

# ILRI and ACIAR One Health Related: Research Activities in Lao PDR

P.Inthavong<sup>1</sup>, B.Khamlome<sup>2</sup>, B.Somoulay<sup>2</sup>, K.Blaszak<sup>3</sup>,  
A.Okello<sup>3</sup>, H.Holt<sup>4</sup>, K.Graham<sup>3</sup>, J.Allen<sup>3</sup>, P.Durr<sup>3</sup>  
& J. Gilbert<sup>4</sup>

One Health Symposium Conference  
Luang Prabang, 5-6 September 2013



# ILRI

International Livestock Research Institute

Better lives through livestock



Who we are » Vision, mission and strategy

## Who we are

- ◉ Why livestock matter
- ◉ Mission and strategy
- ◉ Governance
- ◉ Management
  - ◉ Institute management committee
- ◉ Internal audit
- ◉ Organization
- ◉ Corporate services
- ◉ Human resources
- ◉ Institutional Planning and Partnerships
- ◉ Investors
- ◉ Partners
- ◉ People
- ◉ Key documents
- ◉ Hosted initiatives
- ◉ ICT
- ◉ Jobs
- ◉ Tenders

## Vision, mission and strategy

ILRI's strategy 2013-2022 was approved in December 2012. It emerged from a wide process of consultation and engagement.

ILRI envisions... a world where all people have access to enough food and livelihood options to fulfil their potential.

ILRI's mission is... to improve food and nutritional security and to reduce poverty in developing countries through research for efficient, safe and sustainable use of livestock—ensuring better lives through livestock.

ILRI's three strategic objectives are:

1. with partners, to develop, test, adapt and promote science-based practices that—being sustainable and scalable—achieve better lives through livestock.
2. with partners, to provide compelling scientific evidence in ways that persuade decision-makers—from farms to boardrooms and parliaments—that smarter policies and bigger livestock investments can deliver significant socio-economic, health and environmental dividends to both poor nations and households.
3. with partners, to increase capacity among ILRI's key stakeholders to make better use of livestock science and investments for better lives through livestock.

This is ILRI's second ten-year strategy. It incorporates a number of changes, many based on learning from the previous strategy (2000–2010, initially produced in 2000 and modified in 2002), an interim strategy (2011–2012) and an assessment of the external and internal environments in which the institute operates.





A Global Agricultural Research Partnership



HOW WE DO RESEARCH

WHAT'S NEW IN RESEARCH

CONSORTIUM NEWS

MEDIA

EVENTS

RESOURCES

WHO WE ARE



## CGIAR Research Programs

[+](#) Share | [f](#) [t](#) [e](#) [m](#)

It has been recognized for more than a decade that the ever more complex issues facing agricultural research for development require an innovative approach to research. No single research institution working alone can address the critically important issues of global climate change, agriculture, and food security and rural poverty. Our ambitious new CGIAR Research Programs tackle the cross-cutting issues in agricultural development across the globe.

### Tackling complex issues with collaborative research

Our new CGIAR Research Programs align the research of our 15 **Research Centers** and their partners into efficient, coherent, multidisciplinary programs. These realize the full potential of collaborative research for tackling complex development issues.

### Our Research Programs to improve yields and profits of crops, fish, and livestock

- **CGIAR Research Program on Dryland Cereals;**
- **CGIAR Research Program on Grain Legumes;**
- **CGIAR Research Program on Livestock and Fish;**
- **CGIAR Research Program on Maize;**
- **CGIAR Research Program on Rice;**
- **CGIAR Research Program on Roots, Tubers and Bananas;** and
- **CGIAR Research Program on Wheat.**

### Our Research Programs to improve sustainability and environmental integrity, adapt to and mitigate climate change

- **CGIAR Research Program on Climate Change, Agriculture and Food Security;**
- **CGIAR Research Program on Forests, Trees and Agroforestry;** and
- **CGIAR Research Program on Water, Land and Ecosystems.**

### How We Do Research

#### CGIAR Research Programs

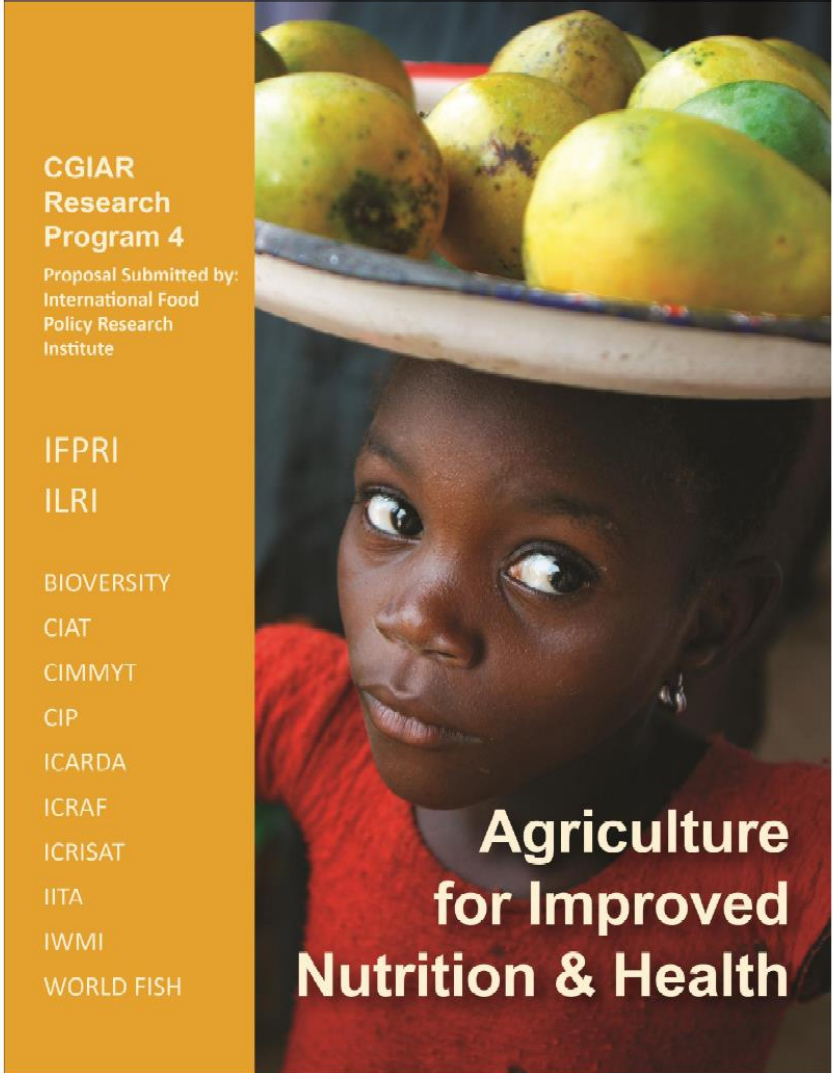
- Agriculture for Nutrition and Health
- Aquatic Agricultural Systems
- Climate Change, Agriculture and Food Security (CCAFS)
- Dryland Cereals
- Dryland Systems
- Forests, Trees and Agroforestry
- Grain Legumes
- Humidtropics
- Livestock and Fish
- Policies, Institutions and Markets
- Maize
- Rice (GRISP)
- Roots, Tubers and Bananas
- Water, Land and Ecosystems
- Wheat
- Genebanks

#### CGIAR Challenge Programs ▶

Research on Gender and Agriculture ▶

Partnerships

# CRP4



**CGIAR  
Research  
Program 4**

Proposal Submitted by:  
International Food  
Policy Research  
Institute

IFPRI  
ILRI

BIOVERSITY  
CIAT  
CIMMYT  
CIP  
ICARDA  
ICRAF  
ICRISAT  
IITA  
IWMI  
WORLD FISH

**Agriculture  
for Improved  
Nutrition & Health**

# Broader thinking - OneHealth

- One Health is the **collaborative effort of multiple disciplines** working locally, nationally, and globally, to address critical challenges and **attain optimal health** for people, domestic animals, wildlife, and our environment

One Health Commission (<http://www.onehealthcommission.org/> )

- The One Health concept is a worldwide strategy for **expanding interdisciplinary collaborations** and communications in **all aspects of health care for humans and animals**. One Health Initiative (<http://onehealthinitiative.com/>)

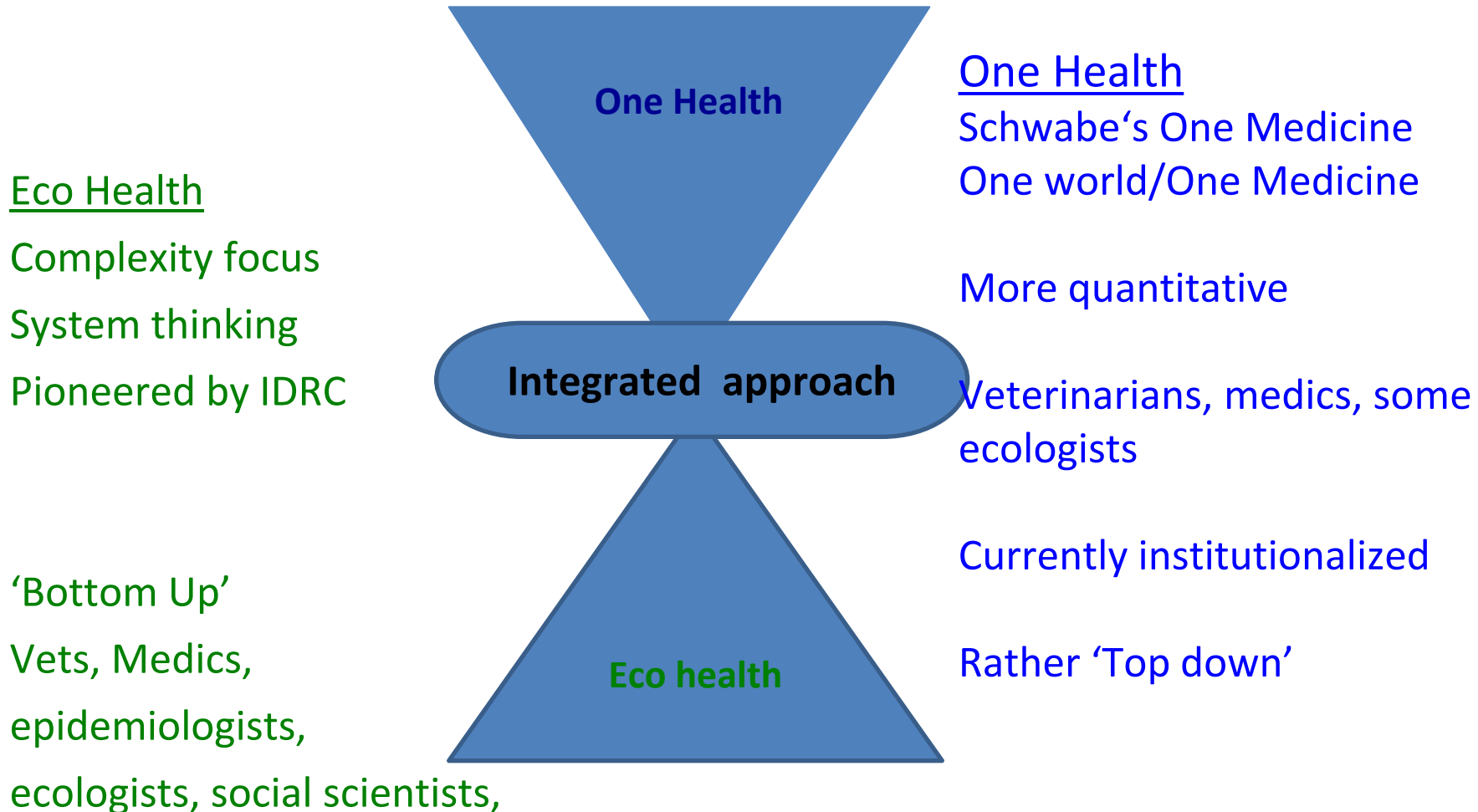
# Broader thinking - EcoHealth

- Ecosystem approaches to public health issues **acknowledge the complex, systemic nature of public health and environmental issues**, and the **inadequacy of conventional methodologies** for dealing with them. [David Walter-Toews, University of Guelph](#)
- The Ecohealth approach focuses above all on the place of human beings within their environment. It recognizes that there are **inextricable links between humans and their biophysical, social, and economic environments**, and that **these links** are **reflected** in a population's state of **health**. [International Development Research Centre \(IDRC\)](#)
- EcoHealth is an emerging field of study researching **how changes in the earth's ecosystems affect human health**. It has many prospects. EcoHealth examines changes in the biological, physical, social and economic environments and relates these changes to human health. [Wikipedia](#).

## Compare / Contrast

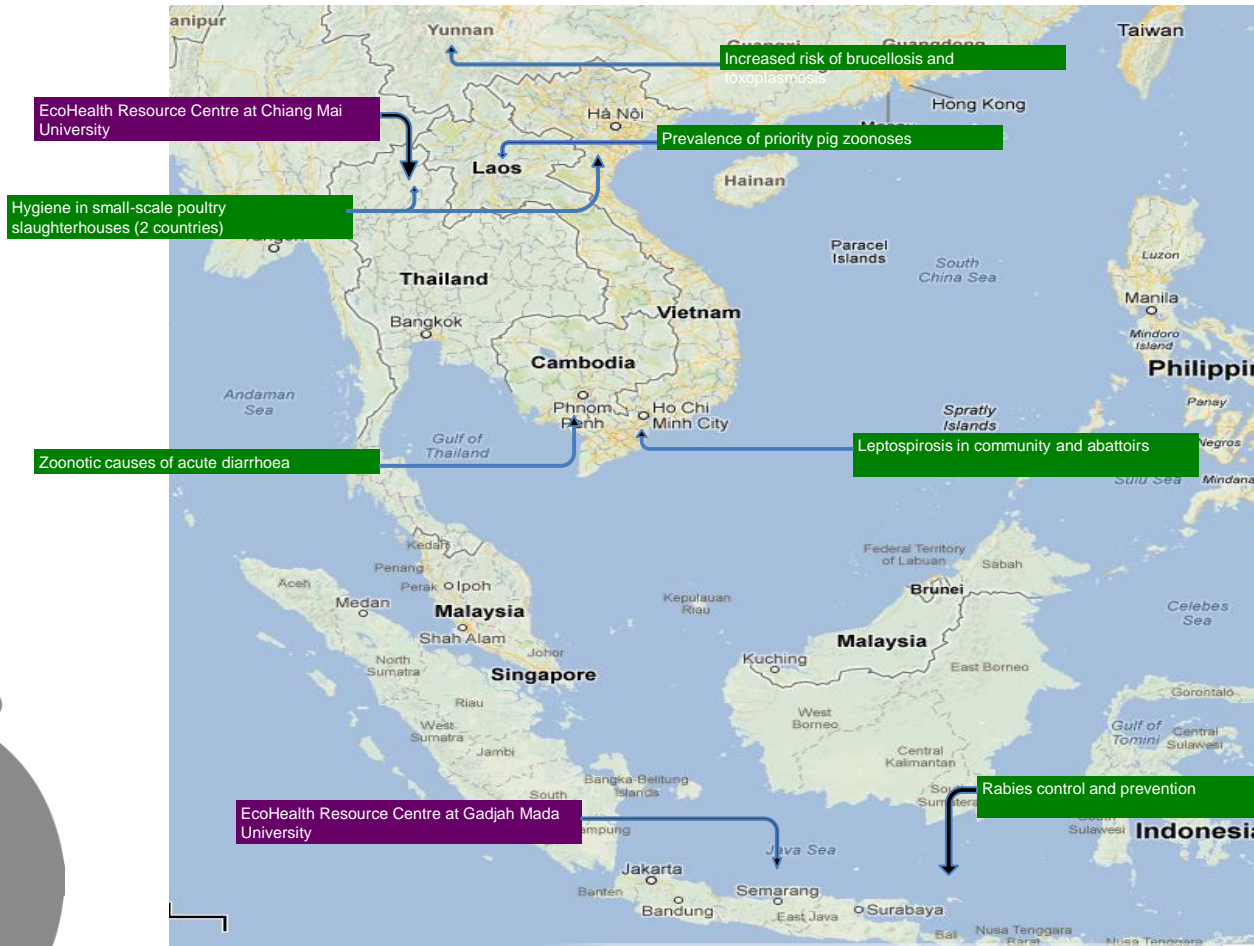
- Definitions open to debate: range from quite rigid to very flexible; issues of branding
- **One-Health** – biomedical focus: human + animal + wildlife;
- **One-Health**: focus on communicable diseases
- **One-Health**: operational / strategy
- **EcoHealth**: environment & socio-economic aspects – pioneered outside ‘traditional’ health
- **EcoHealth**: communicable & non-communicable diseases (dioxin; heavy metal toxicity)
- **Eco-Health**: academic / research / complexity

# Compare / Contrast





# EcoZD: Location of Project Activities



# Challenges & Solutions

## Challenges

- Accepting novel 'EcoHealth' paradigm and fostering trans-disciplinary collaboration (some countries rigid mechanism including financial mechanisms)
- Limited capacity within disciplines eg proposal writing, epidemiology, dissemination (journal articles, policy, IEC)
- Competition with other projects/initiatives/'paradigm (One Health)
- Sustainability of EcoHealth (One Health) approach

## Solutions

- 5 year project cycle assisted, *learning by doing* approach gives first-hand experience using country priorities not donor ones
- Plans for all countries to disseminate approach and findings to research community, policy makers and communities
- Mentoring by ILRI researchers & technical experts provided real-time support according to needs; EcoHealth(One Health) Resource Centres for regional training and advocacy
- Teams/members were encouraged to be part of other initiatives; some team members drafted & submitted multi-country proposal to APEIR
- Ownership by teams: they chose the priority and conducted the research
- Further funding cycle(s) essential: 10+ years to institutionalise

# ILRI/ACIAR supported - Lao Projects

## 1. ILRI EcoZD project:

A participatory EcoHealth study of smallholder pig system in lowland and upland of Lao PDR

## 2. ACIAR project: (funded by Australian Gov.) Smallholder Pig System Project

Purpose: To conduct baseline seroprevalence surveys of key pig diseases and pig related zoonoses and evaluate public health risks of pig-raising & pork consumption in one upland and one lowland province in Lao PDR

# ILRI/ACIAR supported - Lao Projects

## Background/ rationale:

- Smallholder pigs owned by 50-70% of village HH.
- No prior epidemiological prevalence surveys and risk analysis.
- Regional increase in zoonoses and increasing disease outbreaks
- Health and production risks.



# ILRI/ACIAR supported - Lao Projects

## Research methodology

A cross-sectional data collection including blood sampling from HUMAN and PIGS with questionnaire survey for risk factors.

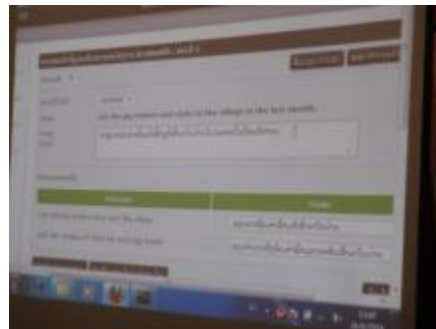
- 3 sets of Questionnaires
  - Village head to get general village information
  - Human
  - Pig owners



# ILRI/ACIAR supported - Lao Projects

## Training and field data collection:

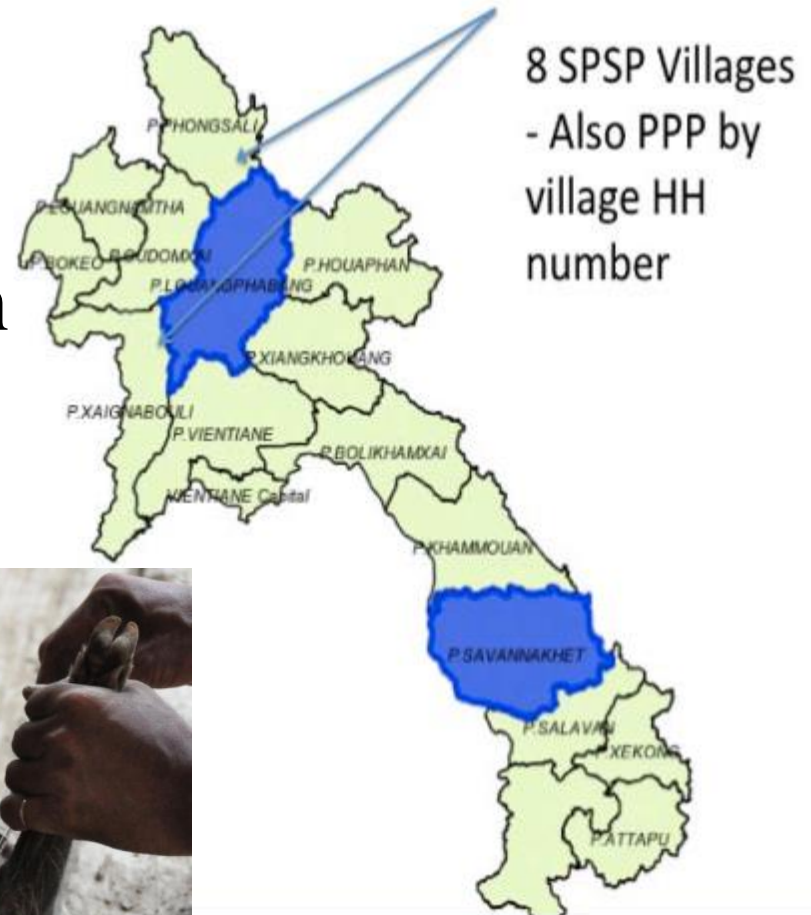
- Introduction of the principle on EcoHealth with participatory sessions in teams that included
- Introduction of the project, diseases and known zoonoses risks
- Conducting practice random sampling, questionnaire interviews
- How to collect pig and human blood samples under ethical conditions.



# ILRI/ACIAR supported - Lao Projects

Study designs:

Select 2 provinces Each  
province:  
30 Villages -sampled each  
15 Persons per village  
15 Pigs per village



# ILRI/ACIAR supported - Lao Projects

## Study designs:

Multistage random sampling

- random selection of village: PPP: Villages are randomly sampled weighted by human population
- random selection of HH
- random selection of individuals





# Diseases Tested in the Survey:

- Humans:
  - JEV,
  - Hep E,
  - Taenia /Cysticercosis
  - Trichinella
  
- Pigs:
  - JEV, Hep E, Trichinella,
  - CSF,
  - PRRS,
  - Erysipelas,
  - FMD (Types O, A and Asia 1)



# Conceptual OneHealth issues to consider

- Structuring sampling frames for humans and pigs
  - Sampling based primarily on human population (not pig population)
- Ethical issues
  - informed and signed consent forms for human participants
  - individual results within each village not identified by household names
  - Appropriate modest health practical gifts to participating households
  - Village level feedback of overall results



Group meeting with villagers for Introduction

- Interview of selected HH before blood sampling





Blood sampling from pigs



# Data Management

- Data entry and manipulation using new web based program: SurVet
- Data analysis on Stata program

ອອກແບບການສຳຫຼວດ (608066) ລົບການສຳຫຼວດຕື່ມ ປັບປຸງ/ຮັບເດດ ປັນທຶກ & ເພີ່ມໃໝ່

ການແປການສຳຫຼວດ ສັ່ງພິມການສຳຫຼວດ ບ້ອນຂໍ້ມູນ

**ແບບຟອມເກັບຂໍ້ມູນລະດັບແຂວງຂອງໂຄງການ Ecohealth : ສ່ວນທີ 1**

ເລກລະຫັດຕົວຢ່າງ: 608066  
ເລກລະຫັດຕົວຢ່າງ: village  
ວດປ ການສຳຫຼວດ: 2011-07-06 00:00:00  
ຜູ້ເຮັດການສຳພາດ: ຫ.ຢ່າເຈົ້າ

1. ຊື່ຂອງບ້ານແມ່ນຫຍັງ?   MV  NA

2. ຫມາຍເລກລະຫັດຂອງບ້ານແມ່ນຫຍັງ?   MV  NA

3. ຈຳນວນຄອບຄົວພາຍໃນບ້ານນີ້ເທົ່າໃດ?   MV  NA

# Results

Number of pig and Human sampled

Study location	Human	Pig
ILRI Luangprabang (north)	447	310
ILRI Savannakhet (South)	435	365
ACIAR/ SPSP (North)	140	91
<b>Total</b>	<b>1022</b>	<b>766</b>

## Sample test

All tests carried out in Laos using commercial kits

Human samples were tested NCLE

Pig sample NAHC

# Results: Crude Sero-prevalence

Disease	Humans	Pigs
JEV IgM	4.4%	8.5%
JEV IgG		75.2%
Hep E IgG	64%	61.4%
Trichinella	47.3%	13.7%
Taenia solium IgG	2.9%	
Cysticercosis IgG	4.7%	
Erysipelas		47.5%
CSF		10.3%
PRRS		8.2%
FMD (ABC non-structural ELISA)		2.1%

\* Prevalence data reported above has not been adjusted for population weighting factors

## Results: Human Seroprevalence

Antibody test	Nth (n= 447) Crude Seroprev	Sth (n = 435) Crude Seroprev
JEV IgM*	4.9%	6.0%
HEV IgG	50.0%	77.9%
Trich IgG	55.9%	37.5%



# Results Seroprevalence

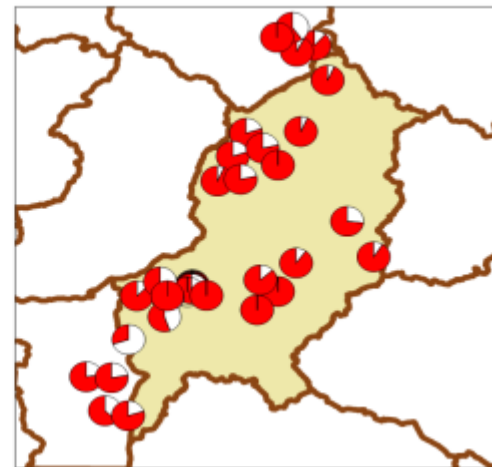
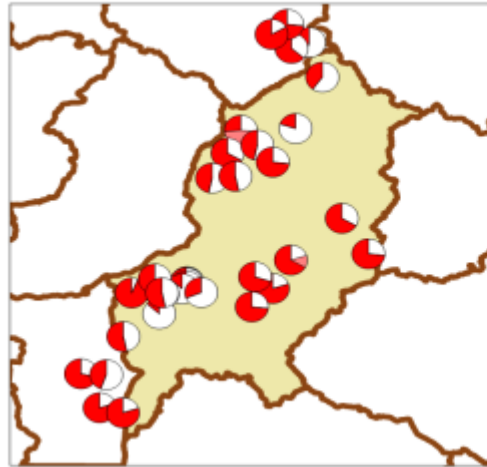
Antibody test	Nth (n= 310) Crude Seroprev	Sth (n= 365) Crude Seroprev
JEV IgG	75.4%	81.8%
JEV IgM	12.2%	6.7%
HEV	81.9%	50.0%
Trich	13.5%	9.0%
CSF	7.4%	14.7%
PRRS	11.3%	9.6%
Erysipelas	63.5%	30.2%
FMD	2.0%	2.8%

# Human and Pig Hepatitis E Sero-prevalence Results

Combined Human  
Prev 61.4%

Combined Pig  
Prev 64.0%

North – Upland



50.00%

81.9%

South- Lowland



77.9%

50.00%

# Discussion and recommendation

- ▶ Significant level of exposure of tested diseases were found in this study
- ▶ Detailed risk related analysis have been done just only for HEV
- ▶ Similar data analysis and interpretation for other diseases to be done
- ▶ Using collected serums to test for other diseases
- ▶ Risk reduction PA
- ▶ Validation of test

## Further use of ILRI-EcoZD serum bank

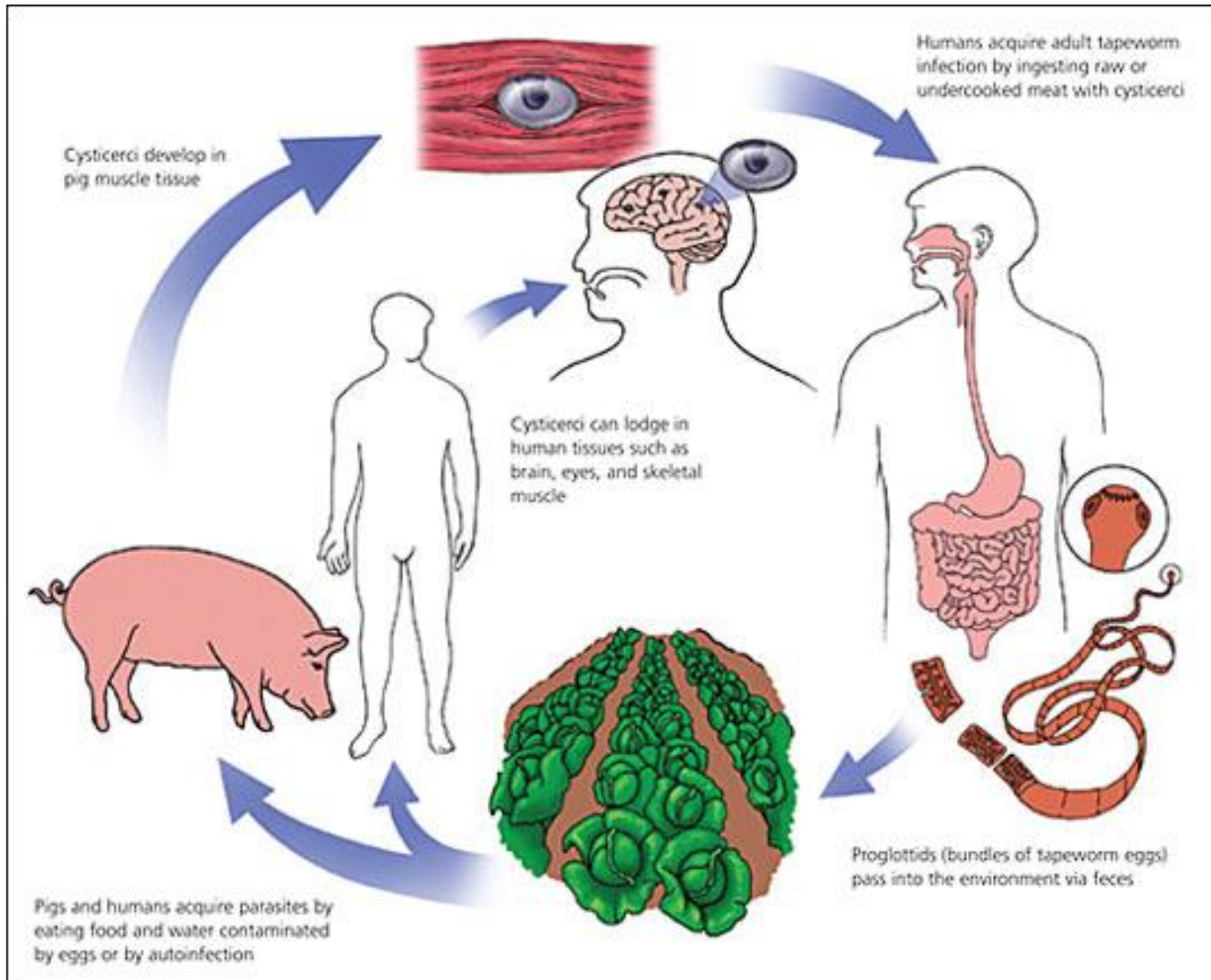
- Serum stored from both pigs and people (NAHL/NCLE)
- Other zoonoses of potential interest
  - Coxiella (Q fever)
  - Brucella
- Joint laboratory activities to process samples and gain further insight into both these pathogens – though anticipate low prevalence/detection in pigs

*Taenia solium:*  
Baseline Survey Results and  
Intervention Options

Anna Okello BVSc PhD  
Smallholder Pig Systems  
In-country Project Co-ordinator



# Life Cycle *T. solium*



# **Taenia/Cysticercosis Complex: The Village Perspective**

- Free-range pigs
- Poor latrine provision
- Informal slaughter (especially for ceremonies)
- Raw pork consumption
- Low animal/human health inputs
- Unknown cattle status
- Unknown dog status

# Human Health Implications of *T. solium*

- Neurocysticercosis = leading cause of acquired epilepsy in the developing world
- Responsible for approximately 5-3,000 DALYs lost/year globally
- Epilepsy highly stigmatised
- MDA Interventions to control taeniasis also has impact on other NTDs (e.g *shistosomiasis*, STH)

**CONTROL OF *T. solium* =  
opportunity to address  
several NTDs at the same  
time**

**PACKAGED INTERVENTIONS**

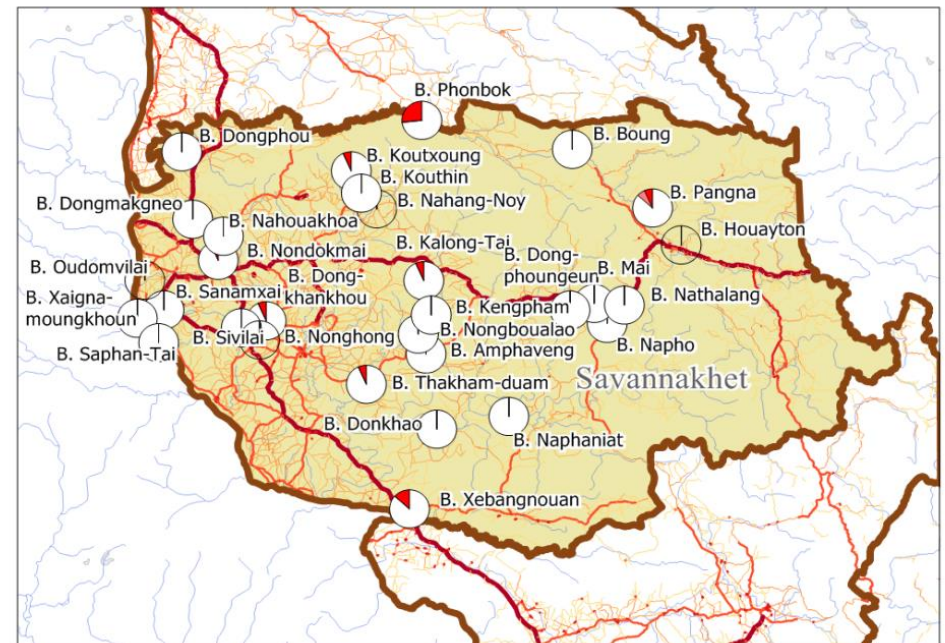
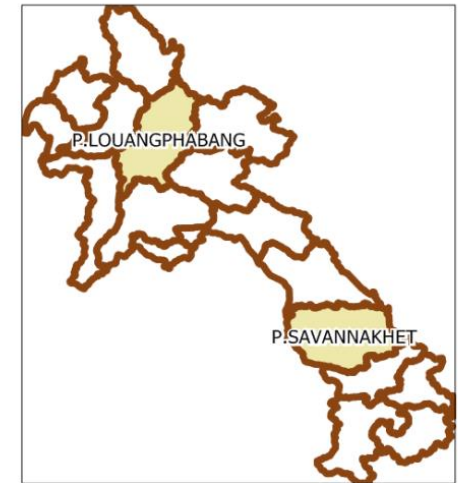
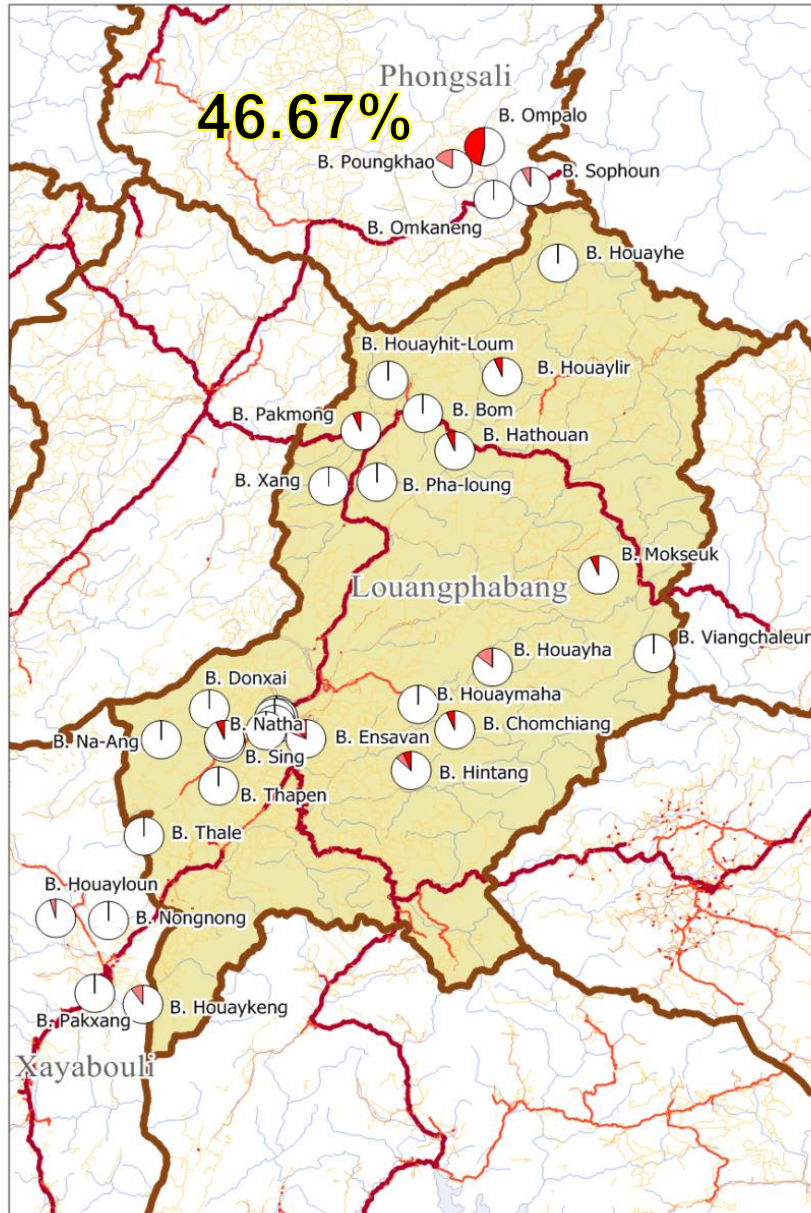


Image from; <http://www.cmaj.ca/content/180/6/639.full>

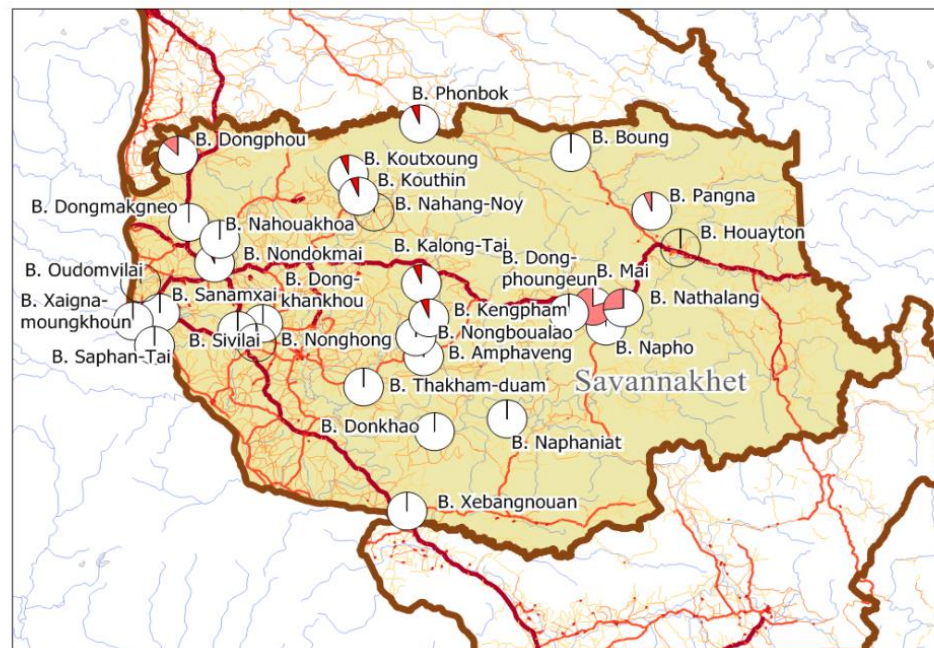
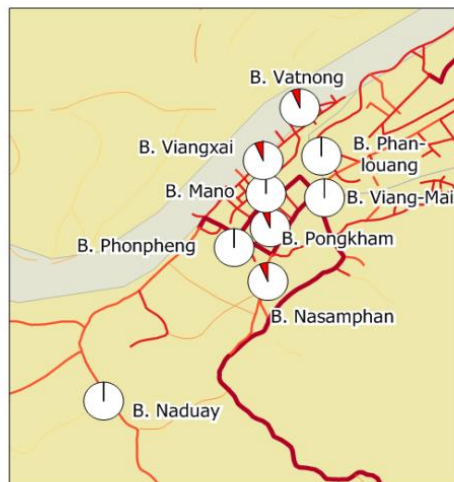
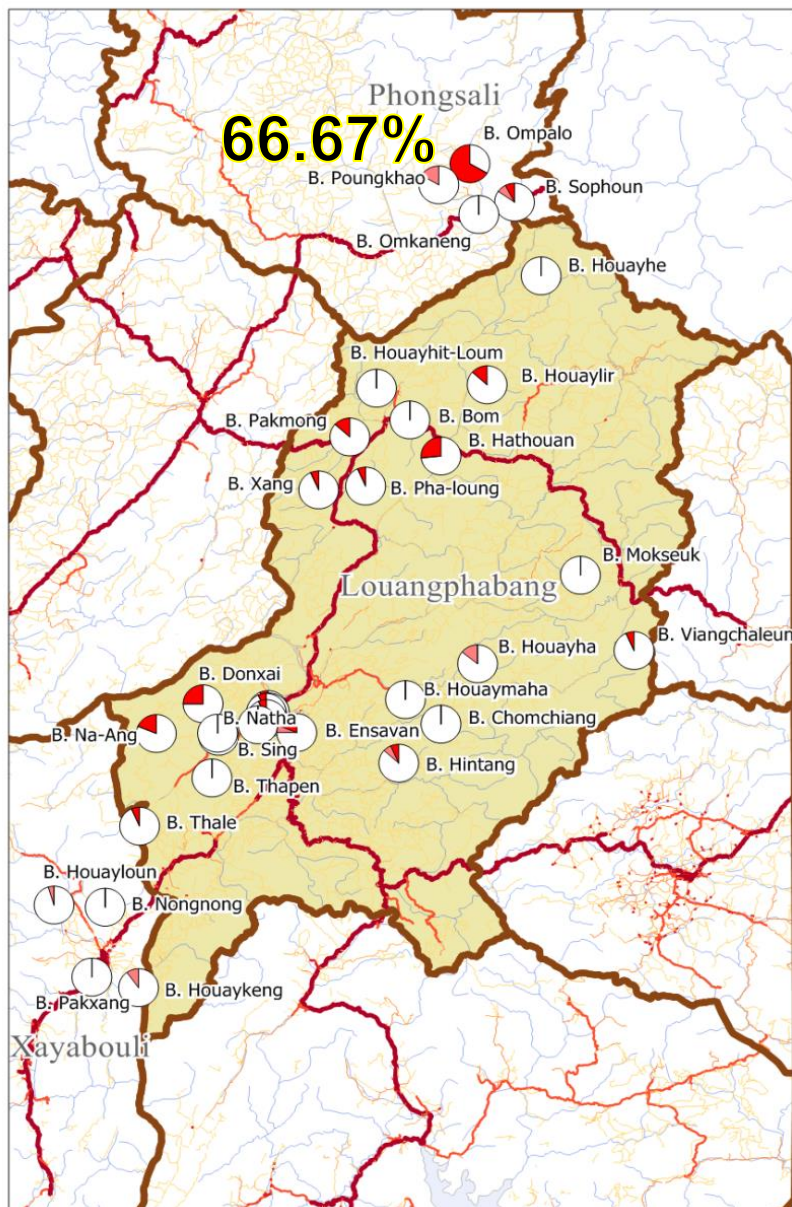


# 2011 EcoZD (ILRI/ACIAR) Human Taeniasis Prev

## 2.9% (some hot-spots)



# 2011 EcoZD (ILRI/ACIARI) Human Cysticercosis Prevalence 4.7% (some hot-spots)



## **2013: Work-up in Om Phalong village to confirm high prevalence via ANTIGEN TESTING**

- 26% (CI 18-35) taeniasis (30/115) –copro-Ag ELISA
  - 30% (CI 9-61) cysticercosis (4/13) – serum-Ag ELISA
- *Hyper*-endemic status and active human cysticercosis

### **Questionnaire data: Significant ( $p < 0.05$ ) findings (univariate analysis only)**

- Age [t.test  $p > 0.0001$ ]
- Male [OR = 3.16]
- No. times raw blood consumed per month [t.test  $p = 0.03$ ]
- No. pigs kept [t.test  $p = 0.0009$ ]
- Pigs kept confined in dry season , confinement = protective [OR = 0.27]
- Contact with dogs (play) = protective [OR = 0.27]
- Knowledge of tapeworm from raw pork = protective [OR = 0.22]

# Plan: One Health Approach

- **Treat Humans:** Mass Drug Administration (Niclosamide + Albendazole) – MOH/WHO – Month 0, 12
- **Treat Pigs** in 1<sup>st</sup> year of life: Vaccination (TSOL18) + oxfendazole – ACIAR - every 4 months for 3 treatments
- **Human Behaviour Change** – KAP analysis important
- **Policy** – Economic analysis plus Proof of Scientific concept

CHALLENGES	OPPORTUNITIES
Sustained political commitment required	Timing good – WHO 2102 NTD Roadmap, WHA Resolution 66.12 on NTDs May 2013
Isolation - logistics increase difficulty	Isolation – As good as “closed” system for purposes of testing models
Incoming slaughtered animals – not entirely “closed” situation	Best chance at real impact in this village
Bringing all actors together in a One Health space – transdisciplinary and multi-sectoral	2020 and beyond – Lao to be a regional leader in cysticercosis control

# Intervention Monitoring

## **Porcine cysticercosis**

- Human sentinels – repeat MDA at 12 months – Oct 2014
- Buy & post-mortem pigs – high # required

## **Human cysticercosis**

- Serum Antigen ELISA – fingerprick sampling development, however focus is to decrease human taeniasis

## **Human taeniasis**

- Faecal monitoring – post MDA treatment as must be combined with safe disposal

# Thank You



International Development Research Centre

Centre de recherches pour le développement international



Email: [J.Gilbert@cgiar.org](mailto:J.Gilbert@cgiar.org)