LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Economic Evaluation of Animal Health Surveillance

LinkTADs workshop

Design and evaluation of animal health surveillance systems

25th -27th April 2016, Qingdao, China

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

Presentation outline

- Useful definitions
- What is economic evaluation
- Why do we need economics?
- Challenges
- Economic evaluation methods
- Practical

cirad

LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Useful definitions

- **Monitoring**: to observe a situation for any changes that occur over time.
  - E.g.: Monitoring the quality of the suspicion forms received every month

- **Evaluation**: the comparison of actual impacts against strategic plans. It looks at original objectives, at what was accomplished and how it was accomplished
  - E.g.: Evaluating if the surveillance system meets its objective

cirad

LinkTADs
Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Useful definitions

- **Efficacy**: Ability to produce a desired amount of a desired effect.
  - E.g.: The ability to have a sensitivity of 90%
- **Effectiveness**: The capacity or potential for achieving results. The property of being effective (efficacy), of achieving results.
  - E.g.: The sensitivity is sufficient to meet the surveillance objectives
- **Efficiency:** The extent to which a resource is used for the intended purpose.
  - E.g. the ratio of useful work to energy expended
  - E.g. the ratio of effectiveness according to cost of my system

cirad

What is economic evaluation?

- Economics is about making choices between alternative uses of limited resources. It is about studing the i**mpact on the well-being of different groups of people in society and for society as a whole**.
- Economics is not only about finance (What is the cost?)
- Economics is about social behaviors for ressource allocation (which decision I need to make?)

- Economic evaluation of surveillance systems/components should be required **as an aid to decision-making in surveillance to inform the allocation of scarce resources**.
  - Value of different strategies
  - Facilitate decision about ressource allocations

cirad

LinkTADs
Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Why do we need economics?

- **Because budget is often (always!) limited**
- **Allocation of ressources in Animal health surveillance is not always optimum**
- **To make choices between different options**

cirad

LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Challenges?

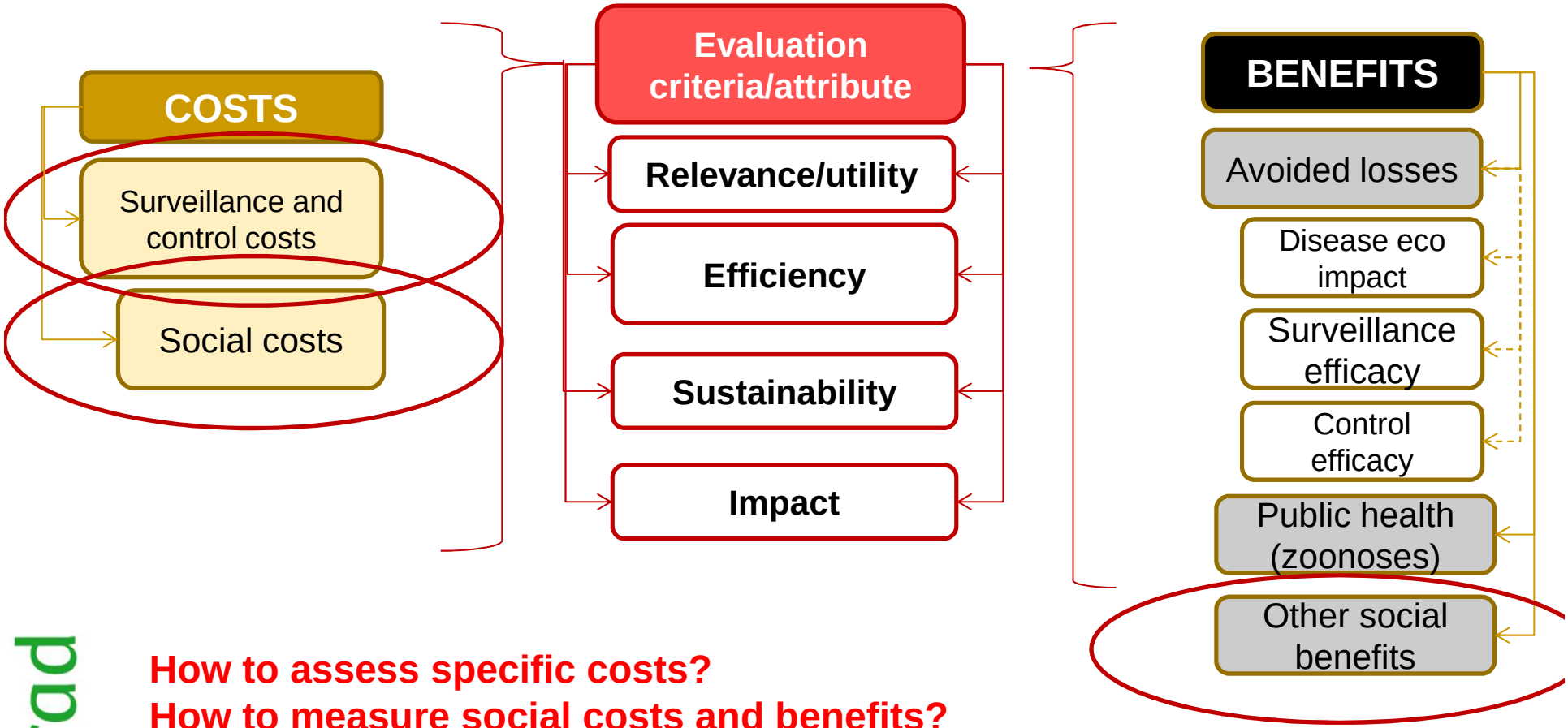
- Decision is not always based on scientific evidence, other factors
- Economic issues are not always the first concern

However

- Decision makers are requesting more and more information on the economics
- Recent but growing field in animal health surveillance

Source: Calba, C, Goutard, F. L, Hoinville, L., Hendrikx, P., Lindberg, A., Saegerman, C. & Peyre, M. Surveillance systems evaluation: a review of the existing guides. **BMC Public Health.2015**, 15:448. DOI: 10.1186/s12889-015-1791-5.

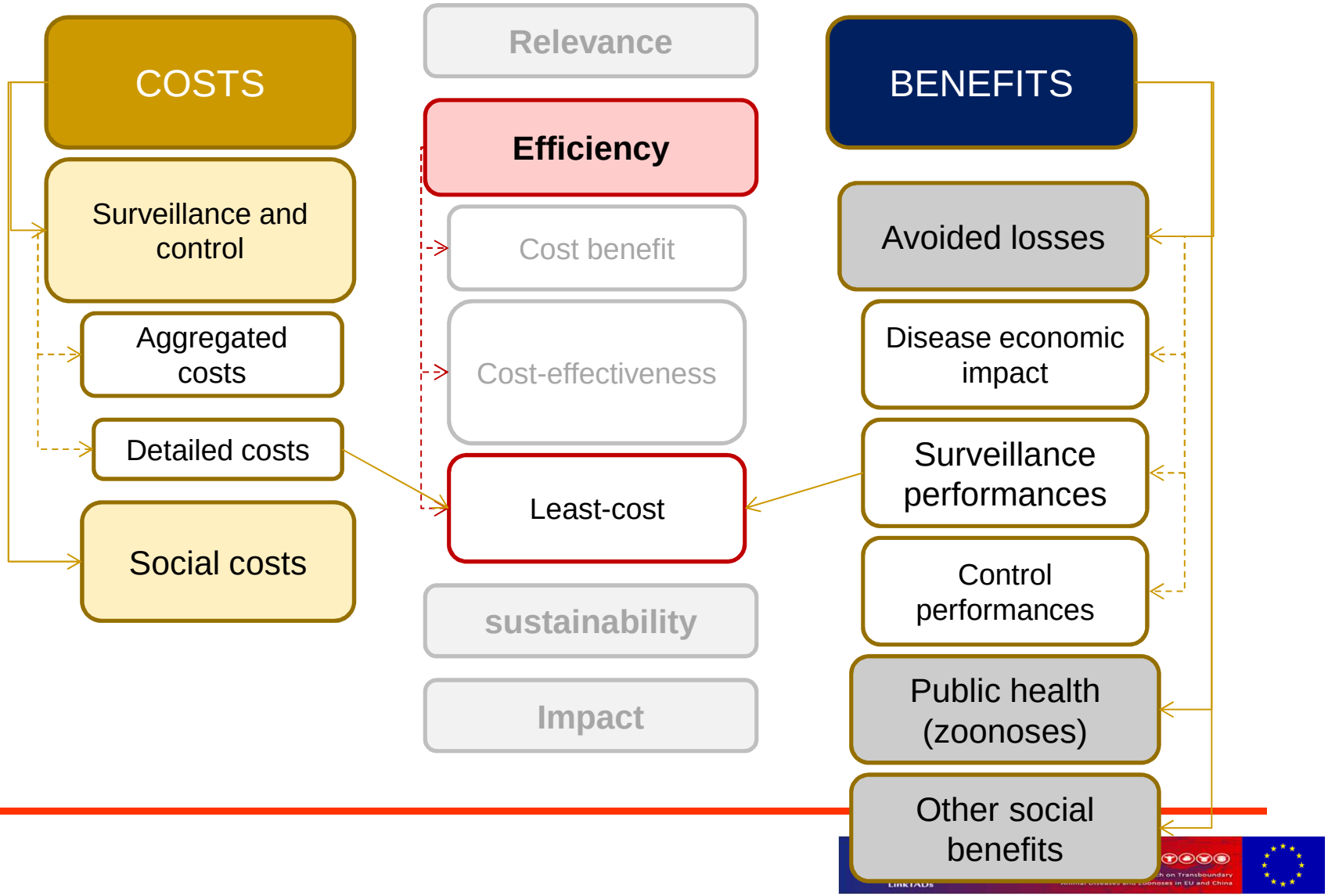
Economic Evaluation of Animal Health Surveillance and control programs



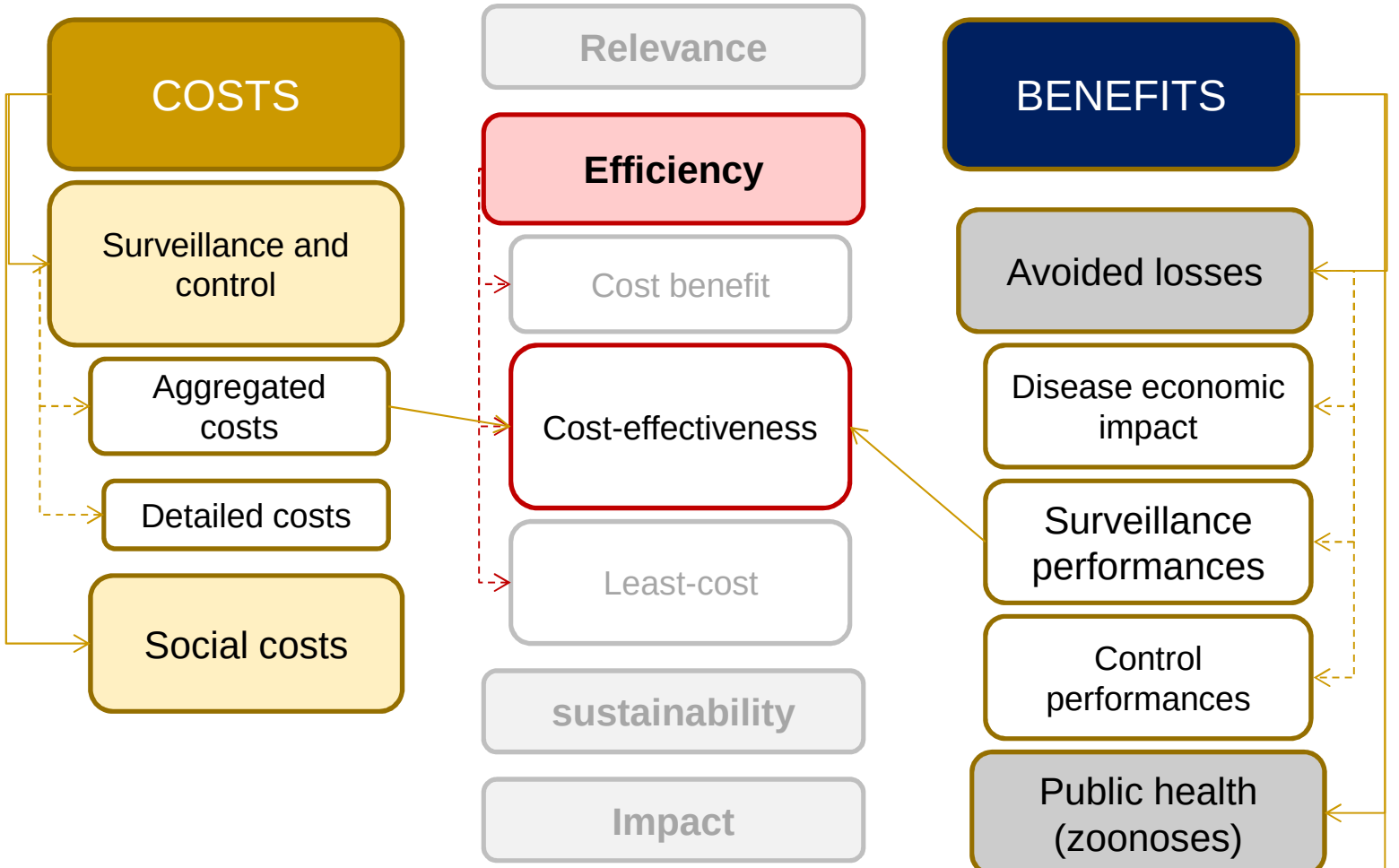
How to assess specific costs?
How to measure social costs and benefits?

cirad

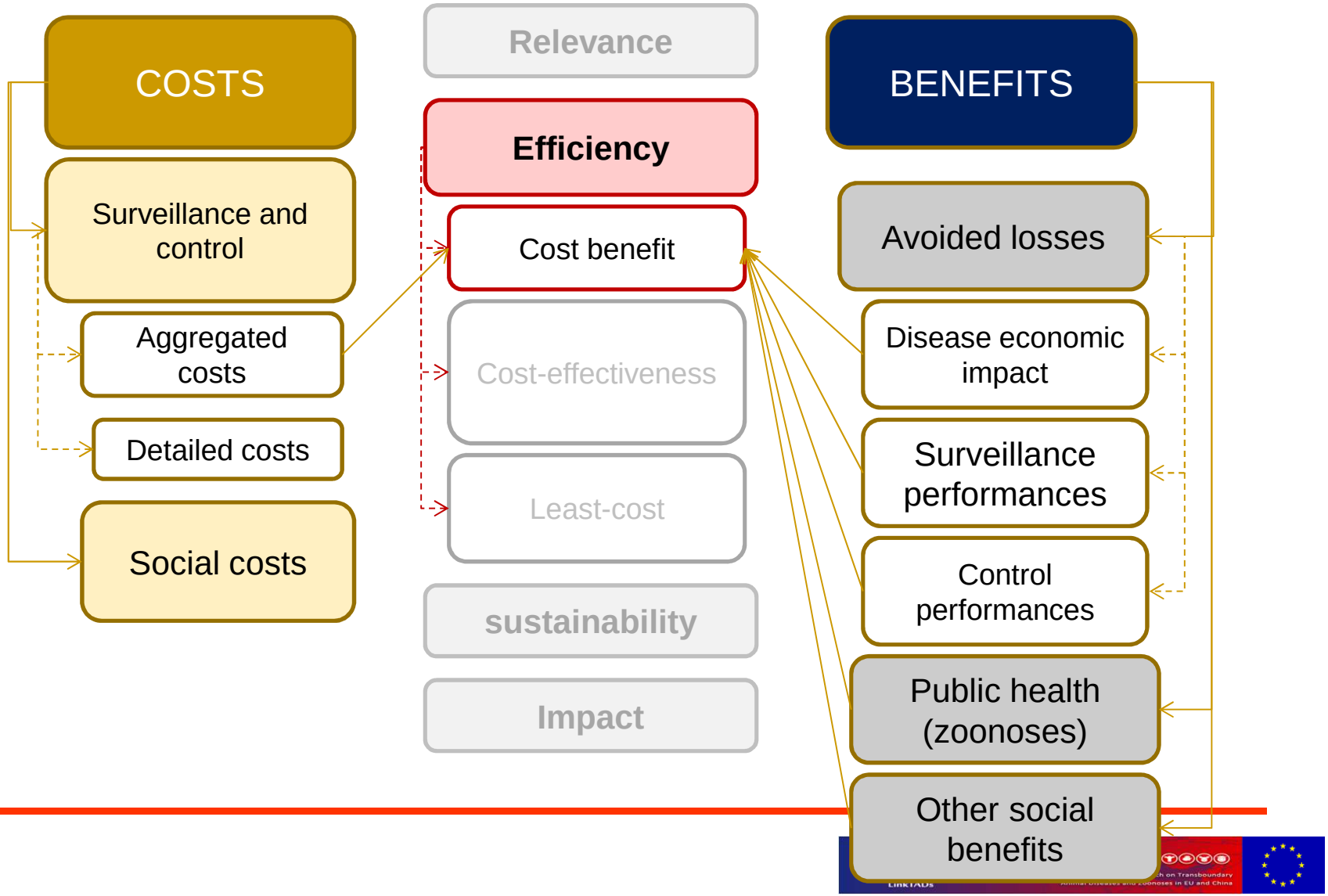
Economic Evaluation of Animal Health Surveillance and control programs



Economic Evaluation of Animal Health Surveillance and control programs



Economic Evaluation of Animal Health Surveillance and control programs



Economic evaluation methods

- **Cost analysis**: about finance not economics ! (but required for any economic evaluation)
- **Least-cost analysis**
- **Cost-effectiveness analysis**
- **Cost-benefit analysis**

cirad

LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Cost analysis

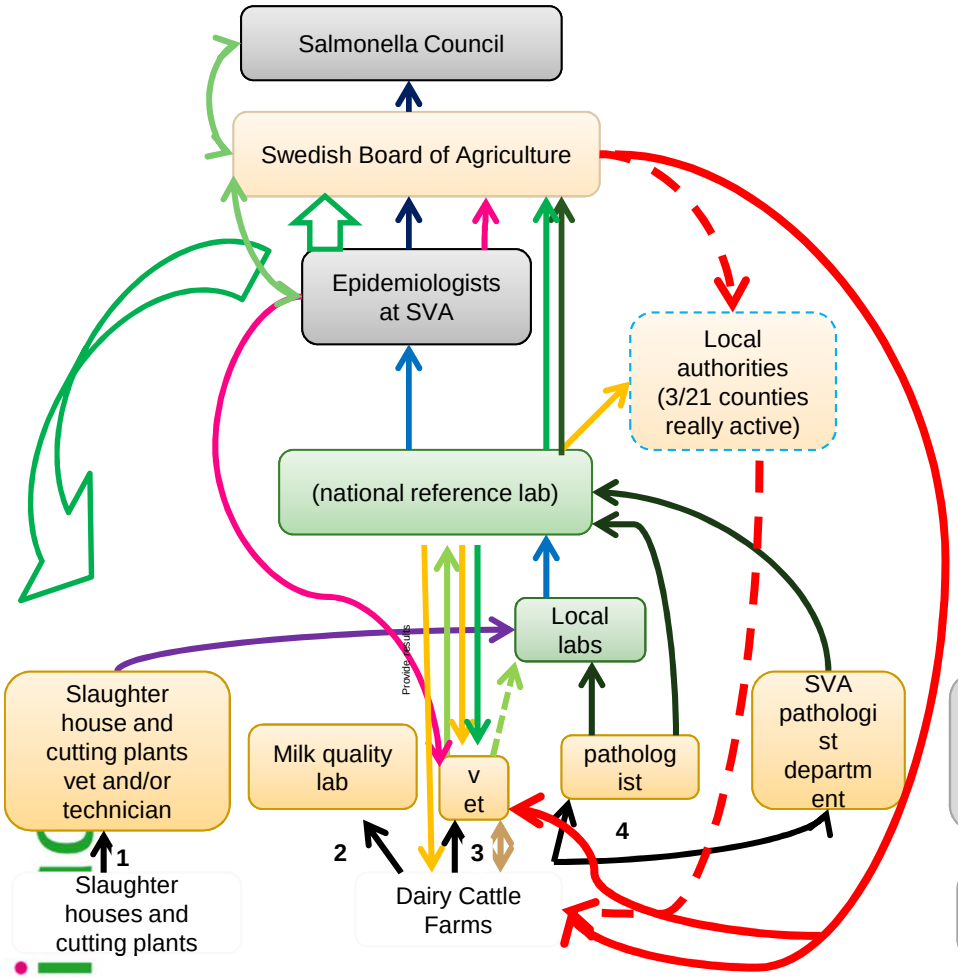
- First step in conducting an economic evaluation
- Assess the total costs of components
- Distribution of costs among surveillance activities and stakeholders involved
- Proportion of fixed and variable costs
- Allows comparison between different component designs: only variable costs
- **Limits**: laborious to identify all the costs; limited availability of data
- **Solutions**:
  - Use system mapping to identify all actors/actions and related costs
  - Use comparative analysis: only need to measure changes in costs between the options

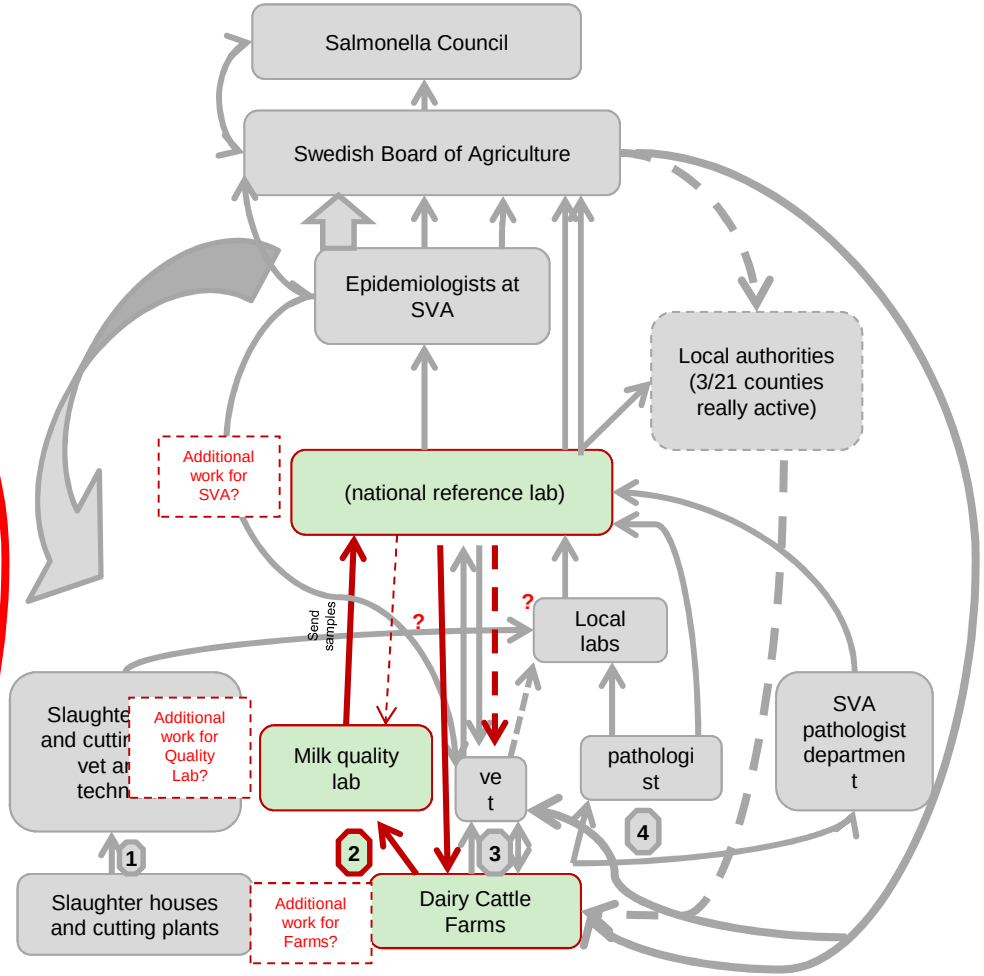
cirad

LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Comparative cost analysis





Least-Cost analysis

- Identify the cheapest among different possible options **producing the same outcome (e.g.effectiveness)**.
- The cost is the most important factor in a choice between different options,
- The outcome is fixed.

Implementation:

- Select option with same effectiveness
  - compare if effectiveness known
  - assess effectiveness and compare
- Rank the options according to the cost

cirad

LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Example least-Cost analysis

- Comparing Effectiveness
  - Effectiveness criteria: sensitivity ≥ 80%

Component	Sensitivity	Effectiveness criteria
C1	30%	Do not pass
C2	90%	PASS
C3	85%	PASS

- Ranking options according to costs

Component	Sensitivity	Effectiveness criteria	Cost	Least cost ranking
C2	90%	PASS	1700 USD	2
C3	85%	PASS	950 USD	**1**

- **The least cost option is C3**

Cost-effectiveness (CEA)

- Cost per unit of outcome obtained
- To compare the effects of different alternatives
- For comparison, effectiveness measure should be in the same units for all components
- E.G:
  - Cost of surveillance per % of sensitivity
  - Cost of surveillance per time (weeks) between detection and reporting

Component	Sensitivity	Cost
1	30%	5 USD
2	90%	10 USD

Component	Time	Cost
1	2 wks	5 USD
2	1 wk	10 USD

cirad

LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Cost-effectiveness (CEA), Advantages/limits

- Sometimes outputs are difficult to interprete

Component	Sensitivity	Cost/animal	Timeliness	Acceptability
C1	30%	5 USD	2 wks	High
C2	90%	10 USD	1 wk	Medium
C3	85%	8 USD	0,5 wk	High

- What is the added value of C2 compared to C3?
- Is it worth it to double the cost for 5% increase in sensitivity?
- To interprete results:
  - Add more effectiveness criteria (e.g. Timeliness, Acceptability)

And/or

  - Compare the benefits of the components

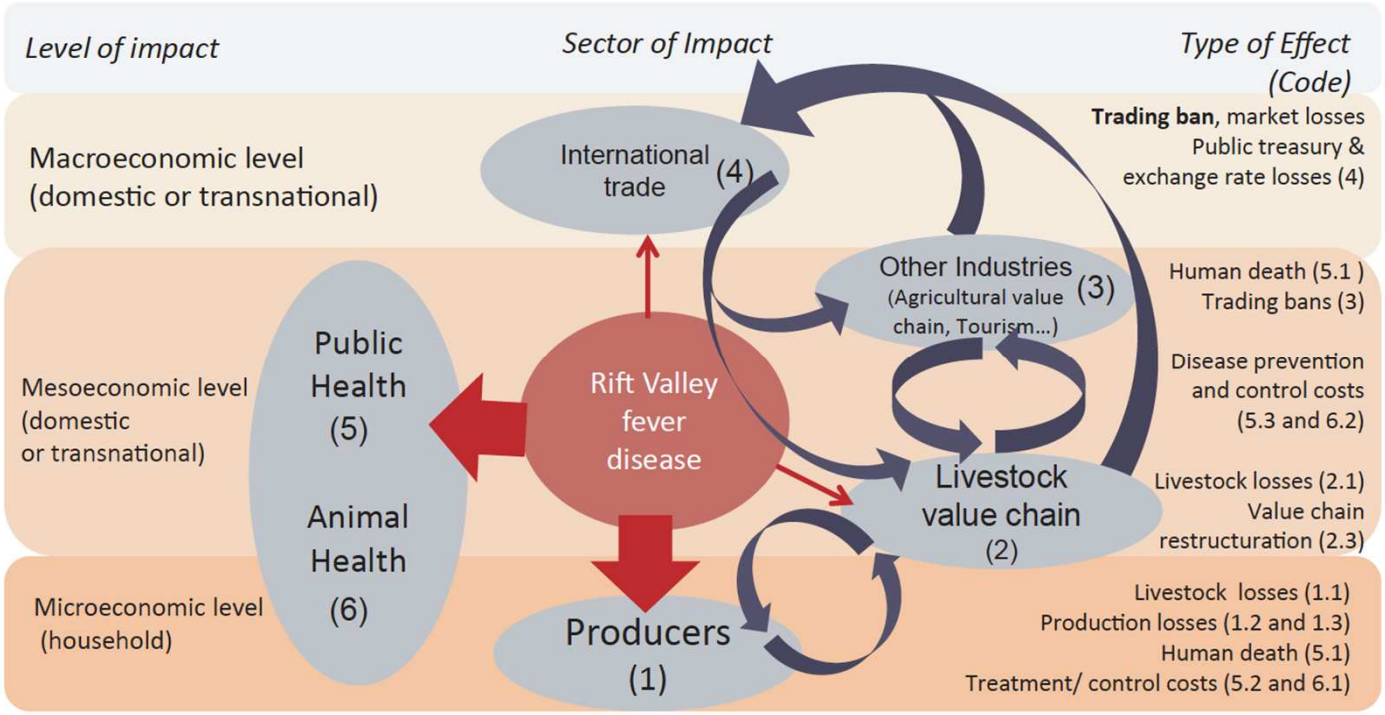
cirad

LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Cost-benefit (CBA)

- Evaluate, in monetary terms, all types of costs and benefits of surveillance and assess if it generates a **positive net value: Benefits > Costs**
- Surveillance benefits = benefits from controling the disease (avoiding disease impact)



Source: *Peyre et al., A Systematic Scoping Study of the Socio-Economic Impact of Rift Valley Fever: Research Gaps and Needs Zoonoses and Public Health, 2013, doi: 10.1111/zph.12153*

Cost-benefit (CBA)

- Evaluate, in monetary terms, all types of costs and benefits of surveillance, direct and indirect, market and non-market values, in order to find out if it generates a positive net value.
- **Direct costs and benefits** are related to the direct effects resulting from animal health surveillance (e.g. resource use, animal health)
  - Avoided losses: **value of the production saved** because of control implemented following surveillance results.
- **Indirect costs and benefits** are related to external effects, e.g. on the whole economy, on human health or on the general social welfare, on the environment.

cirad

LinkTADs

Cost-benefit (CBA) Advantages/limits

- **Advantages**: provides decision-makers with an objective tool, as the costs and benefits are expressed in monetary terms.
- **Limits**:
  - Often reduced to avoided losses,
  - Some costs and benefits can not be expressed in monetary terms (e.g. absence of pain or suffering) other methods required, e.g. contingent valuation (experimental economics).
  - Indirect impact often difficult to estimate (data difficult to get)
  - Not considering external effect and not ideal for capturing longer-term dynamic effects

LinkTADs

Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China

Introduction to Animal Health Surveillance Evaluation

LinkTADs workshop

Design and evaluation of animal health surveillance systems

25th -27th April 2016, Qingdao, China

THANK YOU !

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

PRACTICAL

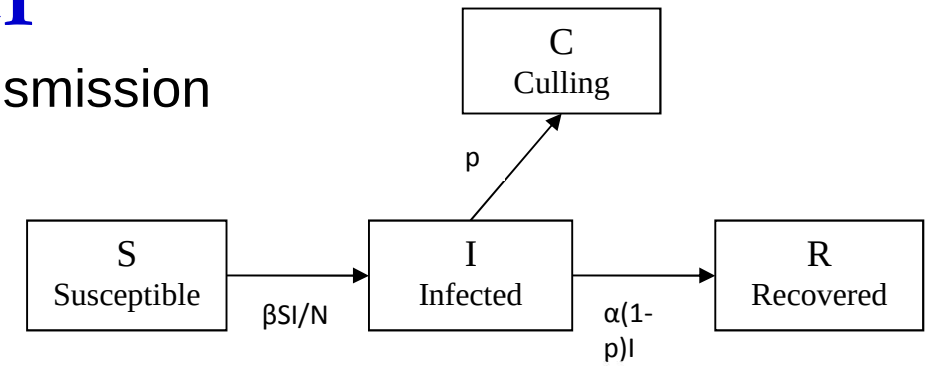
Economic evaluation case study

- CSF is **endemic in Vietnam with sporadic cases** in Hung Yen Province.
- CSF is one of the priority disease (with FMD and PRRS) for surveillance and control by the National veterinary services. The **objective of CSF surveillance is to detect cases to control the disease**. CSF vaccination in swine farms is compulsory.
- **Passive surveillance** of CSF is the main surveillance component but it is believed that the number of outbreak detected is very low. **Active surveillance** of CSF virus is in place in swine farms but the performance of this surveillance is not known. The active protocol is sampling of 30 pigs in 100 farms randomly selected in the Province every 6 months (recommendations from the National Surveillance and Control plan).
- When a positive case is confirmed by laboratory analysis, all the pigs in infected farms are culled and vaccination is enhanced in the surrounding area.
- The veterinary services would like **to know the performance** of its surveillance activities in order **to improve the control of the disease** and trying **to limit the cost of the active surveillance**. The veterinary services would like to compare the performances and costs of the current surveillance (passive and active) with a **new design of active surveillance** based on risk (age of the pigs in the herd). The new design is to sample young pigs (between 1-3 months) only in 100 randomly selected farms.
- You have been appointed by the veterinary services **to evaluate the performance of the current system components and new design** and **to provide recommendations** on the interest **and added value of changing** the active surveillance design.

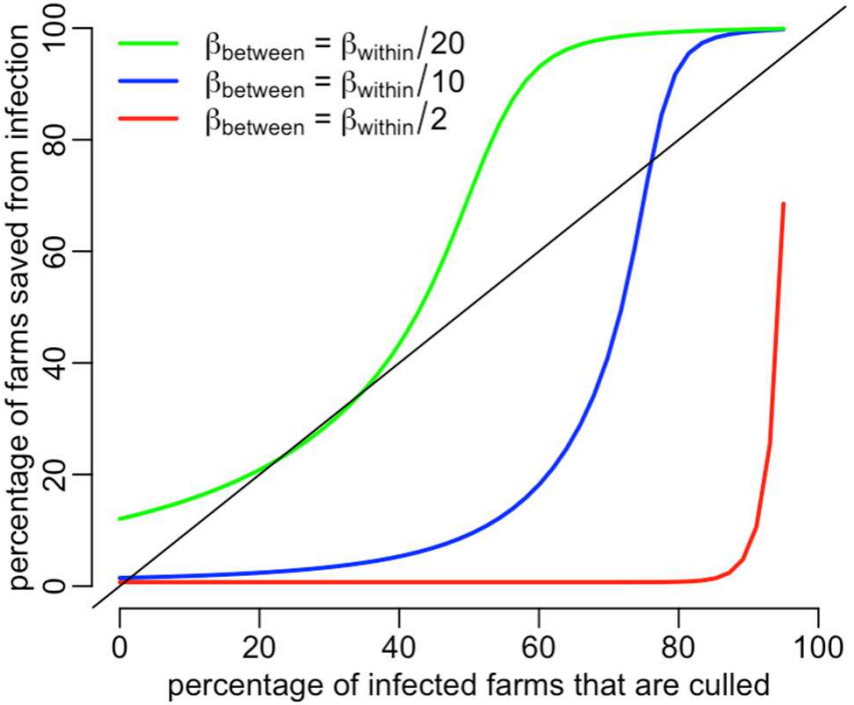
cirad

Simulation model

- SIR model, between herd transmission



- Test 3 scenarios (colored lines)



- Outputs:
  - Number of infected herds
  - Number of uninfected herds
  - Number of reported infected herds
  - Number of culled pigs
  - Number dead pigs in infected farms
  - Number of saved pigs
  - Duration of infection

cirad

LinkTADs
Linking Epidemiology and Laboratory Research on Transboundary Animal Diseases and Zoonoses in EU and China