Improving impact with smallholders

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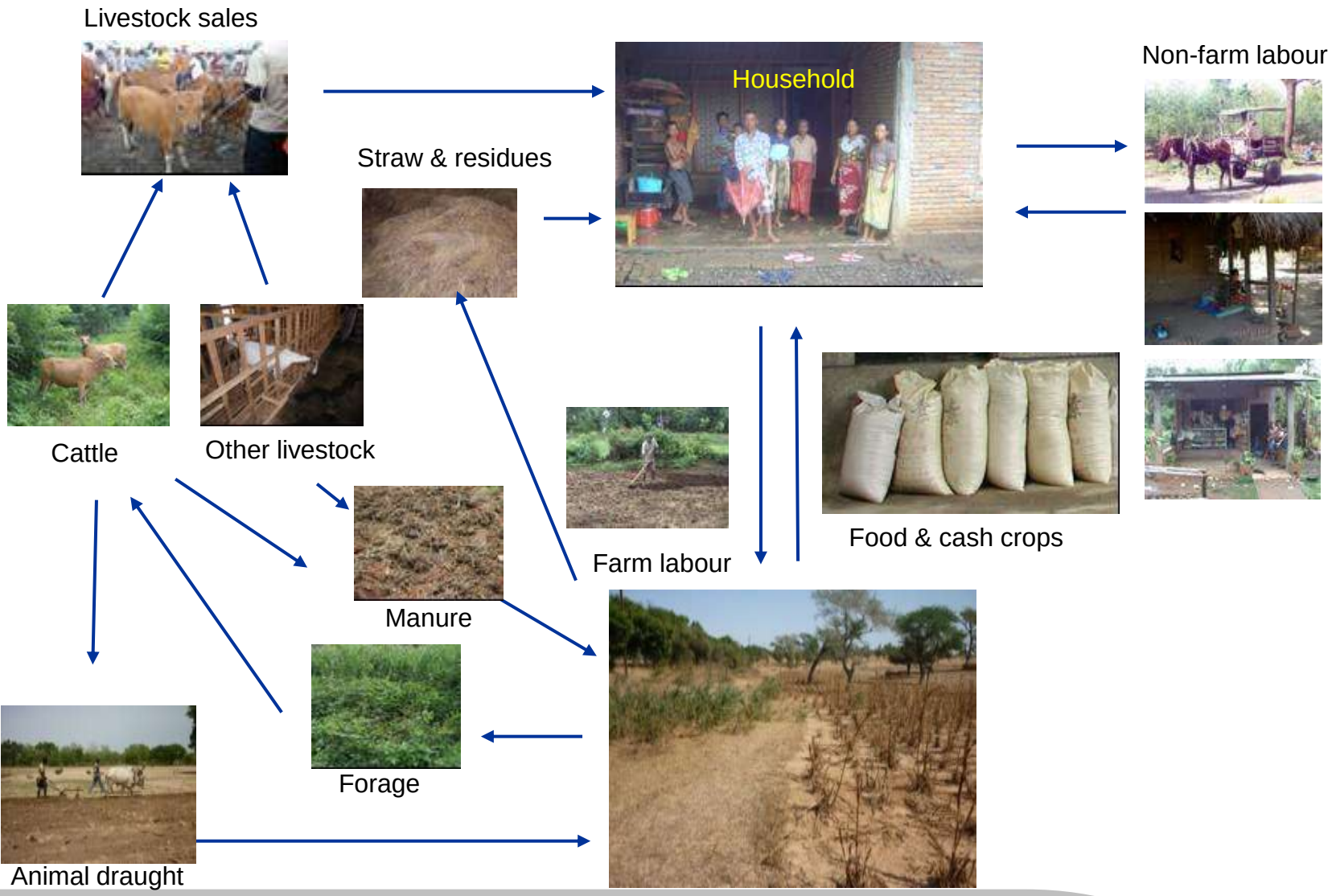
Outline of presentation

- Methodology for introducing new technologies to smallholders
  - Complexity of smallholder farms
  - Brief outline of traditional methods
  - An alternative integrated approach
  - How modelling can assist in the process
  - Strategies for achieving Research results AND lasting Impact

Complexity of smallholder farm



Farm complexity

- Overall complexity
  - Climate
  - Land area, land fertility
  - Labour resources
  - Crops and animals
  - Cash resources

Farm complexity

- Biophysical complexity
  - Suitable crops and forages
  - Animal management
  - Manure management
  - On and Off farm labour
  - Food supply

Traditional method

- Work done by or with local Universities, Agricultural Depts, and NARS
- No real assessment of smallholders needs or capacity to implement any new technology
- New technology taken to smallholders (typically as on-farm demonstrations or trials, or machinery)
- No assessment of risk and little on-going support
- Little lasting impact

Example from Indonesia

- Tree legumes had been introduced at some time in the past
- Smallholders hardly using it
- No knowledge of its potential benefits
- Now a major part of their farm activity

Traditional method

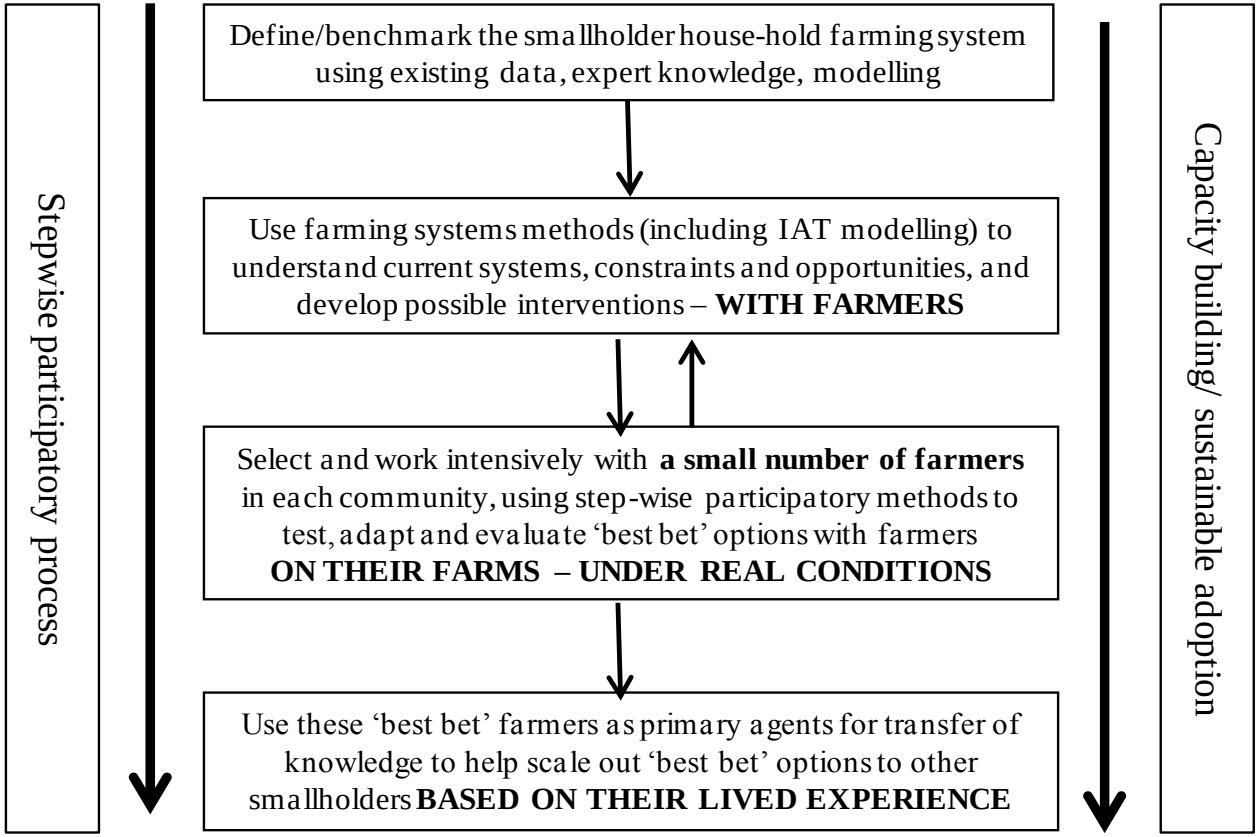
- Scaleout
  - There have been some successes
  - Assumed there would be a natural spread
  - This can happen, but rarely

- Problems
  - System too complex for simple solutions
  - Difficult to demonstrate potential benefits
  - Little assessment of risk
  - No on-going support

Potential solution

- Alternative integrated approach
  - Collect detailed baseline information
  - Integrate any new technology into farming system
  - Support for several years
  - Let farm experiences direct research activity
- Modelling
  - Assess potential benefits and risks
  - Can assess a wide range of options

Alternative integrated approach



Integrated approach - benchmarking

- Benchmarking
  - Household data
  - Biophysical data (crops, forages, animals)
  - Economic data
  - Social and cultural information

- Method
  - Not as simple as it sounds, farmers often have no records
  - General surveys of little use (e.g. % of farmers keeping cattle)
  - Need quite detailed information for modelling and understanding
  - Need to cross check information given

Integrated approach - benchmarking

- Household data
  - People in the family
  - Labour input to on-farm and off-farm activities
  - Labour activities by age and gender
  - Goals of the household
  - Living costs (school fees, govt fees, etc)
  - Non-farm income
  - Farm size

Integrated approach - benchmarking

- Crop and forage data
  - What crops and forages grown
  - What area of each normally grown
  - Typical yields in good and bad years
  - Management activities (e.g. Fertiliser, irrigation)
  - Input costs and revenue
  - Home consumption
  - Labour requirements
  - Constraints/opportunities

Integrated approach - benchmarking

- Animal data
  - Types of animals kept (goats, cattle, etc)
  - Purpose animals kept (breeding, trading, food supply)
  - Calving and growth rates
  - Feed supply (across the year)
  - Management (weaning, selling, mating)
  - Labour requirements
  - Input costs (supplements, veterinary costs)
  - Constraints/opportunities

Integrated approach – case study

- Mertak village, Lombok, Indonesia
  - 3-4 month wet season
  - 1 ha lowland for rice, soybean
  - 1 ha upland for grazing and ‘cut & carry’
  - Severe shortages of animal feed in dry season
  - Regular crop failures
  - Farmers wanted a more reliable income

Integrated approach – case study

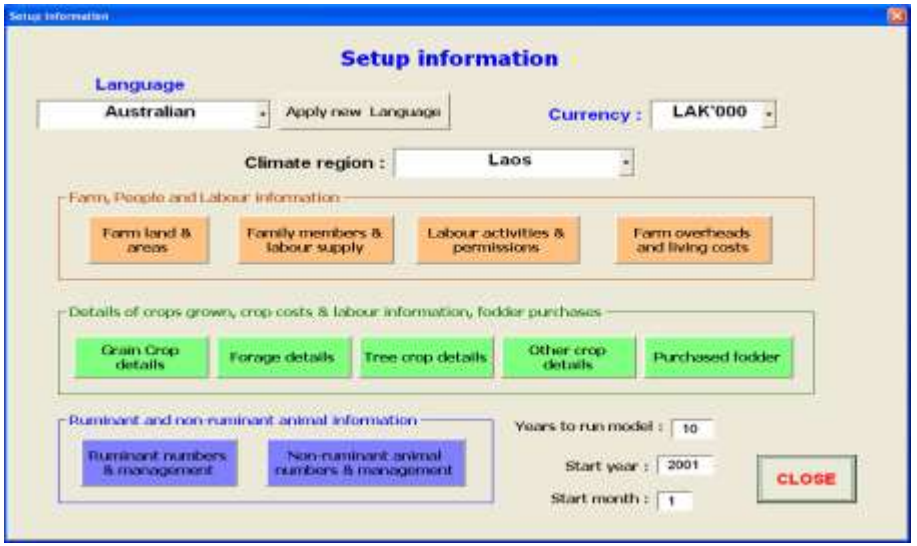
Activity / Land type		J	F	M	A	M	J	J	A	S	O	N	D
Food crops	Lowland (1 ha)	Rice, Soybean		Soybean								Rice, Soybean	
Grazing area (1ha)													
Calving / Weaning			Weaning		Calving			Mating					
Critical feed shortage period									Feed shortage				
On–farm cut and carry		Grass		*Sesbania*								Grass	
Off-farm residue /cut and carry										Grass, Rice (2 trucks per year)			
Conserved feed (period of use)									Rice, Soybean				
Peak labour periods - Cattle								Feed collection and hand feeding					
Peak labour periods - Cropping		Weeding	Harvesting									Prep'n and sowing	

Integrated approach - modelling

- Essential to link all the resources (on- & off-farm)
- Many good crop and animal models, but not whole farm models
- The smallholder system is tightly constrained
- Often there are trade-offs between activities
- Models can explore potential benefits, risks and trade-offs
- Integrated Analysis Tool (IAT) developed for this purpose

Integrated approach - modelling

- Baseline
  - Adapt, calibrate and parameterise whole farm model
  - Simulate existing system
  - Identify constraints (e.g. Food security, animal feed) and risk
  - Confirm results with farmers and extension/research personnel



Integrated approach - modelling

% Crop residue retention	Cut & carry kg/day	Cattle sold over 5 years	Transported fodder (truckloads)	Labour	Cash balance Million RP
Baseline: 0.75ha rice in wet, 0.5ha soybean in early dry, 1ha upland grazing, 2 cows, 2 calves					
30% of soybean	25	Sold 6-7 3-4 on hand	3-4 truckloads/year	Just enough	-3.0

Integrated approach - modelling

- Intervention strategies
  - With same group, Identify potential strategies to overcome constraints
  - Model whole farm system with potential interventions, singularly and cumulatively
  - Assess the potential impact on target constraint, and the potential risk of failure
  - Develop a range of ‘best bet’ options
  - Identify possible ‘best bet’ farmers

Integrated approach – case study

Activity / Land type		J	F	M	A	M	J	J	A	S	O	N	D
Food crops	Lowland (1 ha)	Rice, Soybean		Soybean				Short term forage legume				Rice, Soybean	
Grazing area (1ha)		Setaria, Verano and Seca stylo for native pasture upland area											
Calving / Weaning			Weaning		Calving			Mating					
Critical feed shortage period									Feed shortage				
On–farm cut and carry		Grass		*Sesbania*								Grass	
		Setaria and Elephant grass for lowland bunds – small forage bank for backyard, more *Gliricidia* around upland											
Off-farm residue /cut and carry										Grass, Rice (2 trucks per year)			
Conserved feed (period of use)									Rice, Soybean				
							Preferential feeding of cow and calf and early weaning						
Peak labour periods - Cattle									Feed collection and hand feeding				
Peak labour periods - Cropping		Weeding	Harvesting									Prep'n and sowing	

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Scenario 1: plant 200m of tree legume, plus 0.5ha of setaria and stylo (for cut & carry)					
30% of soybean	25	Sold 6-7 3-4 on hand	0 truckloads/year	Sufficient	-0.7

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Scenario 2: increase number of cows to 4, increase cut & carry to 35kg/day					
30% of soybean	35	Sold 10-11 6-7 on hand	3-4 truckloads/year	Just enough	2.8

Integrated approach - modelling

- Discussion groups
  - Farmers discuss strategies
  - Farmers suggest their strategies

Integrated approach - modelling

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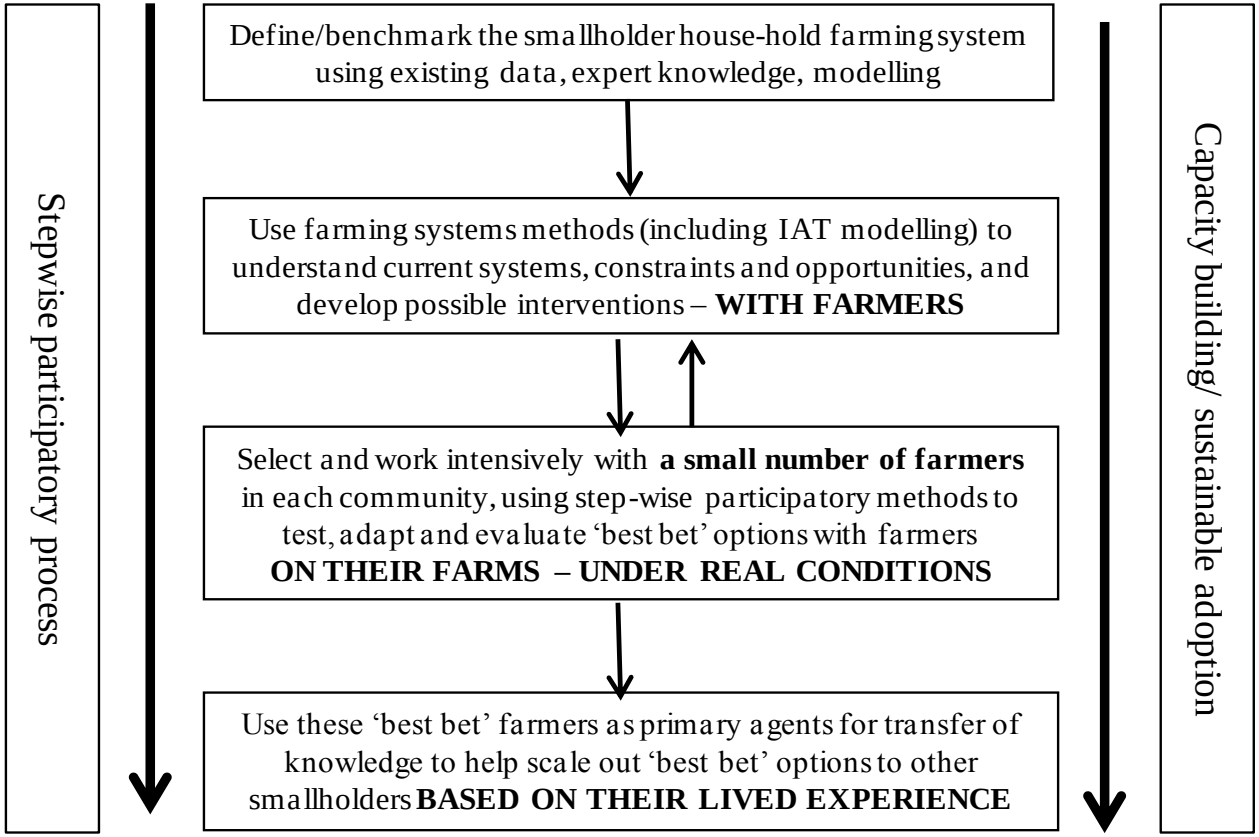
Scenario 3: Scenario 2 plus Ammoniate 40% of rice straw, retain 70% of soybean					
70% of soybean	35	Sold 10-11 6-7 on hand	2-3 truckloads/year	Sufficient	4.6
Scenario 4: STOP GROWING RICE!, 0.75ha soybean, no second crop, buy rice for consumption					
70% of soybean	35	Sold 11-12 7-8 on hand	2-3 truckloads/year	Surplus	10.3

Alternative integrated approach



Integrated approach – best bet farmers

- Start with a small number of farmers
- Describe possible intervention strategies
- Address any concerns and adapt strategies if necessary
- Let them choose which strategies to test

Integrated approach – best bet farmers

- Provide inputs if necessary
- Provide on-going support
- Identify any research questions
- Move farmers from animal ‘keepers’ to animal ‘producers’

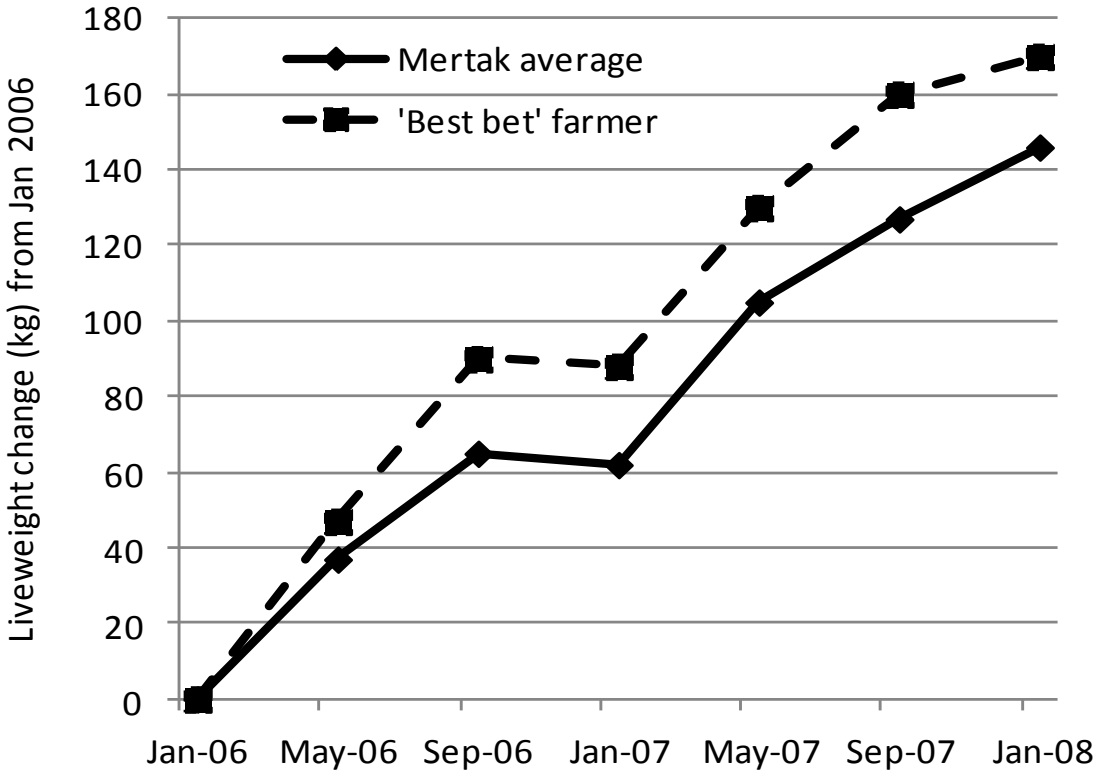
Best bet farmers – Case study

- Started small
- Quickly saw the benefits and expanded their areas
- Use of tree legume increased to 80% over 3 years
- Some farmers started early weaning
- Rice straw ammoniation not suitable due to labour constraints

Integrated approach – Impact

- Did not increase cattle numbers
- Reduced demand for off-farm feed
- Increased animal live weight gain
- Dry season labour decreased from 6-8hrs/day to 1-2hrs/day
- Wet season labour demand was also less

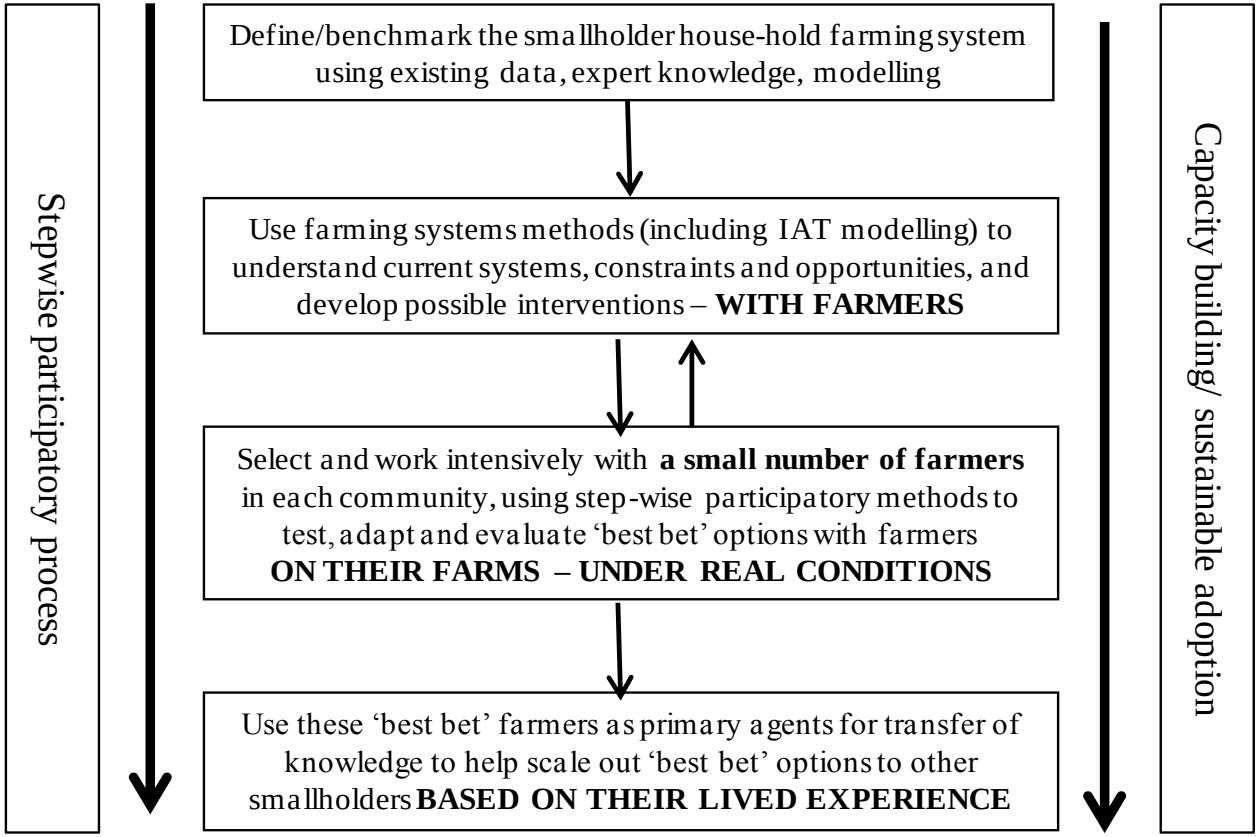
Integrated approach – Impact



Integrated approach – Impact

- Farmers spent extra time weeding rice, which led to increased yields
- Increased their income by 50-300% over 3 years
- 40% of farmers put more focus on cattle (some farmers started trading)
- 80% continued with interventions
- Reduction in disputes (feed, theft)
- Increased confidence in decision making
- Extended house, bought motor bikes (better schools, off-farm work, more income)

Alternative integrated approach



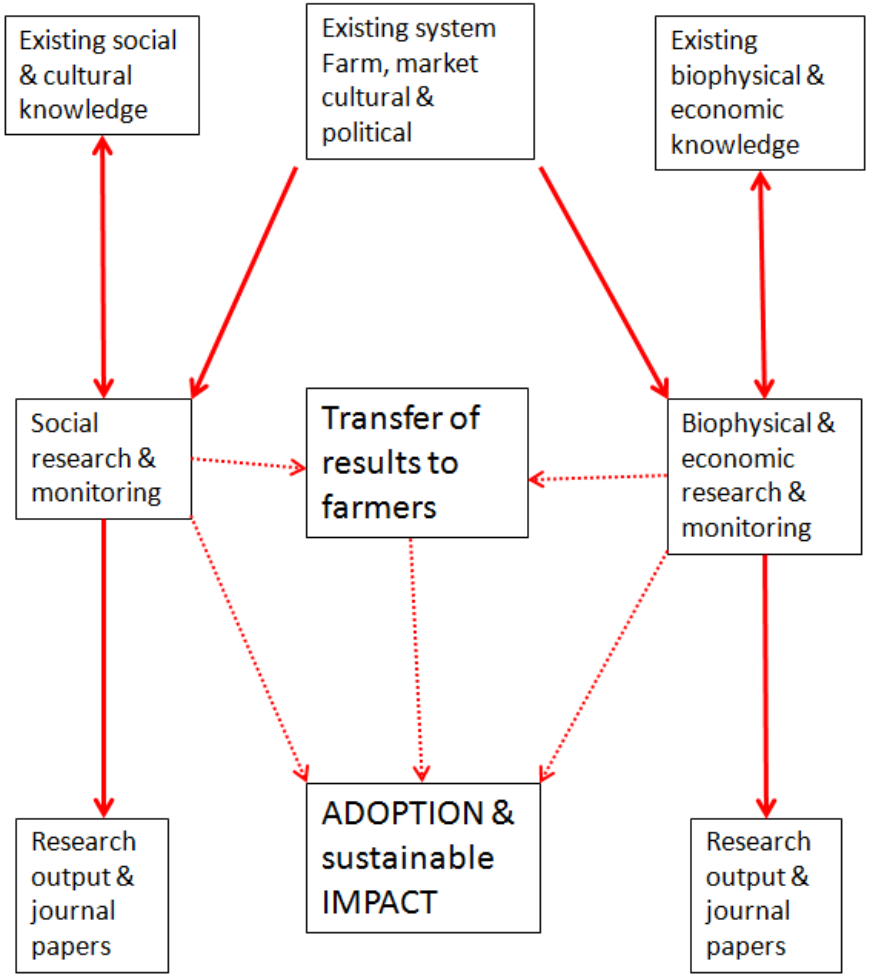
Integrated approach – scale out and scale up

- Unrealistic to have major scale out in a 3-4 year project
- Use the ‘Best bet’ farmers to inform other farmers in the village
- Hold field days and use ‘Best bet’ farmers as agents

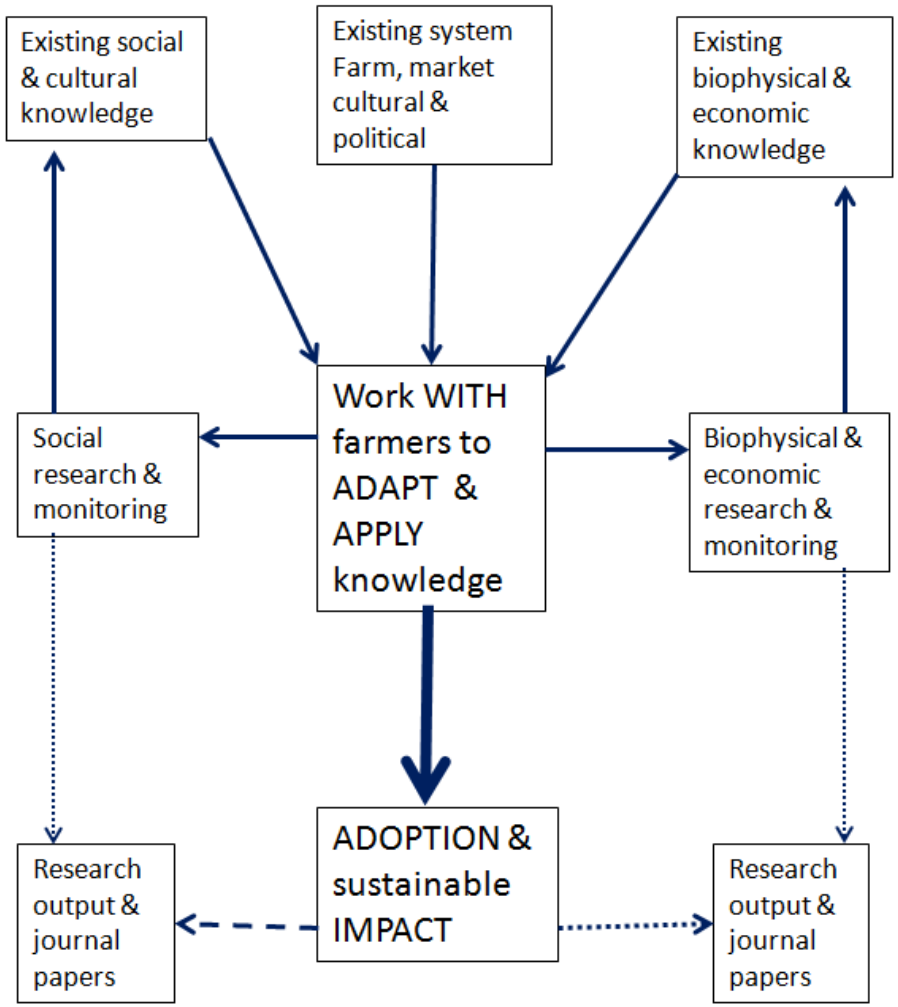
Integrated approach – scale out and scale up

- New farmers must have support, so important to have well trained extension officers
- Provides capacity building in systems thinking and modelling
- Important the 'whole package' is transferred out e.g. you need forages before introducing early weaning
- Can employ your own extension officers but better to get technology into institutions

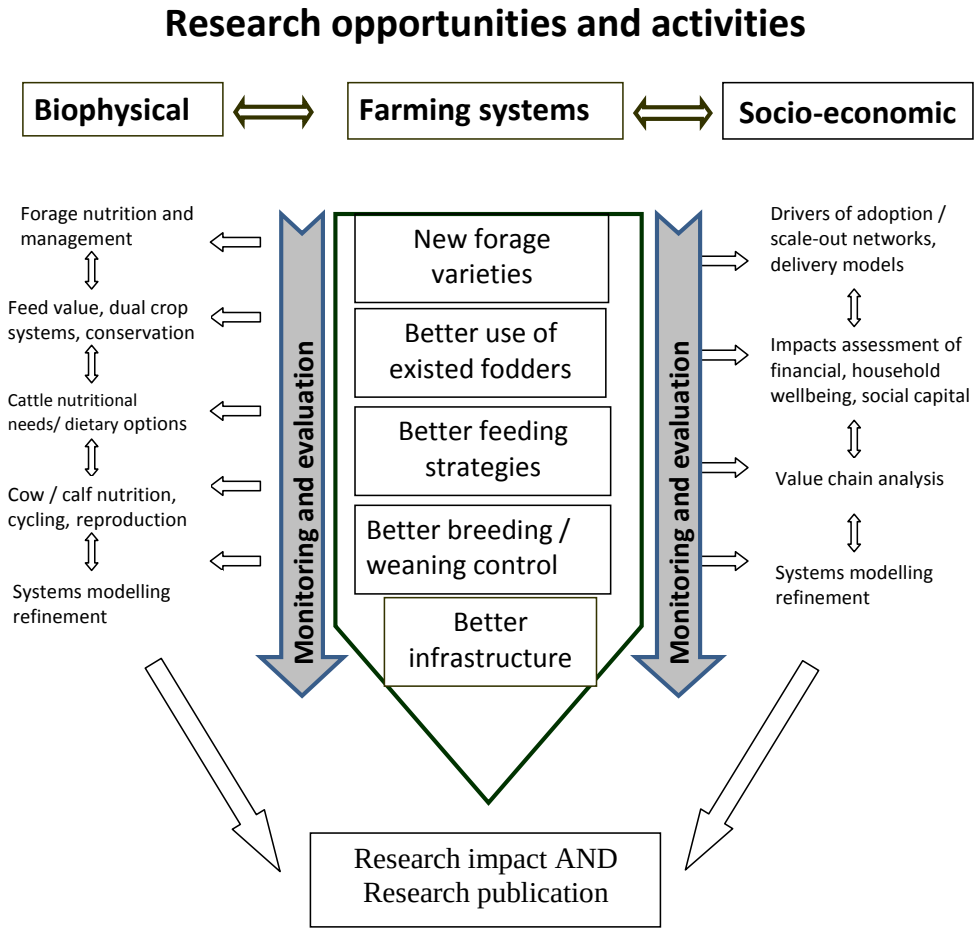
Traditional approach – Impact vs Research



Integrated approach – Impact vs Research



Dual approach – Impact vs Research



Concluding remarks

- The success
  - Technology now taken up by 2-3000 Indonesian smallholders
  - Similar technology and methodology implemented in north and south Vietnam
  - IAT model now being used in Laos, Zimbabwe and west Africa

- Differences to other PAR approaches
  - Use of a ‘whole farm’ model to assess potential benefits, risks and trade-offs of a wide range of options
  - Technology integrated into the existing farming system
  - On-going support provided for a number of years

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Thank you