The Uplands Program

Research for Sustainable Land Use and Rural Development
in Mountainous Regions of Southeast Asia

# Evaluation of smallholder pig production systems in North Vietnam

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# Background


- Vietnam: 71% of households own pigs (MARD, 2003)
- pork: 70% of livestock products (Lich, 1999)
- pig production: 70 to 80% small-scale (Lapar et al., 2003, Akter et al., 2004)
- deltas: centres of pig production

- marginalised mountainous areas: increasing land pressure limits cropping => extension of husbandry
- introduction of improved pig breeds (Vietnamese, exotic)

# Objectives

Demand-driven pig production

Mountain valley

Near town

Good market access

Improved breed: Mong Cai

Picture: Lemke

Resource-driven pig production

Hillside

Distant from town

Poor market access

Local breed: Ban

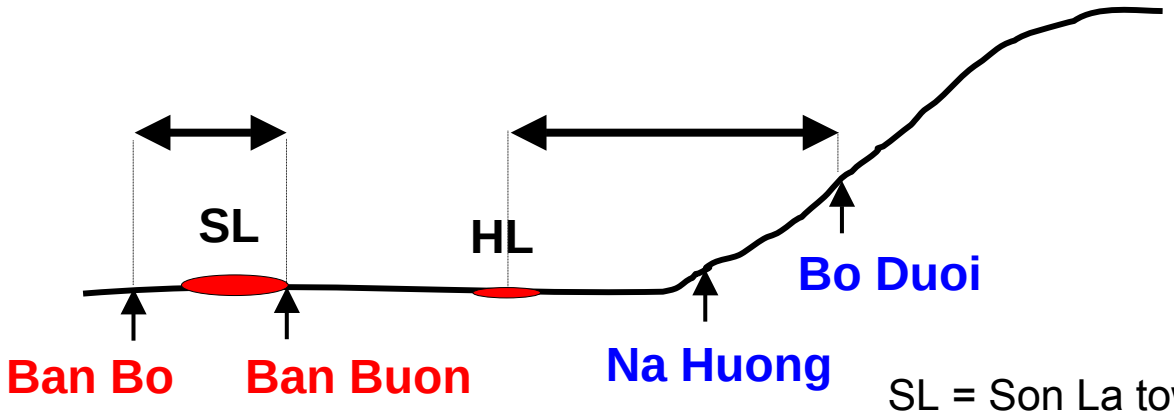
Picture: Huyen

Assess suitability of pig breeds for different smallholder production conditions

Compare Vietnamese improved with indigenous pig breed

# Villages, households, animals

Fieldwork:
February 2001 – August 2002




SL = Son La town
HL = Hat Lot town

| | Demand driven | | Resource driven | | **Total** |
|---|---|---|---|---|---|
| Pig keepers, hh (n) | 17 | 16 | 16 | 15 | **64** |
| Structured interviews (n) | 60 | 60 | 57 | 57 | **234** |
| Pigs weighed (n) | 211 | 190 | 187 | 167 | **755** |

# Definitions

**Productivity index** = **litters sow$^{-1}$ year$^{-1}$ x piglets weaned litter$^{-1}$ x piglet weaning weight** (kg LW sow$^{-1}$ year$^{-1}$)

**Feed use efficiency** = **live weight offtake/ energy intake** (kg LW (GJ ME) $^{-1}$ hh$^{-1}$ year$^{-1}$)

**Gross margin** = **C – V** (VND hh$^{-1}$ year$^{-1}$)

**Net benefit** = **(C + N) – (V + O)** (VND hh$^{-1}$ year$^{-1}$)

**Benefit cost ratio $_1$** = **C/ V**

**Benefit cost ratio $_2$** = **(C + N)/ (V + O)**

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LW = live weight
ME = metabolisable energy
VND= Vietnamese Dong
(1 USD ~ 15,000 VND, 2001/2)

C = cash revenue
N = non-market value
V = variable costs
O = feed opportunity costs

# Statistical models

Litter size, farrowing frequency: $y = Breed + Year + B*Y$

Body weight: $y = \beta_1 Age + \beta_2 Age^2$

Variable costs,
LW offtake, feed use efficiency: $y = Village$

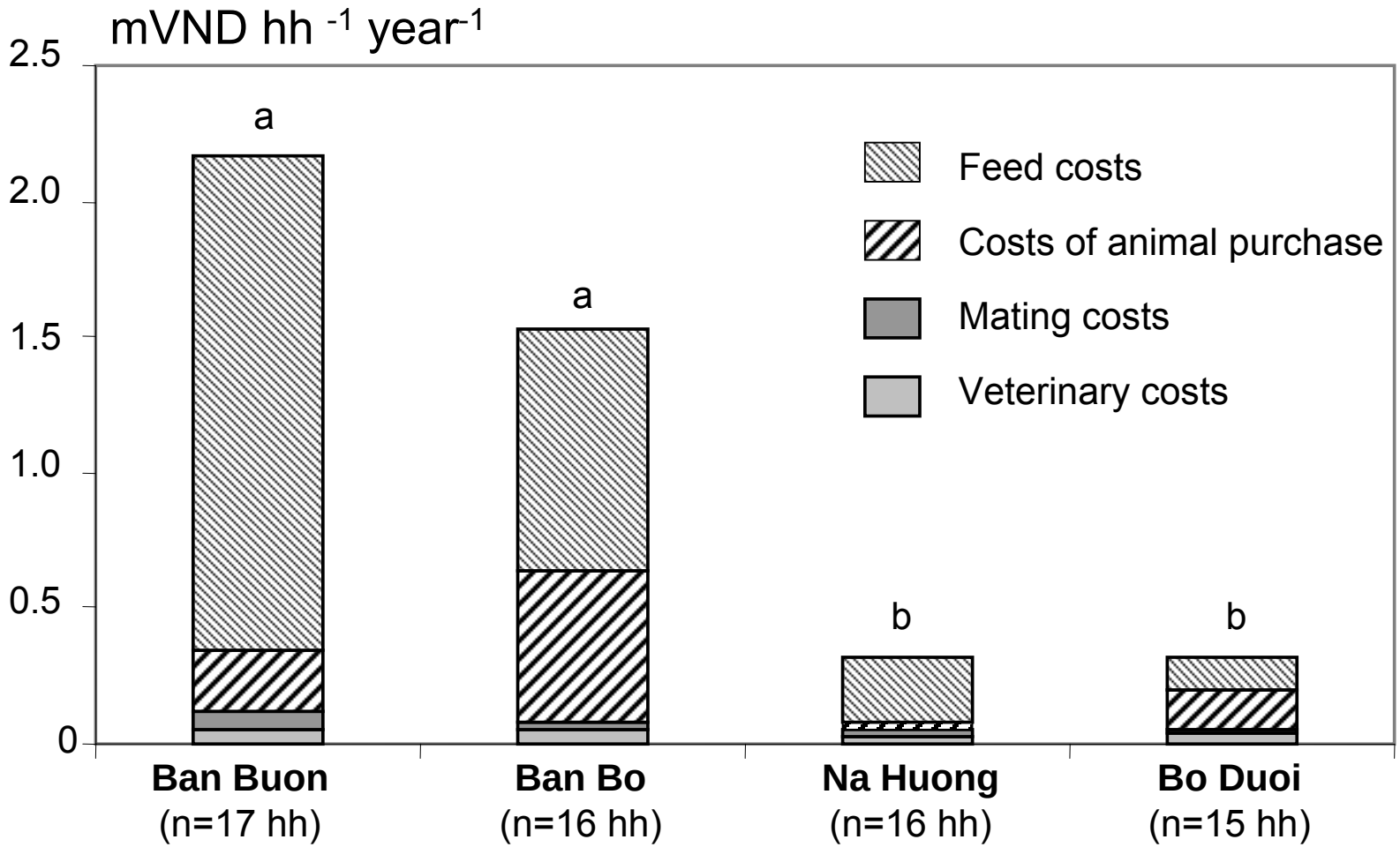
Feed costs sow $^{-1}$ day $^{-1}$: $y = Village + Year + Season + Repro.\ state + V*Y + V*S + V*R + Y*S + Y*R + S*R$

Breed (2): Mong Cai, Ban
Year (2): 2001, 2002
Village (4): Ban Buon, Ban Bo, Na Huong, Bo Duoi
Season (2): spring, summer
Reproductive state (4): gilt, empty/early gestation, late gestation, lactation
*Breed and village effect confounded*

# Pig production management

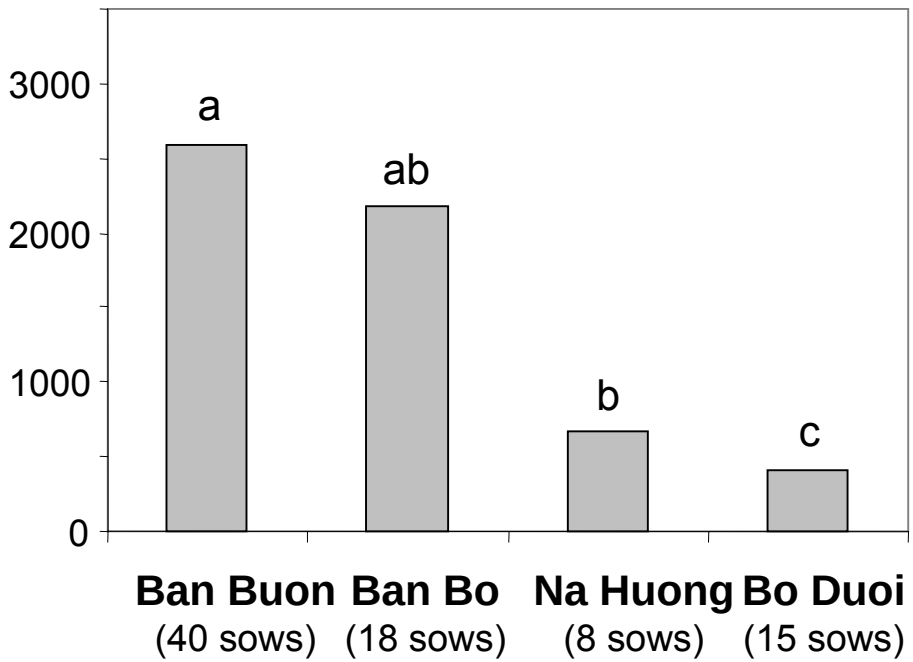
- herd size: 1.3 ± 0.6 sows, 4.2 ± 3.0 fatteners, 6.6 ± 3.9 piglets, boars in few hh in resource-driven system
- permanent confinement
- farm-grown feed, additional purchase (concentrate, fish; maize)
- production: sow – weaner (– fattener) and weaner – fattener
- natural mating, AI (demand-driven system)
- inbreeding in local pigs

# Variable costs in pig production

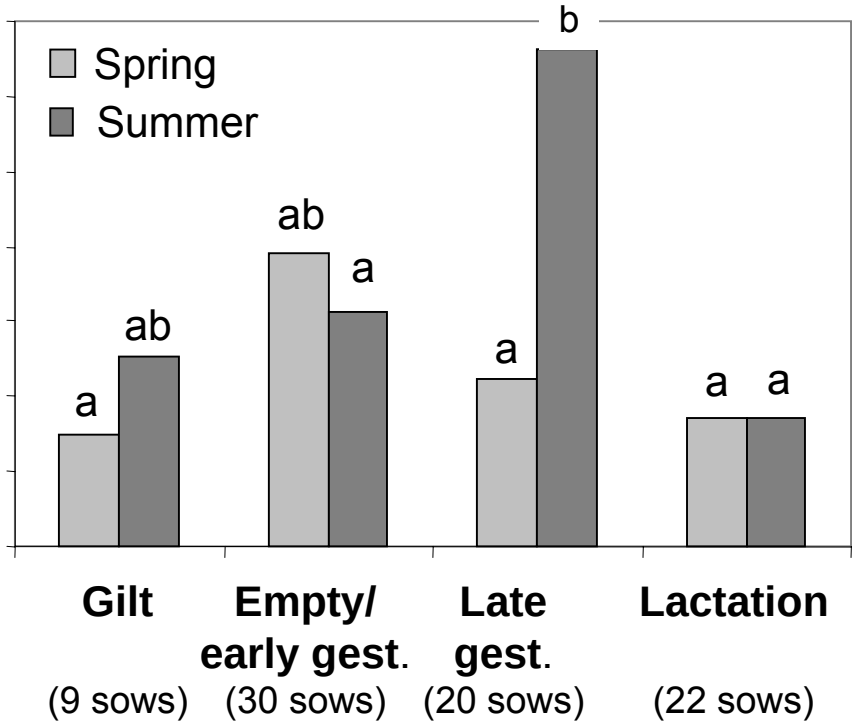


# Feed costs for sows on test day

**By village**
(VND sow$^{-1}$ day$^{-1}$)




**By season and reproductive state**
(VND sow$^{-1}$ day$^{-1}$)



# Reproductive performance of sows

| | Mong Cai | | Ban | |
|---|---|---|---|---|
| | n | LSM | n | LSM |
| Litter size, birth (n litter$^{-1}$) | 29 | 11.3 $^{a}$ | 54 | 7.2 $^{b}$ |
| Litter size, weaning (n litter$^{-1}$) | 7 | 8.4 $^{a}$ | 32 | 4.9 $^{b}$ |
| Farrowing frequency (n year$^{-1}$) | 22 | 1.6 $^{a}$ | 50 | 1.1 $^{b}$ |

# Productivity index of sows

| Sow breed | Mong Cai | | Ban | |
|---|---|---|---|---|
| Sire breed | MC | LW | Ban | LW |
| Piglets weaned (kg sow$^{-1}$ year$^{-1}$) | 83 | 89 | 21 | 31 |

# Growth performance of offspring

| Pig genotype | MC | LW x MC | Ban | LW x Ban |
|---|---|---|---|---|
| Pigs weighed (n) | 85 | 195 | 207 | 65 |
| ADG, day 7 – 60 (g day $^{-1}$) | **103** | **113** | **64** | **95** |
| ADG, day 60 – 180 (g day $^{-1}$) | **126** | **183** | **65** | **78** |
| Weaning weight, day 60 (kg) | **6.2** | **6.6** | **3.9** | **5.7** |

derived from genotype specific quadratic regression functions

# Live weight offtake and feed use efficiency

| Village | Ban Buon | Ban Bo | Na Huong | Bo Duoi |
|---|---|---|---|---|
| Households (n) | 16 | 16 | 15 | 15 |
| Sold LW offtake (kg hh $^{-1}$ year $^{-1}$) | 325 $^{a}$ | 510 $^{a}$ | 107 $^{b}$ | 124 $^{b}$ |
| Total LW offtake (kg hh $^{-1}$ year $^{-1}$) | 340 $^{ab}$ | 538 $^{b}$ | 242 $^{ac}$ | 157 $^{c}$ |
| Feed use efficiency (kg LW GJ ME $^{-1}$ hh $^{-1}$ year $^{-1}$) | 12.7 $^{a}$ | 23.8 $^{b}$ | 15.0 $^{ab}$ | 9.0 $^{a}$ |

# Economic success of pig production

| Village | Ban Buon | Ban Bo | Na Huong | Bo Duoi | p |
|---|---|---|---|---|---|
| Households (n) | 16 | 16 | 15 | 15 | |
| Gross margin/ hh (mVND year $^{-1}$) | 1.7 | 3.7 | 2.3 | 1.7 | (*) |
| Gross margin/ animal (mVND year $^{-1}$) | 0.07 | 0.16 | 0.14 | 0.11 | ns |
| Benefit cost ratio$_1$ | 3.6 | 8.6 | 6.4 | 13.7 | ns |
| Net benefit/ hh (mVND year $^{-1}$) | 0.6 | 2.3 | 3.0 | 1.8 | ns |
| Net benefit / animal (mVND year $^{-1}$) | 0.02 | 0.11 | 0.19 | 0.11 | ns |
| Benefit cost ratio$_2$ | 1.6 | 2.9 | 4.6 | 5.7 | * |

# Conclusions

- two **distinct production systems**, with **graduations**, in permanent **transition**
- **improved Mong Cai**: **higher** biological and economic **performance**, when **free market access** provided (input, sale)
- **local Ban**: **performance potential in resource-driven system** shown
- choice of **evaluation parameters influences ranking** of villages, breeds

## Required and in progress

- assess **sustainable utilisation** of biological/economic **potential of breeds**
- separate estimation of genetic and environmental effects and their interactions (**cross-factorial design**)
- assess **factors** causing **intra-village differentiation of pig producers**