SUPWAS CONFERENCE

Annual crops results

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INRGREF-DIFAF

Socio-Economic impact of SUPROMED Project: Analysis at the farm level.

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European Commission
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PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

OBJECTIVES

Analysis of Socio-economic and environmental impact of SUPROMED

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Analysis of socio-economic and environmental impact of SUPROMED

We have three level of analyzes:

1. Economic analyzes at the plots/Farm level (monitoring crops) :
   - Analyze comparative of the various forms of management
   - Gross margin, EWUE, Energy use productivity, economic sustainability etc.
   - Comparison between treated Groups (G1 and G2) and control group (G3).
   - Analyze the impact of SUPROMED technology adoption at demo-site level

2. Analyzes at the regional level/National level:
   - Map the different stakeholders and potential sustainable partnerships for exploiting SUPROMED results
   - Extrapolation at regional level

3. Analyze at the Mediterranean level: Extrapolate the results
   - Assess the quantitative potential impact of SUPROMED deployment at Mediterranean level
   - Assess the acceptability by farmers and end users of results generated by the SUPROMED
   - Integrate SUPROMED results to provide policy recommendations to make the Mediterranean agro-food sector more resilient to global changes while preserving the environment and supporting social and economic developments

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Conceptual and Empirical Approach for analysis at the farm level

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I. CONCEPTUAL APPROACH TO PERFORM SOCIO-ECONOMIC ASSESSMENT

There are three main steps for performing a socio-economic assessment.

- **First step:** a definition of the scenarios that are to be compared is needed. Two scenarios in were defined in this study:

  - **1rst Scenario:** represents the situation without innovative water management ("baseline scenario"). **Collecting baseline data is the crucial step to develop a prospective evaluation of the project**. It provides material to help understanding the local context.

Baseline data can be compared to the evaluation of the project outcomes during or at the end of the project.

- **2nd scenario:** includes the adoption of innovative water management (Project scenario”).

- **Second step:** The indicators must be defined and the value of each indicator to be assessed must be estimated for each of the two scenarios.

- **Third step**, the difference between the two values for each indicator (“The impact”) is calculated. This is illustrated in the following equation:
  - Impact = (value of indicator under the adoption of Supromed Project – value of indicator under baseline scenario before the Project).

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Methodology

- To be able to quantify SUPROMED impact at farm, national and Mediterranean level by the mentioned techniques it’s necessary to **establish a monitoring system for Intervention Group and Control Group, to collect data.**

- **The suggested monitoring system covers 3 groups:**

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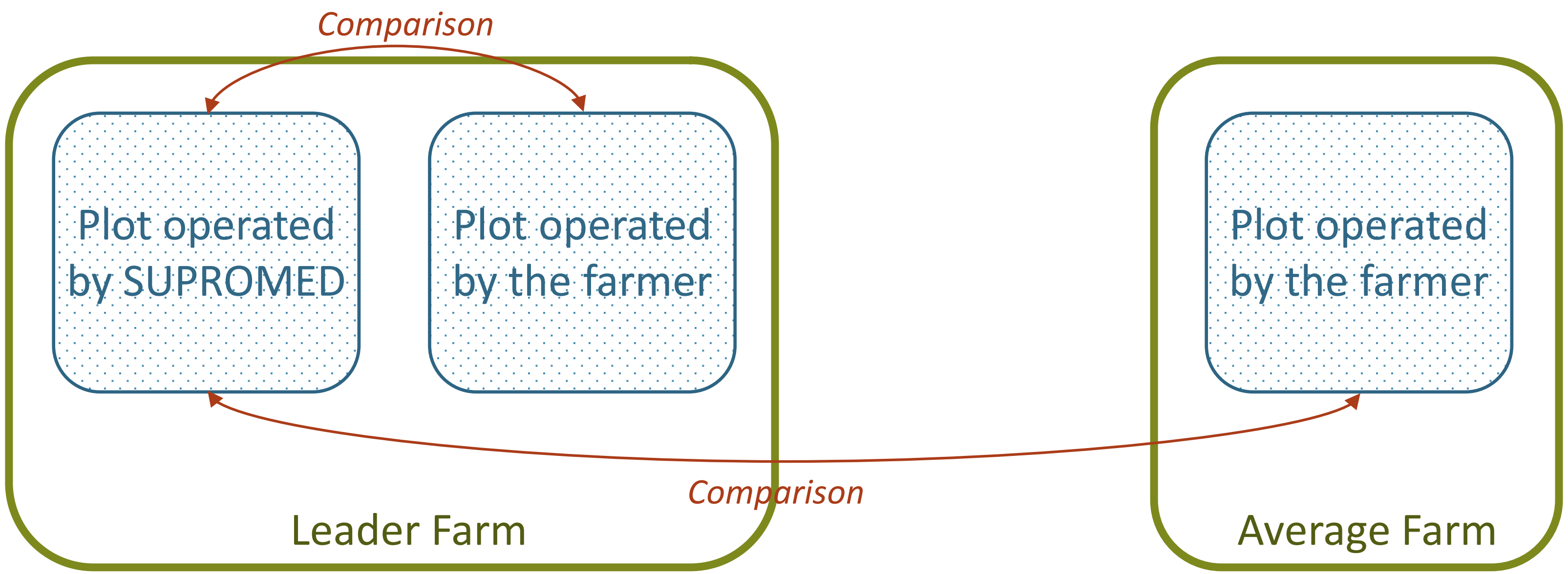
Methodology

- **Treated Group:**
  - **Group 1: Pilot farms (where SUPROMED equipment will be deployed)**



→Technical monitoring of SUPROMED implementation
→Monitoring of socio-economic and environmental impact at pilot farms

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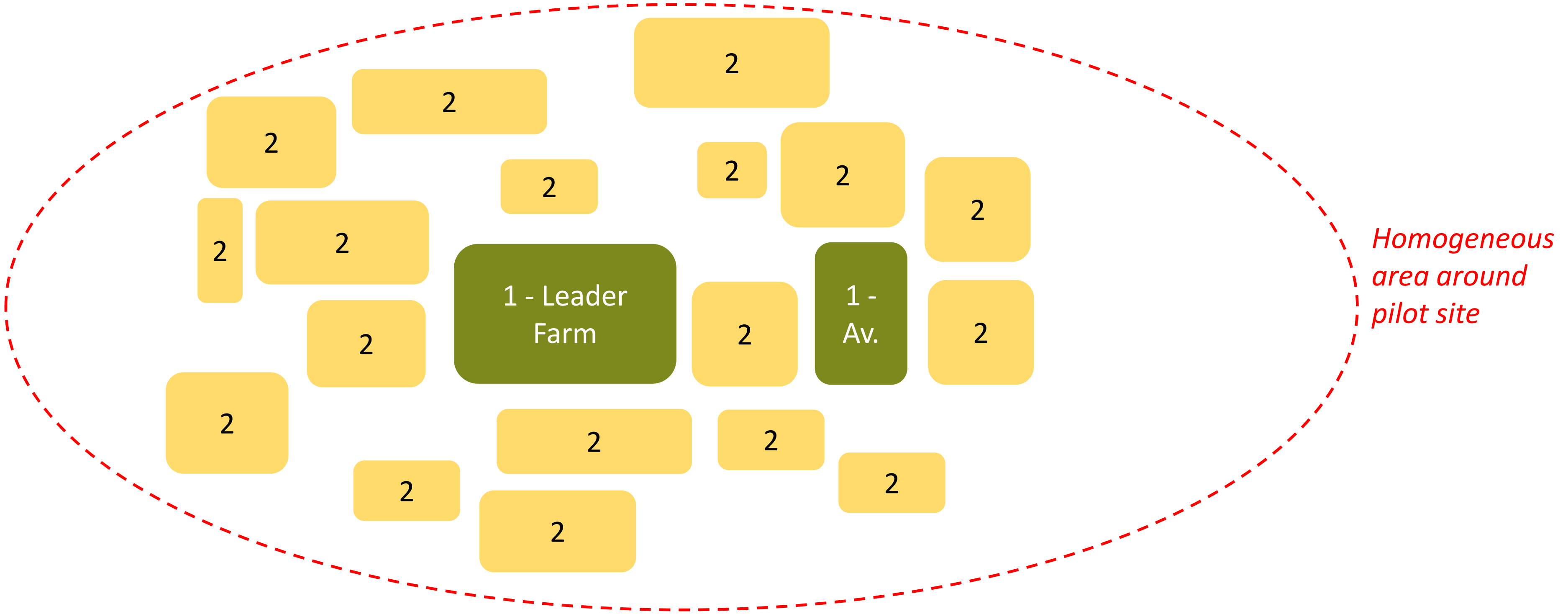
Methodology

- **Group 2:**

Associated neighbouring farms (trainings, access to data) located in delimitated homogeneous area around each pilot site.



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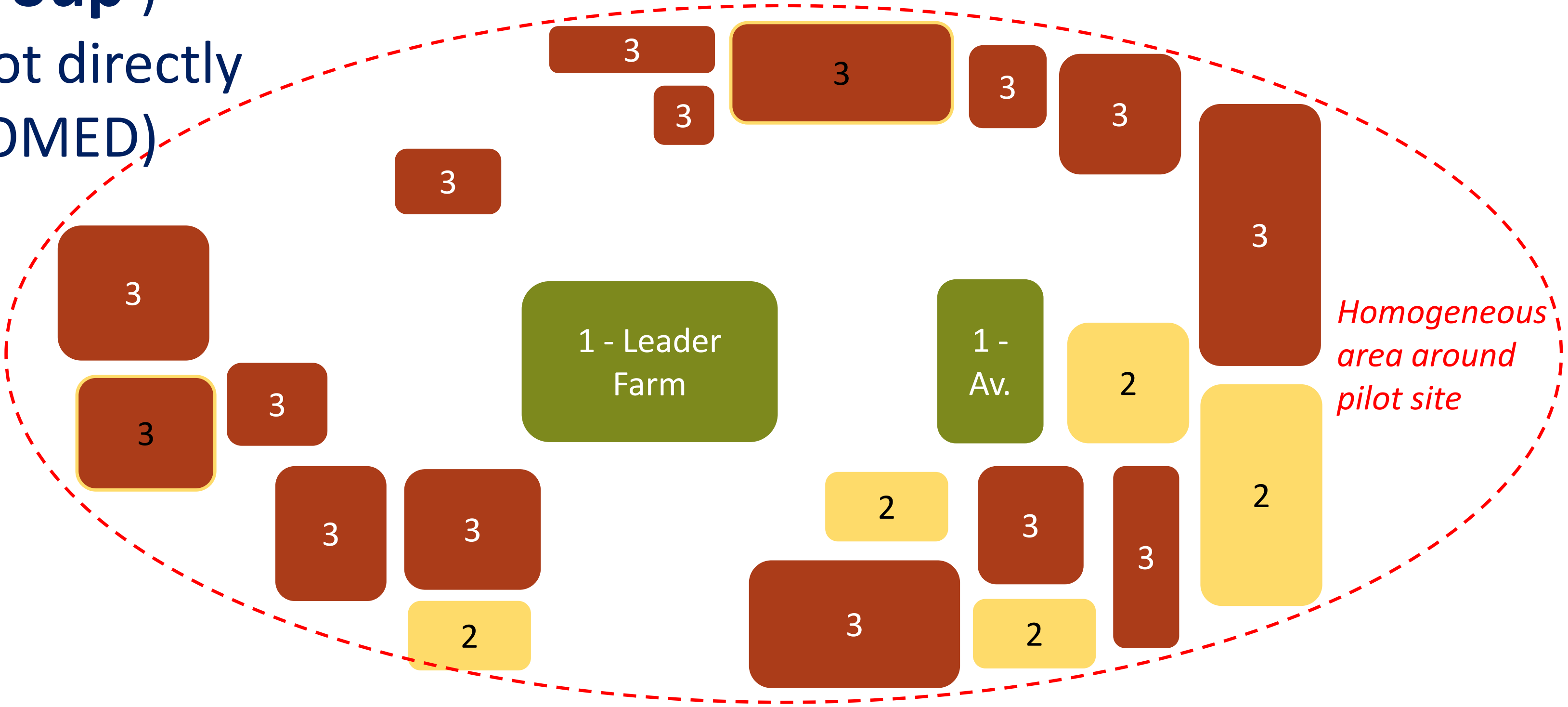
Methodology

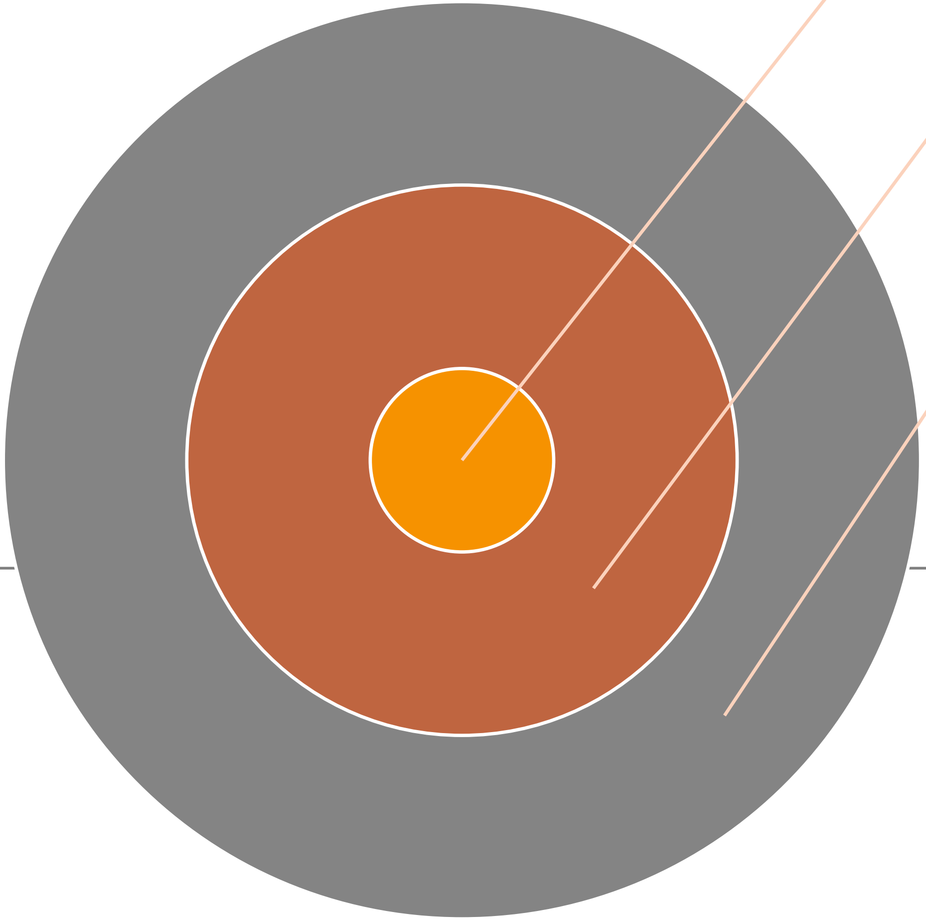
SUPROMED

- **Group 3 (Control Group**)
  - Reference farms (not directly interested in SUPROMED)



The “control group” is a (small) sample of the population not targeted by the project, i.e. not benefited by the project activities. The survey is repeated on the control trial whenever done on the “treated” sample.

97 farms were selected….They are distributed by Target group as follow:



Group 1: 14 farmers

Group 2: 47 farmers

Group 3: 36 farmers

97 farmers were interviewed and monitored

Data source and collection procedure

The assessment of the socio-economic baseline was based on both primary and secondary data:

- Secondary data already available before the project at the national and local level is obtained from local department of agriculture and governmental offices (may even be not fully reliable or not full complete, but provides material to help understanding the local) context. The secondary data include: baseline information on farmer's population, cropped lands, main crops, water use, yields, environmental standards, social incomes, water use efficiency etc.…
- Primary or Direct data: gathered via surveys focused on selected farmer: G1, G2 and G3.

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- **INDICATORS**

Economic indicators

- Production output (yields)
- Production cost
- Water irrigation cost and share in total production cost
- Energy cost
- Gross margin

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Social indicators

- Farmer’s income
- Training and improving knowledge,

Environmental indicators

- Water saving
- Energy saving
- Fertilizers management
- Manure use (increase soil fertility and moisture holding capacity).

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Therefore, in order to assess direct socio-economic impact, data were gathered on those identified indicators as potentially affected by the project over a period of time, to establish a baseline level and rate of change in key variables, as well as the level and nature of potential impacts of the project on those affected.

▪ Data Analysis

Data from these surveys should be analyzed using various analytical and statistical tools ranging from partial budgeting to optimization models.

- A comparative data analysis will be performed between the data of the two samples.

- The impacts on adopters can be addressed by changes of indicators between the two scenarios. These changes may be:
  - qualitative or
  - quantitative

Questionnaire

A questionnaire was elaborated by INRGREF, discussed with DIFAF and shared with the members to adapt it according to the socio-economic conditions of each demo site. It is divided into two main parts:

The first part seeks to collect data (qualitative) on:
- General household characteristics
- Land use and cropping patterns
- Livestock
- Irrigation network
- Water management
- Fertilizers management: Minerals/manure
- Agricultural practices adopted to mitigate water shortage/droughts

-Building capacity (training, field days, info days...). <u>It's was added recently to the questionnaire.</u>

The second part (quantitative) concerns collecting data on crop management (monitored crops).

All inputs used and their respective costs as well all the obtained outputs (principal and secondary) and their market sale prices are noted.

INPUTS	**Output Value**	**Enterprise profitability**
▪ soil preparation ▪ Seeds ▪ fertilizers ▪ Labor ▪ Irrigation water ▪ Energy ▪ Pesticides ▪ insecticides ▪ Harvest etc.	▪ Principal Output x Market price ▪ All Secondary output x Market price	Total Value of Production – Total Variable cost
Total Variable Cost	**Total value of production**	**Gross Margin**

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Main Results

- **Yields, Water use and Water Productivity**

Crops	Unit	Onion		Wheat		Oat		Almond		Pistachios	
		Sup.	Farm.	Sup.	Farm.	Sup.	Farm.	Sup.	Farm	Sup.	Farm.
Yield	T/ha	81	49	64	43	10.08	6.7	1,4	1,8	0.8	0.35
Water	m^3/ha	7320	9235	4100	6120	3470	3370	5550	9670	2200	2135
Water productivity	Kg/m^3	**11.1**	5.3	**1.56**	0.72	**2.9**	1.2	**0.252**	0.186	**0.364**	0.162

- **Better results for Supromed plots**
- **Water use efficiency is significantly higher under Supromed management for all crops.**

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- **Potential to increase Yields**

Crops	Supromed Yield (T/ha)	National average yield (T/ha)	Potential to increase yield relative to Supromed (%)
Wheat	6.5	3.5	86
Oat	10.1	9	12
Onion	82	30	173
Almond	1.4	1.35	3.7
Pistachios	0.8	0.35	129
Olive	6.3	3.5	80

There is substantial potential to increase production at the national level via improve irrigation management at the farm level combined with good agricultural practices. The potential of increase ranges from 12% for oat crop to 129% for pistachios trees.

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- **Potential to save water**

Crops	Supromed treatment (m^3/ha)	Average National water use (m^3/ha)	Water saving (m^3/ha)	National average irrigated area (ha)	Water saving at national level (m^3)
Wheat	3600	4300	700	48100	33670000
Oat	3474	4200	726	17166	12462516
Onion	7320	9231	1911	15196	29039556
Almond	5550	8250	2700	11640	31428000
Pistachios	2200	5000	2800	3230	9044000
Olive	3960	5500	1540	115820	178362800

- This quantity is close to 180 million m^3, representing thus 8-9% of the total volume of water used in irrigated agriculture, which varies depending on the year between 1900 and 2100 million m^3.

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▪ Production Cost, Gross Margin/ha and WUE

Crops	Unit	Onion		Wheat		Oat		Almond		Pistachios	
		Sup.	Farm.	Sup.	Farm.	Sup.	Farm.	Sup.	Farm	Sup.	Farm.
Production cost	TND/ha	9100	7925	2723	2671	2355	1967	6806	6598	3514	1424
Irrigation cost share	%	13	18	18	30	20	23	19	46	22	41
Gross margin	TND/ha	11578	5569	5350	2202	3942	2223	5373	4998	12499	7000
Economic Water efficiency	TND/m^3	1.581	0.603	1.3	0.36	1.15	0.67	0.969	0.518	5.68	3.27

- The production varies accross plots…However, le lowest share of irrigation cost is observed at the level of Supromed plots.
- Gross Margin per ha and WUE (GM/m3) is higher under Supromed management.

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- **Average production cost at national level and on experimental plots.**

Crops	Average Production cost at regional level (TND/ha)	Average production cost on experimental plots (TND/ha)	Reduction cost relative to Supromed plots (%)
Wheat	3014,4	2873,6	-5%
Oat	1942,4	1795,2	-8%
Onion	8329,6	7942,4	-5%
Almond	7235,2	6684,8	-8%
Pistachios	5961,6	5392	-11%
Olive	3516,8	3104	-13%

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▪ Energy productivity, Specific energy

Crops	Unit	Onion		Wheat		Oat		Almond		Pistachios	
		Sup.	Farm.	Sup.	Farm.	Sup.	Farm.	Sup.	Farm	Sup.	Farm.
Energy productivity	kg/Kw	41.3	19.6	5.78	2.6	10.7	7.4	0.49	0.36	0.71	0.319
Specific energy	Kwh/Kg	0,024	0,05	0,173	0,573	0,093	0,135	2	2.74	1,4	3.15

▪ Specific energy shows the amount of energy spent to produce one unit of marketable product (kWh/kg). It was much lower for experimental (Supromed) plots than for others, meaning that control farmers have used more energy to produce one kg of each product. As an example, the average's farmers adopting conventional management have used 3.5 times more energy than that used on Supromed plot to produce the same quantity of wheat (one kg).

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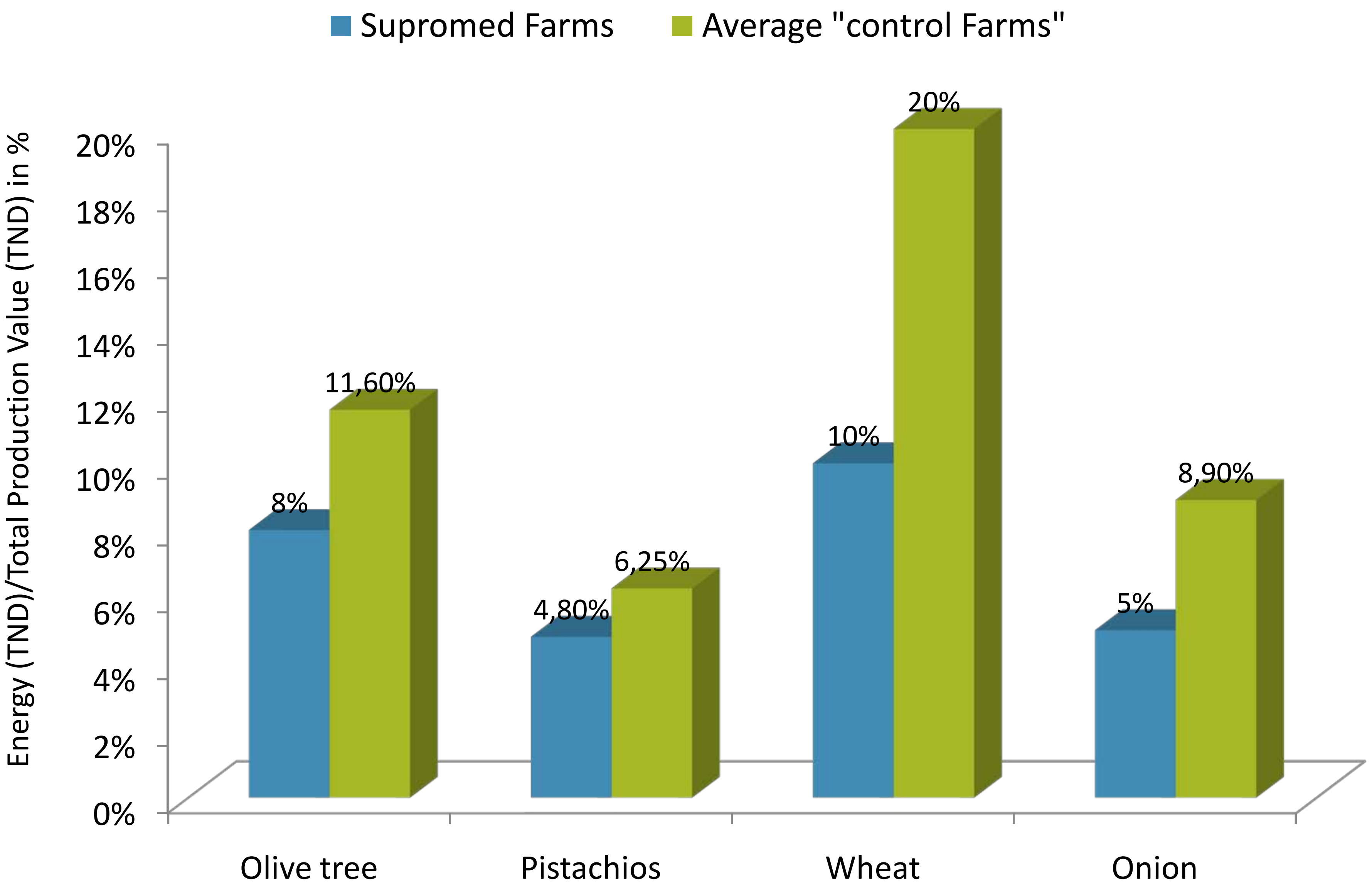
▪ **For Olive tree**

- For Supromed Plots: around of 8% of Total output Value is spent on energy input; that is 0,08 TND for each Dinar of Product sold,

- This value is 11,6% for “Control farms”,



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- ## Energy saving

Crops	Specific energy to produce a marketable product (Kwh/kg)		Energy saved Kwh/kg	Average national production (kg)	National energy saved per crop (10^3Kwh)
	Experimental plots	Average national level			
Wheat	0,17	0,4	0,23	168350	38721
Oat	0,09	0,15	0,06	154494	720
Onion	0,02	0,1	0,08	455880	36470
Almond	1,9	1,95	0,05	15714	786
Pistachios	1,04	4,57	3,53	1130,5	3991
Olive	0,32	0,55	0,23	405370	93235
Total					174 Gwh

- From this table, it can be drawn that the amount of energy that can save at the national level is close to 174 Gwh, representing this 26% of the total electric energy used in agriculture in Tunisia.

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- **Resilience towards Market prices Fluctuations**

- Under innovative management crops are more resistant towards prices fall.

- Even with a fall of 62% of price relative to average price, Gross Margin of onion crop conducted under SUPROMED management remains positive while that relative to "farmers" plots becomes negative.

- Innovative/smart irrigation management helps to sustain the economic profitability of irrigated systems under market prices fluctuations.

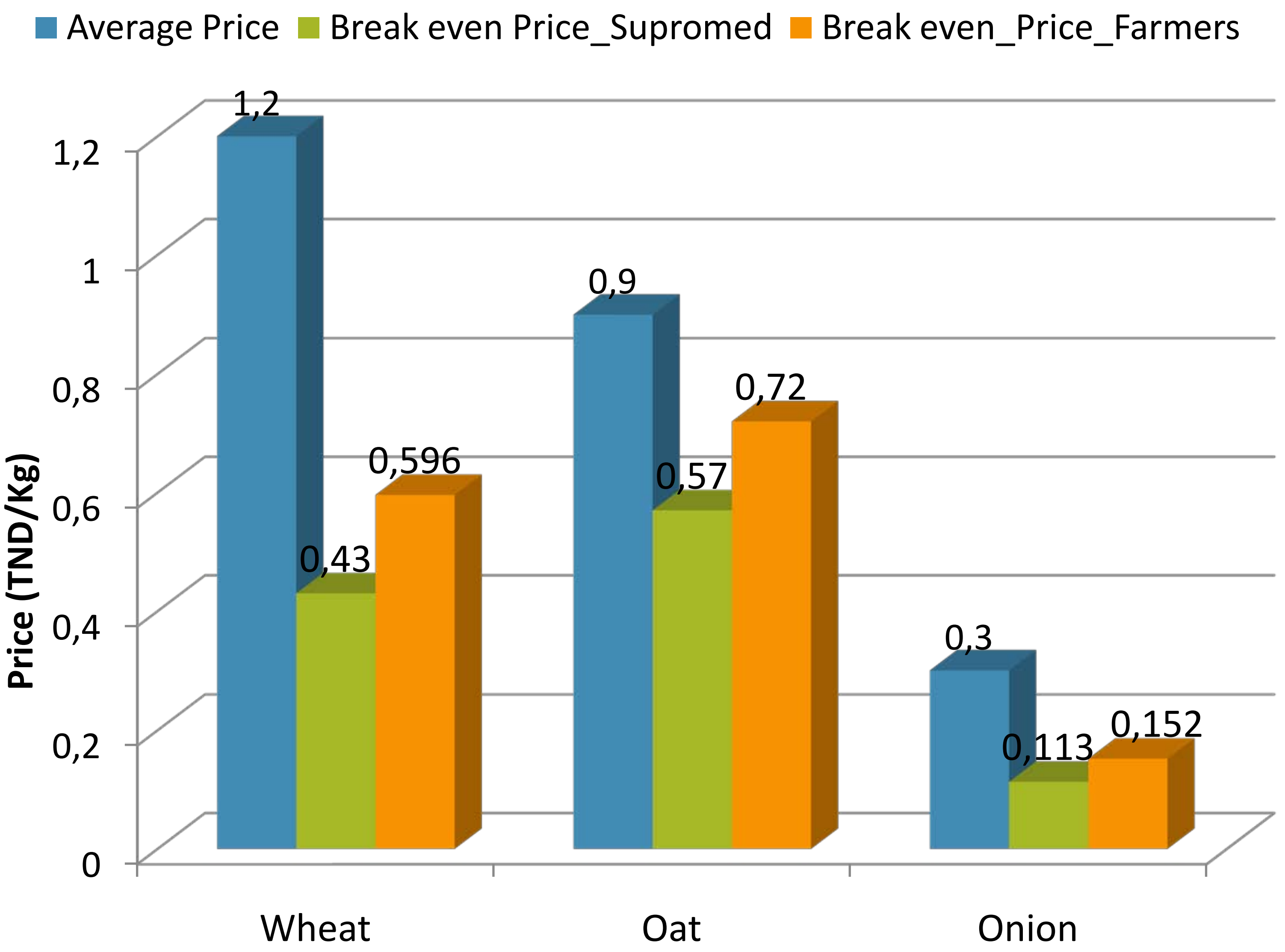

Table 3: Average production cost at national level and on experimental plots.

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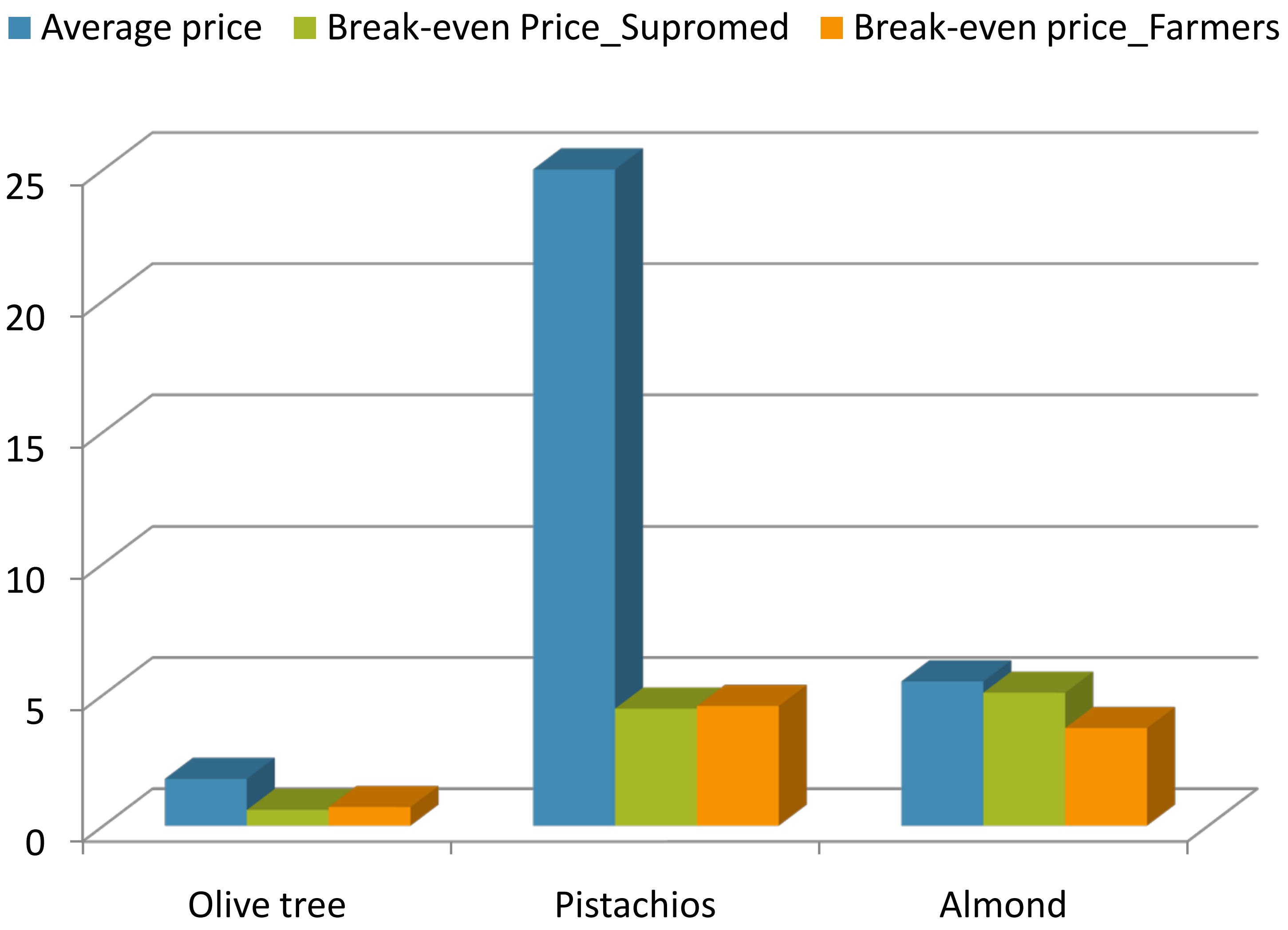

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- **Increase of participant Farmers' incomes.**

Groups	Change in farmer’s income		
	Before (2019)	After (2022)	Difference between periods
Participants	32600	39772	7172
Non-participants	26850	28950	2100
Difference between groups	5750	10822	5072

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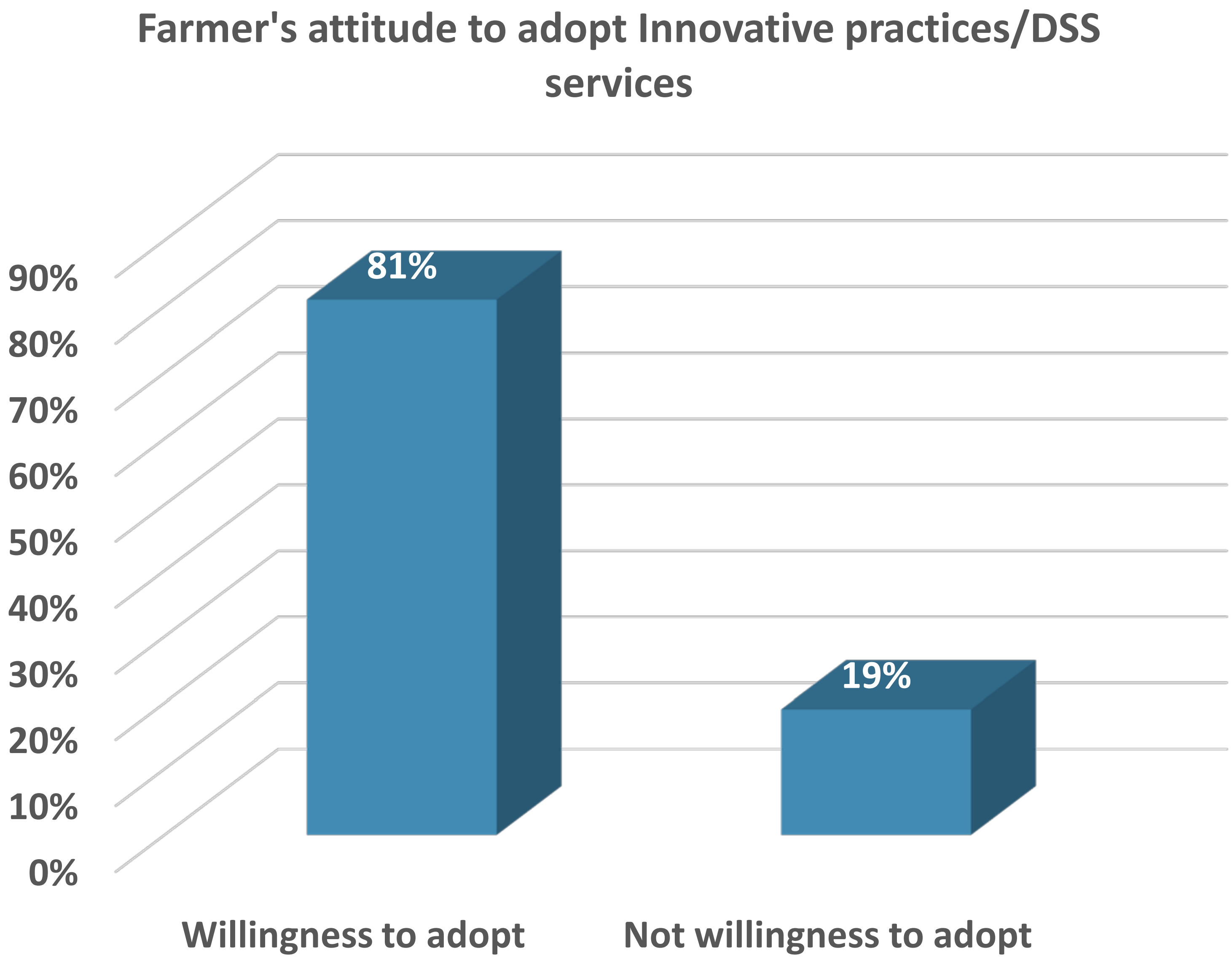
- **Farmers Innovative practices adoption**



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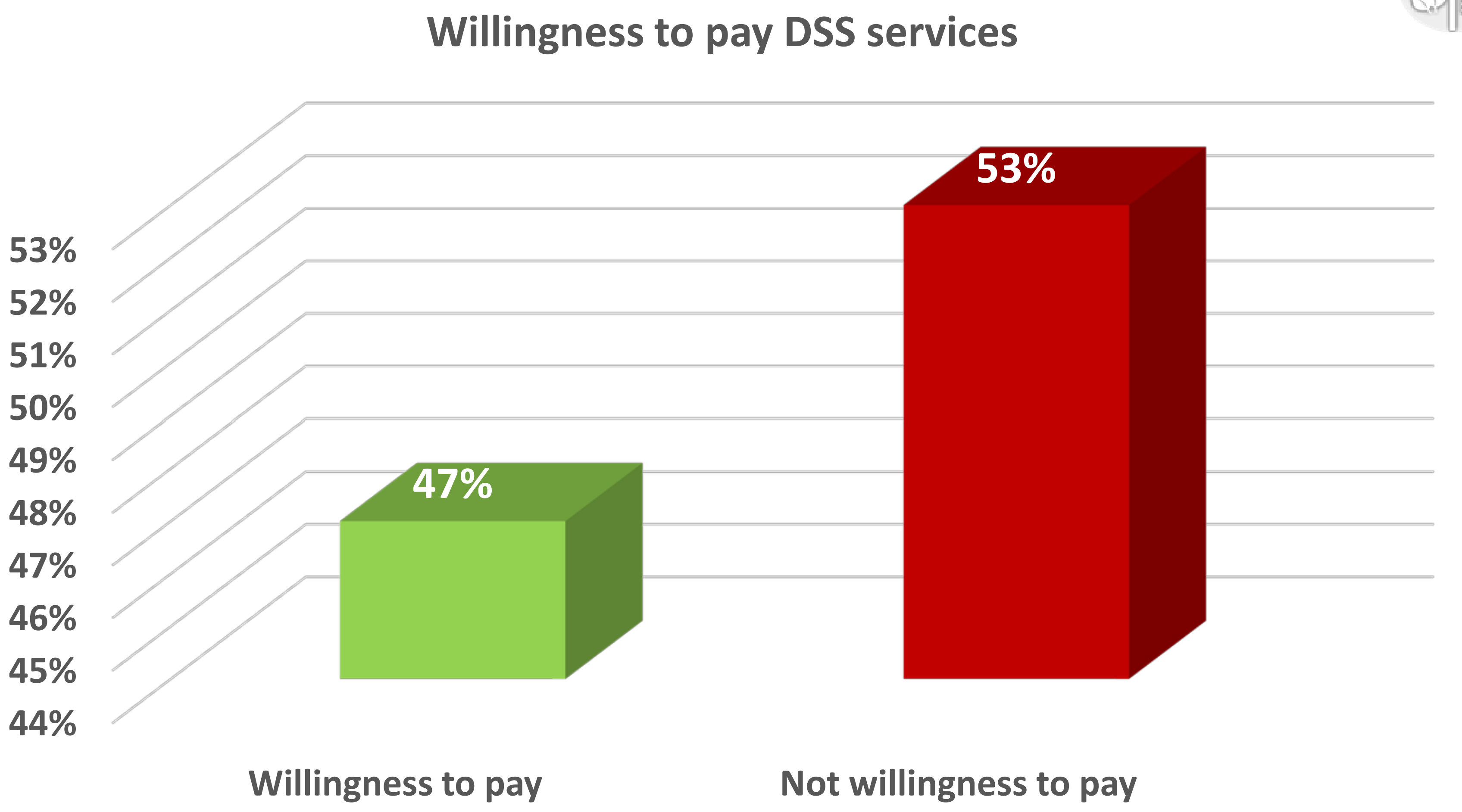

Although 81% of farmers declared interested by Supromed/innovative practices.....only 47% are ready to pay the service.

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- **Training and change in practical knowledge of farmers "before" and "after".**

Items	Before the project	After the project	Impact
Water Sensitive stage for crops.	Very limited knowledge	Sufficient knowledge	80% of the farmers adjust now the applied water to stage growth of the crop.
Decision when to irrigate and how much	Very limited and usually based on experiences and perception leading often in either under irrigation or over irrigation	Sufficient knowledge about the determination of the time and the volume of irrigation.	Farmers try to rely their decision on many criteria: stages of growth, soil characteristics, local weather conditions and rainfall forecast.
Fertilizers application: time of application and quantity	Most farmers think the use of mineral fertilizers increases yields without effect on soil fertility and salinity.	Sufficient knowledge about effect of fertilizers on environment.	Better optimize the use of mineral fertilizers organic manure

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Training and change in practical knowledge of farmers “before” and “after”.

Use of manure	Most farmers have only superficial knowledge of the usefulness and real benefits of using manure.	Sufficient knowledge about the effect of manure on soil and moisture saving.	It was seen from our visits that there is a significant trend among farmers to use manure in the field so to increase soil fertility, reduce salinity and save water by keeping soil moisture for long period.
Dialogue-communication between farmers	There is little opportunity for a genuine dialogue between farmers about agricultural practices.	Creation a group of farmers in each pilot zone to active the exchange of knowledge about agricultural practices as well as visits on the fields.	For each crop, the best farmers are contacted and visited by the less performing farmers in order to improve their farming practices.

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▪ Conclusion

This study aimed to identify the potential socio-economic impact resulting in utilizing innovative irrigation management at the farm level. Results showed that innovative management allowed higher yields, lower production cost as well as irrigation cost, comparative to conventional management. Results showed also that under smart management farmers' incomes become more resilient towards market prices variability leading thus to better economic viability of the farms.

All indicators obtained on experimental plots (farm level) are higher than those observed at the regional and national level, meaning that there is opportunity to better increase yields with less water while increasing benefits farmers in limited environmental water.

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