**Appendix A:** Questionnaire

This questionnaire was developed by researchers at the Department of Agriculture of the University of Sassari in collaboration with Coldiretti as part of the AGRITECH project funded by the PNRR (National Recovery and Resilience Plan).

The purpose of the questionnaire is to study the perceptions of **durum wheat farmers in Sardinia** regarding the adoption of new digital technologies known as **"Precision Agriculture."**

Please carefully read the information on the following pages and then proceed to answer the questions. There are no right or wrong answers. The questions aim to understand the perceptions of durum wheat farmers about the use of precision agriculture technologies.

The information provided will be treated with the utmost confidentiality and will be used **for research purposes only**.

The questionnaire takes **less than 15 minutes** to complete.

Would you like to participate in this research?

- Yes
- No

Do you cultivate durum wheat?

- Yes
- No

Are you involved in decision-making regarding strategies and investments on your farm?

- Yes
- No

According to the latest **ISTAT Census (2020)**, the Utilized Agricultural Area (UAA) in Sardinia has further declined compared to the 2010 census. Today, it stands at just under 32,000 hectares (an 18% drop since 2010), with just under 5,000 farms.

According to the **International Society of Precision Agriculture**, precision agriculture is a **farm management strategy** in which data are collected, processed, analyzed, and combined with other

information to guide decisions based on spatial and temporal variability, with the goal of improving **resource efficiency, productivity, quality, profitability, and sustainability** in agricultural production.
Thanks to precision agriculture, it is now possible to:

- **Reduce resource waste**: technology provides detailed information on crop health, soil temperature and moisture levels, and other critical parameters. This helps optimize, for example, fertilizer use and crop protection treatments.
- **Increase yield and crop quality**: customized management of cultivation practices based on specific soil conditions.
- **Improve working conditions and efficiency**: reduces operator workload by minimizing unnecessary operations and using new precision machines that assist or replace the operator in monitoring tasks.
- **Trace production**: products can be tracked to the final consumer, increasing the perception of the producer-consumer connection and recognizing the unique characteristics of local production.

**But how much does precision agriculture cost?** Although it's hard to give exact figures, here are some estimates:

- **4.0 tractors and machinery**: Onboard computers, automatic steering, automated treatment and fertilization systems. These systems typically add **from €5,000 and up** compared to traditional machines.
- **Weather stations and Decision Support Systems (DSS)**: Installed on the farm with weather sensors. DSS analyze data and issue alerts (e.g., pest forecasts), irrigation recommendations, and fertilizer calibrations. **Starting from about €1,500**.
- **Data platforms and field apps**: Integrate data from tractors, sensors, drones, and satellites; allow field data input; enhance DSS precision. **Annual costs range from €500 to €2,500**.
- **Drone use**: Fly over fields for imagery, multispectral surveys, and—in some cases—treatments. Drones **start at €5,000**, plus the cost of a pilot license. Alternatively, **services from third parties** range from **€25 to €200 per hectare**.

**A – Socio-Demographic Data**

1. **Region** where the main durum wheat area is located:
2. **Age**:
    - 18–49
    - 50–64
    - Over 65
3. **Gender**:
    - Male
    - Female
    - Prefer not to say
4. **Education level**:
    - Below high school diploma
    - High school diploma
    - University degree or PhD
5. **Role on the farm**:
    - Owner

    - Manager/director of farm or cooperative (as an employee)
    - Other
6. **Type of farm**:
    - Multi-generational family farm
    - First-generation family farm
    - Part of a corporate enterprise
7. **Years of work experience**:
    - Up to 10 years
    - Between 11 and 30 years
    - More than 30 years
8. **Probability that the farm will have a successor**:
    - None
    - Unlikely
    - Likely
    - Very likely
    - Certain
9. **Main production technique**:
    - Conventional farming
    - Integrated farming
    - Organic farming
10. **Use of Information Technology (IT) tools**:

- Use of mobile phone for business purposes
- Use of computer/tablet for business purposes

11. **Average hectares cultivated with durum wheat** (please enter a number):
12. **Average yield per hectare of durum wheat area**:

- Less than 20 q/ha
- Between 21 and 30 q/ha
- Between 31 and 40 q/ha
- More than 41 q/ha

13. **Marginal land** is often defined as land with poor soil quality, low rainfall and/or extreme temperatures, and poor connectivity. Do you believe the land you cultivate falls into this category?

- Yes
- No

14. **Do you use external consultancy services for farm practices?**

- Yes
- No

15. **Experience with precision agriculture techniques**:

- I use precision agriculture techniques.
- I have no experience with them.
- I don't use them, but I've seen them used and consider myself somewhat familiar.

16. **In my farm (or through others), I use**: *(you can tick multiple)*

- Site-specific yield maps
- GPS-guided tractor to avoid fertilizer overlap

- GPS-equipped combine harvester
- Other (please specify):

17. **Do you offer precision agriculture services to other farmers (contract services)?**
- Yes
- No

18. **Have you made investments in machinery or buildings on your farm in the past 5 years?**
- Yes
- No

We now propose a series of questions/statements in order to analyze perceptions regarding precision agriculture.

**Performance expectancy:**

**PE1** – I believe that precision agriculture would help in durum wheat cultivation by reducing the use of resources such as fertilizers and crop protection treatments.
**PE2** – I believe that precision agriculture can increase durum wheat yield per hectare.
**PE3** – I believe that precision agriculture allows for better quality of durum wheat production.
**PE4** – I believe that the use of precision agriculture is compatible with the other technologies I already use in durum wheat cultivation.

**Response options (all PE items):**

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

**Effort Expectancy**

**EE1** – I believe that precision agriculture reduces time and workload in durum wheat cultivation.
**EE2** – I believe that precision agriculture allows for better work organization in durum wheat cultivation.
**EE3** – I believe that using precision agriculture can reduce accidents, especially in more difficult fields.

**Response options:**

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

**Social Influence**

**SI1** – I believe it is useful to consider the opinions of other farmers regarding the adoption of precision agriculture techniques.
**SI2** – I believe it would be easier to use precision agriculture techniques if neighboring farmers also used them.
**SI3** – I think I would consider adopting precision agriculture techniques if Farmers' Associations actively promoted their adoption.

**Response options:**

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

**Facilitating Conditions**

**FC1** – I believe I have all the necessary knowledge to adopt precision agriculture in durum wheat cultivation.
**FC2** – I believe that the implementation of a specific measure under the Sardinia Region's RDP, providing a capital grant of 60% or more for farms investing in precision agriculture, would encourage me to invest in these technologies.
**FC3** – I believe that precision agriculture technologies are compatible with those I already use.

**Response options:**

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

**Price Value**

**PV1** – I believe that using precision agriculture could reduce durum wheat production costs.
**PV2** – I believe that using precision agriculture could allow me to work more efficiently.
**PV3** – I believe that using precision agriculture could lead to greater profit.

**Response options:**

- Strongly disagree

- Disagree
- Neutral
- Agree
- Strongly agree

**Perceived Performance Risk**

**PR1** – I believe it is likely that the use of precision agriculture techniques would cause more problems than solutions for managing my farm.
**PR2** – I believe it is likely that precision agriculture would make me dependent on external consultants and experts due to the sophistication of these techniques.
**PR3** – I believe it is likely that using precision agriculture would create more administrative work, distracting me from fieldwork.

**Response options:**

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

**Behavioral Intention**

**BI1** – I will introduce precision agriculture in my durum wheat cultivation in the coming months.
**BI2** – In the near future, I intend to use precision agriculture techniques in durum wheat cultivation.
**BI3** – I have already planned to use precision agriculture techniques on my farm.

**Response options:**

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

**Table Appendix B.** Pairwise comparisons of means: t-test of the constructs' differences between marginal and non-marginal farmers (**)

| **Constructs** | **Mean Difference** | **Std. Err.** | **t-value** | **p-value** |
|---|---|---|---|---|
| Performance Expectancy | -0.25 | 0.10 | -2.50 | 0.014* |
| Effort Expectancy | -0.22 | 0.09 | -2.44 | 0.017* |
| Social Influence | -0.20 | 0.10 | -2.00 | 0.047* |
| Facilitating conditions | -0.28 | 0.10 | -2.80 | 0.006* |
| Price Value | -0.18 | 0.09 | -2.00 | 0.047* |
| Perceived Performance Risk | 0.26 | 0.10 | 2.60 | 0.011* |
| Behavioural Intention | -0.35 | 0.14 | -2.50 | 0.014* |
| (*) *p*-values are significant at the 5% level<br>**(**)** Mean differences calculated as Marginal – Non-Marginal constructs' values | | | | |