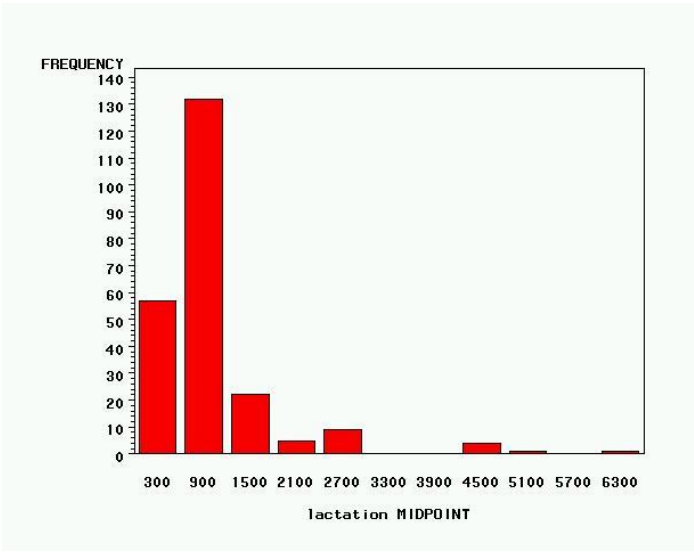
Milk production
Fertility rate
Mortality rate
Herd structure



Linking disease prevalence and livestock productivity

- What is the loss of livestock production from brucellosis
- Main effect on fertility
- Baseline fertility
  - Cattle **0.7** calves / cow / year; 1000 l milk / cow / year
  - Small ruminants **1.2** lambs / ewe / year
- Livestock productivity Baseline Fertility: annual number of offspring per breeding female
  - Fertility= baseline fertility * (1 – (0.15)*Prevalence)
  - Cattle **0.695**, Small ruminants **1.195**
  - Milkproduction = baseline * (1–0.15)*Prevalence)
  - Cattle 996 l milk / cow per year

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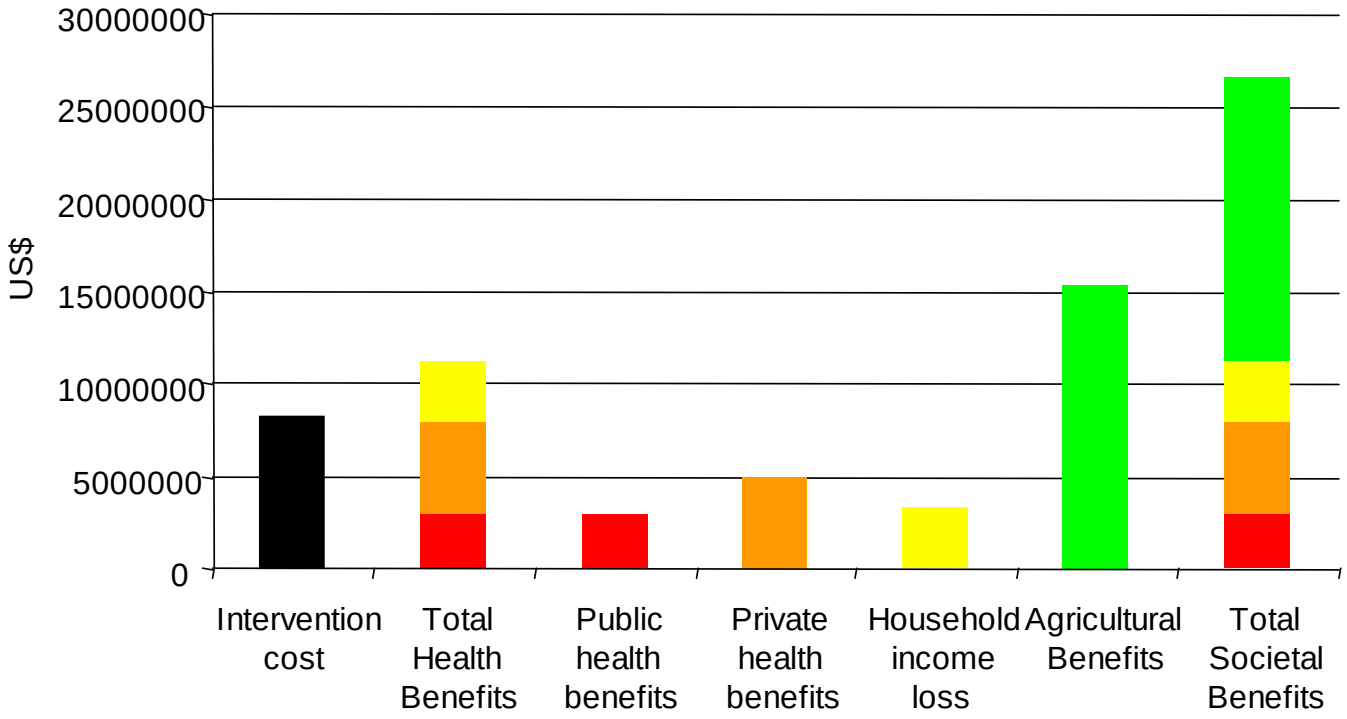
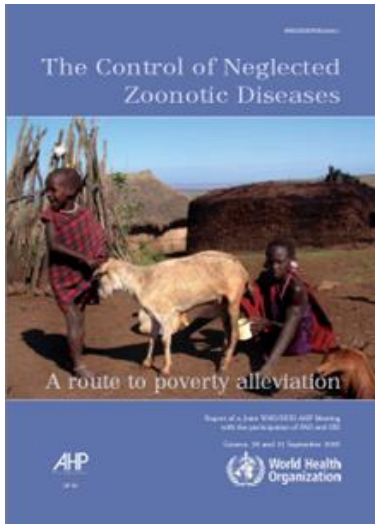
Synoptic view of benefits and costs of animal brucellosis mass vaccination in Mongolia





Other socio-economic factors

- Benefit & benefit distribution
  - Society, private, public health, agric sector
- Costing interventions
  - Diagnostic, surveillance, control (laboratory, reagent, sampling, vaccine production)
  -
- Research area
  - Fertility, productivity, household economics, DALY, strain for vaccine,modelling transmission

Other case studies

Surveillance in Kirghystan

- Representative animal and human brucellosis prevalence and incidence
  - The study aimed to establish the brucellosis **sero-prevalence in livestock** and the **incidence of newly recorded human** cases representative for Kyrgyzstan.
  - The sampling frame is a multistage cluster sampling by levels of **Oblast**, **Rayon, village** and **households**

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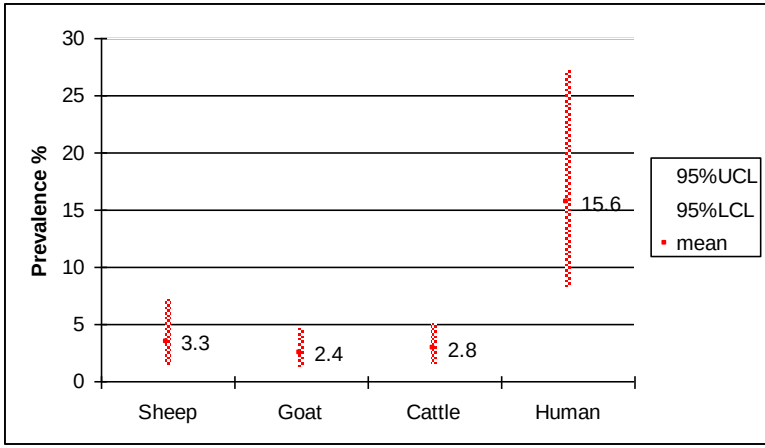
Reducing surveillance cost

- Dialog and intersectoral approach
- Capacity building (eg. quantitative epidemiology)
- Lab analysis (mutualisation of resources)
- Cost of the representative prevalence study ~60‘000 Dollars
  - ➔ method could reduce the cost of the national surveillance program



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Joint sampling

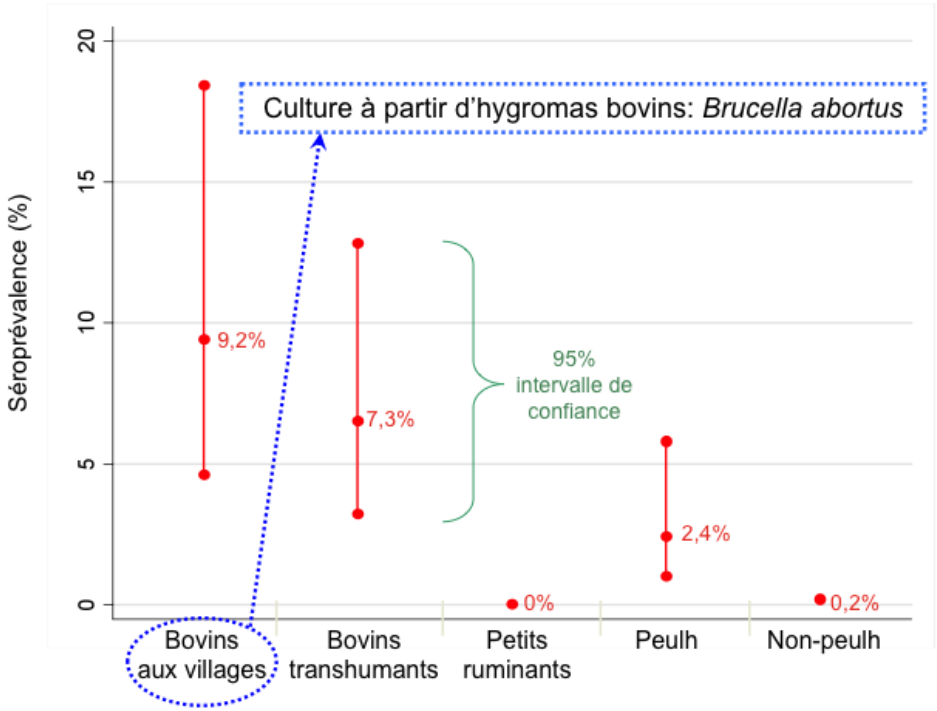
Prise de sang par l'infirmier

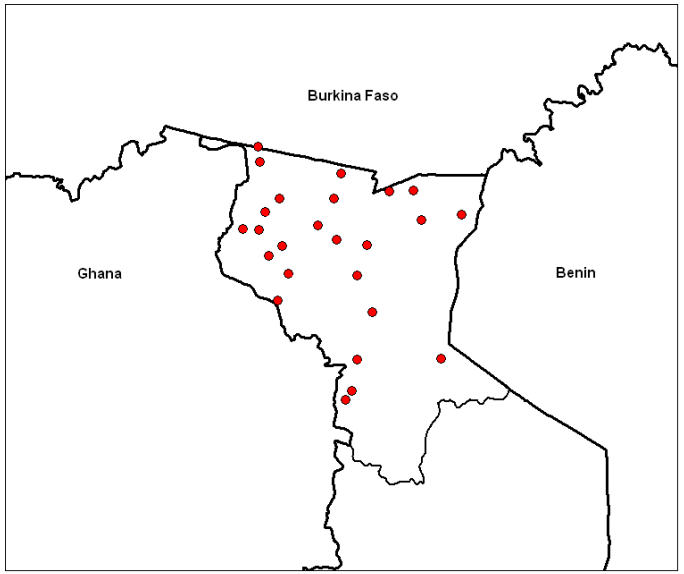
Prise de sang du bétail

Cross-sectional study Togo

- 683 peoples, 596 bovines, 686 small ruminants in 25 villages (juin-juillet 2011)
- 464 transhumants from Burkina Faso (février-mars 2012)

Résultats: Séroprévalence de la brucellose





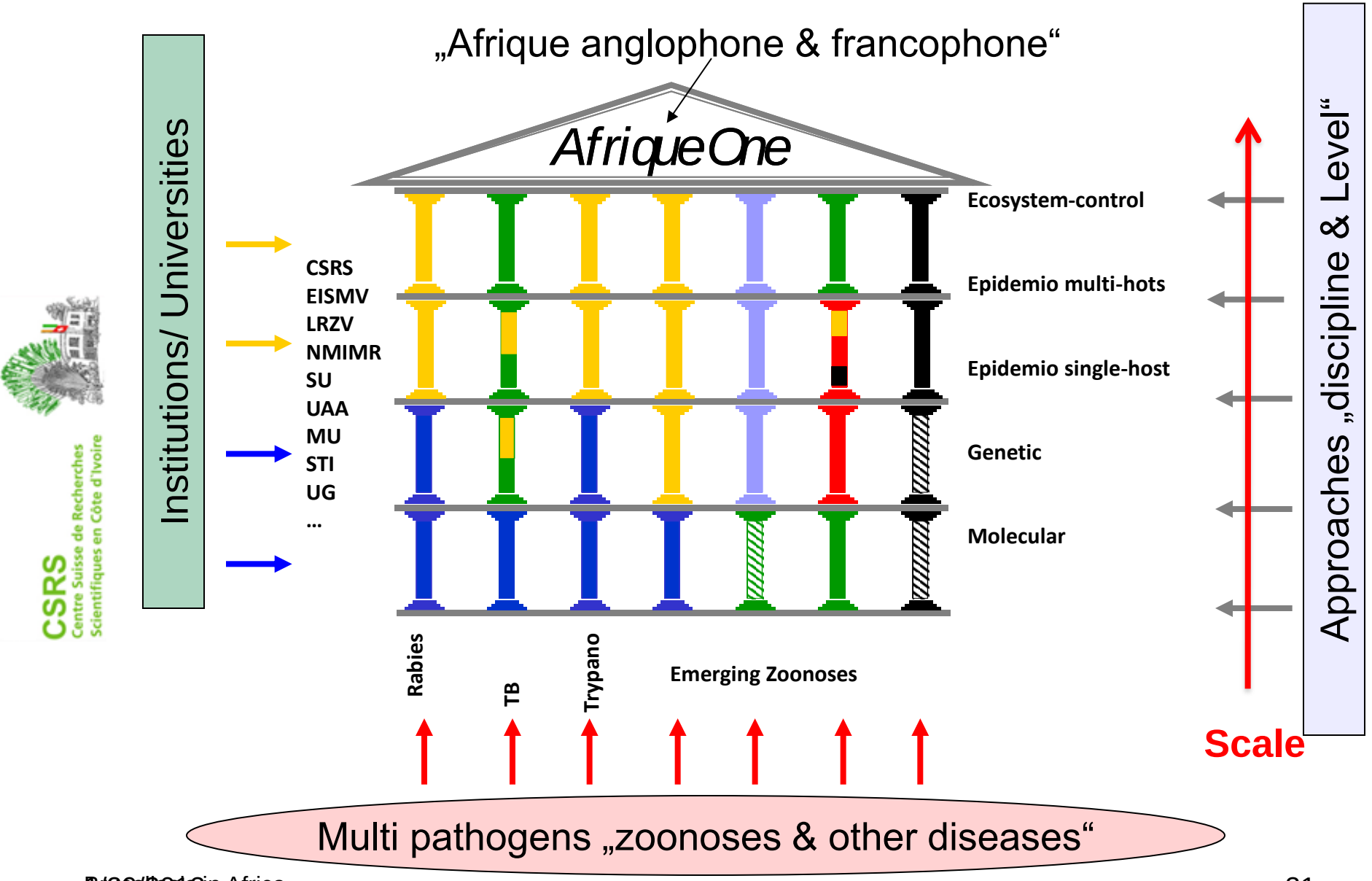
Villages randomly selected

Abortion risque for Brucellosis: OR 3.8 (95%IC: 1.2-12.1) (previous year adjusted for age)

Actors capacity building

New generation of researchers, practitionners and decision-makers

Afrique One set up



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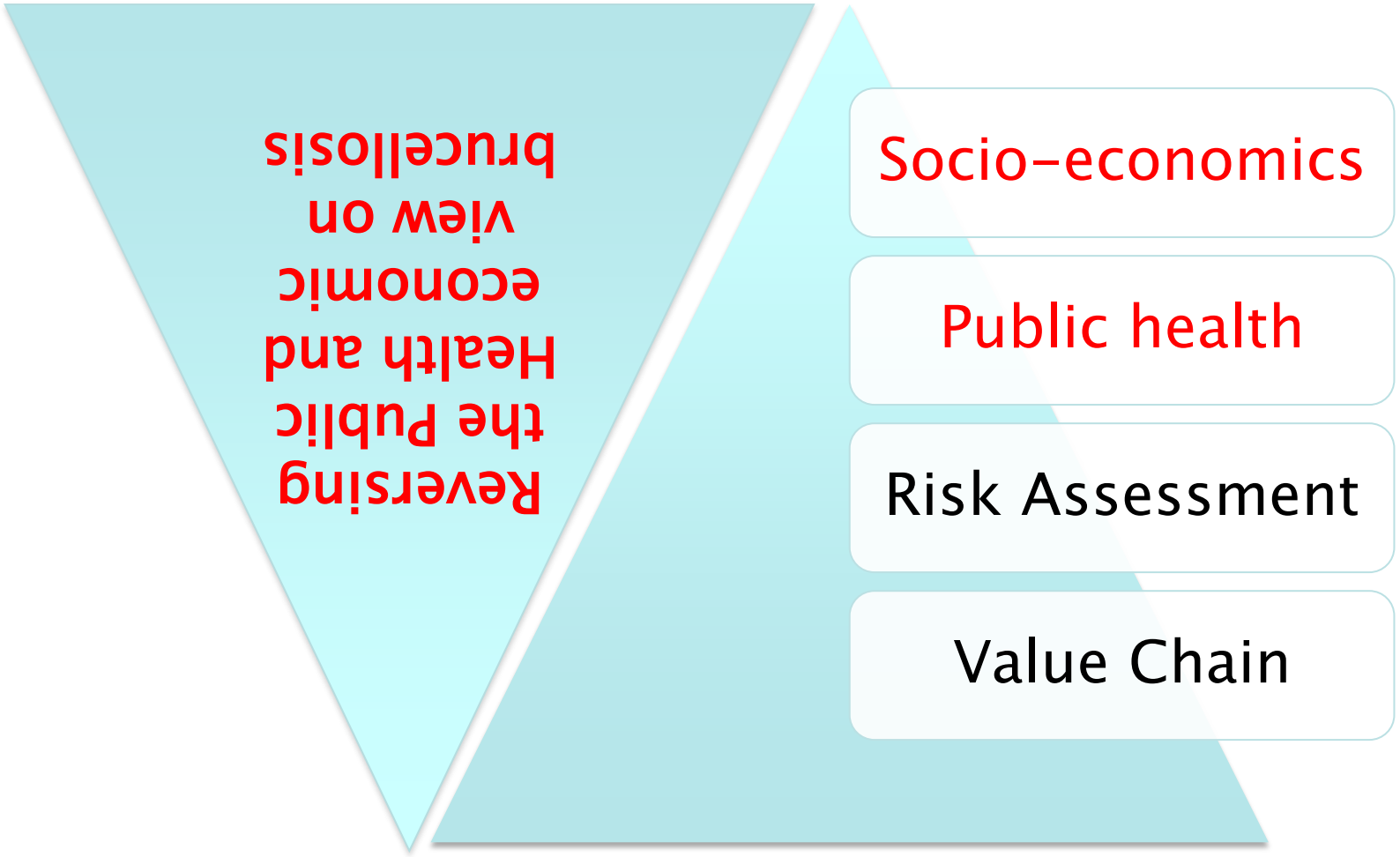
New research perspective



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Conclusion

- Situation better known in animal than in human
- Test and slaughter policy is very not likely applicable (compensation, logistics…)
- Option of mass vaccination in semi-intensive and intensive production system
  - Reduce transmissio at a level te prevent human infection
  - Cutting transmission by pasteurisation, marketing system
- Combining brucella vaccine with other dead vaccines….
- Evidence based advocacy and policy influencing
- Methodological tools on cost-benefit analysis of disease control based on brucellosis case study

Africa 2013
Ecosanté/Ecohealth

- 2nd African meeting of researchers, practitioners and policymakers in human health and ecosystem approach
- 1st African Regional Conference of the International Association for Ecology and Health

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Communauté de Pratiques en Ecosanté de l'Afrique de l'Ouest et du Centre (COPES-AOC)
Ecohealth Network of East and Southern Africa
International Association for Ecology & Health (IAEH)
Universities of Côte d'Ivoire

Gate	Date	Destination	Itinerary
Africa 2013	01 - 05 October 2013	Hôtel Ivoire Abidjan, Côte d'Ivoire	Global change: causes and consequences on health Adaptation and behavior change: integrated approaches From research to action: relationship between communities, researchers and policymakers

Passenger
You

Destination
Hôtel Ivoire
Abidjan, Côte d'Ivoire

Date
01 – 05 October 2013

BOARDING PASS

Population resilience to global change:
New approaches to behavior and policy change

General objective: To contribute to the dissémination and sharing of knowledge and practices among researchers, practitioners and policy makers on integrated approaches and transdisciplinary methods in connection with population adaptation to global changes.

Africa 2013
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