ACIAR & USYD Research Objective
Smallholder farmer productivity in addressing food security

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Outline
Food security
One Health
BBHH Lessons
Biosecurity: FMD

Food security
Exists when populations have access on an ongoing basis to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. (FAO)

Perfect Storm of Food Insecurity?
1% in ag prod. p. capita GDP poverty gap >5X than other sectors

The Task:
>9.5b people by 2050
Up to 70% more food required
Different diets: protein
1.4b people < $1.25 per day in rural areas

The Challenges:
Land resources: 7%; ownership issues
Land degradation prevalent
Water resource constraints
Climate change variability & shocks
Loss of biodiversity
International trade risks: disease, welfare

The Opportunity:
2.5b in agriculture; 95% farms <10ha; 85% <2ha
500m small farms >80% of food consumed
Yield gap 50-76% of potential some countries

The world of undernutrition

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Lao PDR (138 of 186)</th>
<th>Australia (2 of 186)</th>
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</thead>
<tbody>
<tr>
<td>Life expectancy at birth (Years)</td>
<td>67.8</td>
<td>82</td>
</tr>
<tr>
<td>Gender inequality index</td>
<td>0.483</td>
<td>0.115</td>
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<tr>
<td>Mean years of schooling of adults (years)</td>
<td>4.6</td>
<td>12</td>
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<tr>
<td>Under 5 mortality rate (per 1,000 births)</td>
<td>54</td>
<td>5</td>
</tr>
<tr>
<td>GNI per capita (PPP US$)</td>
<td>2,435</td>
<td>34,340</td>
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Stunting affects health, physical and cognitive development capacity in children as well as productivity in adulthood

Stunting in Lao PDR in children < 5 years: 48%

* UNDP Human Development Index Rank  ** Purchasing Power Parity in US$
What is One Health?

Interdisciplinary strategy to address health and food security from an integrated perspective rather than discipline-based, fragmented perspective.

Approach to skills development for efficient & effective collaboration among disciplines, solving shared health challenges including food/nutrition security.
Where we have been working

Description: applied participatory research to improve incomes of smallholder farmers by enhanced large ruminant productivity using knowledge-based interventions.

Objective: assist farmers move from cattle keepers (draft +) to producers

Method: empower HI farmers to self-select interventions to mitigate nutritional, animal health & marketing deficits c.f. LI villagers.

Best Practice Health and Husbandry Projects: Laos & Cambodia
Lao DLF in 3 northern Lao provinces: in Luang Prabang

Trained staff in LDP working in 5 provinces: 326 villages and 13,338 households

Lesson 1. Understanding of culture, history & large ruminant systems: options to improve

Used participatory ‘applied field research’, ‘on the job experience’ plus ‘formal’ training programmes. No cases of FMD were recorded in ‘HI’ villages despite occurrence in ‘LI’ and neighbouring villages.

Cambodian DAHP in 3 southern provinces: Phnom Penh

Perpetual feed deficit; rapid forages uptake to >1,000 households

Lesson 2. Village-level productivity: nutrition, disease & marketing inter-related; training!
Lesson 3. Transboundary disease control needed for trade; collaborations with agencies/projects

Visit June 12 of Dr Xayachak, Vice Foreign Minister of Lao PDR, hosted by SSEAC.
Efficacy of FMD vaccination

FMD mortality & morbidity rates in 4 XK villages in outbreak in early 2009

<table>
<thead>
<tr>
<th>% of large ruminant population</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unvaccinated</td>
<td>81</td>
<td>74</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vaccinated (54%)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Vaccinated (100%)</td>
<td></td>
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FISQ (n=62) losses ex pre-FMD values
Av. post-FMD loss:
54% per animal from weight loss/treatment costs
92% per animal if treated, died & rental draft
Partial budget:
+ve incentive for FMD vaccination:
$31.48 per animal.

FISQ (n=67) losses ex pre-HS values
Av. post-HS loss:
66% per affected animal: $375
Partial budget:
overwhelming incentive for HS vaccine:
$32.44 per animal (outbreak every 20yrs)

Lesson 4. Sustainable market drives livelihood enterprises & environmental innovations

Enterprises:
- Fattening stalls
- Silage preservation
- Breed improvement
- Seedlings
- Other livestock
- Trucks

Environment:
- Manure pits
- Bio-digester: biogas
- Irrigation dams, tanks
Lesson 5. Continuous capacity building assists farmers to implement interventions — measurable impacts

Farmer KAP Surveys: knowledge, attitudes & practices; start, mid, end
Socioeconomic surveys: start & end

HI farmers:

- Improved biosecurity, vaccinate for FMD and HS at own cost, separate sick from healthy cattle, grow & feed forages to fatten.
- That grew forages saved >2 hours per day each for man, woman and child, expanding enterprises, employment & child schooling.
- Increased annual household income (P<0.001); 53% reporting an increase of 100% or more in their annual income.

Evidence that fixing the smallholder yield gap can contribute to food security

1. Cultural history, systems & collaborations; participatory
2. Village level productivity driven by addressing nutritional & health constraints; forages/disease prevention/marketing
3. Transboundary disease control for trade; cost/benefit of vaccines & biosecurity knowledge for disease risk management
4. Sustainability of expanding beef market drives livelihood enterprises & environmental innovations by smallholders
5. Continuous capacity building & assessment required to identify deficits/opportunities PLUS measure/publish outcomes

FMD eradication by 2020 in Mekong is a huge ask, but positive change is happening!
Interested in our papers on smallholders and food security?

Windsor et al. Best Practice Cattle Health Production and Marketing for Cambodia. ACIAR Proc. 138, in press

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