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# Soil Conservation Practices and Stakeholder's Participation in Research Projects—Empirical Evidence from Southern Italy

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**Abstract:** Adoption of soil conservation practices is promoted by increased engagement between researchers and stakeholders. By reporting a case study from southern Italy where farmers have been involved in research projects dealing with soil conservation over several years, we demonstrated that the rate of adoption of conservative technologies is positively linked to the degree of stakeholder participation in the project and that farmers (and other stakeholders) have been driven toward more conscious perception of the complex link between agricultural practices, environmental impacts and socioeconomic effects. The results of this study reinforce the pivotal role of effective participatory processes in soil conservation—evidencing the importance of (i) time required to build relationships and (ii) intensity (and persistence) of collaboration among similar initiatives. Empirical evidence highlights the need to combine different approaches to deal with soil degradation. As well as the participatory time length, the synergies between the methods utilized, and the range of interacting mind sets are also very important.

**Keywords:** agriculture; stakeholders; research impact assessment; research communication; Italy

## 1. Introduction

Research approaches to environmental issues may focus on theoretical solutions and not always have sufficient regard for the implications of land management choices. However, since 2001 the European Commission has required research projects to specifically engage with stakeholders, so that research results may be more easily communicated to those who can take responsibility for mitigation measures. Involving local stakeholders in projects enables the traditional experience and knowledge of local land users to be incorporated and valued [1–3].

An assessment of the wider impacts of research plans and results is clearly fundamental to addressing weaknesses and to boost the acceptance of research recommendations. Starting from the consideration that the adoption of innovation is a learning process [4–6], in this paper we demonstrate that the involvement of farmers and other stakeholders in more than one research project, over several years, significantly improves the likelihood of adoption of soil conservation practices [7–9]. This gradually overcomes the barriers to effective implementation, such as lack of information or lack of trust in the proposed practices that may exist. If the farmers have confidence in the suggestions of researchers and that trust is reinforced by the knowledge that their peers have also been convinced, the uptake of new ideas is likely to be improved [10,11]. A careful analysis of the process whereby soil conservation practices are adopted or rejected is important, because the money currently being spent on promoting such practices is large [6], funding is likely to be reduced in future, and available funding should be spent to best effect. To establish the extent of value for money, long term research studies may investigate not only adoption of conservation practices, but also how long such practices continue to be used [12–14]. In addition, it is critically important to promote the translation of pure science into practical innovations (new products, processes and services) that can be integrated into the governance of the wider economy [15–17]. This paper describes a case study in Basilicata, southern Italy, where farmers have been involved in two recent research projects, and attempts to address two main questions: (i) is the rate of adoption of technologies linked to the degree of stakeholder participation in the projects; and (ii) how have the attitudes/behaviors of the farmers and other stakeholders been influenced by their participation in the projects? An improved knowledge of factors leading to a higher participation of farmers to research activities may contribute to improve the effectiveness of soil conservation measures, e.g., promoting adoption of technologies and field practices that may contain soil degradation.

## 2. State of the Art

### 2.1. Effective Communication for Sharing Research Results with Stakeholders

Stakeholders need to receive research results and information in formats and language to suit their prior knowledge and personal interests [18]. In the context of promoting soil conservation practices, researchers should always find suitable opportunities and methods to consult with stakeholders, to establish the main concerns and the nature of barriers and constraints to adopting such practices. Effective consultation with stakeholders is likely to require more effort than merely a presentation from a researcher at a meeting. Opportunities for discussion, maybe using games and interactive tools, are essential. In the EC-funded DESIRE project [19] a Facilitator tool helped to provide stakeholders with practical choices of suitable land management technologies [20]. This involvement has been an important factor in promoting long-term adoption of technologies. Some other researchers [21] have acknowledged that they may not have provided full details of choices, and this may have affected adoption rates. Few studies in the literature describe the details of how information was disseminated to farmers, so it is difficult to know whether quality or format of information was a factor in adoption or non-adoption of new ideas [22]. In the DESIRE project there were particular efforts to provide information in a range of formats and complexity of language, to appeal to most of the identified stakeholder types [18]. In the regionally-funded REACT project concepts and benefits of soil conservation practices were reinforced [23], particularly for those who had also taken part in the DESIRE project. There may be a hierarchy of stakeholders, where certain individuals or leaders are particularly well-placed to influence the behavior of others [2], and the motivation to embrace change in practices may also be affected by various (apparently) marginal factors such as local competition, local politics and fear of failure. Both research projects implemented a two-years field activity ending with a large-scale dissemination action.

### 2.2. A Framework for Stakeholder Adoption of Research Recommendations

Research in the field of sociology has identified three stages prior to adoption: awareness, evaluation, and trial [5,6]. Individual characteristics of farmers are considered in explaining the adoption process, such as age, social participation, risk adversity and poor orientation towards farming [24]. The initial "acceptance" stage of the adoption process may start with the awareness or perception of the erosion problem and culminate in the decision to implement a soil/water conservation measure [5]. There can be many potential barriers to a final implementation, not least the problem of farmers' inability or unwillingness to recognize that there is an erosion problem in the first place. Erosion-related problems may develop very gradually over time and/or be masked by climatic changes, so their effects may not be readily noticeable, especially in the case of farmers who do not visit their land regularly. A lack of knowledge regarding the symptoms of erosion (e.g., rills, gullies) and the long-term impacts of erosion (e.g., loss of soil nutrients and water) can also explain farmers' inaction. Even in cases where farmers perceive erosion and are aware of the risks they may not consider their case as being serious enough to warrant intervention. Farmers' limited resources (e.g., lack of labor and capital), cultural constraints (e.g., how socially acceptable proposed measures are perceived to be) and lack of investment incentives can also explain why farmers who are aware of erosion problems and have the knowledge to adopt measures choose not to do so. Because of the multiplicity of potential negative responses to erosion prevention or intervention, soil conservation projects may provide cash incentives or reward farmers in kind in order to promote adoption. One of the risks associated with incentivizing the farmers is that they may stop intervention works as soon as incentives are removed [25–28].

Adoption is often considered a binary decision, adoption or non-adoption, when in reality farmers often choose first to trial certain measures on a small scale before applying the measure on a larger scale, which would be considered actual adoption. Ervin and Ervin [29] considered various explanatory factors to explain the likelihood of implementation: personal household characteristics, plus physical, sociological, economic, institutional, and policy factors. The continued-use phase, or final determination of adoption, occurs where farmers perceive long-term benefits, even after incentives and project assistance are no longer in place. An accurate picture of continued investment can only be assessed several years after a project's initial implementation [30].

### *2.3. General Attributes That Can Affect Farmer Attitude to Take-Up of Soil Conservation Practices*

Earlier studies [11,31] indicate the direction of certain factors affecting farmer behavior for uptake of soil conservation measures, but in many cases exceptions to the "rules" can also be cited.

- Age: older farmers may have more experience of how their land performs, but may be unwilling to take risks with new ideas. Younger farmers may be less risk-averse but may have less capital to invest. Younger farmers are more likely to welcome and use modern technologies and machinery.
- Tenure: land owners may make more personal investment than tenants, as they have greater responsibility for long-term profitability [32].
- Time-frame: farming based on short-term profitability may increase the risk of land degradation and soil erosion, and the possibility of reversing such processes using mitigation and restoration techniques may be ignored.
- Gender: male and female farmers may have different priorities, according to social roles and hierarchies. In Yunnan Province, China, Liu and Huang [33] found that there were a large number of women heading farms while their menfolk had higher-paid jobs in the cities, and that these particular women were less likely to embrace new conservation practices than the men.
- Education (formal or extension): Baumgart-Getz et al. [11] found that formal education was less relevant than extension education, which was very beneficial. Therefore, dissemination from research projects may be more important than is generally realized.
- Attitude to extension and research programs: this is largely dependent on the quality, relevance and duration of extension advice and training. Baumgart-Getz et al. [11] noted heterogeneity of responses to conservation practices for these reasons.
- Attitude to risk: farmers with greater willingness to take risks are more likely to adopt new practices. Large farms could absorb the risks of trying new practices more easily than small farms with smaller financial margins [33]. As the number of farmers adopting new measures in an area increases, it is more likely that additional farmers will have the trust and confidence to follow suit.
- Potential income: this is determined by the particular attributes of the farm but also by tax incentives, subsidies and market forces.

- Awareness of environmental and water quality issues: farmers exposed to research projects may have a better understanding of the natural environment and how it is impacted, (and potentially degraded), by inappropriate farming methods.
- Awareness of heritage issues, traditional technologies and traditional food products: farmers may recognize new profitable markets for traditional produce such as artisan breads, cheeses and cured meats.
- Access to networks: farmers in contact with advisory or extension bodies, or other farmers, may have access to the most up-to-date solutions and technologies for issues in their area.
- Effectiveness of local government in providing policy initiatives: policies on e.g., water use may play a large part in decision-making, e.g., in decisions whether to use new technologies for precision irrigation. Communication technology, e.g., better provision of broadband, may significantly improve weather forecasting as well as the rate of diffusion of new ideas.

## 3. Methodology

This study was carried out in the northern side of the administrative region of Basilicata, southern Italy, focusing on a specific agricultural district with homogeneous cropping systems, mainly devoted to cereal production, and a similar territorial/environmental context. The research area (Figure 1) has been investigated recently in two sequential research projects with similar theoretical assumptions and operational approaches. DESIRE (2007–2012) [19] was an EU FP6 project to find new conservation strategies to combat land degradation and desertification. It involved many farmers in its implementation, through an extensive field survey based on workshops and focus groups at 18 study sites around the world. REACT [23] was a project funded under measure 124 "Cooperation for development of new products, processes and technologies" of the Basilicata Rural Development Program, implemented in the Basilicata region in 2014–2015. The REACT project—Return and validation of traditional knowledge for the conservation of soil in the regional cereal growing area—involved approximately 1100 cereal farms, mainly family run farms, organized in two large cooperatives, as well as three research institutions, namely University of Basilicata, the Italian Agricultural Research Council (CRA) and the Italian National Research Centre (CNR). To ensure widespread dissemination of results, representatives of regional cooperatives were also involved. The project addressed progressive deterioration of both social and natural capital by attempting to bring back and update durum wheat cultivation techniques that were used in the past [34,35]). The aim was to identify and evaluate methods that both reduce production costs and promote soil conservation. Guidelines for the creation of a collective trademark of ecological quality for the region's cereal farms that adopt soil conservation techniques were developed. Both the DESIRE and REACT projects were implemented in the northern part of the region that coincides with the Rendina catchment (Figure 1). Here land degradation is mainly due to excessive sediment production, agricultural intensification and land mismanagement [19,36]).

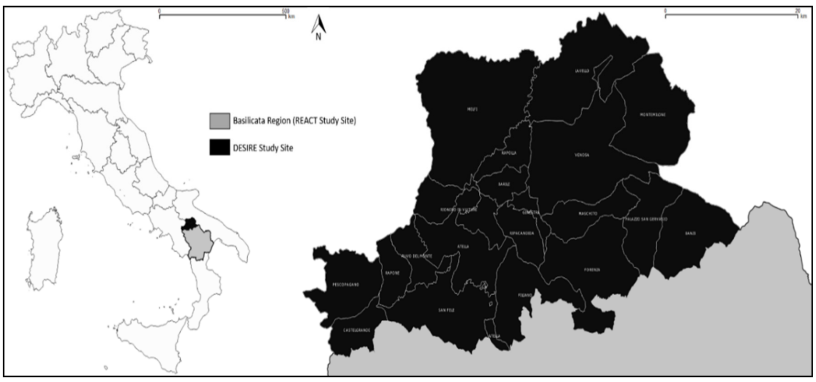


**Figure 1.** The location of the Basilicata region in southern Italy.

*Use of a Questionnaire to Evaluate Stakeholder Perceptions*

A questionnaire (see Appendix A) was delivered to a sample of 1224 cereal farmers, subdivided into 4 groups as follows: 315 farmers that have participated in both DESIRE and REACT projects (D + R group); 305 farmers that have been involved only in DESIRE project (D group); 300 farmers that have taken part in REACT project (R group); and finally 304 farmers that have not been involved in any research project (0 group). Since a complete list of the individual farms with their basic economic and demographic characteristics was not available, a two-step strategy was used in order to achieve a sample representing the farm population of the study area. Although the studied sample was not selected according to an inferential sampling design, sample size was large enough to support a reliable analysis of individual farms operating in the study area, providing a sufficiently detailed overview representative of different farm size, demographic characteristics of farmholders, land tenure/property regime and secondary crop productions (in addition to cereals). To increase sample representativeness, we considered aggregated official statistics by municipality in order to identify the main socio-demographic characteristics of farmers in the study area. Since the most frequent size of cereal farms in the Basilicata region is ranges between 10 and 30 hectares, the first step was to consider a random sample of 2/3 of the farmers from such farms to interview. These farmers were then subdivided into homogeneous groups according to age and education level, considering both young and older farmers in both accessible and remote places. In the second step, the remaining 1/3 of the farmers were contacted, and interviewed only if their characteristics in terms of age and educational level were able to improve the similarity of the sample to the population, providing a comprehensive representation of accessible and remote farms with different secondary crop productions (in addition to cereals). Following this approach, a representative sample of farms was obtained, with the following socio-demographic characteristics: (i) farms size of 10–30 hectares; (ii) Manager/farmer age in the range of 55–65 years; (iii) Farmer educated over 13 years (formal education). Farm size ranging between 10 ha and 30 ha and farmholder's age between 55 and 65 years are also characteristic of active farms operating in the whole of Basilicata region, thus representing a common socio-demographic profile typical of a wider geographical area.

Questionnaires were delivered and collected during the period of May to November 2015. The questionnaire posed 11 questions (see list in Appendix A): answers were collected on a nominal scale. Soil conservation measures were defined and the first question was whether these were practiced on the farm. The conservation measures that impact less on soils and are capable of maintaining structure without reversing the soil layers [37]) range from a simple reduction of tillage depth, to subsoiling (minimum tillage), to sod seeding. Minimum tillage uses harrows or plough disks which only penetrate the topsoil to the minimum depth required for seedbed preparation. No-tillage requires specific seed drills equipped with disk elements which penetrate only the top 5 cm of soil and directly deposit the seed. Techniques promoting water infiltration into the soil and reducing losses of surface runoff are also included. The management of surface water systems through land topography remodeling and drainage design helps to control water outflows, avoiding flooding and containing losses with runoff. In flat areas use of tillage to form slightly convex shaped fields (the local name in Italy is baulatura) creates gentle slopes in order to drive excess water to ditches at the side of fields. On sloping land runoff and erosion control are helped by well-placed ditches. Depending on the slope and soil texture, downstream ditches should be positioned before excess water reaches the threshold speed to trigger erosion. In this way erosion is minimized, and surface water is directed to flatter areas where it can be absorbed by the soil [38]. Farmers adopting at least one practice among those mentioned (in the current growing season) were considered to be an adopter. The remaining ten questions dealt with factors that influence the adoption of new conservation techniques, including the ways in which farmers learn about possibilities, their priorities for the future, and the perceived constraints. In order to have an overall picture of the effects produced by the two different projects, a logistic regression was run for each question and each available response option. In particular, we have considered as explanatory covariates the dichotomous variables D (for DESIRE) and R (for REACT), each with levels 1 for participants and 0 for not participants, by testing the model:

$$\log\left(\frac{p_x}{1-p_x}\right) = \beta_0 + \beta_1 D + \beta_2 R$$

where for each response option $x$, $P_x$ notes the probability of observing $x$ as an answer. In this way, $e^{\beta_0}$ indicates the main effect explaining the odds for response option $x$, $e^{\beta_1}$ and $e^{\beta_2}$ indicates the effect of DESIRE and REACT projects, respectively, in modifying the odds for response option $x$. For a question with J possible alternative answers, we have run the Chi-squared test of independence on the J $\times$ 4 contingency table obtained by classifying the frequencies for the different response options across the four groups of farmers. The same test has been used to test for homogeneity of preferences on J $\times$ 2 contingency tables, classifying response frequencies for each pair of groups. Pair-wise comparisons across the four groups of respondents were also carried out to determine significant inequalities in the observed preference rates for each response option by means of the (two-sided) asymptotic $z$-test. In this way the effect of each project could be evaluated in association with the other. The entire analysis was run within the free R working environment. The significance level was set to $\alpha = 0.05$.

## 4. Results

Differences in the observed distribution of each variable (from 1 to 11) across the four groups of respondents were depicted graphically (Figure 2) by means of a mosaic plot for each question. A sequential description of responses provided to each question was provided in the following paragraph. A specific description of a statistical model was finally provided. Results supported the hypothesis that participation by farmers in more than one research projects did reinforce knowledge, understanding and support for using long-term plans for soil conservation measures and protection of the natural environment. The projects also helped farmers to recognize the value of discussions with researchers and technicians, as well as other farmers, to formulate optimal plans for agricultural land management. This discussion allowed a wide range of factors to be considered, including the availability of a work force. The responses to the individual questions in the Questionnaire, and the implications, are summarized below. The responses of different questions often reinforced one another, and the overall implications are presented in the Discussion section. Table 1 shows a summary of results provided by the logistic regression. Missing values indicate non-significant effects. In order to test for homogeneity of preferences among groups, Table 2 reports the results of the Chi-squared test of independence, first when classifying frequencies for response options across the four groups of farmers for every question (first column) and then by running comparisons for each pairs of groups, $G_1$ and $G_2$ (distinguishing between research project). Table 3 reports the $z$-statistics and the corresponding $p$-values for the (two-sided) $z$-test run for each question and for each response option, and for each pair of Groups. These tests aim to check if the inequalities in observed rates are statistically significant. For the whole analysis, the significance level was set to $\alpha = 0.05$.

- **Question 1 (Implementation of soil conservation practices)**

All farmers who were interviewed believed that they were well-informed. Involvement in both projects (two projects rather than just one) provided a clear advantage in knowledge, understanding, and adoption. As indicated in Table 3, the frequency for option 'a' in Group 0 was significantly higher than those in the other groups. There were differences between the projects. The REACT group was more inclined to implement new practices. However, some DESIRE group farmers did not increase their interest in adoption of conservation practices. As confirmed by the logistic regression (Table 1), participants in the REACT project were more likely to implement measures (exp(β_2) > 1) for option "b"), and accordingly, this contributed to decrease caution (exp(β_2) = 0.706 < 1 (option "d"). The odds for option "d" decreased by about 30%, meaning that fewer REACT farmers were unwilling to adopt a technology, with respect to farmers not involved in this project. Conversely, attendance in the DESIRE project was not a significant determinant to improve the tendency of farmers towards accepting such practices (exp(β_1) not significantly different from 1). On the contrary, there may be evidence of increased unwillingness (as indicated in Table 1), since the rate of preference for option 'd' was significantly higher for DESIRE than the corresponding rate response for Group 0. However, participants in both REACT and DESIRE were associated with an increase in knowledge and adoption of soil conservation practices (exp(β_1), exp(β_2) < 1 for option "c") in both cases, with the REACT project contributing to education to a greater extent. In summary, both projects have helped to promote adoption and understanding of soil conservation practices, but the REACT project was more successful. Participants in the DESIRE and REACT groups were not significantly different in terms of willingness to learn, (from Table 3, the corresponding rates for option 'c' are not significantly different).

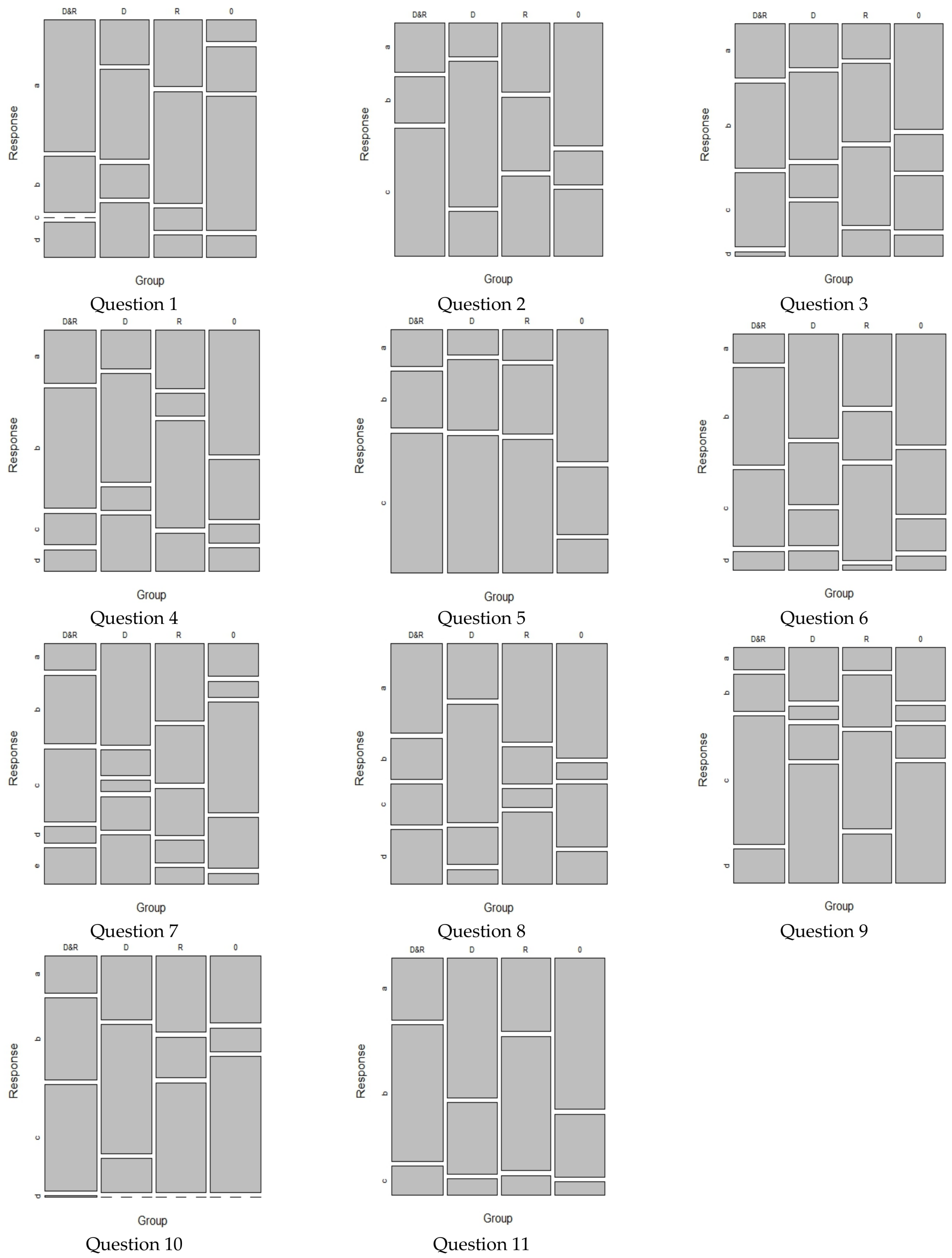


**Figure 2.** A graphical representation of the observed distributions of questionnaire variables.

- **Question 2 (In your opinion, what are the most important features the results/knowledge/ research should have, so that they attract attention from a potential user?)**

Logistic regression shows that both the DESIRE and REACT projects were effective in counteracting the idea that studies should be proposed solely by farmers/land users. In contrast, this farmer-centric opinion was represented strongly in the group of farmers that did not participate in any project. As indicated by Table 3, the frequency for option "a" is significantly higher than for all other groups; note the result from the DESIRE project: ($\exp(\beta\_1) < \exp(\beta\_2)$ for option "a"). Both projects promoted the role of researchers in proposing studies, but with a different effect: in particular, both projects favored the diffusion of the idea that research should be discussed and decided jointly between researchers and land users, but REACT was more effective for this than DESIRE ($\exp(\beta\_2) > \exp(\beta\_1) > 1$ for option "c"). DESIRE encouraged participants to support the idea that knowledge should be studied by researchers and then transferred, while REACT had the opposite effect ($\exp(\beta\_2) < 1$) (for option "b" ($\exp(\beta\_1) > 1$) while $\exp(\beta\_2) < 1$).

- **Question 3 (Which is the most important aspect in deciding whether "knowledge" or information is relevant or not?)**

Farmers participating in both projects welcomed the opportunity of involvement in discussions of long term issues rather than consideration of only short term goals (an effect that was slightly stronger for DESIRE participants—$\exp(\beta\_1) > \exp(\beta\_2) > 1$ for option "b"). However, the reduction in interest for short term goals was greater within the REACT group ($\exp(\beta\_1) < \exp(\beta\_2)$ for option 'a'). The REACT group showed slightly more interest in economic issues than environmental issues ($\exp(\beta\_2) > 1$ for option "c" and $\exp(\beta\_2) < 1$ for option "d"), while, farmers involved at least in the DESIRE project showed decreased interest in economic topics and indifference towards environmental issues ($\exp(\beta\_1) < 1$ for option "c" and $\exp(\beta\_1)$ not significantly different from 1 for option "d"). Table 3 indicates that in order to increase consideration of long-term needs, it sufficed that farmers attended at least one of the projects. Indeed, there is no significant difference in preferences towards option 'b' when comparing DESIRE and REACT together and individually, while there is a significant increase when comparing preferences for 'b' between these and Group 0.

- **Question 4 (Which is the most important feature for ensuring good agricultural practice?)**

Both projects contributed to decreasing the focus on purely short-term agricultural income, particularly DESIRE ($\exp(\beta\_1)$, $\exp(\beta\_2) < 0$ for option "a"). The persistence of the interest in short-term income within the REACT group was supported also by the fact that, among REACT farmers, participation in DESIRE did not significantly modify the preference rates for option 'a' (as indicated in Table 3 by the fact that the two rates are not significantly different). Participation in both projects helped farmers to identify optimum agricultural practices that will serve medium to long-term goals, but with totally different results. DESIRE farmers focused on maintaining their future income ($\exp(\beta\_1)$ significantly higher than 1 for option "b") while REACT participants particularly recognized the importance of conserving local heritage ($\exp(\beta\_2) > 1$ for option "c"). Concerning sustainability of the natural environment, the response within the DESIRE project was not significant. With reference to Table 3, the strong positive effect from the REACT project in relation to preservation of local heritage suggests that, even though participation in REACT does not imply an increased interest towards such aspects among farmers already associated with DESIRE, the combined association of the two projects yields improvements (the rate for option "c" within DandR is significantly higher than within Group 0). In DESIRE, preferences for this factor were not significantly different from that expressed by farmers in Group 0 (rates for option "c" were not significantly different when comparing DandR with D, and D with Group 0).

- **Question 5 (In the adoption of a new soil conservation technique, which is the most relevant effect: the workforce needed on a farm, or the effect on economic resources needed to implement it?)**

The Chi-squared test of independence (Table 2) showed no significant differences among distributions of responses provided by the DESIRE and REACT groups, as illustrated by the corresponding mosaic plot (Figure 2). Both projects have had a positive effect in promoting the importance of the financial benefits, but only if associated with positive effects on organization/manpower (exp(β_1), exp(β_2) significantly higher than 1 for option 'c' in Table 1). In particular, only the decrease in relevance relating to organization/manpower aspects differentiated farmers participating in at least one project from Group 0 (with reference to Table 3, rates for option 'a' are significantly different). Indeed, farmers who had not participated in either project were more likely to be concerned only about the effects of the potential lack of a labor force in the future (rate for option 'a' registered in Group 0 is significantly the highest).

- **Question 6 (Which is the most important criterion for choosing innovative agricultural techniques?)**

Farmers in the DESIRE group did not respond differently from those in Group 0 with respect to this question (non-significant Chi-squared test of independence, $p = 0.626$—see Table 2). In fact, differences in responses for all group combinations and options were not significant, as indicated by Table 3). For example, the DESIRE group and Group 0 agreed to the same extent that innovative agricultural techniques would be worth trying if a technology was identified by academic research and judged good by researchers. Overall, both projects assigned little importance to this aspect (exp(β_1), exp(β_2) < 1 for option 'a' in Table 1). In addition, DESIRE participants noted positive impacts on the natural environment, and were very keen to check if a new technology would suit the management of their particular company or organization (exp(β_1) significantly greater than 1 for options 'd' and 'b' respectively, in Table 1). Conversely, the REACT project yielded particular interest in the likelihood of increasing profitability (exp(β_2) = 3.453). Thus, it was at least three times more likely that a farmer participating in the REACT project would judge increase in profitability as the most important criterion compared to a farmer who did not participate. Globally, farmers involved in the REACT project were not interested in positive impacts on the natural environment and organization benefits (exp(β_2) is not significantly different, comparing options 'd' and 'b', respectively).

- **Question 7 (What is most important when adopting a new technique?)**

Both projects increased confidence in the recognition of support by technicians and decreased the level of importance paid to the minimization of financial risks (REACT to a greater extent in both cases: compare exp(β_2) and exp(β_1) for options 'b' and 'd' in Table 1, respectively). As for financial risks, this conclusion could also be deduced by observing that the preference rate for option 'b' in Group DandR is significantly lower than the corresponding rate in Group D, while there is no empirical evidence to support the claim that preferences for option 'd' were different when comparing Group DandR with Group R. The main difference between the REACT and DESIRE projects was that participants in the former were confident in their own observations, and did not necessarily need their confidence boosted by the backing of the institutions (having observed a significant reduction in the importance paid to favor and support provided by institutions: see exp(β_2) for option 'a' in Table 1). Participation in the DESIRE project contributed positively to the successful validation of technologies (see exp(β_1) for option 'e' in Table 1), and significantly reduced the former confidence relying solely on exchange of ideas with other farmers (exp(β_1 < 0) for option 'c' in Table 1).

- **Question 8 (When a new technique has been adopted, what is the most important criterion to judge and implement it on a larger scale?)**

New technologies that provided improvements for the natural environment were perceived as the most important criterion by participants in DESIRE. Participation in DESIRE also decreased the significance assigned to economic advantages, and simplification of management provided by new measures (exp(β_1) < 1 for options 'a' and 'd', respectively). However, we also observed that there is no significant difference between DandR and group R in the perception of economic advantages (no significant difference for option "a"—see Table 3): participation in REACT had no overall effect in relation to economic advantages. Indeed, REACT participants were more than three times more likely to be mostly interested in new technologies to simplify land management compared to those not participating in REACT (see exp(β_2) for option "d" in Table 1). As a result, the level of importance they assigned to improvements to working conditions for employees and to the natural environment decreased.

- **Question 9 (Who should assess the benefits of a technique?)**

According to the Chi-squared test of independence (Table 2), no significant differences were observed between the DESIRE group and farmers not involved in any project ($p$ = 0.977): both groups were mainly characterized by preferring that the benefits of a technology should be judged by an independent assessor. Both the DESIRE and REACT projects registered the advantages of a collaborative approach to evaluation, but the REACT participants had a stronger opinion than DESIRE participants (exp(β_2) = 5.850 against exp(β_1) = 1.481 for option "c" in Table 1. It was also REACT project participants who had the particular opinion that the task of assessing the benefits of the technology should be assigned only to researchers. In contrast, participation in the DESIRE project did not seem to play any direct role in the establishment of the choice of assessor. In particular, as reported in Table 3, there is no significant difference between DandR and R groups as to the belief that only researchers should assess the technologies.

- **Question 10 (What is the most significant barrier to the dissemination of information about successful techniques?)**

The declining number of young people staying to work in the region was considered a barrier to the dissemination of information for participants in the REACT project (with a significant increase in the odds quantified by exp(β_2) = 1.573 for option "c" in Table 1—meaning that the odds for this response were about 57% higher among REACT participants than among farmers not participating in the REACT project). In contrast, the DESIRE participants considered that the most significant barrier was the lack of trust between farmers in sharing or collaborating to use new ideas (see exp(β_1) = 5.262 for option 'b' in Table 1). Moreover, the opinion that the lack of confidence in the practical application is the most significant barrier was not differentiated significantly among Groups D, R and 0 (the preference for option 'a' is not significantly different according to the $z$-test reported in Table 3), but the combination of the two projects significantly weakened this belief (the observed rate in Group DandR is significantly lowest with respect to the corresponding responses in the other groups). In addition, among REACT farmers the additional participation in DESIRE did not significantly modify the perception that the lack of a young workforce was the most significant barrier ($p$ = 0.367 for the two-sided $z$-test of equality of two proportions for option 'c' when comparing DandR and R).

- **Question 11 (Often the absence of young people with practical or management qualifications on a farm is reported as a barrier to the introduction of innovations. How do you judge this statement?)**

This question divided the respondents into two main sets: (a) DESIRE + REACT, or just REACT; (b) DESIRE only or not in any project. Thus, the key factor was participation or not in REACT. This conclusion is supported by the Chi-squared test of independence (See Table 2). In addition, within each of these groups there were non-significant differences in rates for all response options, as reported in Table 3. Participants in the REACT and DESIRE + REACT groups were most likely to recognize that there were various barriers to progress, including but not solely the continuing reduction in numbers of young people with practical or management qualifications. The positive role that the REACT project played in recognizing such a factor as a barrier has already been underlined within Question 10.

**Table 1.** Logistic regression: for each question and each response option x, $e^{\beta_0}$ indicates the main effect explaining the odds for response option $x$, $e^{\beta_1}$; and $e^{\beta_2}$ indicates the effect of the DESIRE and REACT projects, respectively, in modifying the odds for response option $x$.

| Question | Response Option | Main Effect | Project Effect | |
|---|---|---|---|---|
| | | exp(beta_0) | DESIRE exp(beta_1) | REACT exp(beta_2) |
| 1 | a | 0.092 | 2.966 | 4.989 |
| | b | 0.433 | | 1.370 |
| | c | 1.580 | 0.103 | 0.062 |
| | d | 0.130 | 2.306 | 0.706 |
| 2 | a | | 0.299 | 0.655 |
| | b | 0.423 | 2.400 | 0.526 |
| | c | 0.290 | 1.302 | 2.659 |
| 3 | a | 0.660 | 0.606 | 0.497 |
| | b | 0.288 | 1.829 | 1.517 |
| | c | 0.291 | 0.733 | 2.155 |
| | d | 0.211 | | 0.358 |
| 4 | a | | 0.373 | 0.570 |
| | b | 0.253 | 4.621 | 0.761 |
| | c | 0.157 | 0.327 | 4.615 |
| | d | 0.216 | | 0.704 |
| 5 | a | | 0.268 | 0.309 |
| | b | 0.443 | | |
| | c | 0.341 | 2.720 | 2.524 |
| 6 | a | 1.229 | 0.583 | 0.308 |
| | b | 0.342 | 1.638 | |
| | c | 0.183 | | 3.453 |
| | d | 0.047 | 2.046 | |
| 7 | a | 0.436 | | 0.694 |
| | b | 0.087 | 1.384 | 3.888 |
| | c | 0.557 | 0.431 | |
| | d | 0.292 | 0.631 | 0.401 |
| | e | 0.067 | 3.575 | |
| 8 | a | 0.888 | 0.531 | |
| | b | 0.186 | 4.215 | 0.450 |
| | c | 0.282 | | 0.540 |
| | d | 0.149 | 0.586 | 3.325 |
| 9 | a | 0.318 | | 0.355 |
| | b | 0.070 | | 3.549 |
| | c | 0.146 | 1.481 | 5.850 |
| | d | 1.175 | | 0.197 |
| 10 | a | 0.462 | 0.616 | |
| | b | 0.197 | 5.262 | 0.695 |
| | c | | 0.378 | 1.573 |
| 11 | a | 1.768 | | 0.239 |
| | b | 0.420 | | 3.508 |
| | c | 0.070 | | 1.716 |

**Table 2.** Chi-squared test of independence (bold values indicate that the test is not significant).

| | **All Groups** | | **D&R-D** | | **D&R-R** | | **D&R-0** | | **D-R** | | **D-0** | | **R-0** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $x^2$ | *p*-Values | $x^2$ | *p*-Values | $x^2$ | *p*-Values | $x^2$ | *p*-Values | $x^2$ | *p*-Values | $x^2$ | *p*-Values | $x^2$ | *p*-Values |
| **Q1** | 528.723 | 0 | 123.714 | 0 | 90.092 | 0 | 302.881 | 0 | 30.855 | 0 | 132.697 | 0 | 177.423 | 0 |
| **Q2** | 291.222 | 0 | 130.515 | 0 | 28.3 | 0 | 73.033 | 0 | 61.926 | 0 | 169.345 | 0 | 41.862 | 0 |
| **Q3** | 200.524 | 0 | 83.035 | 0 | 27.308 | 0 | 69.425 | 0 | 41.611 | 0 | 92.034 | 0 | 76.783 | 0 |
| **Q4** | 376.209 | 0 | 27.312 | 0 | 152.137 | 0 | 71.655 | 0 | 157.41 | 0 | 98.23 | 0 | 142.223 | 0 |
| **Q5** | 276.642 | 0 | 4.911 | **0.086** | 2.716 | **0.257** | 157.12 | 0 | 0.69 | **0.708** | 176.908 | 0 | 159.672 | 0 |
| **Q6** | 177.531 | 0 | 89.926 | 0 | 61.584 | 0 | 102.391 | 0 | 57.386 | 0 | 1.75 | **0.626** | 62.805 | 0 |
| **Q7** | 350.028 | 0 | 162.506 | 0 | 54.993 | 0 | 101.746 | 0 | 75.748 | 0 | 200.652 | 0 | 108.874 | 0 |
| **Q8** | 270.482 | 0 | 93.858 | 0 | 14.684 | 0.002 | 31.91 | 0 | 130.908 | 0 | 149.516 | 0 | 62.907 | 0 |
| **Q9** | 313.646 | 0 | 172.798 | 0 | 12.986 | 0.005 | 175.337 | 0 | 126.733 | 0 | 0.205 | **0.977** | 127.485 | 0 |
| **Q10** | 225.635 | 0 | 74.333 | 0 | 37.119 | 0 | 59.687 | 0 | 114.867 | 0 | 178.193 | 0 | 10.422 | 0.005 |
| **Q11** | 149.767 | 0 | 73.187 | 0 | 3.818 | **0.148** | 95.695 | 0 | 52.85 | 0 | 1.777 | **0.411** | 71.442 | 0 |

**Table 3.** The results of the asymptotic (two-sided) *z*-test for testing the significance of the observed rates inequalities. Bold results are those for which the null hypothesis of equality of rates cannot be rejected at the fixed significance level $\alpha = 0.05$ (D = DESIRE project, R = REACT project, 0 = farmers not participating in any project).

| | | **D&R-D** | | **D&R-R** | | **D&R-0** | | **D-R** | | **D-0** | | **R-0** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Z-Value** | ***p*-Value** | **Z-Value** | ***p*-Value** | **Z-Value** | ***p*-Value** | **Z-Value** | ***p*-Value** | **Z-Value** | ***p*-Value** | **Z-Value** | ***p*-Value** |
| Q1 | a | 9.929 | 0 | 7.24 | 0 | 12.833 | 0 | −2.842 | 0.002 | 3.507 | 0 | 6.2 | 0 |
| | b | −4.05 | 0 | −6.39 | 0 | 1.491 | 0.068 | −2.39 | 0.008 | 5.445 | 0 | 7.715 | 0 |
| | c | −7.163 | 0 | −5.755 | 0 | −16.408 | 0 | 1.886 | 0.03 | −11.492 | 0 | −12.91 | 0 |
| | d | −2.705 | 0.003 | 2.164 | 0.015 | 2.226 | 0.013 | 4.738 | 0 | 4.809 | 0 | 0.054 | 0.478 |
| Q2 | a | 2.204 | 0.014 | −2.537 | 0.006 | −8.431 | 0 | −4.653 | 0 | −10.311 | 0 | −5.94 | 0 |
| | b | −11.126 | 0 | −3.443 | 0 | 1.803 | 0.036 | 7.852 | 0 | 12.536 | 0 | 5.141 | 0 |
| | c | 9.521 | 0 | 5.293 | 0 | 6.86 | 0 | −4.386 | 0 | −2.832 | 0.002 | 1.586 | 0.56 |
| Q3 | a | 1.465 | 0.072 | 2.732 | 0.003 | −6.046 | 0 | 1.28 | 0.1 | −7.378 | 0 | −8.503 | 0 |
| | b | −0.26 | 0.397 | 0.761 | 0.223 | 6.138 | 0 | 1.013 | 0.155 | 6.354 | 0 | 5.364 | 0 |
| | c | 5.421 | 0 | −0.554 | 0.29 | 2.414 | 0.008 | −5.906 | 0 | −3.058 | 0.001 | 2.937 | 0.002 |
| | d | −8.268 | 0 | −4.732 | 0 | −3.992 | 0 | 4.09 | 0 | 4.898 | 0 | 0.84 | 0.201 |

**Table 3.** *Cont.*

| | | D&R-D | | D&R-R | | D&R-0 | | D-R | | D-0 | | R-0 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Z-Value | *p*-Value | Z-Value | *p*-Value | Z-Value | *p*-Value | Z-Value | *p*-Value | Z-Value | *p*-Value | Z-Value | *p*-Value |
| Q4 | a | 1.993 | 0.023 | −0.026 | 0.266 | −8.02 | 0 | −2.587 | 0.005 | −9.741 | 0 | −7.329 | 0 |
| | b | 1.281 | 0.1 | 11.428 | 0 | 6.782 | 0 | 10.254 | 0 | 5.505 | 0 | −5.195 | 0 |
| | c | 1.452 | 0.073 | −9.005 | 0 | 2.27 | 0.012 | −10.116 | 0 | 0.829 | 0.204 | 10.745 | 0 |
| | d | −5.09 | 0 | −2.74 | 0.003 | −0.415 | 0.339 | 2.391 | 0.008 | 4.649 | 0 | 2.311 | 0.01 |
| Q5 | a | 1.772 | 0.038 | 0.937 | 0.174 | −10.6 | 0 | −0.828 | 0.204 | −11.948 | 0 | −11.232 | 0 |
| | b | −1.736 | 0.041 | −1.595 | 0.055 | −1.404 | 0.08 | 0.134 | 0.447 | 0.329 | 0.371 | 0.194 | 0.423 |
| | c | 0.103 | 0.459 | 0.525 | 0.3 | 11.544 | 0 | 0.42 | 0.337 | 11.398 | 0 | 10.988 | 0 |
| Q6 | a | −9.183 | 0 | −5.784 | 0 | −9.884 | 0 | 3.572 | 0 | −0.769 | 0.221 | −4.324 | 0 |
| | b | 4.119 | 0 | 5.725 | 0 | 3.824 | 0 | 1.668 | 0.048 | −0.295 | 0.384 | −1.959 | 0.025 |
| | c | 5.16 | 0 | −2.159 | 0.015 | 5.773 | 0 | −7.169 | 0 | 0.356 | 0.256 | 7.754 | 0 |
| | d | −0.1 | 0.460 | 3.403 | 0 | 0.958 | 0.169 | 3.481 | 0 | 1.051 | 0.147 | −2.525 | 0.006 |
| Q7 | a | −9.311 | 0 | −6.73 | 0 | −1 | 0.159 | 2.731 | 0.003 | 8.344 | 0 | 5.744 | 0 |
| | b | 5.955 | 0 | 1.402 | 0.08 | 7.511 | 0 | −4.583 | 0 | 1.796 | 0.036 | 6.203 | 0 |
| | c | 8.75 | 0 | 3.25 | 0.001 | −4.29 | 0 | −5.841 | 0 | −12.355 | 0 | −7.349 | 0 |
| | d | −3.08 | 0.001 | −1.192 | 0.117 | −5.474 | 0 | 1.886 | 0.03 | −2.496 | 0.006 | −4.306 | 0 |
| | e | −1.823 | 0.034 | 3.349 | 0 | 4.633 | 0 | 5.032 | 0 | 6.244 | 0 | 1.383 | 0.083 |
| Q8 | a | 3.917 | 0 | −1.015 | 0.155 | −2.836 | 0.002 | −4.87 | 0 | −6.64 | 0 | −1.803 | 0.036 |
| | b | −9.01 | 0 | 0.512 | 0.304 | 3.981 | 0 | 9.343 | 0 | 12.19 | 0 | 3.471 | 0 |
| | c | 0.494 | 0.311 | 3.493 | 0 | −2.888 | 0.002 | 3.008 | 0.001 | −3.347 | 0 | −6.166 | 0 |
| | d | 5.997 | 0 | −2.13 | 0.017 | 2.986 | 0.001 | −7.87 | 0 | −3.185 | 0.001 | 5.019 | 0 |
| Q9 | a | −4.717 | 0 | −0.15 | 0.441 | −4.646 | 0 | 4.523 | 0 | 0.072 | 0.471 | −4.452 | 0 |
| | b | 4.077 | 0 | −2.044 | 0.02 | 3.762 | 0 | −5.938 | 0 | −0.338 | 0.368 | 5.642 | 0 |
| | c | 10.83 | 0 | 3.431 | 0 | 11.088 | 0 | −7.603 | 0 | 0.321 | 0.374 | 7.882 | 0 |
| | d | −10.013 | 0 | −2.181 | 0.015 | −10.122 | 0 | 7.958 | 0 | −0.125 | 0.450 | −8.07 | 0 |
| Q10 | a | −3.561 | 0 | −4.979 | 0 | −3.937 | 0 | −1.456 | 0.073 | −0.383 | 0.351 | 1.073 | 0.142 |
| | b | 5.14 | 0 | 5.032 | 0 | 7.491 | 0 | 9.835 | 0 | 12.062 | 0 | 2.628 | 0.004 |
| | c | 8.551 | 0 | −0.339 | 0.367 | −3.212 | 0.001 | −8.798 | 0 | −11.419 | 0 | −2.845 | 0.002 |
| Q11 | a | −8.552 | 0 | −1.402 | 0.080 | −9.782 | 0 | 7.141 | 0 | −1.319 | 0.094 | −8.384 | 0 |
| | b | 7.13 | 0 | 0.268 | 0.394 | 8.112 | 0 | −6.802 | 0 | 1.039 | 0.149 | 7.781 | 0 |
| | c | 2.303 | 0.011 | 1.642 | 0.050 | 2.919 | 0.002 | −0.661 | 0.254 | 0.644 | 0.260 | 1.298 | 0.097 |

## 5. Discussion

By taking part in research programs, farmers may increase their understanding of beneficial soil conservation practices. Different conservation measures have different levels of attractiveness to farmers, according to perceived risks: in a less reliable or changing local climate; how rapidly a financial benefit might be felt; how visually evident any improvement might be; or the costs of machinery, fuel or energy. Effectiveness and practicality are both desirable but not necessarily achievable at the same time. Availability of capital may be one of the best predictors of adoption of soil conservation practices. Another important predictor is the availability of a workforce for new ventures [11]. This research has shown that thresholds for adoption or non-adoption change according to certain key factors, particularly those related to quality, format, volume and reinforcement of information. Specifically, the greater adoption of soil conservation practices within the group of farmers that have participated in both projects seems to support the idea that participatory research activity, especially when reinforced by extension services or advice as in the REACT project, has a greater impact on informing farmer choices. The combination of both participatory and extension allows farmers to both understand the concept of the technologies and to adapt them to the local context and their own needs. Farmers are becoming more educated in agriculture and have greater access to information technology. Yet the results from the studies of adoption and the information valuation in this paper show that the value placed on highly localized agronomic information remains particularly strong, and there appears to be a growing demand for local research information. This is likely to reflect an increasing need for information to be well targeted and have high quality characteristics if it is to be influential in adoption decisions [39], considering also relevant spatial constraints and socioeconomic background [40–42].

A certain length of time is required both to build relationships [43], and to establish collaboration among similar initiatives to boost the outcomes. We are aware of the risk that some well-meaning research initiatives fail to engage the interest of stakeholders, or the rewards for participation may be disappointing in some way, or not be sufficiently attractive [44]. Stakeholders may become weary of participation and disengage with researchers. Our results highlight the need to combine different approaches to dealing with land degradation problems, especially approaches that reinforce one another.

Care must be taken to ensure that researchers address a diversity of mind sets [45], to ensure that a wide range of ideas and implications are discussed. Exchange of information between researchers and stakeholders is expected to ideally be in all spatial and also hierarchical directions, and not just top-down as has prevailed in the past. Our results confirm that to be identified as useful and to be effectively used, knowledge should be built up jointly, in a context where, despite the differences of roles and objectives, there are equal opportunities for all participants to have their say. Although there have been significant recent improvements in knowledge-sharing, epistemological barriers continue to hinder the effective impact. Active involvement in research activities and the design of tools for effective dissemination have raised awareness, but now there needs to be more focus on fine-tuning the knowledge that promotes adoption of conservation measures. Participation in research projects shapes attitudes towards a "medium and long-term approach" rather than just a short-term fix, despite a progressively ageing farmer sector, reduced area of farmed land, or reduced labor force. Especially in Western countries, (where agriculture may be a declining sector due to economic factors, depopulation and land abandonment), scientific research has a part to play in reinstating the basic relationships between people and the land.

Participation in more than one project has highlighted the importance of access to new and expanding networks. Exchange of ideas among peers is pivotal to the diffusion of innovations and the participation in research activities increases opportunities to share ideas and to build trust and confidence [43,46,47]). The role played by institutions in favoring and supporting the new technologies is also important [48]. As well as a broader knowledge of the benefits of soil conservation, farmers exposed to research projects may also have a better understanding of the natural environment and how it is impacted, and potentially degraded, by inappropriate farming methods. Results showed that farmers participating only in the DESIRE project placed a greater importance on the observed improvements to the natural environment.

It is likely that the continued adoption of conservation techniques will be influenced by the economic benefits associated with them, together with the perceived improvements to the natural environment. Both financial and technical assistance may be needed to initiate and maximize take-up of new conservation practices. Policy-makers may also identify farmers most likely to adopt new ideas [11], and then use communication networks to inform other farmers of the benefits. Glenk et al. [21] also noted the value of policy-makers providing "a mix of extension and awareness raising, regulation, and positive financial incentives" to promote best practice. Ngwira et al. [49] advocated that technical support should be as long term as possible. Involvement in DESIRE and REACT has helped to reveal the potential sustainability of the proposed measures. The absence of young people might not (as some thought) represent a barrier to the introduction of innovation [50,51], as promoting wider recognition of economic and environmental benefits can attract young people back into farming.

Considering that this study is based on the specific assumption that participation in integrated research projects may increase environmental awareness, technical expertise and cooperation among farmers, our results outline a rather homogeneous context confirming that stakeholders' participation in research activity is improving significantly improves the willingness to adopt effective soil conservation practices at farm scale. More important, the joint impact of sequential research projects on farmers' ability to implement such measures is positive, implying that a continuous participation in innovative activities dealing with soil conservation and knowledge interchange with researchers, local institutions and other stakeholders is key to form a new generation of farmers with an active role in sustainable land management. Farmers' actions mitigating soil degradation and implemented in cooperation with researchers, land managers and spatial planners may contribute significantly to soil conservation. A better coordination among actions taken by individual farmers to preserve soil quality is increasingly required in marginal rural areas.

## 6. Conclusions

Using as a case study of four groups of farmers with different degrees of participation in research projects as a case study, our research clearly shows that long-term involvement of farmers and other stakeholders in research projects does improve adoption rates for sustainable measures. However, the success of involvement may depend on the quality, volume and reinforcement of information available to the farmers, and whether that information is presented in an attractive and intelligible format. In addition, it is essential to gain support from local decision-makers and regional policy-makers, to provide access to incentives, subsidies and advanced technical knowledge. Local and regional government policy-makers have a key role in promoting soil conservation practices, because they can be a source of trusted information adapted to the specificity of local environments and socioeconomic contexts, reducing the perception of risk by farmers, and increasing support for new ventures. Involvement of stakeholders in ongoing research projects to foster greater uptake of soil conservation practices is costly and will not difficult to achieve for many regions. Therefore, the construction and maintenance of trusted farmer/policymaker communication networks could provide an effective alternative. It may remain difficult to reach specific non-adopters, but it will be important to identify reasons for non-adoption—or rejection after a short trial—and see if they can be addressed. Based on these premises, future studies should advance knowledge of the main factors influencing adoption of soil conservation measures at farm level in other southern European contexts. This research objective can be reached by comparing farmers' adoption rates in areas (more or less) prone to soil degradation.

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## Appendix Questionnaire List

**(1) Implementation of soil conservation practices**

a. Yes, I have adopted them
b. I am evaluating the opportunity to implement them
c. I do not know enough about them
d. I have no intention to adopt them

**(2) In your opinion, what are the most important features the results/knowledge/research should have, so that they attract attention from a potential user?)**

a. Studies should be proposed by the farmers/users
b. Studies by researchers must be transferred (Research carried out by experts should be then communicated to information users)?
c. Research ideas should be discussed and decided jointly between researchers and land users
d. Other (please write) ________________

**(3) Which is the most important aspect in deciding whether knowledge or information is relevant or not?**

a. It addresses short-term needs in particular
b. It addresses medium and long-term needs (it alerts you to actions that might cause problems in the future)
c. It only addresses economic considerations
d. It only addresses environmental considerations

**(4) Which is the most important feature for ensuring a good agricultural practice?**

a. To guarantee an income for the farm in the short term
b. To guarantee an income for the farm over the medium- long term
c. To ensure preservation of local heritage
d. To ensure conservation and sustainability of the natural environment
e. Other ________________

**(5) In the adoption of a new soil conservation technique, which is the most relevant effect: the workforce needed on a farm, or the effect on economic resources needed to implement it?**

a. Only organization / manpower aspects are relevant
b. Only management / financial aspects are relevant
c. Both a. and b. are relevant
d. Other (please write) ______________

**(6) Which is the most important criterion to choose innovative agricultural techniques?**

a. A technology is identified by academic research and judged good by researchers
b. A technology suits the organization of their company/enterprise (according to availability of labor; availability of technical resources, etc.)
c. A technology increases profitability
d. A technology has a positive impact on the natural environment
e. Other (please write) __________

**(7) What is most important when adopting a new technique?**

a. The institutions favor and support the new technique/technology
b. The technicians favor and support the new technique/technology
c. Exchange of ideas with other farmers brings increased confidence in a new technique/technology
d. The potential financial risk of a trying new technique/technology is minimized in some way
e. The assurance that a new technique/technology has been validated successfully out of the "laboratory"
f. Other (please write) _______________

**(8) When a new technique has been adopted, what is the most important criterion to judge and implement it on a larger scale?**

a. Economic advantages
b. I Improvements to the natural environment
c. Improvement to working conditions for employees
d. Simplified management or organization of a company or enterprise
e. Other (please write) ______________

**(9) Who should assess the benefits of a technique?**

a. Only the researcher who proposed it/supported it
b. Only those who have used the technique/technology
c. Both a. and b.
d. An independent assessor
e. Other (please write) _______________

**(10) What is the most significant barrier to the dissemination of information about successful techniques?**

a. Lack of confidence in the practical application of suggestions based on theoretical research
b. Lack of trust between farmers about recommendations from one another
c. Absence of young people (due to outmigration from the area) who might otherwise take over a farm or enterprise for the future
d. Other (please write) ______________

**(11) Often the absence of young people with practical or management qualifications on a farm is reported as a barrier to the introduction of innovations. How do you judge this statement?**

a. True
b. Partially true
c. Completely false
d. Other ____________

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