The Contribution of Benchmarking Tools to Increasing Transparency in Agricultural Data Sharing in Value Chains and Farmer's Trust

Antonella Di Fonzo, Iraj Namdarian* and Concetta Cardillo**

Council for Agricultural Research and Economics, Research Centre for Policies and Bioeconomy, Rome, Italy (CREA-PB)

Presenter's email address:

antonella.difonzo@crea.gov.it

Short resume of the presenter

- Dr. Antonella Di Fonzo, Council for Agricultural Research and Agricultural Economics Analysis, Centre Policies and Bioeconomy (CREA-PB)
- PhD in Economics with deepening quantitative methods for economics, region and environment. Prior to joining CREA, I worked at the University of Cassino and Southern Lazio (Department of Economic and Law) where, currently I am adjunct professor of Natural Resource Economics and Agri-Food Economics.
- Main research interests are related sustainability of natural resources in agriculture and policy, quantitative and qualitative analysis of agri-food chains, agroindustrial value chains and national and international policies that regulate the agri-food system and sustainability (such as unfair trade practices, CAP, food safety, climate change).

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Dr. Antonella Di Fonzo

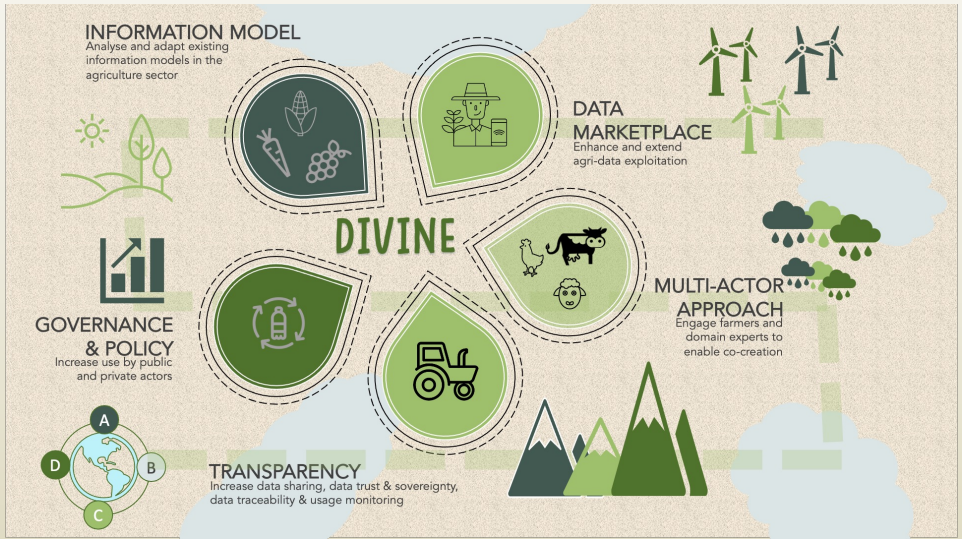
Topics of research interest of workgroup and current projects

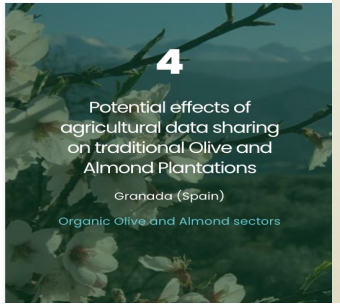
- DIVINE **D**emonstrat**I**ng **V**alue of agri data shar**I**ng for boosti**N**g data **E**conomy in agriculture
- Funded under:
  Food, Bioeconomy Natural Resources, Agriculture and Environment
- Topic(s): HORIZON-CL6-2021-GOVERNANCE-01-20 - Data economy in the field of agriculture – effects of data sharing and big data
- Call for proposal HORIZON-CL6-2021-GOVERNANCE-01
- Funding Scheme:
  Research & Innovation Action (RIA)
  - Start Date: October 1st, 2022
  - End Date: September 30th, 2025

- https://divine-project.eu/
- https://cordis.europa.eu/project/id/101060884

Project description and objective

- The EU-funded DIVINE project aims to show the cost benefits and added value of sharing agri-data.
- DIVINE develop an agri-data ecosystem that combines data already commonly shared while also using industry-led pilots that are devised on data-sharing plans. The results would support policy makers, technology providers, farm representatives and other agri-data stakeholder





Research objective

- This study investigates the use of benchmarking tools to help increase farmers' confidence in sharing agricultural data.
- The digitalization of agriculture through the proliferation of Information Technology (IT) capabilities has generated exponential growth in data:
    - Agriculture generates a large amount of data, but its potential often remains unexplored.
    - The reasons are identified in technical interoperability, commercial relationships between stakeholders and social acceptability issues related to data ownership and market transparency.
    - Lack of experience in managing data or adopting data-driven services can limit the opportunities arising from digital transformation.
    - The valorisation and use of agricultural data implies that the owners of the data also agree with their sharing. However, the willingness to share by data owners is low and it is precisely this lack of sharing and its acceptance that is the biggest obstacle.
    - The nature of agricultural data is highly specific, but very diverse, and the economic value it generates both for farmers and the entire value chain requires that the necessary safeguards be established.
    - It is difficult to monitor who is authorized to share data and which data is shared. Furthermore, it is known
- In the institutional context, the European Commission has stressed in several documents the need to facilitate and strengthen the agricultural data sharing and optimize their use for better policies design that transparency is necessary to consolidate farmers' trust regarding data sharing (Data Strategy, SAIO, IFS, Data Governance Act).

The lack of transparency and clarity on issues such as data ownership, portability, privacy, trust and accountability in the business relationships that govern smart agriculture are contributing to **farmers' reluctance to engage in widespread sharing of agricultural data**.

Methodology

Benchmarking definition:

- Analysis of the existing performance and comparison with other, to identify the causes of performance gaps and find possible adjustments of activities.
- Comparison with relevant internal or external norms and standards, to improve the performance of an organization. It implies also the comparison. internally with previous performance and desired future targets, or externally against similar organisations performing similar functions.
- Comparison of one´s performance with the performance of others engaged in a similar activity and learning from these comparisons.
- It implies sharing information with others, comparing with peers, learning from each other and identifying actions .

Benchmarking: steps to implement

- Identification of indicators (KPI's) to assess economic, environmental, agronomic and social sustainability of farms.
  - Important sources of data which are currently or of potential use for benchmarking in agriculture (Bodini et al., 2017) include:
    - Accountancy data (e.g. FADN or other accountancy data); together with the analysis provide significant business economic information. For example, in Lithuania proposals are in place to ensure that bookkeeping is a main source for analysis since every business must pay taxes and therefore retain financial information.
    - Official statistics data (e.g. Farm Structure Surveys, Economic accounts for agriculture).
    - Specific administrative registers (e.g. animal traceability databases, land use and ownership databases, producer and subsidies registers, animal veterinary drug use registers).
    - Industry supply/processor databases; for example, in Northern Ireland, cattle abattoirs share data enabling the development of online benchmarking systems at a producer level (BovIS, 2015).
    - Technical data is inputted by primary producers directly or collected by specialist bodies e.g. feed use, fertilizer use, purchases and sales, etc.
    - Machine/sensor-derived data; (e.g. yield and quality data direct from harvesting equipment, animal performance data direct from monitoring equipment).
- Compare farm indicators with others calculated for other farms (or for the same farm during different periods).
- Detect and understand performance gaps.
- Develop and implement an action plan to fill the gap.

Economic and Environmental Indicators

- Profit: difference between the money that comes into the farm business from the sales of a product and the money that goes out to produce it (Farm income as €/unpaid awu).
- Technical efficiency: measures the farmer's skill and success in producing the highest possible level of output from a fixed number of inputs (Yields per hectare of major food staple and high value crops/livestock, Production to ha ratio (t/ha), Production to unit of input (t/unit).
- Economic efficiency: measures the financial returns on resources used (Revenues to costs ratio (€/100 costs), Revenues to ha ratio (€/ha), Revenues to unit of input (€/unit).
- Physical and structural data, such as location, crop areas, livestock numbers, labour force, etc.
- Economic and financial data, such as the value of production of the different crops, stocks, sales and purchases, production costs, assets, liabilities, production quotas and subsidies.

Economic

They are based on quantitative measurements of environmental conditions, and they can be referred to a wide variety of geographic scales, from local to regional or even national scale.

- •energy supply and renewable energy
- •CO2 emission and air quality (greenhouse gas emission on farm level)
- •forest cover surface
- •biodiversity
- •organic farming
- •use of water for irrigation (yield/irrigation water applied kg/mm), no irrigated area in the farm (% surface of the agricultural used area)
- •use of agrochemicals in pest management (number of treatments/ha; number of treatments/crop, pesticide area in the farm as proportion of farm agricultural used area, active ingredients etc.)
- •nutrient management (such as for nitrogen and phosphorus: the measure of the nutrient input/output ratio or the change in nutrient balance across the years.

Environmental

Agronomic Indicators

- Actual yield: level of yield obtained that reflects the current state of soils and climate, farmer's skills, and technology. It could be a real value per field or an estimated value (e.g. remote sensing).
- Theoretical yield: maximum crop yield as determined by biophysical limits, it can be estimated with models (the use is limited by the availability of inputs and parameters and by the model implementation in on-line system).
- Potential yield: it the one of a current cultivar that may be reached under optimal growing conditions (water and nutrients not limited and without biotic or abiotic stress). It assumes that growth is determined by factors such as CO2 concentration, solar radiation, temperature, and genotype. It can be estimated using crop models.

Social Indicators

- Level of education
- Age of head of farm and other components or workers
- Gender
- Composition of labor force
- Form of contracts
- Presence of immigrant workers

Benchmarking Framework and Components in DIVINE

1. Generic Farm Comparison: a generic tool usable by all farms with a minimum set of requested inputs, that allows each farm to know its performance over the years. The component will provide, to each farm, a set of basic indicators to be used to get a general benchmark of the farm activities. The system should be connected to the Farm accountancy data network (FADN) or other farm-level data sources and will be able to provide each farm with an estimated reference of the farm performance indicators. From the farm's general structure, a set of general indicators (European regions, dimension, surface by crops, composition of livestock) will be defined.

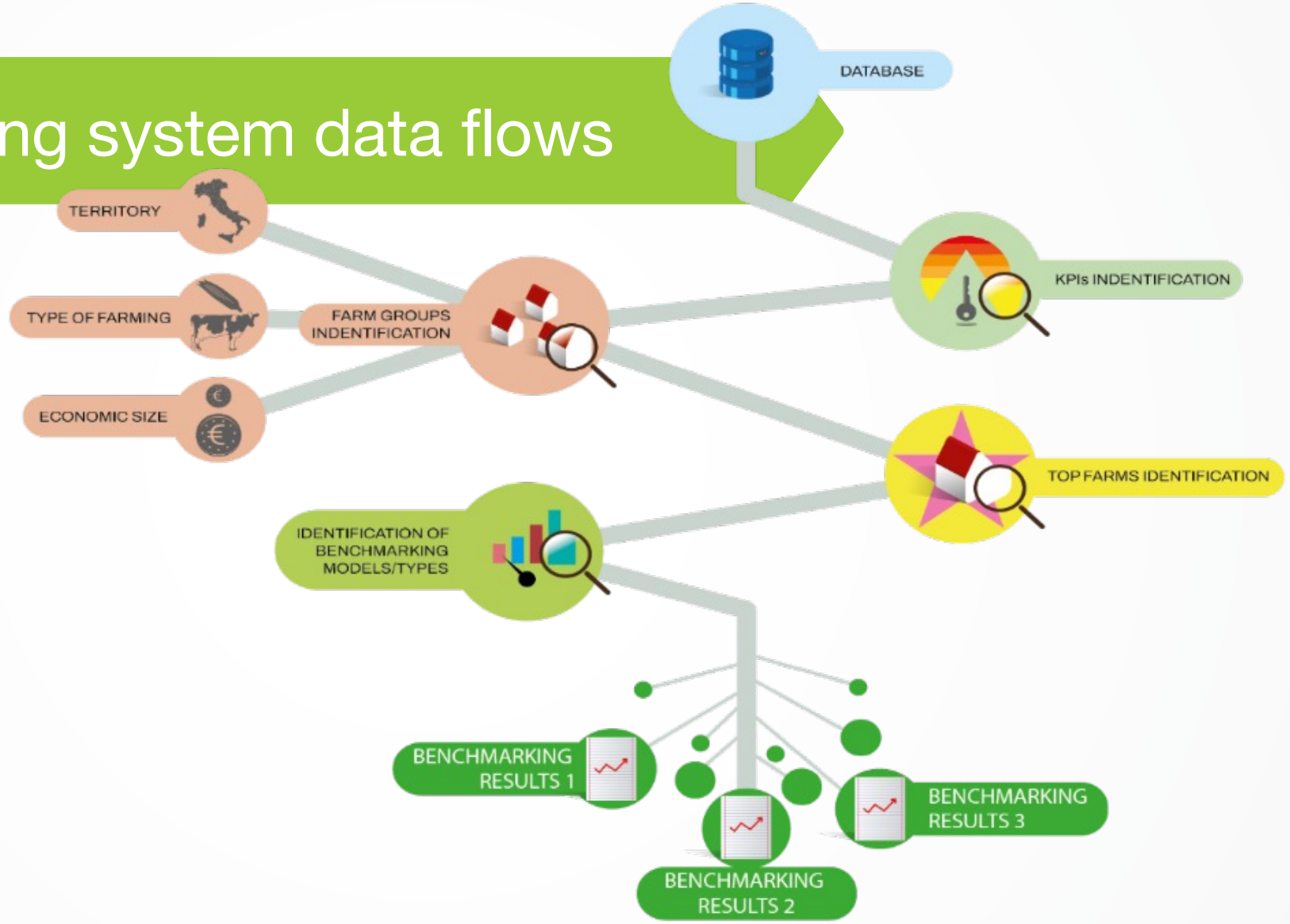
Input: A minimum set of mandatory data must be identified, such as the location of the farm centre (using coordinates or the related administrative region), the surface of the farm by crop group (e.g., cereals, permanent crops, horticultural crops, etc..) and the number of livestock units by species, other information from the farms' balance sheet (input, output, profit) or other related to agronomic, social and environmental aspects.

Output: A set of indicators that a farm can use to make a comparison with the same indicators in other years.

2. Farm Group Benchmarking: a tool usable by a single farm to compare its results with those of a group of similar farms in terms of type of farming or location area economic size etc.
Input: it is necessary to identify groups of farms based on a series of common characteristics (type of farming, economic size, gender of manager, level of education, etc.) and calculate the average values of the indicators considered for each of the groups identified.
Output: A set of indicators that a farm can use to make a comparison with a group of farms with similar characteristics.

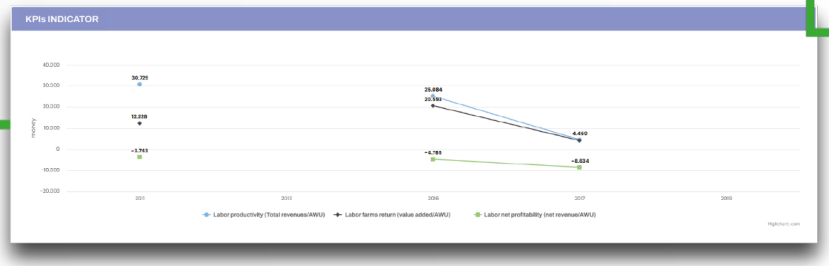
3. Top Farms Benchmarking: a tool helping farmers evaluate their performance in comparison with a group of farms that realized the best performance in the considered period.
Input: it is necessary to identify a group of farms that, depending on different indicators, achieved the best performance in the period considered.
Output: A set of indicators that a farm can use to make a comparison with the same indicators achieved by the best farms in the sector.

Benchmarking system data flows



Benchmarking demonstration

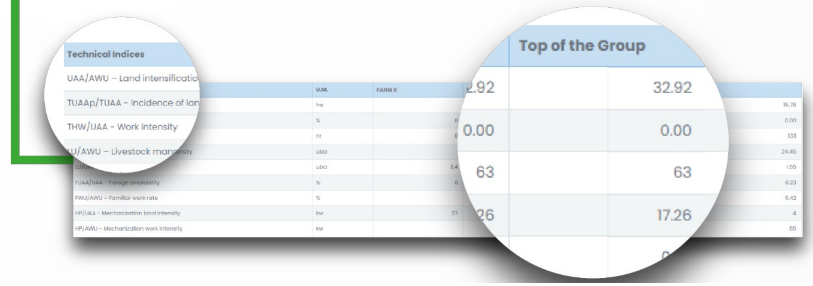
Benchmarking 1: farm over the years



Benchmarking 2: comparison with group of farms

Economic Indices	U.M.	FARM X	Reference Group	Top of the Group
GSP/AWU – Gross work productivity	euro		59,938.21	44,185
GSP/UAA – Gross land productivity	euro	4,550	1,820.48	2,803
TR/KFIX – Fixed capital efficiency	nr	0.0712	0.2227	0.35
CC/TR – Current costs incidence	%	0.42	0.30	0
PC/TR – Pluriennal costs incidence	%	1.07	0.09	0
VA/UAA – Net land productivity	euro	2,676	1,314.32	2,246
VA/KCUR – Current capital efficiency	nr	0.2358	1.6027	2.4

Benchmarking 3: comparison with top farms



Results and conclusions

Some attempts have been made to encourage interoperability, there are still important challenges to address.

- Our study presents a benchmarking model implemented with data provided by farmers.
- Benchmarking tool has been developed by the implementation of a set of DIVINE compliant components that can be demonstrated in the pilot activities, based on available data.
- We intend to contribute to increasing farmers' trust by demonstrating that sharing agricultural data can provide them with valid support for farm management.
- We aim to fill the lack of concrete examples of how data sharing in the agri-food sector can be useful for the analysis of economic performances.
- Our research study intends to offer a contribute to show the cost and benefit and added value of sharing agri-data to support policy makers, technology providers, farm representatives and other agri-data stakeholder.

Thanks for your attention and interest

Contact for DIVINE project:

antonella.difonzo@crea.gov.it

iraj.namdarian@crea.gov.it

concetta.cardillo@crea.gov.it

Website DIVINE project

https://divine-project.eu/news