

Prin MUR 2022

ECOWHEATALY

"Evaluation of policies for enhancing sustainable wheat production in Italy"



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



ITALIADOMANI
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



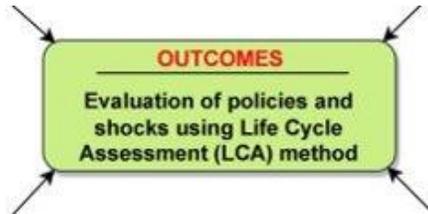
Università degli studi
"G. d'Annunzio"

Consiglio Nazionale
delle Ricerche



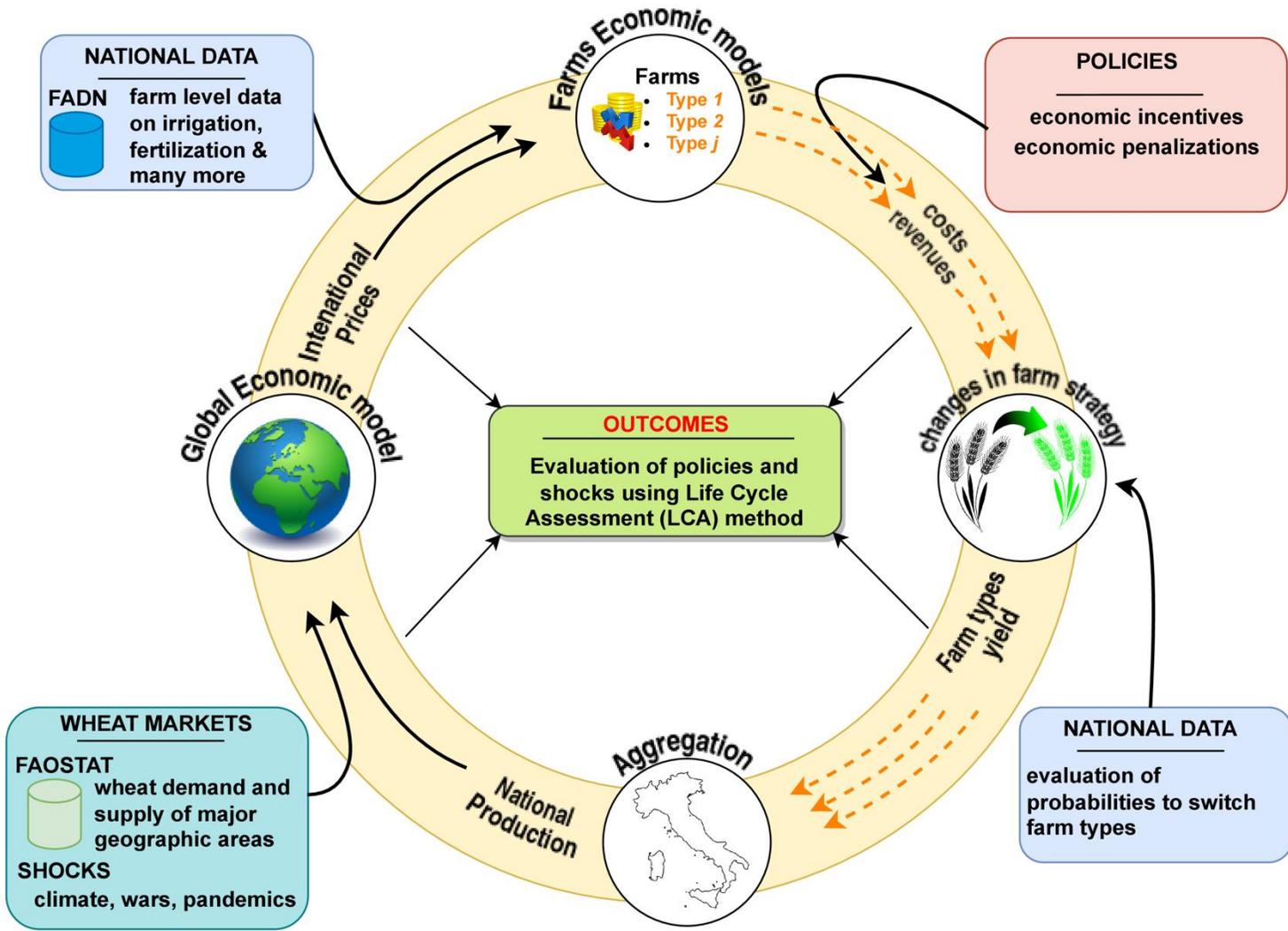
Consiglio per la ricerca in agricoltura
e l'analisi dell'economia agraria

Outcomes

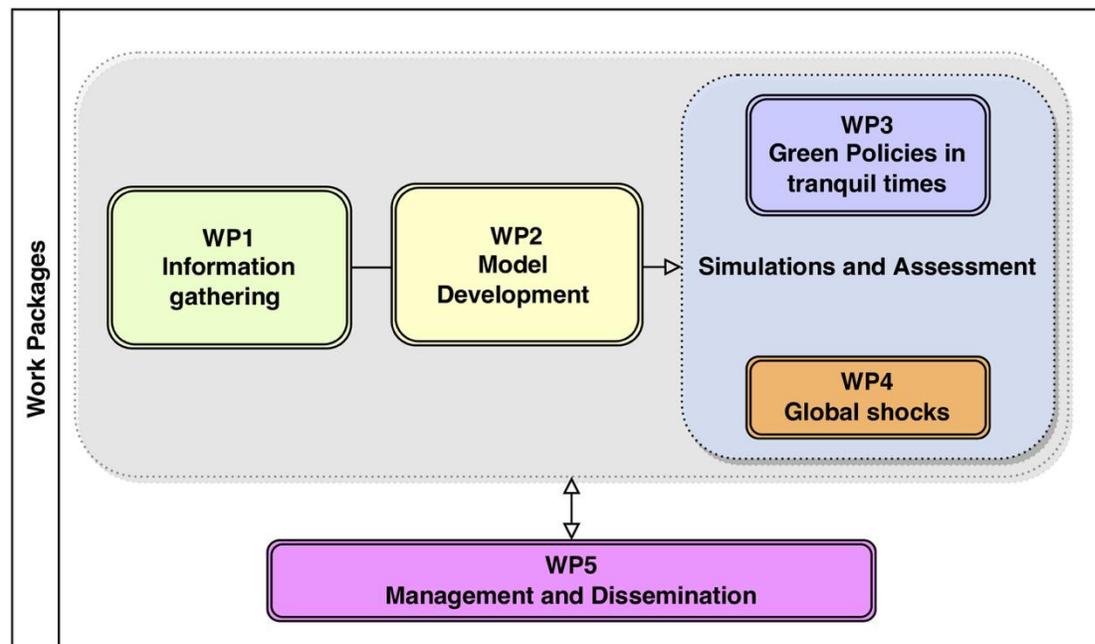


- 1) to build an **agent-based model** for the Italian wheat system
 - ✓ handling several types of farming strategies and the possibility of switching among types
 - ✓ Interfacing the output with a global model
- 2) to assess the effects of economic policies (**green**)
 - ✓ which measures could be put in place by policymakers to “greening” the agriculture sector and favoring the implementation of mitigation and adaptation strategies while preserving sustainability priorities
- 3) to evaluate the effects of **global shocks** on the sustainability of Italian wheat production
 - ✓ tools to measure the effects of different government orientations against recession, increasing national debt, pandemics, war
- 4) to build a **framework** to be used for further investigation after the project ends
 - ✓ handling the bidirectional effect of a country’s production on international prices
 - ✓ open-source and easily obtainable code

ECOWHEATALY Visual presentation



- **WP1:**
 - ❖ **Wheat** data and information at both local (FADN, Incentive bonus) and global (FAOSTAT) levels
- **WP2:**
 - ❖ Implementation of an **Agent-Based** model for the Italian wheat production system
 - ❖ Extension of a **Computational** Global Economic Model
 - ❖ **Integration**
- **WP3:**
 - ❖ **Simulations** in tranquil times in which traditional policies are progressively replaced by green policies
 - ❖ Evaluation of the explored **green policies** on both the environment and the national wheat production for policymakers
- **WP4:**
 - ❖ **Simulations** with global shocks (global warming, pandemics, or wars in specific areas)
 - ❖ Evaluation of negative effects on **sustainability of wheat production** if there is a change in government priorities because of global shocks
- **WP5:**
 - ❖ made public on **Open Science platforms** and dedicated web pages the data produced and methodological improvements

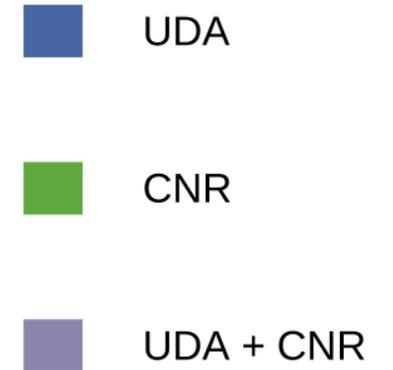


TASKS – STATE OF THE WORK

WORK SCHEDULE

Apr 2024
Task report

Task Name	Task #	Year 1	Year 2	Year 3
Identification of farm type and green policies	1.1	I11		
LCA setup	1.2	I12		
Global Economic Model adaptation	2.1	I21		
Modeling Italia wheat system	2.2		D1	
Global and Italian models integration	2.3		I23	
Simulation in tranquil times	3.1		D2	
LCA evaluation in tranquil time	3.2		D2	
Simulations with global shocks	4.1		D3	
LCA evaluation with shocks	4.2		D3	
Project coordination and amministration	5.1	GA	GA	GA
Communication, dissimination and exploitation	5.2	M1	M2	M3



Oct 2023
UdA

Oct 2024

Sept 2025

Apr 2024

M1: Release of the communication, dissemination, and exploitation management plan

➤ **Task 1.1** (*Concetta + Arianna + Sara + AdR UdA + Antonio*)

Gathering information and data about the Italian wheat production system (IWS):

- ✓ the features of the local farm management, such as the type of farms (small/big, traditional/organic) or the level of environmental sustainability
- ✓ the list of national and EU regulations in terms of external inputs usually used (when, how, how much),
- ✓ Classifying the farms reported in the FADN according to the care they take for the environmental and natural resources (how to inferring features from sampled farms)

➤ **Task 1.2** (*Antonella + Arianna + Gianfranco*)

Life Cycle Assessment (LCA)

- how to set up the methodology for the wheat production system
- what computation method & software

- **Task 2.1** (*Gianfranco + Edmondo + Adr UdA + AdR CNR*)

Global Economic Model (GEM)

- ✓ building of a specific module for Italy
 - ✓ exploring new market strategies (stock, speculation, ban)
 - ✓ translating from Java to Python
-
- **Task 2.2** (*Gianfranco + AdR UdA +*)
 - ✓ design and implementation of an **agent-based model** for the Italian wheat production system (IWS)
-
- **Task 2.3** (*All*)

Models integration

- ✓ The IWS software will feed the GEM by supplying the Italian wheat production.
- ✓ The IWS needs also to be interfaced with the software performing the LCA
- ✓ Building a script that iterates the execution of the different software representing the four nodes of the project

DISSEMINATION

1) EGU 2024 General Assembly



EGU24-19756, updated on 20 Mar 2024
<https://doi.org/10.5194/egusphere-egu24-19756>
EGU General Assembly 2024
© Author(s) 2024. This work is distributed under
the Creative Commons Attribution 4.0 License.



Towards Sustainable Agriculture: Classifying the Environmental Impact of Italian Wheat Farming

Gianfranco Giulioni¹, Concetta Cardillo², Antonella Del Signore¹, Edmondo Di Giuseppe³, **Arianna Di Paola**³, Antonio Gattone¹, Massimiliano Pasqui³, Sara Quaresima³, Marco Simonetti³, and Piero Toscano³

¹d'Annunzio of Chieti-Pescara, Department of Philosophical, Pedagogical, and Economic-Quantitative Sciences, Italy
(gianfranco.giulioni@unich.it)

²Council for Agricultural Research and Agricultural Economy Analysis (CREA), Rome, Italy

³Institute of Bioeconomy, National Research Council of Italy, Rome-Florence, Italy

Reducing the environmental impact of food production represents one of the most significant challenges to increase sustainability.

The ECOWHEATALY project - *Evaluation of policies for enhancing sustainable wheat production in Italy* - aims at tackling the issue of environmental impacts of the wheat production system in a dynamic socio-economic and environmental interaction setting by analyzing the changes in farmers' behavior after the adoption of green policies by the national authorities and in combination with the level of price in the main worldwide markets.

In the context of the ECOWHEATALY project, the behavior of farmers operating in Italy is classified into a few macro-typologies according to the farm environmental impact in terms of pesticides, fertilizers, and fossil fuel uses, with their costs and revenue profiled in alignment. To this end, ECOWHEATALY will take advantage of the Farm Accounting Data Method (FADN) as extensive

Conference Abstracts

2) AIAM 2024

Autori *

Gianfranco ~~Giulioni~~, Concetta Cardillo, Arianna Di Paola, Antonella Del Signore, Edmondo Di Giuseppe, Massimiliano Pasqui, Sara Quaresima, Marco Simonetti, Antonio Gattone, and Piero Toscano

Titolo *

The ~~Ecowheataly~~ project: Evaluation of policies for enhancing sustainable wheat production in Italy. An ancillary investigation of fertilizer and pesticide transition to a sustainable use.

Riassunto *

The PRIN 2022 ECOWHEATALY project aims to assess the efficacy of policies in promoting sustainable wheat production techniques in Italy. The study will analyze the impact of offering financial incentives to farms that adopt sustainable practices and move towards more sustainable use of fertilizers and pesticides. To accomplish this, it will use the Farm Accountancy Data Network (FADN) and the life cycle assessment (LCA) methodology. ECOWHEATALY plans to develop an open-source dynamic model that integrates social, economic, and environmental dimensions. The model will serve as a tool for Italian policymakers to evaluate sustainability indicators in wheat production under different policies. Using the LCA methodology, the project will assess the environmental impact of policies. The focus will be on the impact of fertilizers and pesticides, although agriculture machinery will also be modeled. The process of applying fertilizers involves various stages such as the production of fertilizers, transportation to farms, application through tractors, and direct emissions to air, soil, and water resulting from fertilizer application. To conduct the Life Cycle Assessment (LCA) of fertilizers, we intend to employ the ~~NutriNet~~ tool (<https://nutrinet.haifa-group.com/v3/>). This tool collects user data

on crop-growing programs and field characteristics to recommend an optimized fertilizer program. The process of applying pesticides mainly focuses on the emissions to air, soil, and water that result from fertilizer application. To determine the main active ingredients of herbicides, fungicides, insecticides, miticides, and molluscicides, we use the ~~Fitogest~~ database (<https://fitogest.imagelinenetwork.com>). Once we have identified the active ingredient, we use the ~~Usetox~~ model (<https://www.usetox.org>) to evaluate the ecotoxicity and human toxicity of the pesticide. Additionally, we are considering using the OLCA-Pest model (<https://orbit.dtu.dk/en/projects/olca-pest>), which is a current development of ~~Usetox~~.

Sessione *

I SESSIONE: Previsione e gestione delle ~~avversità~~ biotiche e abiotiche in agricoltura.

II SESSIONE: Metodi innovativi per la stima dei fabbisogni idrici e la gestione irrigua.

III SESSIONE: Strumenti e modelli agrometeorologici di supporto per la "twin transition" in agricoltura.

Conference Abstracts

3)

Università degli Studi “G. d’Annunzio” di Chieti-Pescara,
Dipartimento di Scienze Filosofiche, Pedagogiche ed Economico-Quantitative

Workshop

Ambiente, economia e società.

Approcci, modelli e strumenti per lo sviluppo sostenibile

Pescara, 9-10 maggio 2024

The ECOWHEATALY research project: Evaluation of policies for enhancing sustainable wheat production in Italy

Concetta Cardillo,^a Arianna Di Paola,^b Antonella Del Signore,^c Edmondo Di Giuseppe,^b Gianfranco Giulioni,^c Massimiliano Pasqui,^b Sara Quaresima,^b Marco Simonetti,^b Antonio Gattone,^c and Piero Toscano^b

Abstract

Reducing the environmental impact of food production represents one of the greatest challenges to increase sustainability. The ECOWHEATALY project focuses on the power of policies in providing economic incentives for farms switching from less to more sustainable wheat production techniques either in tranquil economic times or in times of crisis. In this regard, ECOWHEATALY tackles this issue in a complex socio-economic and environmental interaction dynamics setting. To deal with real-world complexity ECOWHEATALY will build an agent-based model for the wheat production system in Italy. This model will be interfaced with an existing tool that is able to handle the international wheat markets. In this way, the double-sided interaction between farmers' choices and international prices will be endogenously accounted for. Indeed, a wanting in the current state of the art concerning agriculture decision-making is the poor integration of models in a global context. ECOWHEATALY integration in the international context allows an evaluation of how negative international shocks will affect the sustainability of the Italian system. Indeed, the global context in which public authorities operate changes rapidly, requiring new tools and approaches to reduce the negative side-effects of unexpected and sudden events such as those that have been characterizing the present historical period: the international crisis in Ukraine strongly impacts the internal market not only drastically reducing the imported quantity (about -30% -40%), but also with relevant effects on many other commodities. The cost of energy rocketed, followed by most inputs including chemicals and fertilizers. Therefore, the selling price of agricultural commodities is also affected. The paper presents the state of advancement of ECOWHEATALY implementation and the achieved results.