9th Sustainable Animal Agriculture for Developing Countries
(SAADC2023)

Environmental Trade-offs of Livestock Intensification in the Northwest Highlands of Vietnam

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November 2023

Context of study

Northwest Highland

- Predominantly extensive local cattle systems characterized by low quality breeds and low productivity due to:
  - Poor animal health management and husbandry: animal disease outbreaks
  - Lack of resource feeds and forages available year-round
- Pressure on natural resources and GHG emissions

Addressing these challenges:

SAPLING – Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion.

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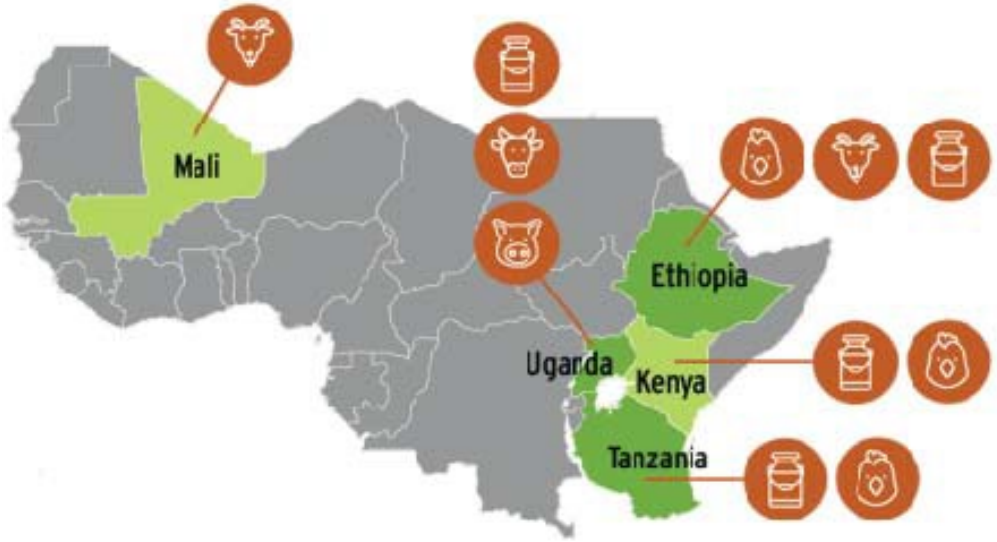
Son La province

- The largest mountainous province (1.4 Mil. Ha) in NWH
- Population: > 1.25 Mil. People, 83% ethnic minority faces poverty, malnutrition, gender disparities
- Sources of livelihoods: Forestry, cash cropping, and **livestock production** (**22% incomes**)
- Annual average temp: 23°C, total rainfall: 1,400 – 1,700mm/year but high variability between months.
- Extreme weather event: severe cold (°C); occasional heat waves (°C), widespread rain, acid rain reduced fruit production by over 40% in 2022

What is SAPLING?



In Vietnam: Sapling known as **Chan-henh** or “more beautiful” and “better” in Thai local language.

Chan-henh objectives:

- To transforming livestock value chains in Northwest highland (NWH) of Vietnam to make them more productive, resilient, equitable and sustainable.
- To fill critical productivity and value-chain competitiveness gaps by co-developing and delivering a pipeline of new and existing demand-driven health, genetics, feed, and market systems innovations, including climate-smart and digital solutions.

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Chan-henh Innovation Packages

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Health Interventions

- Cleaning and disinfecting farm (basic biosecurity)
- Vaccine, antibiotic and other drugs…
- Recording for husbandry situation, use of vaccines, drugs, and illness/death

+

Genetic Interventions

- AI on pigs and cattle

+

Feeds and Forage

- Feed processing: silage, urea treated rice straw
- Improved cultivated forages: Mulato II, Mombasa Guinea, Ubon stylo, biomass maize, Green Elephant grass…

Intensifying Livestock Production → Increase Productivity → Deforestation, land degradation, biodiversity loss, and water scarcity → Environmental trade-offs of intensifying cattle and pig systems

Specific Research Objectives

1. Estimate likely changes in land, soil health, water use, and GHGe with implementation of integrated Chan-henh's Innovation packages in cattle and pig production systems by CLEANED tool.

2. Quantify trade-offs expected with the implementation of Chan-henh's innovation packages at scale.

CLEANED Environmental Analysis Framework

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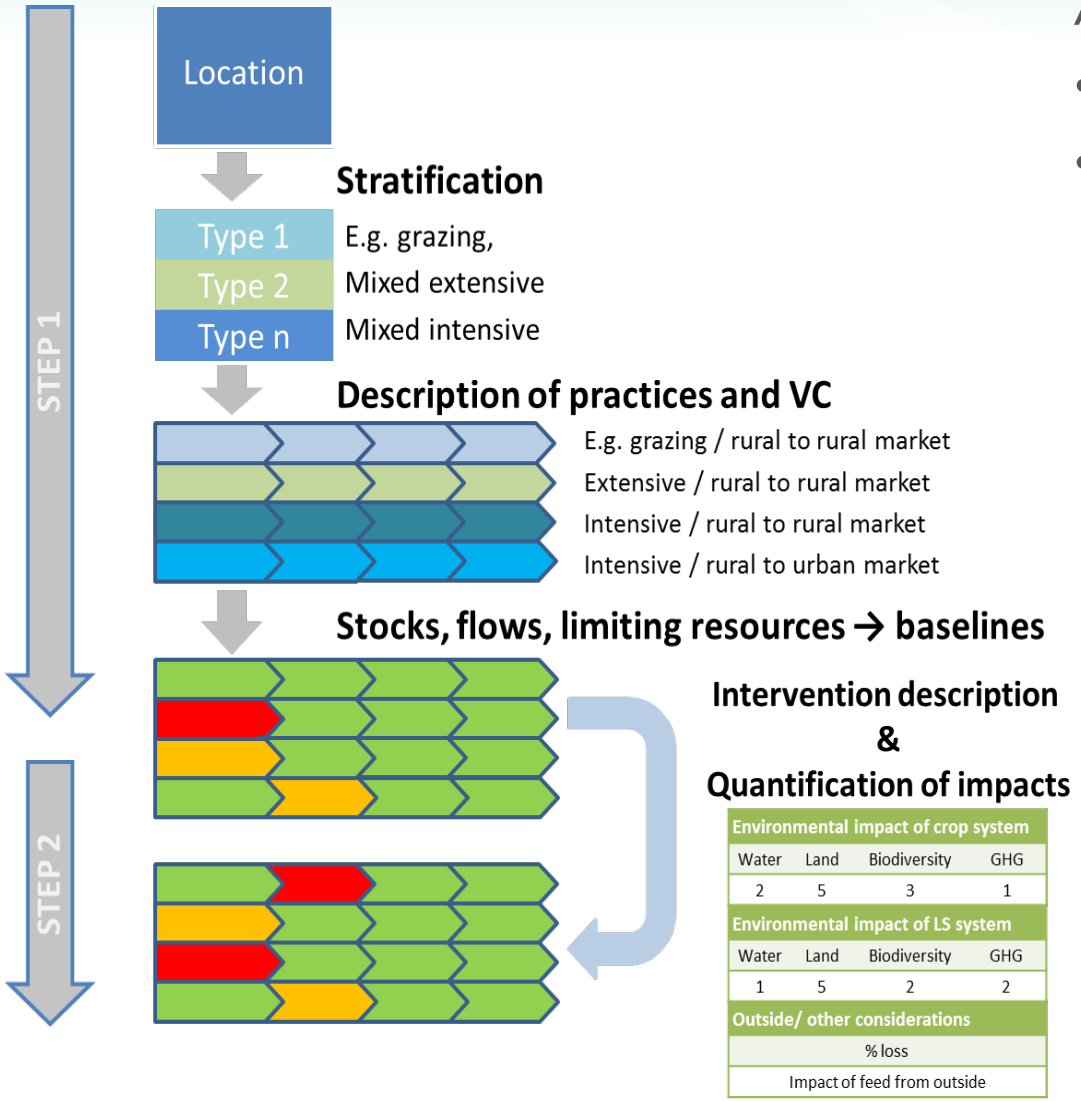

A. Setting the baseline

- Stratification
- Description
  - Land use and management practices
  - Stocks and flows
  - Value chains
  - Vulnerable and limiting resources

B. Ex-ante assessment

- Intervention description
- Local impact assessment
- Out-scaling
- Flagging of risks

Methodology

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Data collection, typology development and CLEANED analysis

- Constructing farm typology (Type A, B1, B2, C1, C2): used G- Feast survey, 2021, 2022 and RHoMIS report
- Variables included in typology development; production system, feeding regimes, livestock numbers, market access
- Follow up survey on winter feeding regimes, 2022
- Out-scaling data from an experts' workshop
  - Data validation done with sub-DAH
  - Livestock characteristics verified by NIAS
- CLEANED modeling and Extrapolation through Microsoft Excel 2019

RESEARCH PROGRAM ON Livestock

More meat milk and eggs by and for the poor

Rapid survey of livestock feed resource availability and use in Mai Son district, Son La province, Vietnam, using the Gendered Feed Assessment Tool (G-FEAST)

Mary Atieno, Tu Mai, Sabine Douxchamps, Michael Peters and Alan Duncan

Farm typology

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Type A

HHs close to roads and markets, in the valley bottoms with the best soil and most commercialized and intensified farming systems (urban)

Type B1 and B2

HHs on the valley edges and slopes, who practice more mixed agriculture and are less specialized classified (semi-urban)

Type B arose from different in the feeding diets so divided into type B1 and B2

Type C1 and C2

HHs on the slopes who have poor road access, poorer quality land, and are generally extensive (rural)

Type C arose from differences in management system and herd composition, so divided into type C1 and C2

Modelled farm types

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Typology	Size	Management System	Livestock characteristic			
			Baseline value		Intervention value	
			Type and No. of animals	Body weight	Type and No. of animals	Body weight
A	Mon 1 – Chieng Luong	Confined and tethering	Adult cattle (male): 2	225	Adult cattle (male): 4	225
			Pigs - growers: 7	17	Pigs - growers: 7	35
B1	Khoa – Chieng Chung	Confined and tethering	Steers/heifers: 3	190	Cows (local): 2	320
			Pigs - growers: 1	20	Pigs-growers: 3	25
					Calves: 3	40
					Pigs-dry sows/boars: 1	75
B2	Oi – Chieng Luong	Confined and tethering	Adult cattle (male): 1	360	Adult cattle (male): 1	360
			Cows (local): 1	300	Cows (local): 1	300
			Pigs-grower: 4	20	Pigs-growers: 6	40
			Pigs-sow: 1	70	Pigs-dry sows/boars: 1	75
C1	Buom Khoang - Chieng Luong	Confined and tethering	Cows (local): 2	350	Cows (local): 1	350
			Calves: 2	25	Calves: 2	27
			Pigs - growers: 2	10	Pigs - growers: 2	35
					Adult cattle (male): 1	380
C2	Xam Ta – Chieng Chung	Grazing/ semi razing – (young confined)	Adult cattle - male: 2	360	Adult cattle (male): 2	360
			Cows (local): 5	360	Cows (local): 7	360
			Calves: 2	20	Calves: 5	25
			Pigs - growers: 6	10	Pigs - growers: 6	30
			Pigs - sows: 1	70	Pigs - sows: 1	50
			Steers/heifers: 3	70		

Annual cattle diet

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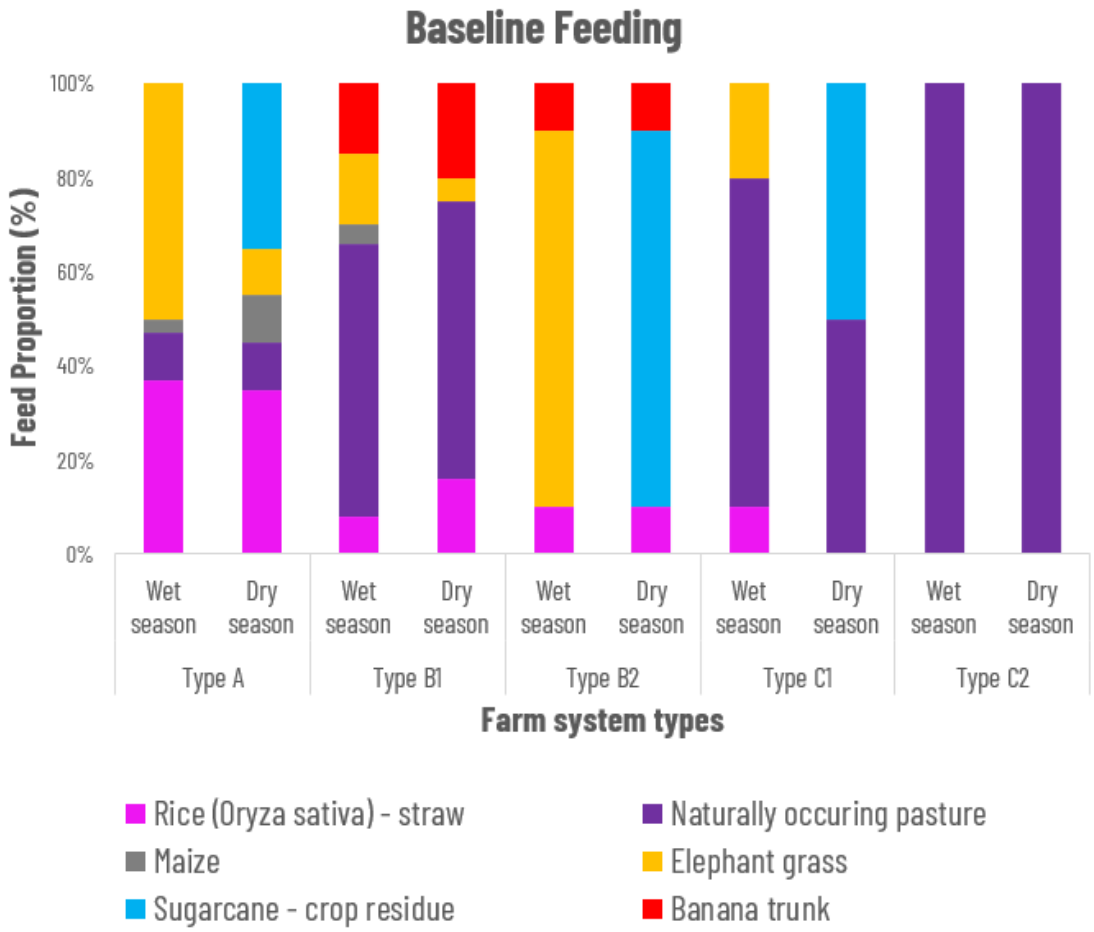
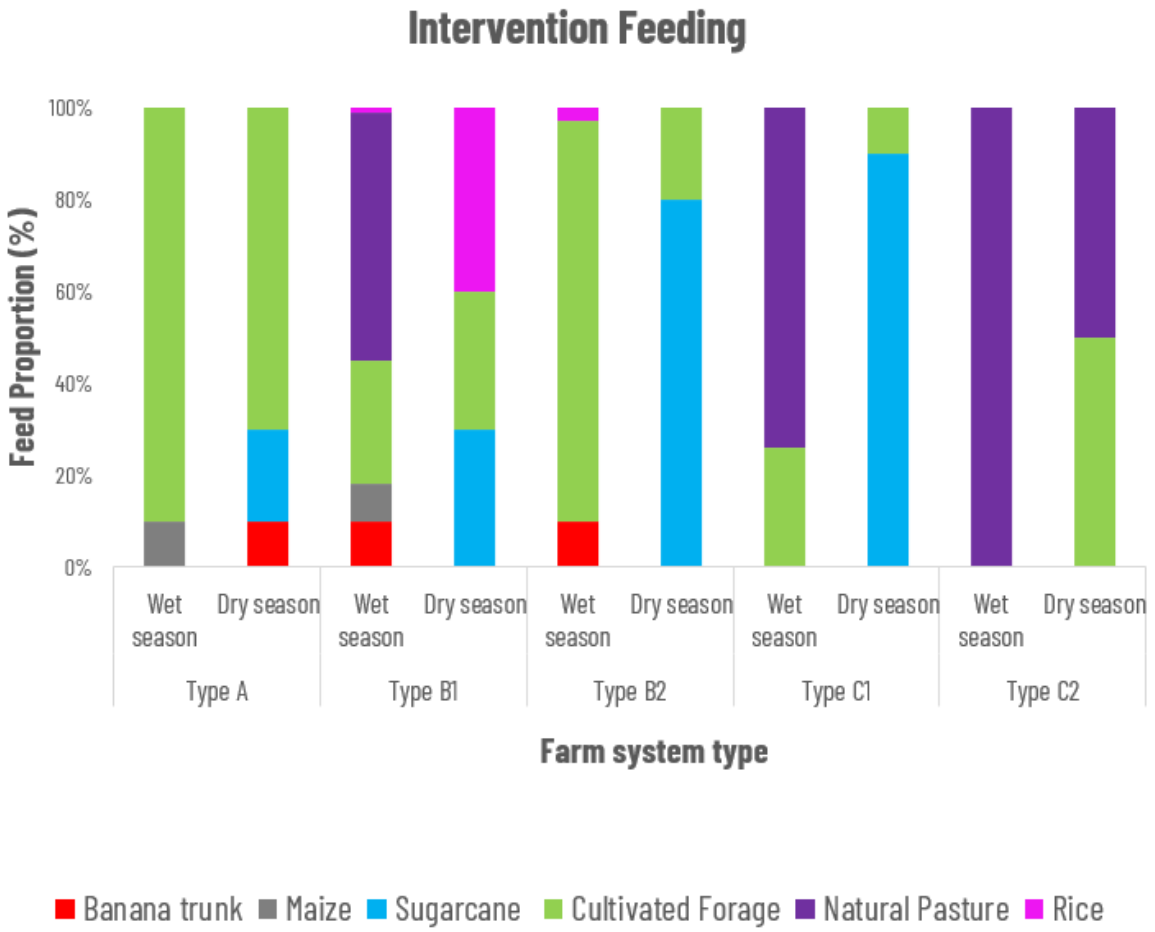
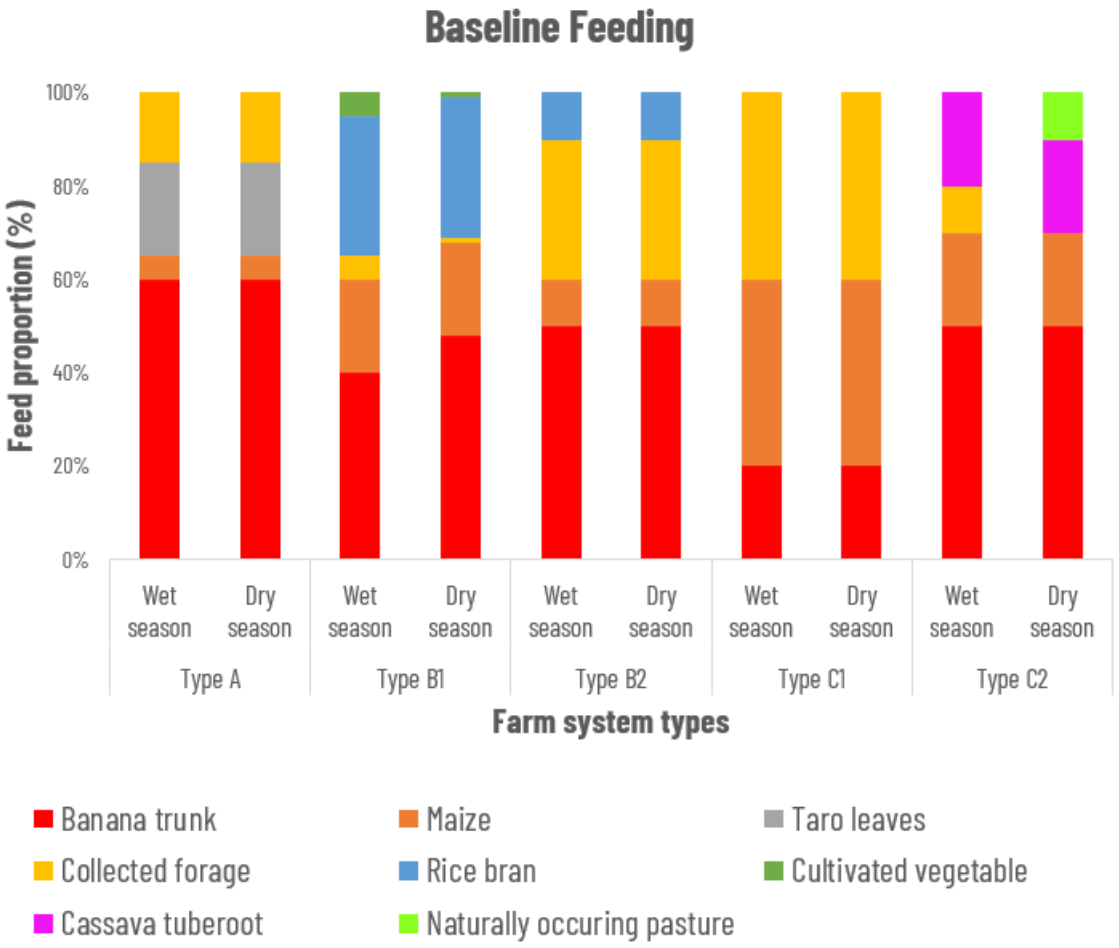
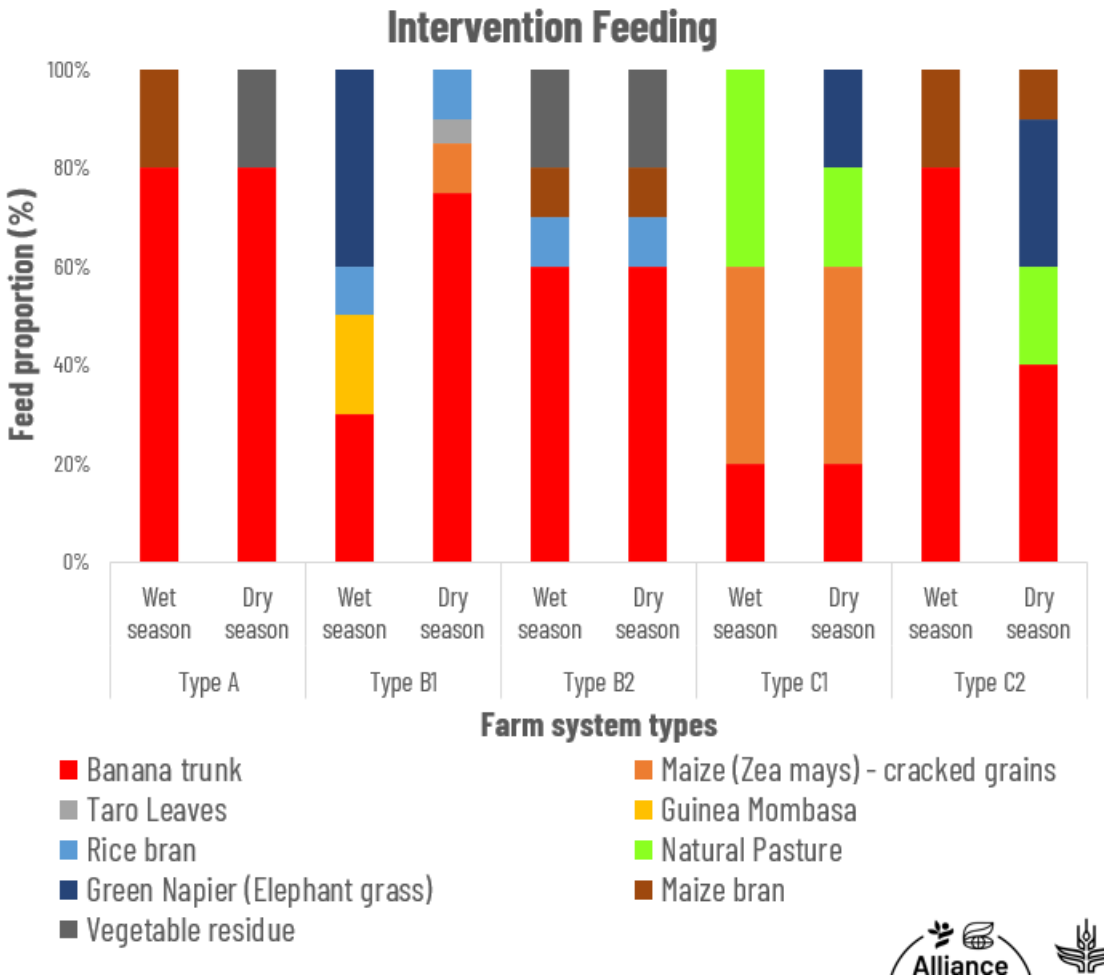




Annual pig diet





Outcome 1: Trade-off with implementation of integrated IPs

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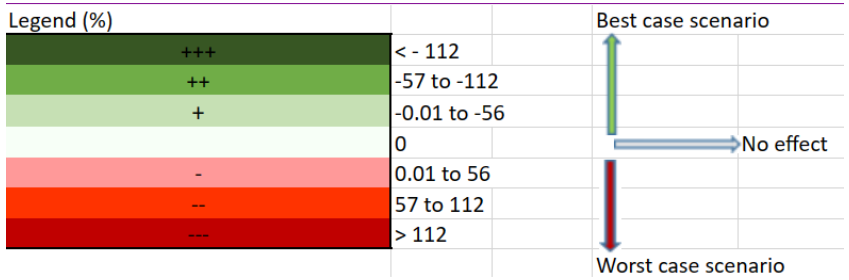
Farm System Types	Production	Land requirements		Soil impacts		Water impacts		GHG emissions	
	meat produced (kg/year)	ha/yr	Ha/MT meat	Erosion (t soil/yr)	Erosion (kg soil/kg meat	m^3/year	m^3/kg meat	t CO2eq./ year	kg CO2 eq. /kg meat
Type A	++	+	++	+	++	+	++	-	+
Type B1	+++	-	+	--	+	--	+	+	++
Type B2	+++	-	+	-	+	--	+	-	++
Type C1	+	+	+	--	-	+	+	-	+
Type C2	+	+	+	+	+	+	+	+	+

Compared the situation after implementation of the IPs with the baseline situation and used a color code to indicate if the situation is likely to worsen or get better



- The impact of the interventions varies across different farm types
- Yet: overall improved resource use efficiency
- Increased absolute resource use in the mixed system types

Outcome 2: Impacts at scale

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Farm System Types	Production	Land Requirements		Soil Impacts		Water Impacts		GHG Emissions	
	Meat produced (kg/year)	ha/yr	Ha/MT meat	Erosion (t soil/yr)	Erosion (kg soil/kg meat	m^3/year	m^3/kg meat	t CO_2 eq./year	kg CO_2 eq. /kg meat
Total baseline @scale (Mai Son district)	4.1 Mil.	0.047 Mil.	9.66	0.67 Mil.	237.46	131 Mil.	26.84	0.32 Mil.	62.56
Total intervention @scale (Mai Son district)	6.4 Mil.	0.035 Mil.	5.47	0.56 Mil.	184.97	120 Mil.	16.77	0.24 Mil.	35.26
Relative change (%)	**55%**	**-25.21%**	**-43.42%**	**-15.53%**	**-22.11%**	**-8.77%**	**-37.52%**	**-25.17%**	**-43.64%**

High production efficiency = low environmental impact at scale.

Key Outcomes and Lesson learned

- Current situation
  - High environmental impacts in systems with local breeds
  - Erosion is a big challenge in sugarcane/fruit tree growing areas

    à need for cover crops and terracing with dense forages
- Adopting Chan-henh interventions in different systems across the Mai Son district shows a promising pathway
  - sustained productivity and improved livelihoods

    → At landscape scale: production efficiency could increase by 88%.
  - synergistic with decreased environmental burdens per unit of output
  - better resistance to soil erosion in mountainous areas by cultivating improved grasses
- Implementation of IPs in the mixed agriculture systems will require additional land and water resources
- Improving animal reproductive performance can act as a climate mitigation option.

Recommendations

- Raise awareness on improved feeding and linkages to SAPLING goals
- Diversify and raise awareness on breeding techniques
- Embrace proactive planning in systems experiencing resource challenges
- Encourage continuous feedback mechanisms for project's evaluation and success
- Make use of evidence generated to identify Climate change mitigation and adaptation options in the study sites

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