

Il ruolo della valutazione multicriteriale per sostenere la transizione verso un'agricoltura sostenibile basata sulla diversificazione colturale

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H2020 project DiverIMPACTS (2017-2022)

- Promuovere la diversificazione colturale in EU (attraverso rotazioni, consociazioni, policolture) nello spazio e nel tempo e coinvolgendo diversi attori delle filiere agro-alimentari a monte e a valle del sistema colturale



Consorzio
34 Partners
11 Paesi
Leader: A Messéan (INRA)

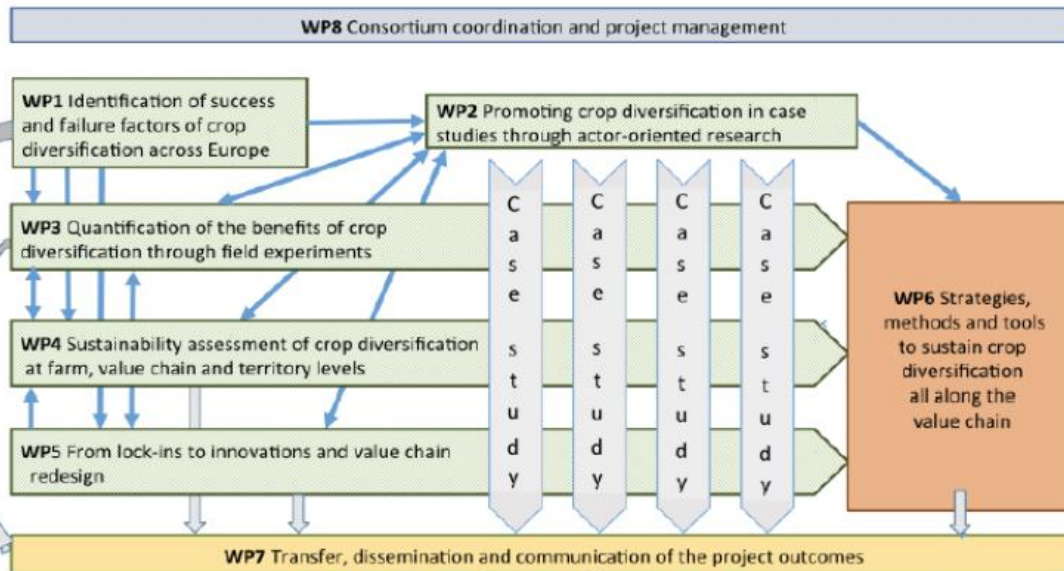


Figure 1. Operational structure of DiverIMPACTS

Struttura
9 WPs

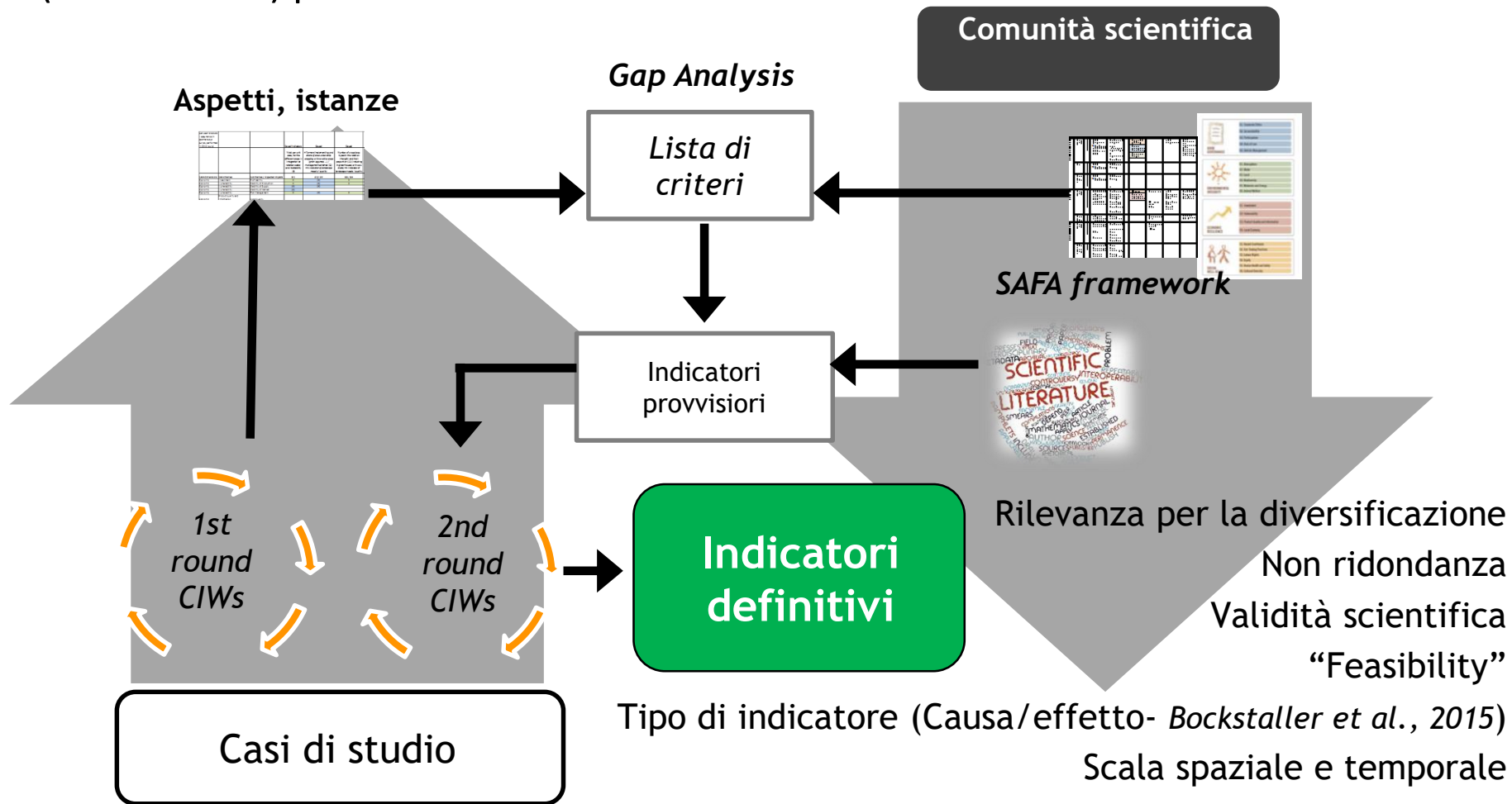
WP2: Casi studio (CS)
WP3: Siti sperimentali (FE)

WP4 - Obiettivo

- Sviluppo di un **framework di indicatori capaci di:**
 - essere **sensibili alla diversificazione culturale e valutarne gli effetti** (carry-over, sinergie e trade-off);
 - Individuare **sinergie e trade-off** fra le componenti considerando i vari ambiti della sostenibilità (agroambientale, economica, sociale);
 - effettuare valutazioni sia di sistemi produttivi già esistenti (**valutazioni ex-post**), sia di scenari o possibili strategie (**valutazioni ex-ante**) prima della loro effettiva realizzazione, al fine di selezionare le opzioni più sostenibili.
 - Lavorare in **contesti di “vita reale”** (CS) spesso caratterizzati da **scarsa disponibilità di dati** e supportare la loro transizione verso sistemi più sostenibili

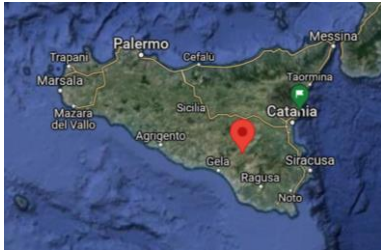
Metodologia

Integrazione di un approccio **top-down** (comunità scientifica) e **bottom-up** (*attori dei CS*) per l'identificazione del framework di indicatori



Metodologia

- **Test preliminare in 3 CS** (Francia, Italia, Germania)



IT (Caltagirone, 10 ha)

- **Sistema di riferimento** (Convenzionale, **Ex-post**): frumento duro-carciofaia;
- **Sistema diversificato** (Biologico, **Ex-post**): canapa, frumento tenero, frumento duro (3 varietà antiche);
- **Sistema diversificato con sulla** (Biologico, **Ex-ante**): canapa, frumento tenero, frumento duro (3 varietà antiche), sulla

An Actor-Oriented Multi-Criteria Assessment Framework to Support a Transition towards Sustainable Agricultural Systems Based on Crop Diversification

by Ileana Iocola^{1,*} , Frederique Angevin² , Christian Bockstaller³ , Rui Catarino³ ,
 Michael Curran⁴ , Antoine Messéan² , Christian Schader⁴ , Didier Stilmant⁵ ,
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Sustainability **2020**, *12*(13), 5434; <https://doi.org/10.3390/su12135434>
Special Issue Biodiversity 2020: Agriculture, Environment and Wellbeing)

Metodologia

- Valutazione di **14 CSs** per un totale di **20 sistemi diversificati** (confrontati con i sistemi di riferimento) di cui **13 in organico (ORG)** e **7 in convenzionale (CONV)**

CS	Production	Analysis	Ha	n. years	Diversification strategies
CS1_NE	Conv	Ex-post	1	1	Cover crop in maize monoculture
CS3_DE	Conv	Ex-ante	50	6	Longer rotation, cover and catch crops
CS4_BE	Org	Ex-post	1	4	Cover crops grazed by sheep
CS6_CH	Org	Ex-post	4	1	Organic winter rapeseed sown with clover
CS7_HU	Org	Ex-post	3.5	3	Diversified organic system with a legume
CS8_RO_3y	Org	Ex-post	100	3	Rotation with (pea-camelina) intercropping
CS8_RO_5y_m	Org	Ex-post	100	5	Longer rotation with maize
CS8_RO_5y_a	Org	Ex-post	5	5	Longer rotation with alfalfa
CS9_IT_Hemp	Org	Ex-post	10	2	Hemp introduction, local landraces
CS9_IT_Sulla	Org	Ex-ante	10	3	Hemp introduction, local landraces, cover crop
CS11_FR	Conv	Ex-post	63.7	2	Hemp introduction, grain legume increase, cover crop
CS12_BE	Org	Ex-ante	3	3	No till, cover crop, legume intercropping
CS12_BE_control	Org	Ex-ante	3	3	No till, cover crop
CS13_FR_METH1	Conv	Ex-ante	1	13	Long rotation, multiple cropping (some used for the methanizer), cover crops, intercropping
CS13_FR_METH2	Conv	Ex-ante	1	6	Short rotation, multiple cropping (some used for the methanizer), cover crops
CS14_FR	Conv	Ex-post	10	6	Long rotation, cover crops
CS17_FR	Conv	Ex-post	1	1	Pea-wheat intercropping
CS20_Lupine	Org	Ex-post	4	1	Development of new systems to produce organic soya for chickens and pigs
CS20_Soybean	Org	Ex-post	4	1	Development of new systems to produce organic blue lupines for chickens and pigs
CS22_IT	Org	Ex-post	20.9	4	K-line system, cover crops

Risultati

ECON	SAFA Theme/Sub-Themes	Criteria	Indicators
	Investment / Profitability	Productivity	EY LER
	Vulnerability / Stability of Production	Stability of production	YCV
	Investment / Profitability	Profitability	RGM
	Vulnerability / Risk Management	Dependency on external inputs	DEI
	Investment / Profitability; Product Quality and Information / Food Quality	Product quality	PSQ
	Investment / Profitability	Local valorisation	PSC SCCP
ENV	Biodiversity/ Ecosystem Diversity	Ecosystem/landscape Diversity	CDI SNH
	Biodiversity / Species Diversity	Crop diversification	CDI LEG
	Biodiversity / Genetic Diversity	Genetic diversification	CCD CCM
	Land/ Land Degradation	Soil degradation	NWHC BSO
	Land / Soil Quality	Soil quality	ACI
	Fresh water / Water withdrawal	Water withdrawal	PLWR
	Fresh water/Water Quality	Water quality (nutrient)	NBAL and PBAL BSO
	Fresh water/Water Quality	Water quality (pesticide)	LeachAI QAI
	Atmosphere/Air Quality	Air quality	VolAI QAI
	Atmosphere / Greenhouse gases	GHG balance	MNUGHG NU FCFGHG ACI FCFNRJ MNUNRJ MPU
SOC	Materials and Energy /Energy use and Material use	Non-renewable resources	
	Human Safety and Health/ Public Health	Famer and public health	TFI
	Decent Livelihood / Quality of Life	Farmers' quality of life	WOL

Il framework DiverIMPACTS è composto da:

- **19 criteria** (6 -ECON, 11 -ENV, 2 -SOC)
- **32 indicatori di performance** (9 -ECON, 21 -ENV, 2 - SOC)

$$\text{Indicator rotation} = \sum \text{indicator crop}_i * S_i / n * S$$

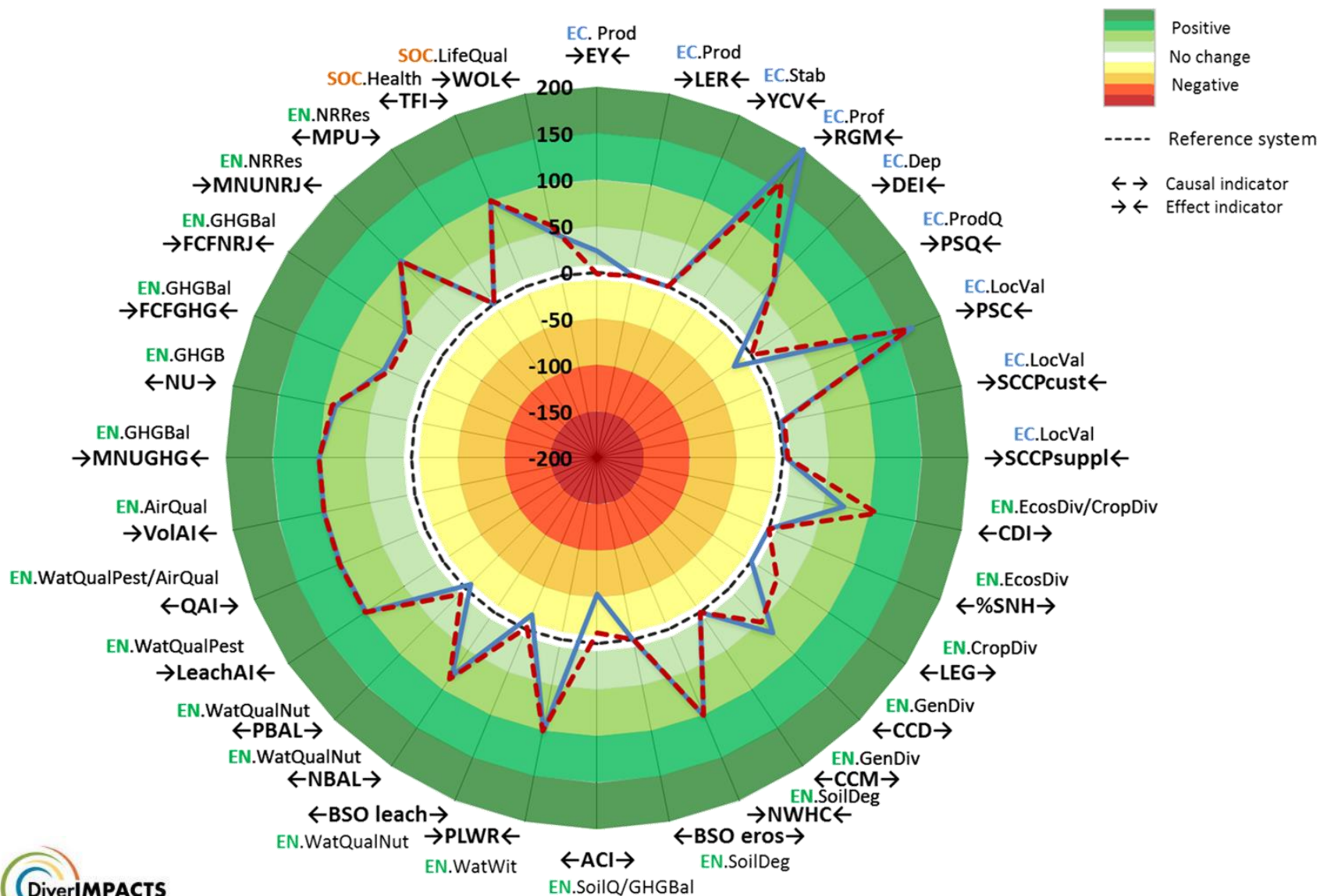
S_i = superficie dove la coltura i è coltivata;

S = superficie totale

n = anni della rotazione

Risultati

Number of changes	EC			EN			SOC		
	pos.	nc	neg.	pos.	nc	neg.	pos.	nc	neg.
Wheat-hemp system	4	4	1	13	5	3	2	0	0
Sulla clover scenario	5	4	0	15	5	1	2	0	0

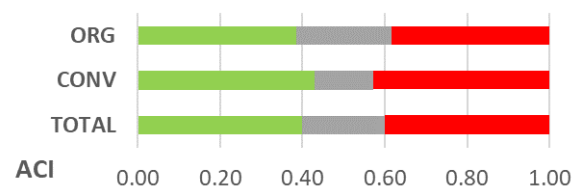
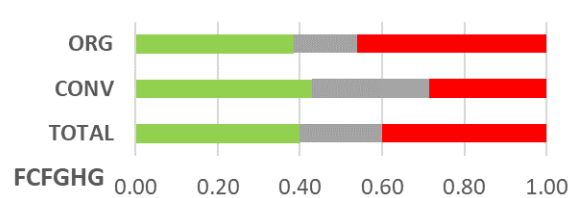
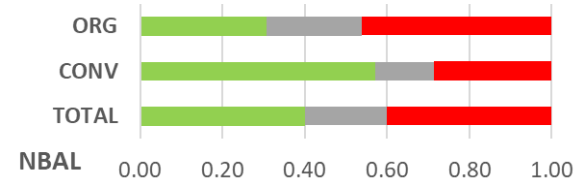
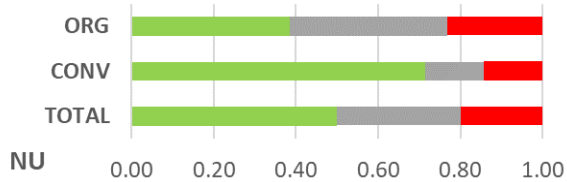
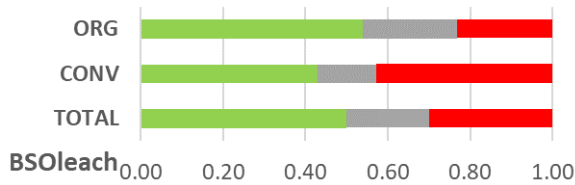
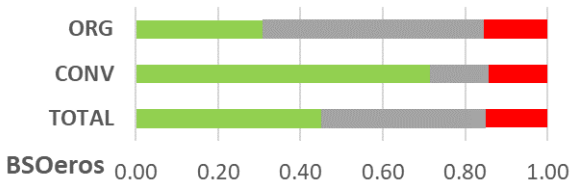
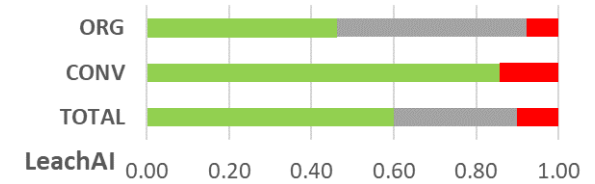
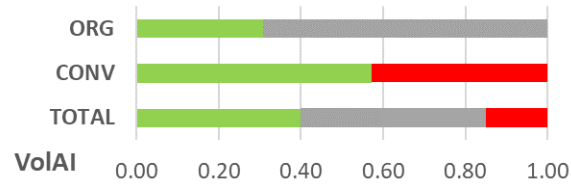
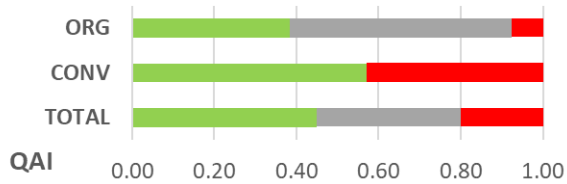
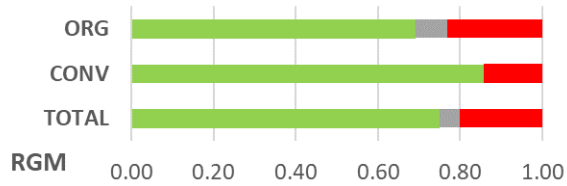


Risultati

pos. > +5%,
neg. < + 5%
−5% ≤ nc ≤ + 5%

Number of changes	EC			EN			SOC		
	pos	nc	neg	pos	nc	neg	pos	nc	neg
CS1_NE	0	6	1	6	9	6	0	2	0
CS3_DE	3	2	2	14	4	3	1	1	0
CS4_BE	1	6	0	1	19	1	0	2	0
CS6_CH	2	5	0	8	13	0	0	2	0
CS7_HU	6	1	0	3	14	4	0	2	0
CS8_RO_3y	2	4	1	7	5	8	0	2	0
CS8_RO_5y_m	0	4	3	6	7	7	0	2	0
CS8_RO_5y_a	1	4	2	8	7	5	0	2	0
CS9_IT_Hemp	4	2	1	13	6	2	2	0	0
CS9_IT_Sulla	6	1	0	15	5	1	2	0	0
CS11_FR	3	4	0	3	11	7	0	1	1
CS12_BE	2	3	2	13	4	4	1	1	0
CS12_BE_control	2	4	1	6	7	8	1	1	0
CS13_FR_METH1	2	5	0	13	6	2	1	1	0
CS13_FR_METH2	2	1	0	10	6	5	1	1	0
CS14_FR	2	1	0	13	6	2	1	1	0
CS17_FR	3	3	1	11	7	3	1	1	0
CS20_Lupine	1	4	2	3	12	6	1	1	0
CS20_Soybean	2	3	2	3	12	6	1	1	0
CS22_IT	2	0	5	7	10	4	0	1	1

Risultati



Conclusioni

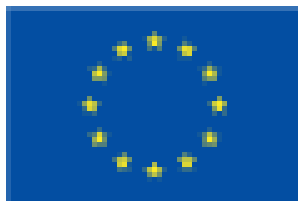
- Processo di creazione del framework ed analisi della sostenibilità come occasione di dialogo ed apprendimento (ricercatori ed attori del territorio);
- Numero e tipologia degli indicatori identificati adeguata a catturare gli effetti della diversificazione in contesti di «working farm»
- La diversificazione presenti impatti positivi su diverse componenti della sostenibilità (in particolare redditività aziendale, qualità dell'aria e delle acque)

Futuri sviluppi

Integrazioni di ulteriori indicatori per agroforestry e sistemi misti



Thank you your attention !



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727482 (DiverIMPACTS)