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Evidence for agroecological intensification

4 July 2024

Brownbag Seminar ETH

Christian Grovermann, FiBL

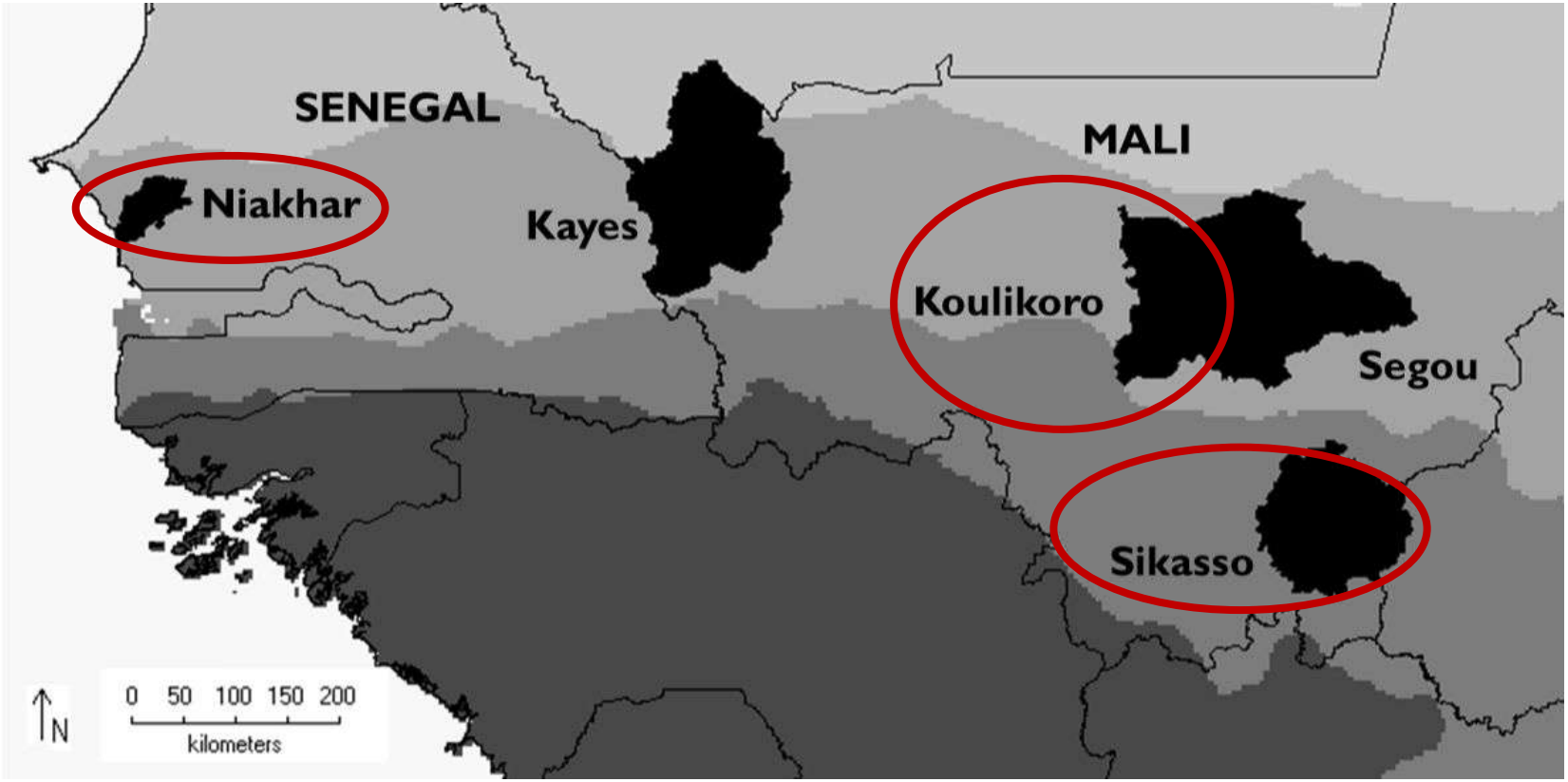
Evidence for agroecological intensification

PART I. Randomised evaluations of capacity development interventions that promote agroecological intensification in the Sahel

PART II. Combining impact evaluation and sustainability assessment – Assessment of organic participatory guarantee systems in Vietnam

Evaluating the farm-level impacts of agroecological innovations in the Sahel

Randomised controlled trials (RCTs) in Mali and Senegal



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Project on the systematic integration of crops, shrubs and livestock in the Sahel

Project Partners

This project has received funding from the European Union's Horizon 2020 sustainable food security programme | Project No: 861974 under call H2020-SFS-2019-2

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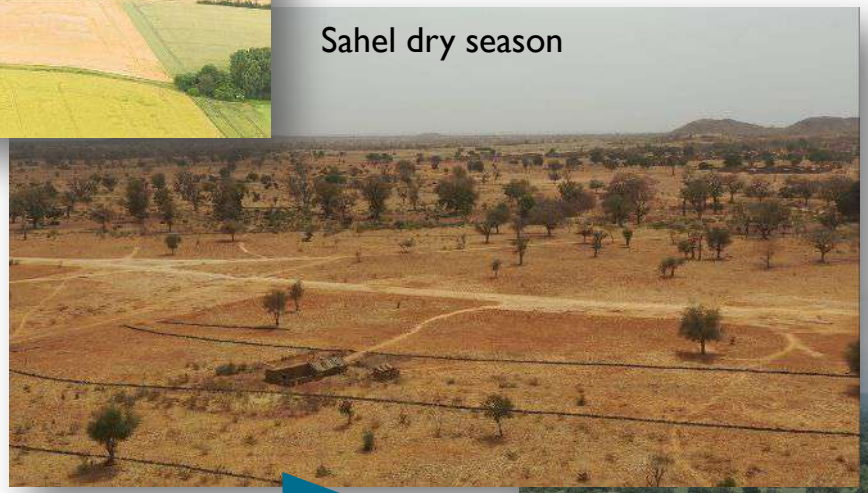
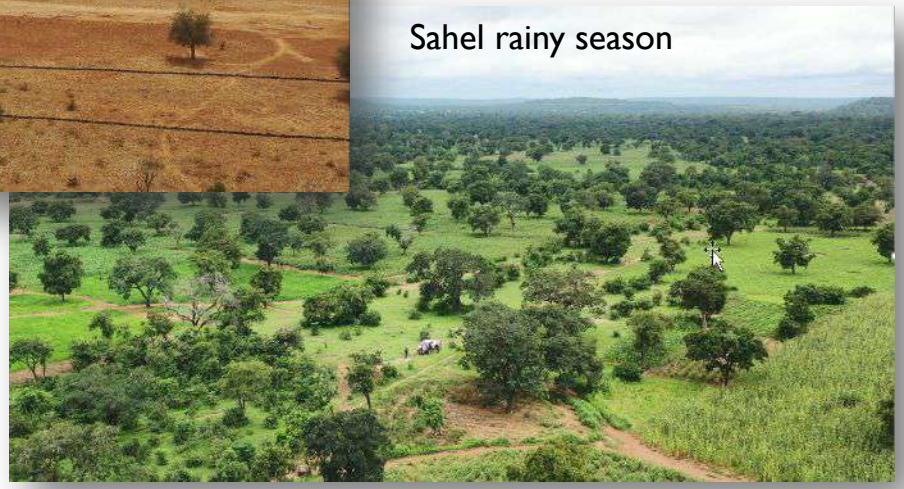
Sahelean versus European croplands

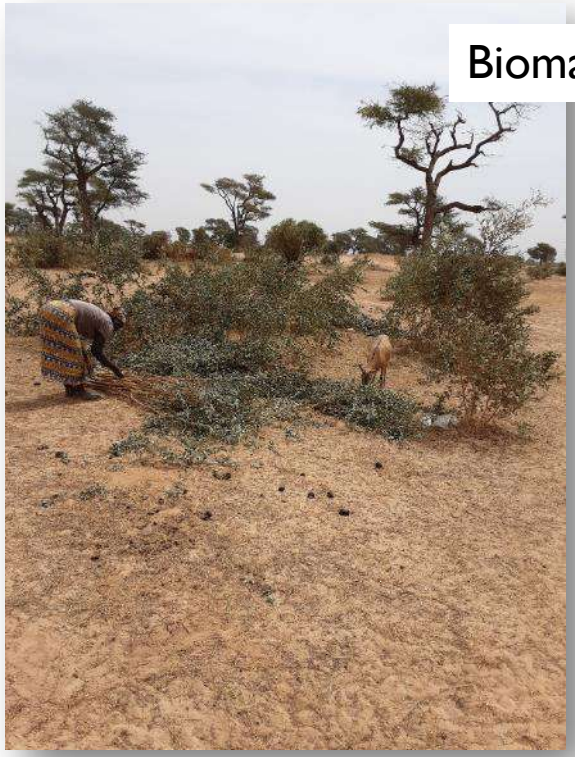




Trees and shrubs appear randomly in croplands

SustainSahel farm system co-design

Focus: Impacts of shrubs and trees on crops

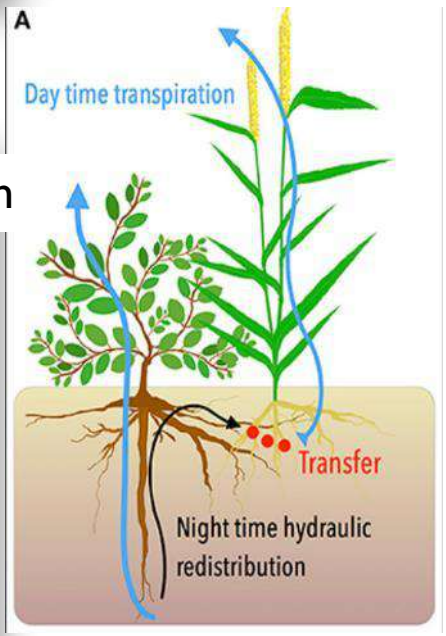


Biomass transfer

Poor sorghum growth in the non-mulched zone (20DAS)

Good sorghum growth in the mulch zone (20DAS)

Integration



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SustainSahel field trials

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Capacity development impact evaluation

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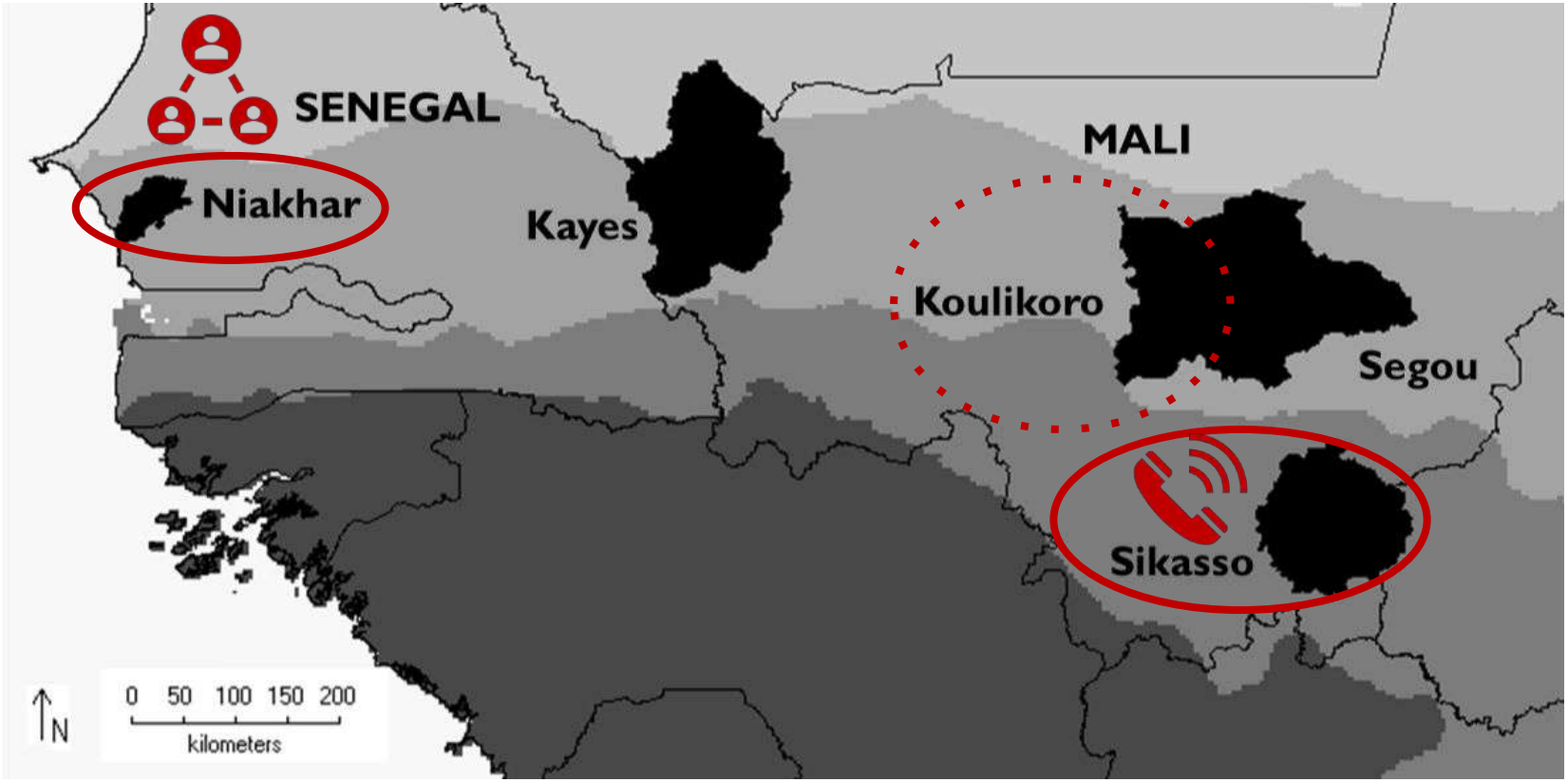
Face-2-face events

Phone-based advice

Evaluating the farm-level impacts of agroecological innovations in the Sahel

RCT sites in Mali and Senegal



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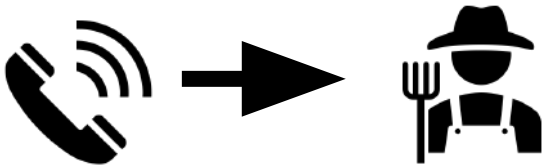
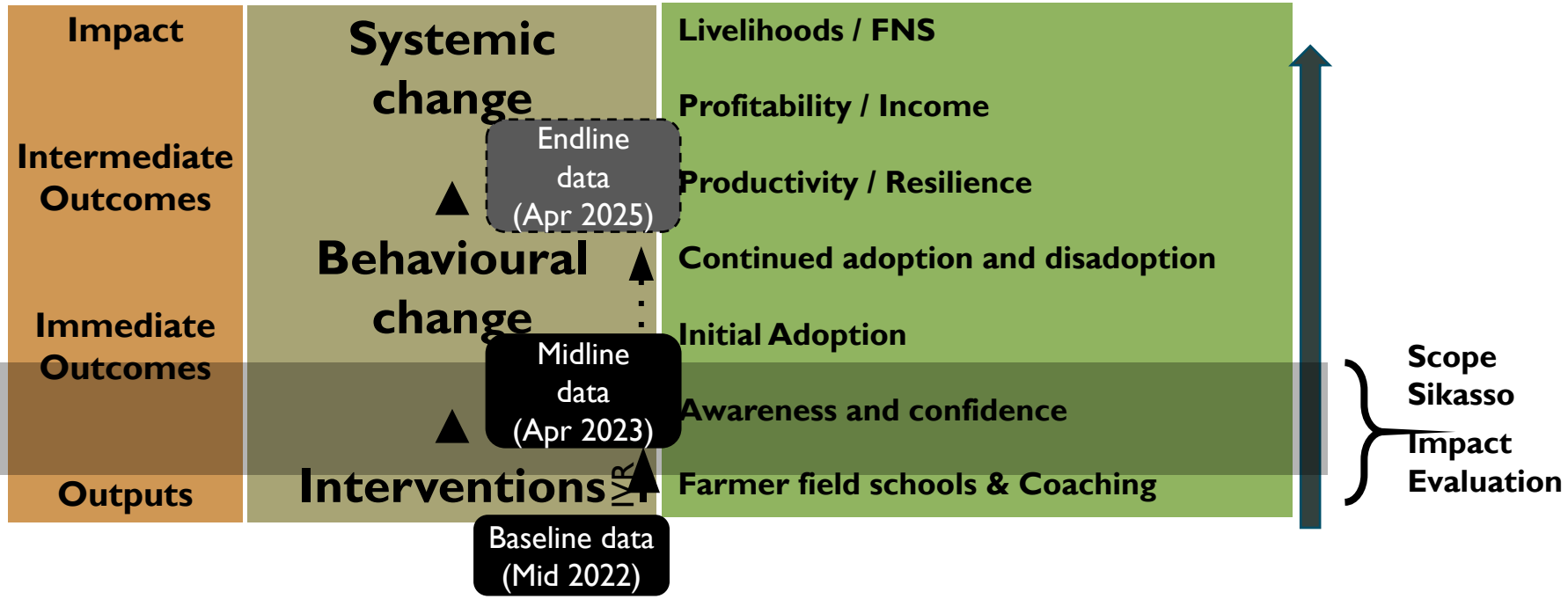
Effectiveness of interactive voice recordings to promote agroecology: Evidence from Sikasso, Mali

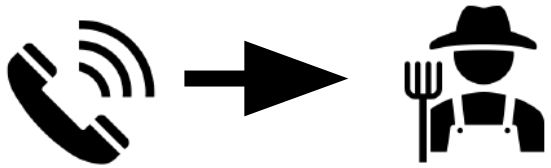
Impact Pathway





Digital Extension Randomised Controlled Trial

Interactive Voice Recordings (IVR)

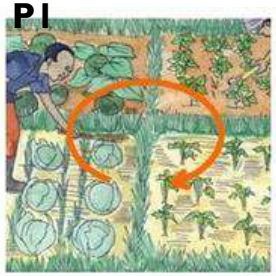


- ***Baseline data CSAT project***: 483 farm households in Sikasso region
- ***Fam-level randomisation***: 2 Groups (Treatment vs. Control)
- ***Balance checks****:* Similar baseline characteristics in both groups confirmed
- ***IVR campaign from Sept to Nov 2022***: 197 Participants
- ***Endline data collection by phone in Apr 2023***: 301 respondents (157 treated)
- ***Attrition appraisal****: Balance maintained*
- ***Analysis***: Description of participation data, Unconfounded group comparison using probit/poisson regressions, Link between participation and outcomes

Agroecological intensification practices

Variable name	Description
P1. Rotation with legumes	*Rotation of sorghum or millet with cowpea or groundnut*
P2. Intercropping with legumes	*Intercropping of sorghum or millet with cowpea or groundnut*
P3. Mulching	*Systematic direct application of shrub and tree residues*
P4. Composting	*Systematic use of shrub and tree residues to produce compost for later application to crops*
P5. Multi-purpose shrubs	*Systematic integration of piliostigma and guiera senegalensis shrubs with annual crops*
P6. Bio-pesticide application	*Application of herbal concoctions, bacillus thuringiensis or bacillus subtilis*

P1



P2

P3

P4

P5

P 6

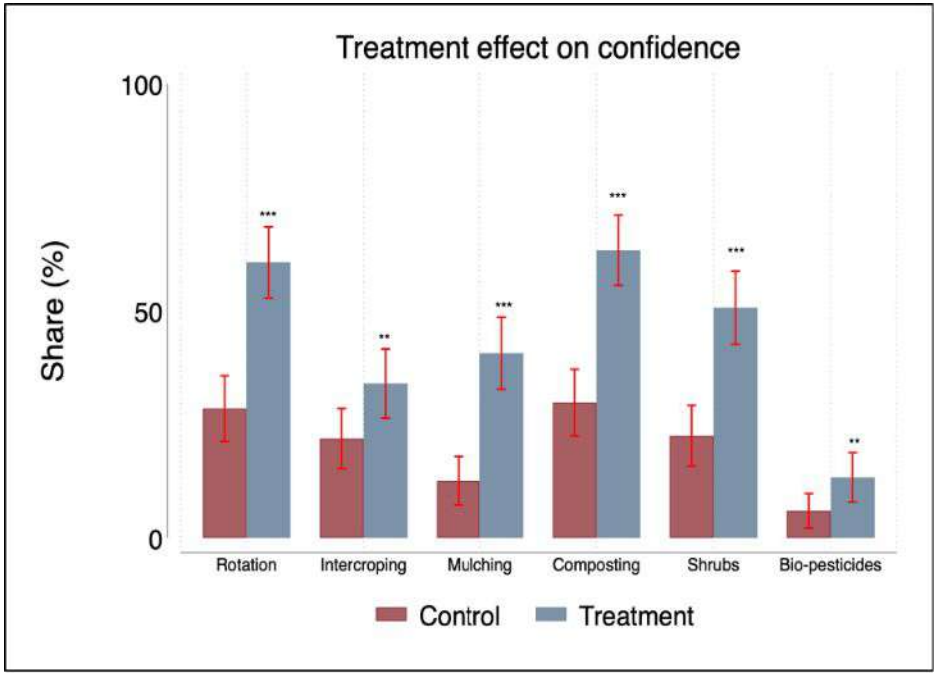
Outcome variables

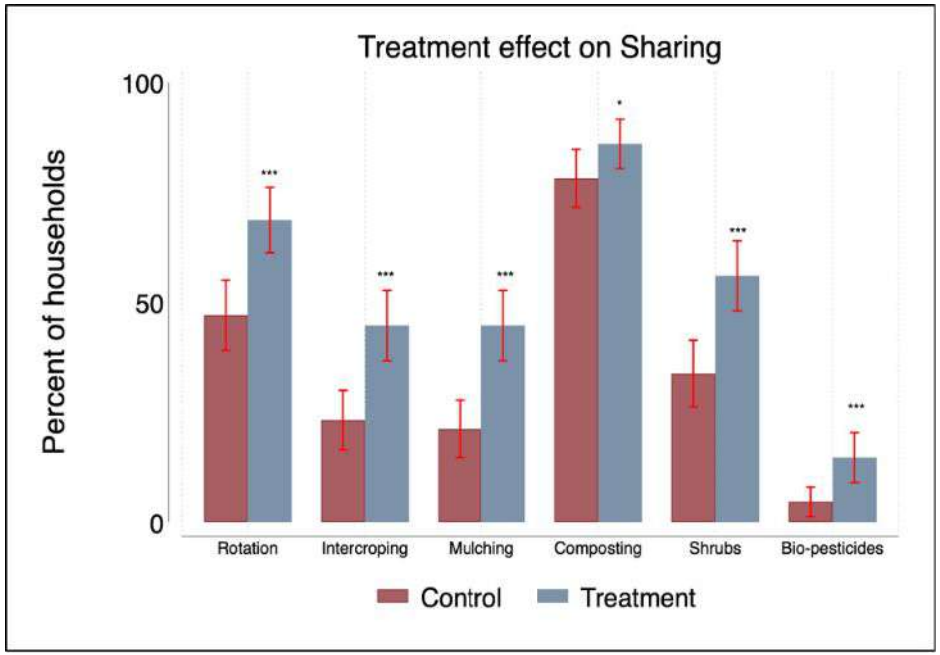
Variable name	Question	Measurement
Awareness	*Have you ever heard of the practice?*	*Individual practices P1 – P6 (YES/NO) & Aggregated practices (#)*
Intention	*Do you plan to use this practice in the coming planting season?*	*Individual practices P1 – P6 (YES/NO) & Aggregated practices (#)*
Sharing	*Have you told anyone else about this practice?*	*Individual practices P1 – P6 (YES/NO) & Aggregated practices (#)*
Learning	*Are you actively trying to learn more about this practice?*	*Individual practices P1 – P6 (YES/NO) & Aggregated practices (#)*
Confidence	*How confident do you feel in applying this practice?*	*Individual practices P1 – P6 (YES/NO) & Average confidence score (0-1)*

Aggregated treatment effects

	Aware	Use (Int)	Share	Learn	Conf
	# practices	*# practices*	*# practices*	*# practices*	*score (0-1)*
ATE	0.678	0.402	0.892	0.694	0.178
Sign	***	*	***	***	***
POM	4.347	3.375	2.146	4.306	0.374
ATE (%)	***16%***	***12%***	***42%***	***16%***	***48%***
n	301	301	301	301	301

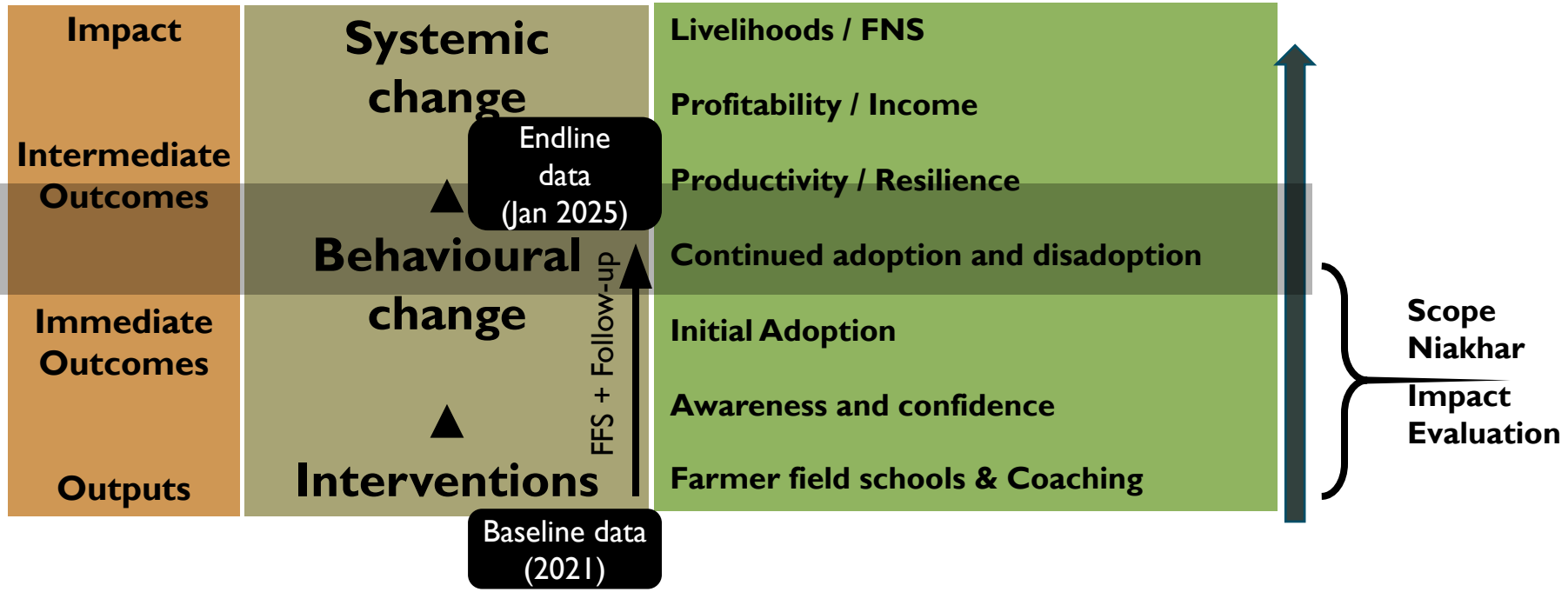
Visualisation of treatment effects by practice





Effectiveness of farmer field days to promote agroecology: evidence from Niakhar, Senegal

Impact Pathway

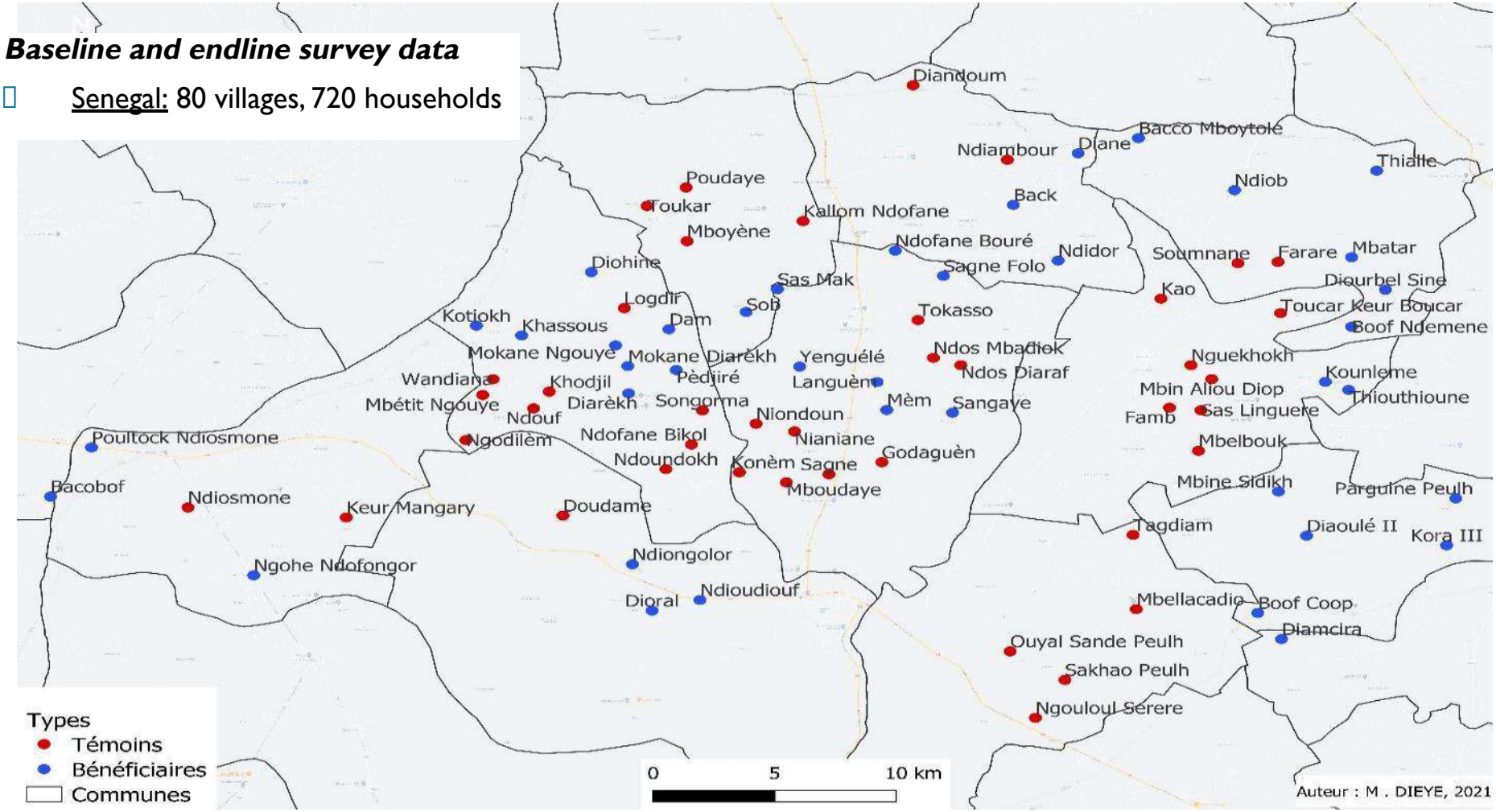


Mail / Senegal – Impacts of farmer field days

Intervention and Control Villages in Niakhar, Senegal

Baseline and endline survey data

- Senegal: 80 villages, 720 households



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Ex-post impact evaluation + sustainability assessment

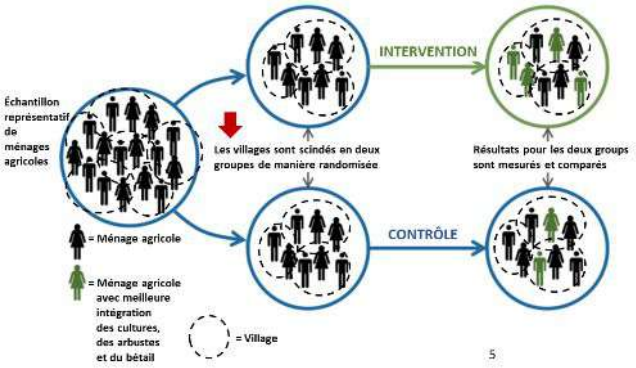
Zero sum game

Ex-post Impact Evaluation

- Causal analysis
- Large-n
- Selected outcomes

Sustainability Assessment (MCA)

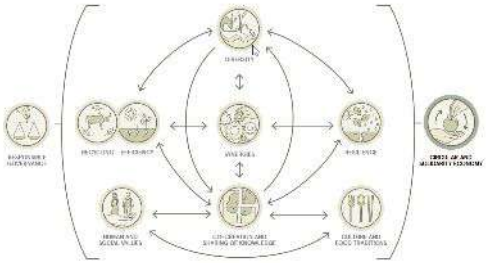
- Descriptive analysis
- Small-n
- Holistic indicator set



A

smart
sustainability monitoring and assessment routine

B



TAP
Tool for Agroecology Performance Evaluation

Ex-post impact evaluation + sustainability assessment

Examples from our research

Evaluation of the impact of training farmers on organic practices in Ghana and Kenya

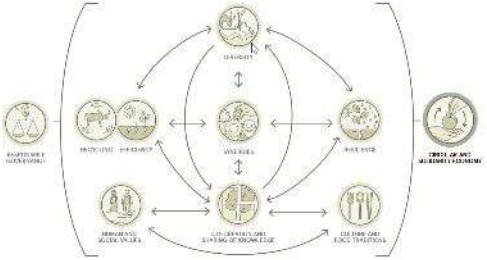
- Survey data from 1200 farms

smart
sustainability monitoring and assessment routine

Blockeel, J., Schader, C., Heidenreich, A., Grovermann, C., Kadzere, I., Egyir, I. S., ... & Stolze, M. (2023). Do organic farming initiatives in Sub-Saharan Africa improve the sustainability of smallholder farmers? Evidence from five case studies in Ghana and Kenya. Journal of Rural Studies, 98, 34-58.

Evaluation of the impact of organic participatory guarantee systems in northern Vietnam

- Survey data from 420 farms



TAPE

Grovermann, C., Hoi, P.V., Yen, N.T. B., Schreinemachers, P., Hai, M. N., & Ferrand, P. (2024). Impact of participatory guarantee systems on sustainability outcomes: the case of vegetable farming in Vietnam. International Journal of Agricultural Sustainability, 22(1).

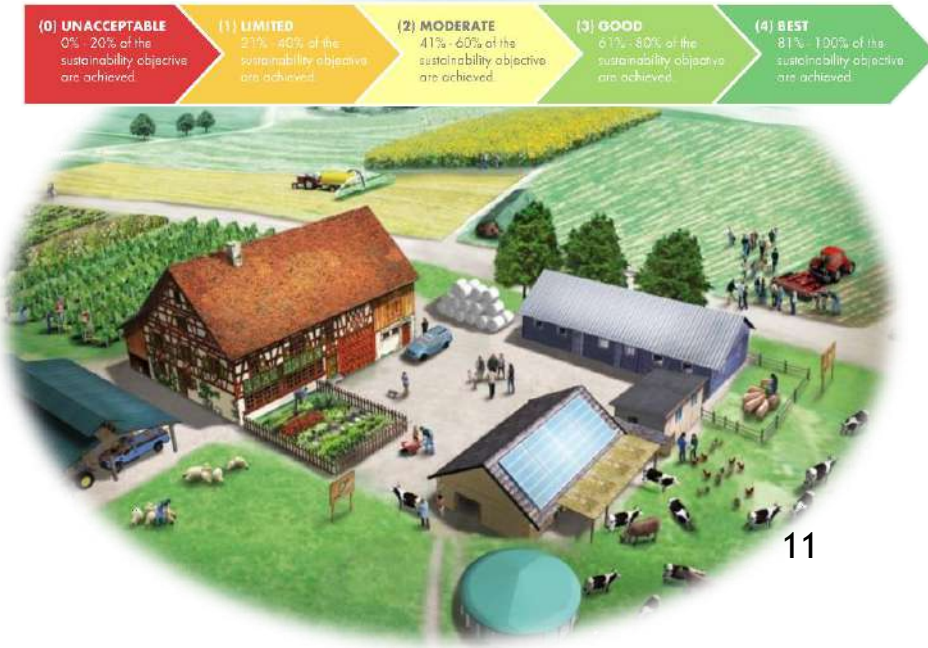
SMART: Sustainability assessment (FiBL)

SAFA guidelines
> 58 sust. objectives

smart
sustainability monitoring and assessment routine

SMART-Farm Tool
> 300 indicators

Sustainabili
performance
farms



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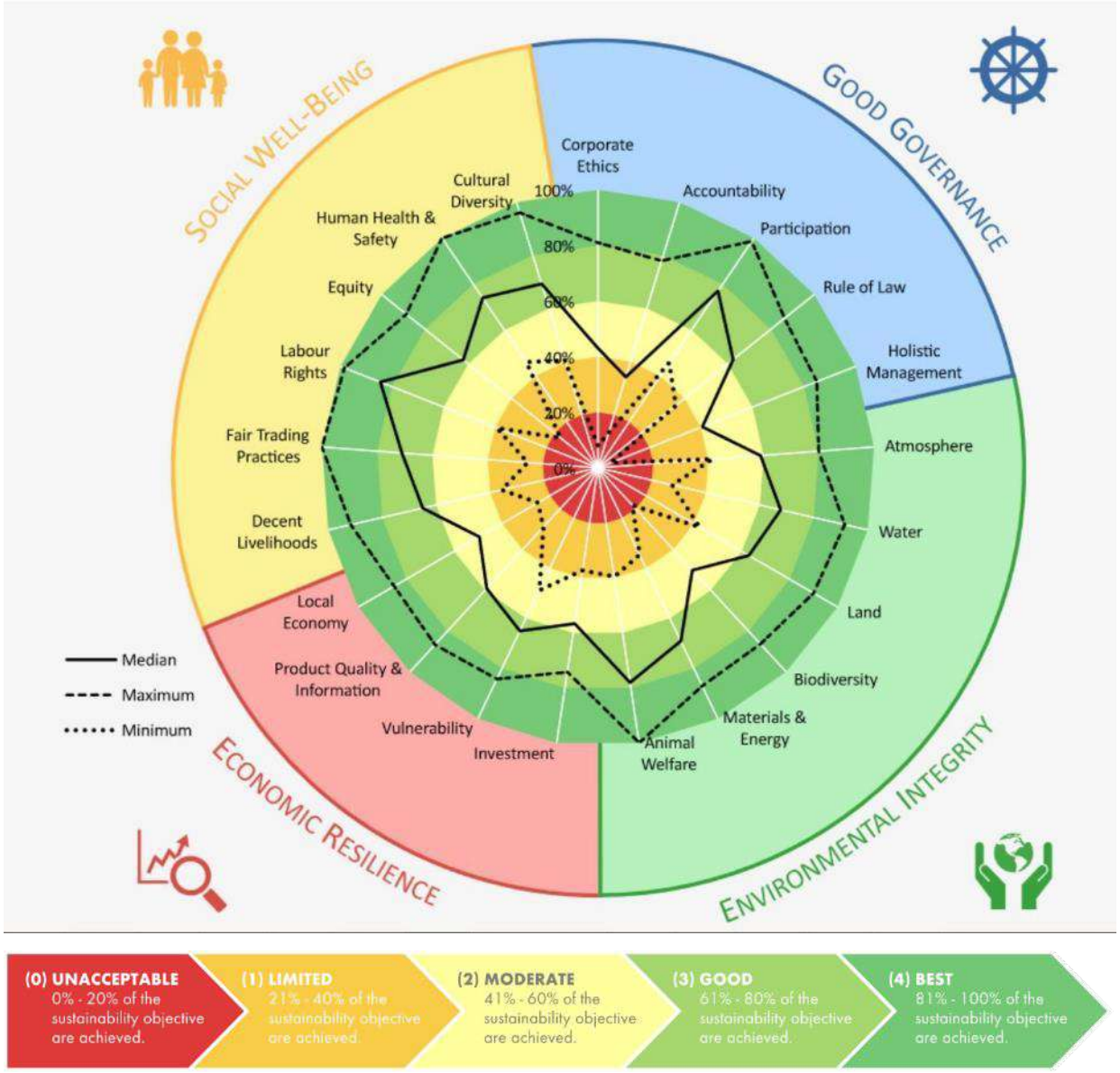
SMART: Sustainability assessment (FiBL)



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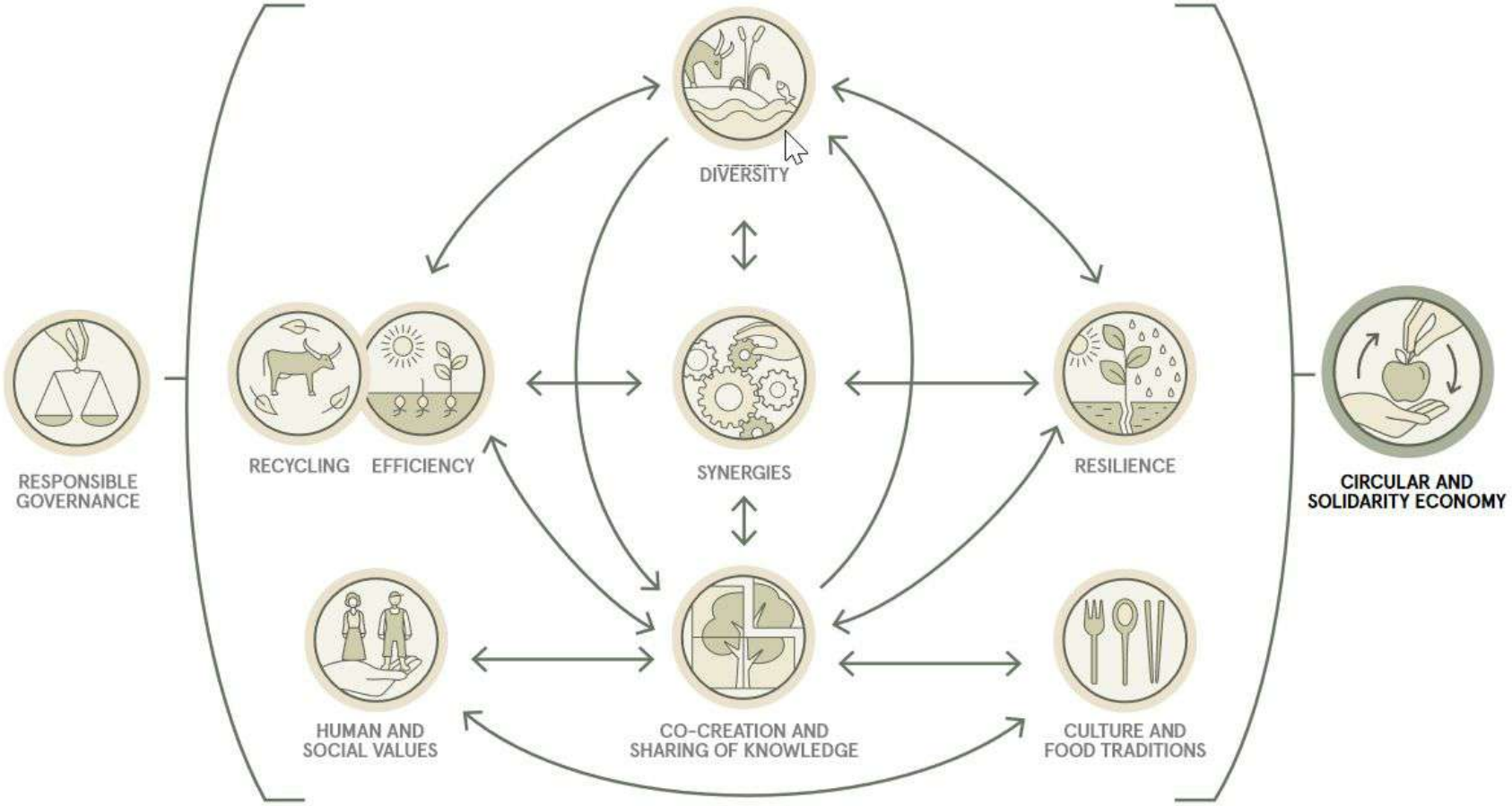
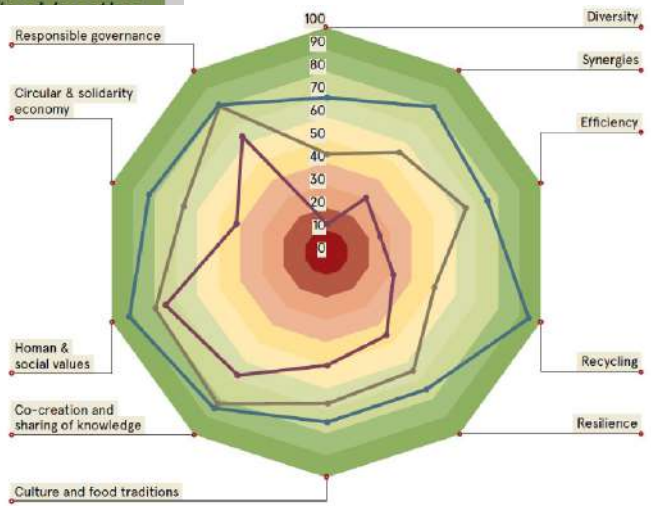
TAPE: Agroecology assessment (FAO)



TAPE: Agroecology assessment tool (FAO)

TABLE 2 Characterization of Agroecological Transitions (CAET): Descriptive scales and scores for the element of "Diversity"

	INDEX	0	1	2	3	4
DIVERSITY	Crops	Monoculture (or no crops cultivated)	One crop covering more than 80% of cultivated area	Two or three crops	More than 3 crops adapted to local and changing climatic conditions	More than 3 crops and varieties adapted to local conditions. Spatially diversified farm by multi-, poly- or inter-cropping
	Animals (including fish and insects)	No animals raised	One species only	Several species, with few animals	Several species with significant number of animals	High number of species with different breeds well adapted to local and changing climatic conditions
	Trees (and other perennials)	No trees (nor other perennials)	Few trees (and/or other perennials) of one species only	Some trees (and/or other perennials) of more than one species	Significant number of trees (and/or other perennials) of different species	High number of trees pere diffe integ the f
	Diversity of activities, products and services	One productive activity only (e.g. selling only one crop)	Two or three productive activities (e.g. selling 2 crops, or one crop and one type of animals)	More than 3 productive activities	More than 3 productive activities and one service (e.g. processing products on the farm, ecotourism, transport of agricultural goods, training etc.)	More prod activ sever



AGRO-ECONVERT: Agroecological transition through organic PGS certification in Vietnam

AGRO-ECONVERT:
Vietnamese-Swiss Joint Research Project

Funding by

Swiss National Science Foundation

FONDS NATIONAL SUISSE
SCHWEIZERISCHER NATIONALFONDS
FONDO NAZIONALE SVIZZERO
SWISS NATIONAL SCIENCE FOUNDATION

Vietnamese National Foundation for Science and Technology Development

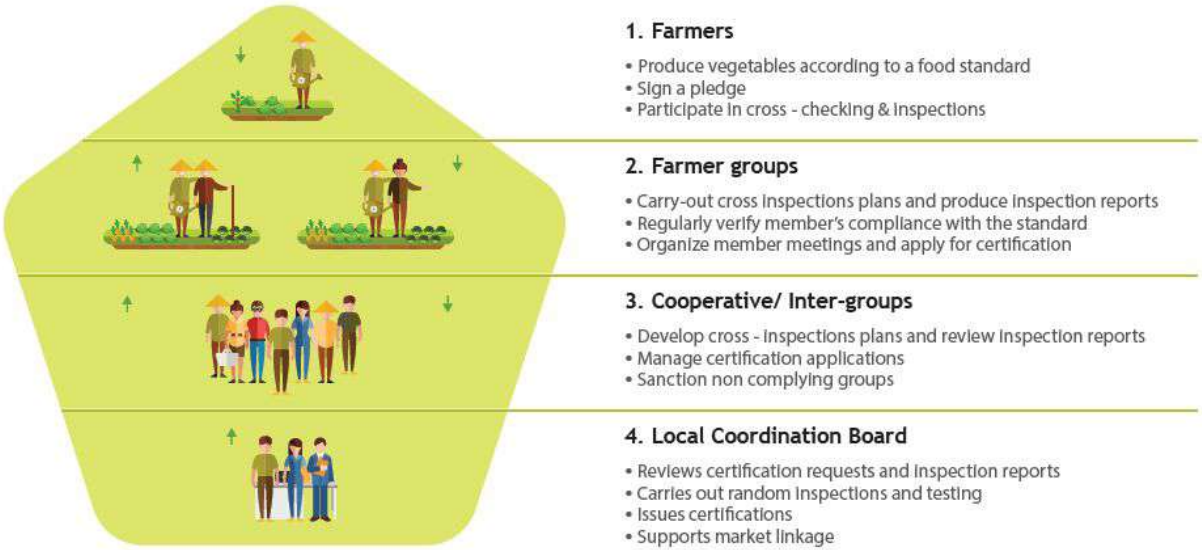
NAFOSTED
National Foundation for Science & Technology Development

Duration

Three years (starting April 1, 2022)

PGS Vietnam – Participatory low-cost organic certification

Established in 2008. PGS Vietnam include 3 intergroups of 180 farmers located in 3 different provinces of northern Vietnam (Hanoi, Hoa Binh, Ha Nam)



1. Farmers

- Produce vegetables according to a food standard
- Sign a pledge
- Participate in cross - checking & inspections

2. Farmer groups

- Carry-out cross inspections plans and produce inspection reports
- Regularly verify member's compliance with the standard
- Organize member meetings and apply for certification

3. Cooperative/ Inter-groups

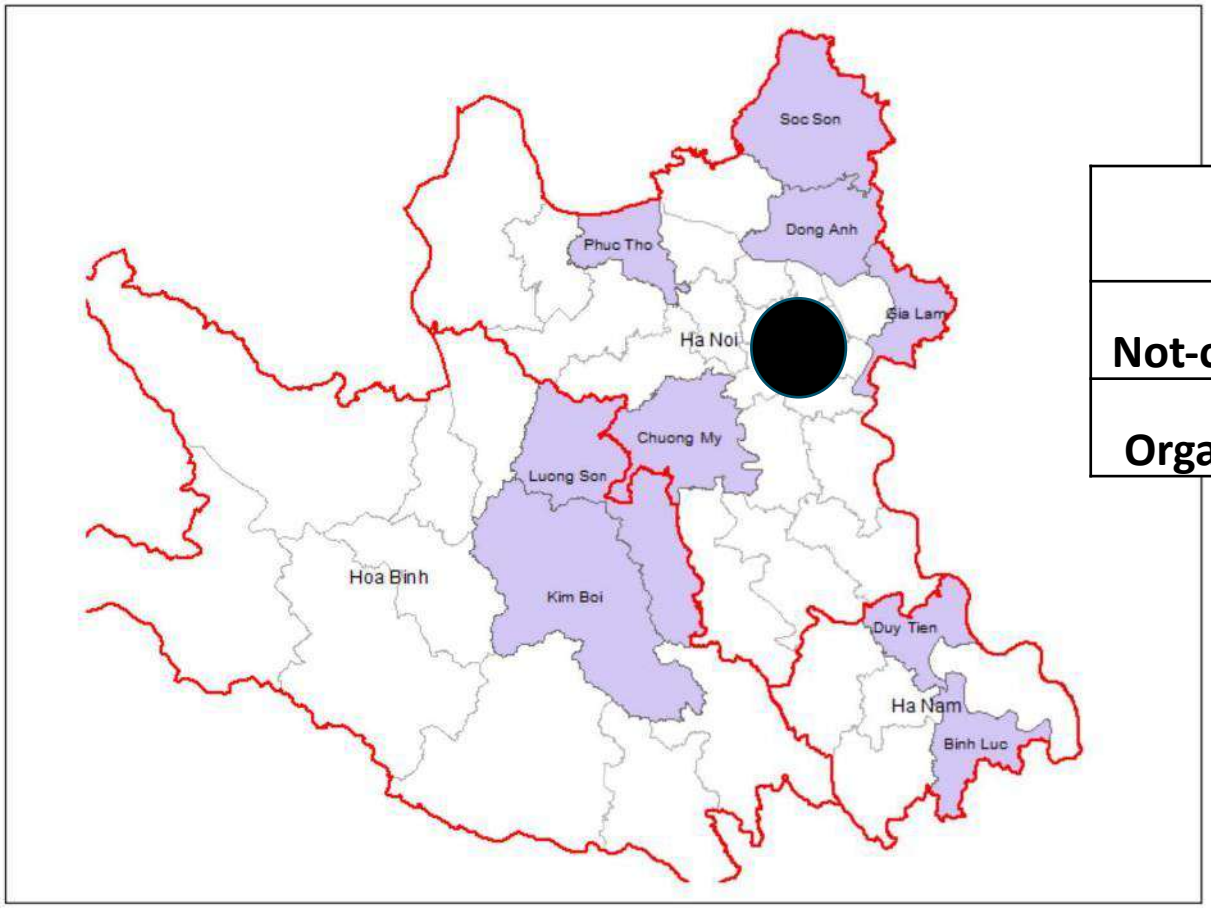
- Develop cross - inspections plans and review inspection reports
- Manage certification applications
- Sanction non complying groups

4. Local Coordination Board

- Reviews certification requests and inspection reports
- Carries out random inspections and testing
- Issues certifications
- Supports market linkage

Research Question, Study Area and Data

Can PGS certification cause a shift to more economically viable and agroecological vegetable production?



	Total Farm HH
Not-certified	301
Organic PGS	119

Key Performance Indicators

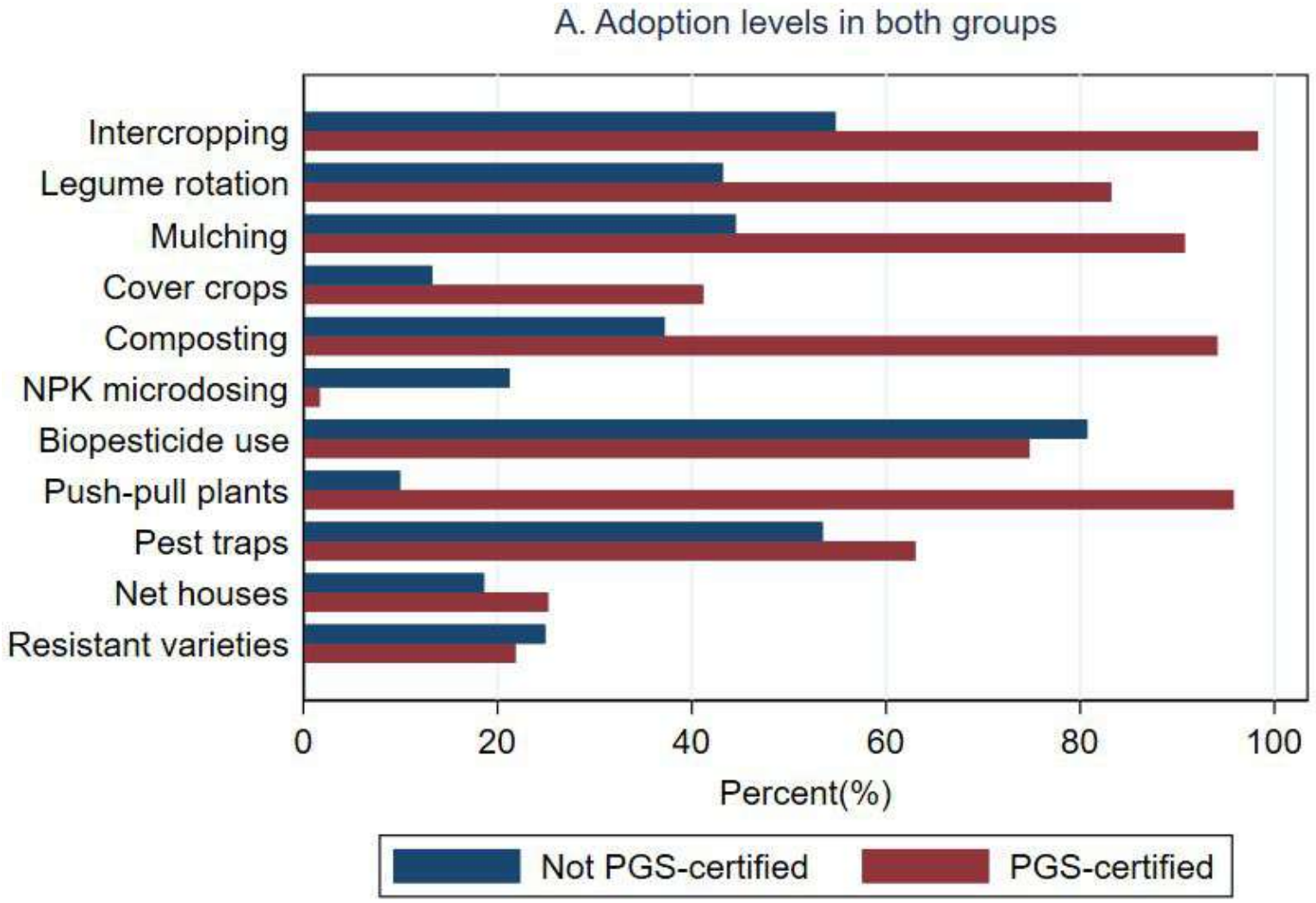
Economic outcomes (white cabbage):

- ✔ Gross margin [gm]
- ✔ Return on labour [labreturn]
- ✔ Yields [yield]

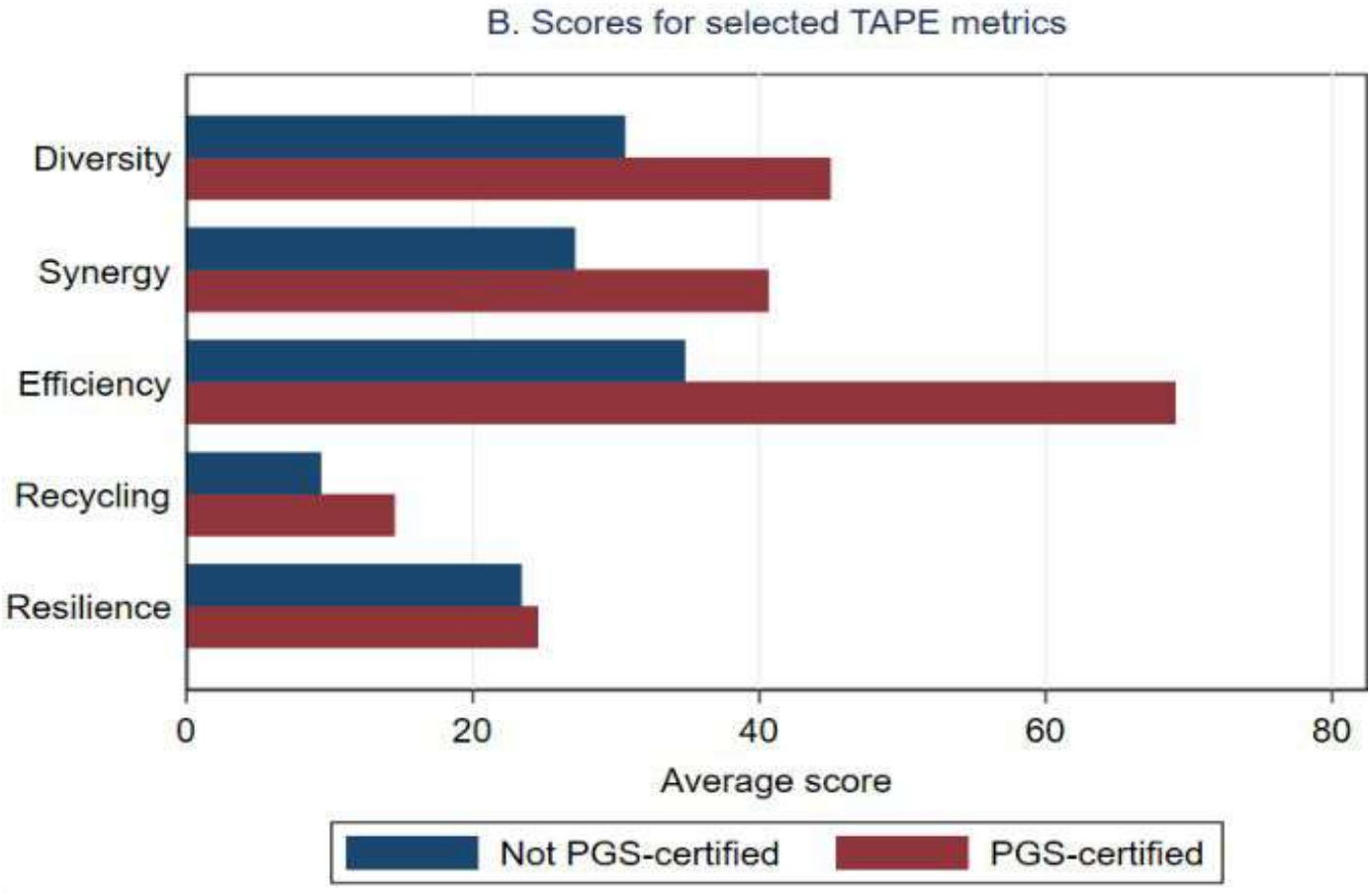
Other sustainability outcomes:

- ✔ TAPE score [tape]
- ✔ Awareness [aware], adoption [use] and confidence [conf] of agroecological practices

Descriptives - Adoption of sustainable practices by organic PGS and conventional farmers



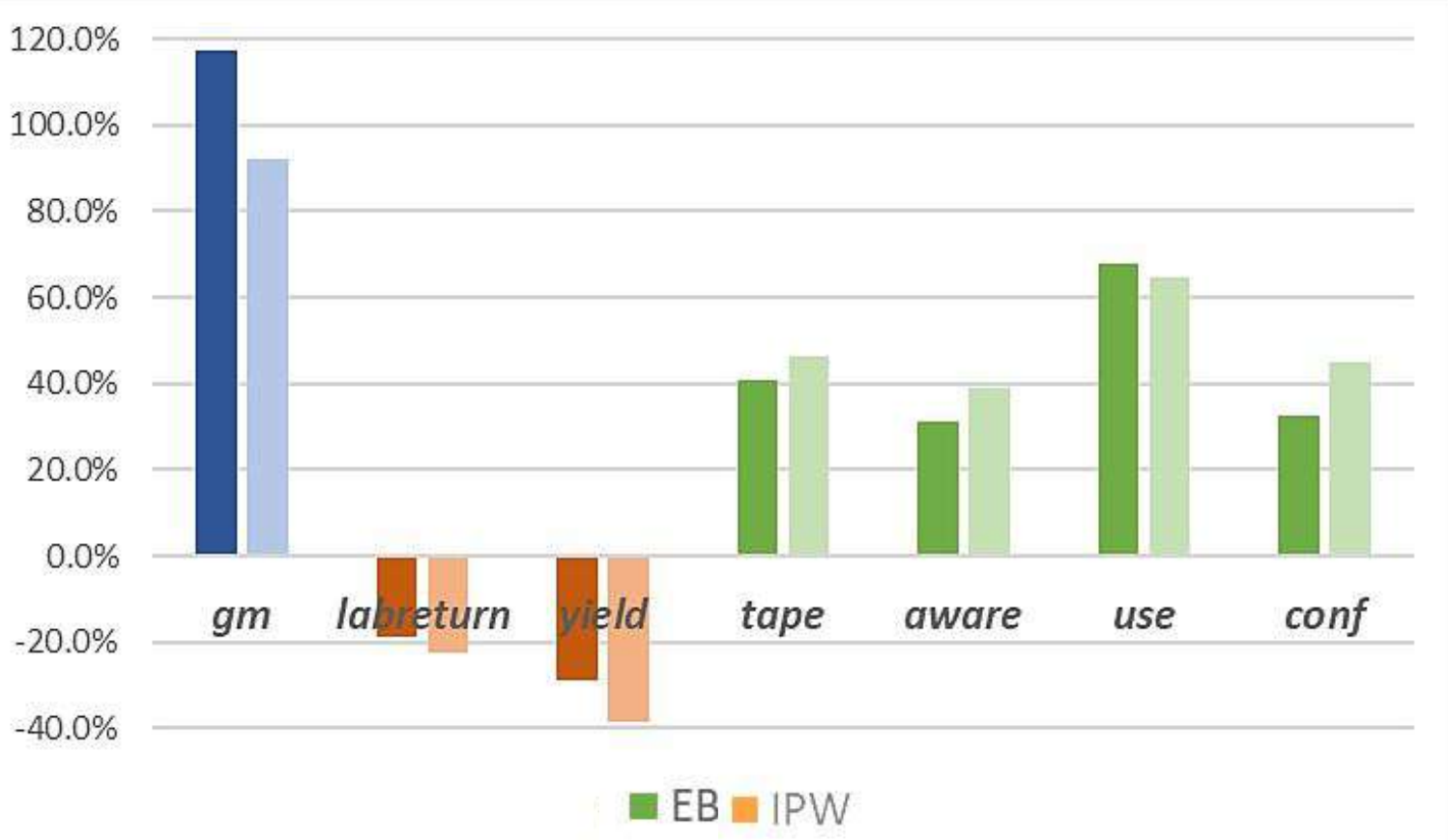
Descriptives - Selected TAPE metrics for organic PGS and conventional farmers



Impact estimation

- ✔ Objective: PGS impact evaluation based on counterfactual
- ✔ Control variables: Wide range of covariates covering farm and farmer charactertistics available from structured survey
- ✔ Estimation: Selection bias corrected with regression adjustment applied to reweighted data → entropy balancing and inverse propability weights (Jann, 2021)
- ✔ Robustness: Sensitivity checks for omited variable bias → selection can also derive from unobserved characteristics, e.g. motivation

Results: Impact estimates



Results: Impact estimates

Entropy weights + regression adjustment

vs.

Inverse propability weights + regression adjustment

Outcome variables	Unit	Treatment effect	Sign.	Standard Error	PO Mean	Treatment effect in %
gm	MVND/ha	149.88	***	(37.774)	127.71	117.4%
labreturn	MVND/day	-0.08	ns	(0.060)	0.45	-18.7%
Yield	t/ha	-8.71	***	(2.563)	30.24	-28.8%
tape	0-1 score	0.14	***	(0.015)	0.33	40.6%
aware	# practices	2.15	***	(0.247)	6.90	31.2%
use	# practices	2.79	***	(0.493)	4.11	67.8%
conf	0-1 score	0.15	***	(0.041)	0.47	32.6%
orgknow	# keywords	1.59	***	(0.388)	2.52	63.1%
choice	1=yes	0.16	*	(0.090)	0.67	23.3%
gm	MVND/ha	133.28	***	(36.148)	144.32	92.4%
labreturn	MVND/day	-0.11	ns	(0.076)	0.47	-22.4%
yield	t/ha	-13.38	***	(2.541)	34.92	-38.3%
tape	0-1 score	0.15	***	(0.016)	0.32	46.2%
aware	# practices	2.54	***	(0.225)	6.52	39.0%
use	# practices	2.70	***	(0.517)	4.19	64.5%
conf	0-1 score	0.19	***	(0.028)	0.43	45.0%
orgknow	# keywords	2.10	***	(0.222)	2.02	103.7%
choice	1=yes	0.21	***	(0.076)	0.62	33.2%

Robustness checks
Omitted variable bias

Regression sensitivity analysis by Diegert et al (2022)

	rxbar(Breakdown)				
Outcome	**cbar = 0**	**cbar = 0.25**	**cbar = 0.5**	**cbar = 0.75**	**cbar = 1**
[gm1]	65.9%	58.1%	55.1%	55.0%	55.0%
[returnlab]	28.4%	27.3%	27.3%	27.3%	27.3%
[yield]	64.9%	57.4%	54.5%	54.5%	54.5%
[tape5]	120.3%	94.8%	82.0%	76.9%	76.9%
[aware]	64.2%	56.9%	54.1%	54.1%	54.0%
[use]	103.6%	84.4%	74.8%	71.9%	71.9%
[conf]	55.2%	49.9%	48.3%	48.3%	48.3%
[orgknow]	77.9%	67.0%	62.1%	61.5%	61.5%
[choice]	49.5%	45.4%	44.4%	44.4%	44.4%

Economic and agroecological benefits

Productivity challenges






Ecological intensification techniques

Thank you!


impact
target
mission
change
outcomes
indicators
qualitative
soft
aim
performance
evaluation
intended
segmentation
resources
monitoring
hard
distance
SROI
money
baseline
activities
objectives
unintended
progress
vision
well-being
quantitative
proxies
social
efficiency
outputs
milestone
benchmark
input
travelled
value
Outcomes
longitudinal
forecast
framework
inputs