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Shedding Light into the Need of Knowledge Sharing in H2020 Thematic Networks for the Agriculture and Forestry Innovation

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Abstract: Providing ready-for-practice materials in an easily accessible and user-friendly way is one of the challenges of Horizon 2020 Thematic Networks (TNs) to promote agriculture and forestry innovation. Those materials are the result of the co-creation and knowledge exchange among TN actors. Using a survey, we investigated the most efficient communication and dissemination (C&D) channels, types and formats of TN-produced data, as well as the involvement of TN actors. Additionally, we propose to collect TN outputs in a single digital platform, such that they are more Findable, Accessible, Interoperable, and Reusable (FAIR), ensuring the TN's impact. An open and interactive platform may allow us to overcome challenging issues such as language barriers, limited Internet access and differing cultural backgrounds. The results obtained from the survey suggest which content should be stored in such a digital knowledge reservoir for agriculture and forestry. For example, newsletters and visual materials are often preferred by farmers and foresters. Additionally, face-to-face interaction is confirmed to be the most preferred way of retrieving information, especially by researchers and farmers/foresters. Future work will further investigate the variations in needs of different user profiles. As such, the proposed platform can stimulate knowledge exchange among all TN actors.

Keywords: agriculture and forestry sustainability; sustainable digitalization; rural development; agricultural policy; EIP-AGRI; EURAKNOS; AKIS



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1. Introduction

Agriculture and forestry are facing great challenges such as reducing greenhouse gas emissions, decarbonizing the economy and reducing the use of pesticides in agricultural practices. As such, there is an increasing need for making agriculture and forestry more sustainable, without forgetting the needs of the rural sector [1]. Successfully addressing these challenges will only be possible if the way knowledge is produced, shared and used is improved and adapted [2].

The European Commission has been working to lay solid foundations for improving the dialogue and collaboration between farmers/foresters, advisors, researchers and other relevant actors in agriculture and forestry innovation and rural development [3]. This was initiated through the launch of the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) in 2012 and strengthened through the Common Agricultural Policy (CAP) strategic plans post 2020. Specifically, the European agricultural fund for rural development (EAFRD) supports the CAP contribution to the rural development of the EU. This is stated in Articles 6, 15 and 114 of the Regulation (EU) 2021/2115 [4].

The dynamic connectivity and exchange systems in which all actors operate at a local, regional or national level are represented by the Agricultural Knowledge and Innovation

Systems (AKIS) [5]. Every year, the European Union (EU) funds many projects for enhancing innovation in agriculture and forestry through Horizon programs, embracing the AKIS principle. These projects have the common goal of co-creating and/or co-sharing innovative solutions for sustainable farming and forestry.

To this purpose, Horizon 2020 Thematic Networks (TNs), following the interactive model, give the possibility to agricultural and forestry actors to collaborate, share their ideas, and turn existing knowledge and research results into innovative solutions. In this way, the disclosed knowledge can be more easily be put into practice [6]. This approach is also known as the multi-actor approach (MAA) and represents the actor's joint forces in project activities, from beginning to end. This ongoing exchange creates a collective intelligence aimed at improving innovation within the group, developing a sense of belonging and mutual commitment [7–9].

TNs translate their results into easily understandable user materials such as short, informative recommendations and solutions (practice abstracts), leaflets, guidelines and audio-visual material (e.g., photos, videos, podcasts, infographics) [10]. To spread TN results as far as possible and to ensure that the 'gained knowledge or exploitable foreground can benefit the whole society', a thorough communication and dissemination (C&D) plan must be structured since the beginning of the project. As such, the involved actors are addressed most efficiently [11,12].

According to the European Commission and the Horizon Europe Programme, communication 'is a strategically planned process that aims at promoting project action and its results. It requires strategic and targeted measures for communicating about (i) the action and (ii) its results to a multitude of audiences, including the media and the public, and possibly engaging in a two-way exchange'. While dissemination is 'the public disclosure of the real results by any appropriate means to be used, including by scientific publications in any medium' [13,14].

Having an efficient C&D strategy also allows a TN to achieve a high impact, which is defined as the societal, economic and environmental effect that EU projects have on society [15]. However, it often happens that the produced materials are not easily findable and accessible, hence actors that can benefit from TN results are not aware of their existence [16–18].

Another aspect that can help TNs to gain visibility, ensuring that their outcomes are effectively put into practice, is the use of digital platforms. As stated by Burssens et al. (2020): 'The future of innovation in European agriculture and forestry is based on the improved (digital) exchange of best practices between farmers, researchers and advisors from different sectors and Member States' [19]. Moreover, a digital platform can also represent a virtual space for actors including farmers/foresters, educators and advisors to find and access relevant networks of actors. In this way, it may be possible to interact, exchange their expertise share opportunities and solutions to the agricultural or forestry challenges they aim to address [20].

The H2020 EURAKNOS project explored the feasibility of setting up a European agricultural and forestry knowledge and innovation open-source platform that collects outputs and materials produced by TNs. In other words, the agricultural and forestry innovation community in Europe can benefit from centralized digital knowledge [21]. Collecting ready-for-practice materials in an easily accessible and user-friendly way would provide a single point of access for actors to discover information. This allows TN outputs to be more visible, findable and reusable. The ultimate goal is to stimulate interest in the implementation and exchange of knowledge and innovative practices in farming and forestry at the European level. The European Commission invites and encourages the Member States to make use of such platforms and digitalization in agriculture. This is necessary to achieve the objectives set by the CAP where digitalization is described in Article 5 (general objectives), Article 6 (specific objectives), Article 13 (chapter on knowledge systems in agriculture) and Article 102 (chapter on agricultural modernization) [22].

Similar agricultural platforms are already present at the international and national level (e.g., Oppla, Ask-Valerie, Organic Farm Knowledge, Family Farming Knowledge Platform (FAO), EIP-AGRI, Groen Kennisnet, Ecoagtube). Based on the study made in the EURAKNOS project, those platforms are heterogeneous as they differ, for example in the format of the available content, search functionalities and target user groups (e.g., some platforms target practitioners, others governmental bodies and policymakers). Despite there being a consistent number of agriculture and or forestry-related platforms, the content that they provide does not meet the needs of users that are mostly involved in TNs [23]. To be successful, such a platform needs to take into account the knowledge demand from TN actors. This means that the typology of data that will be stored in such a platform needs to be well defined from the main categories of actors involved in TNs. The key factors for the adoption and use of a platform are in fact related to the content and its quality. The content should be relevant to users (for example it is widely reported in the literature that videos are an efficient tool to communicate with farmers [24–26]), quality control, as well as content validation, need to be ensured.

To strengthen the insights of the study made in the EURAKNOS project, this work analyzes the results of a survey mainly conducted with farmers/foresters, advisors and researchers (the three main targeted categories in the EURAKNOS project). The aim was to retrieve in-depth information into the most efficient C&D channels, types and formats of TN-produced data. Furthermore, this survey provides an overview of which part of the project activity (conceptualization, implementation and post-execution) actors would like to be involved in.

In recent years, many studies regarding the importance of tools such as videos for C&D purposes were made [17,27–29]. However, in the recent literature, there are no other references whether other materials that TN produce for C&D purposes are effectively used and consulted by TN users. Similarly, regarding the MAA, a recent study from Feo et al. (2022) highlighted that there is a lack of actors' involvement during the different stages of a TN [9]. Still, there are no indications regarding which part of the project activity actors would like to be involved. This might represent a starting point where future TNs can strategically plan actors' involvement by knowing which are the right channels for an efficient C&D and MAA based on actors' preferences.

2. Materials and Methods

This survey was performed on the conceptual work of the EURAKNOS project. Due to the COVID-19 pandemic, the survey was performed online using the tool SurveyMonkey. It was launched in July 2020 and closed in December 2020. The survey was designed with the input of specialists in sociocultural studies, agronomists, researchers and advisors. EURAKNOS partners were asked to spread the survey among their networks and connections. Furthermore, it was promoted during 17 cross-exchange visits, in 2 project newsletters and the social media of the project (Facebook, LinkedIn, Twitter). Participation in the study was voluntary and completing the survey took approximately 10 min. People involved in this survey were primarily farmers/foresters, researchers and advisors. The survey was translated into five languages: Spanish, English, German, French and Estonian.

The survey is composed of 14 questions divided into 3 sections (Table 1): socio-demographic information (gender, age, nationality, occupation), C&D and MAA.

Table 1. Questions to evaluate end-users' needs for communication, dissemination and project involvement in TNs.

Questions	
1.	Socio-demographic information
	To what group do you belong?
	What nationality are you?
	To which age category do you belong?
	What gender are you?
2.	Communication and dissemination (multiple choice)
	There is new information relevant for your practice available, how would you like to be informed about this?
	Where do you search for the information you need in your practice as a farmer/forester/advisor/teacher . . . ?
	What is the reason for searching for information needed for your practice?
	In what language do you most often search for your information?
	In what language would you prefer to search for your information?
	Which of the following digital formats of information do you mostly find when you search online?
	Which of the following formats of information do you prefer to find when you search online?
	What kind of content would you prefer to find when you search online for information?
	Would you like the possibility of being provided information based on your profile and history of interactions?
3.	Multi-actor approach (multiple choice)
	If you have the opportunity to be involved in a project, in what part of the project would you like to participate?

First, the socio-demographic information according to the first section of questions was analysed. Second, we analysed the answers regarding C&D, as well as the MAA. That is, the votes to each answer in bar charts were plotted. Additionally, we visualized the three main categories of actors in these charts (farmers/foresters, advisors and researchers), as well as a general group 'Others' for all other actor groups. In this way, it was possible to see and compare actors' knowledge that needs to be included in the digital platform and how future TNs can target their C&D and implement the MAA. The number of students, educators and policymakers reached was not high enough to draw conclusions about them.

Furthermore, we checked whether the actor category and other socio-demographic information (age and gender) of the participants have a noticeable influence on the votes. In other words, we checked if some groups were more likely to vote on a specific answer compared to the other groups. This was done using Kendall's Tau-b rank correlation coefficient. Kendall's correlation coefficient is a value between -1 and $+1$, where -1 indicates a perfect negative correlation, $+1$ is a perfect positive correlation and 0 is no correlation whatsoever [30]. Additionally, the strength of the correlation can be considered rather weak when the absolute value is between 0.10 to 0.19 , moderate when it is between 0.20 to 0.29 and strong if it is above 0.30 [30]. Moreover, the corresponding p -value was calculated, and we only considered correlations with a corresponding p -value of 0.05 or less to be statistically significant.

Regarding the nationality of the respondents, Europe was grouped into four categories: Western Europe (Belgium, The Netherlands, France, Germany, Switzerland, the UK), Eastern Europe (Romania, Hungary, Croatia, Poland), Southern Europe (Italy, Spain, Greece, Portugal) and Northern Europe (Denmark, Sweden, Estonia). The influence of the nationality on each individual answer was not inspected because the survey's participants were not well balanced among all EU countries; hence this may represent a limitation to this study.

The results presented in this analysis can, therefore, be taken as a starting point to build future research on targeting users' needs and interests in TN outputs and works, so they can also be included in the online platform.

3. Results and Discussion

3.1. Socio-Demographic

A total number of 194 people took part in the survey. More specifically, 71 researchers, 66 farmers/foresters, 50 advisors, 14 teachers, 13 students, 9 policymakers, 9 industry and 13 actors belonging to 'Other' categories (Table 2). When specified, participants belonging to the 'Other' category were representatives of NGOs and media. Most participants belonged to the three main categories of actors (farmers/foresters, advisors and researchers), and only a few participants belong to the other actors' categories. Therefore, we further group all other actors in the group 'Others'. The majority of participants were people between their 20s and 50s (63.4%). Most participants were male (55.7%), in contrast to 39.7% being female (4.6% did not reply to this question).

Table 2. Socio-demographic background of the interviewees ($n = 194$).

Category	Variables	<i>n</i>	%
Gender	Female	108	39.7
	Male	77	55.7
	Unknown	9	4.6
Age	<20	0	0
	20–30	48	24.7
	30–40	48	24.7
	40–50	43	22.2
	50–60	35	18
	60–70	18	9.3
	>70	1	0.5
Category	Unknown	1	0.5
	Farmer/Forester	66	34
	Advisor	50	25.8
	Researcher	71	36.6
	Industry	9	4.6
	Student	13	6.7
	Teacher	14	7.2
	Policymaker	9	4.6
Other	13	6.7	
European region	West Europe	106	54.6
	East Europe	9	4.6
	North Europe	34	17.5
	South Europe	43	22.2
	Outside Europe	2	1

Regarding the size of the sample, reaching a wider audience was challenging. Due to the COVID-19 pandemic, at that time several projects were switching their activities from physical meetings to online activities. Hence, surveys became a popular tool to reach different actors. Additionally, for many people, that period was characterized by an overload of online work, leaving people with less time to spend on filling in surveys. This may have demotivated many actors to fill in this survey. Additionally, because of this, advisors may not have had time to further incentivized farmers (both those familiar and unfamiliar with online tools) to fill in this survey.

Regarding the EU region, the majority of participants belonged to countries in Western Europe (54.6%). Despite the effort to target actors located in Eastern Europe, their participation results are lower compared to the rest (only 4.6%). This can be explained due to the fact that EURAKNOS members involved in spreading the survey mostly belonged

to countries in Western Europe. Through their network, the survey was spread outside their region, however, the lack of contacts in Eastern Europe did not allow to target further that area. This might represent a starting point for future investigation. The difficulty of targeting participants in Eastern Europe reflects the issue that many TNs experienced. As stated by Feo et al. (2021), and supported in the study of Fieldsend et al. (2020), the lack of involvement of actors from Eastern European Countries represents one of the challenges that current and future TNs need to face due to the difficulties of having Eastern actors in TN consortia [9].

Not only actors from Eastern Europe but also different types of actors such as students and educators need to be more involved in TNs' activity (Feo et al., 2021). The difficulty of engaging them was reflected in the survey. When targeting education, EURAKNOS partners provided a list of universities, vocational schools, advisor-training programs and university student associations. However, those lists were used with less success and the estimated number of participants was not reached. This may be related to the fact that educators and students were not the main categories that EURAKNOS aimed to reach. Even though some of the EURAKNOS partners involved in the spreading of the survey were affiliated with universities, it is not automatic that students can easily be reached. The same can be said for people belonging to the industry sector and policymakers.

Additionally, more research is needed in the investigation of different user profiles based on their level of education, small and big-scale farms and agricultural/forestry specific areas. This has the potential to tailor not only TN activities (e.g., discussion and focus groups), but also research and extension organizations, to differentiate and tackle specific interests from different kinds of actors. Educators may need to take those differences into account to ensure comprehensive and focused programming to stimulate innovation [31,32].

3.2. How Would You Like to Be Informed about New Available Information?

When participants were asked how they would like to be informed about new information relevant to their practice, they had the possibility to choose between the most used channels that TNs have at their disposal. Overall, from Figure 1 it is possible to see that discussion with peers and colleagues is the most preferred F2F channel with 46% of answers. Newsletters and technical magazines received the highest preference with 64% and 56% of answers, respectively. This shows the importance of the link between the traditional press and face-to-face meetings. Independently to the age and gender of participants, social media received a very low overall interest, for example only 10% of the participants would like to be informed via Twitter and LinkedIn. Facebook received the highest preferences among the other social media platforms (35%).

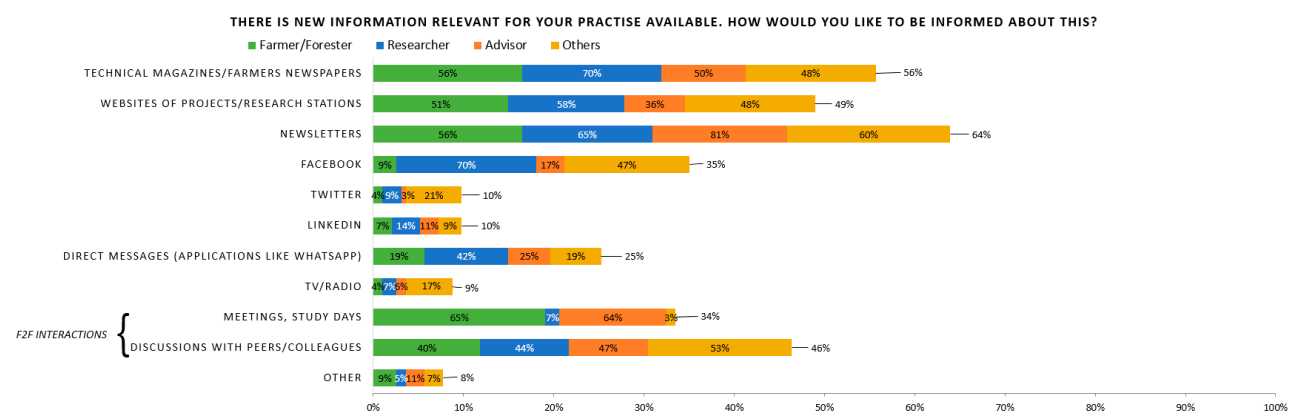


Figure 1. How participants would like to be informed about new available information.

There are few noticeable differences between the three main actor groups. Advisors are generally more interested in newsletters than other actors (Kendall's rank correlation

coefficient is 0.17, i.e., a rather weak correlation, with a p -value of 0.022). Moreover, researchers are more interested than other actors in technical magazines (the correlation coefficient is 0.15, i.e., a rather weak correlation, with a p -value of 0.035). It is clear that LinkedIn is less preferred by farmers/foresters (moderate correlation of -0.20 with a p -value of 0.006), while more preferred by researchers (strong correlation of 0.31 with a p -value of 0.00002). Researchers are also less interested in direct messages (rather weak correlation of -0.14 with a p -value of 0.048).

When comparing differences in votes between the ages, it was observed that a vote for LinkedIn is negatively correlated to the age (moderate correlation of -0.28 with a p -value of 0.00001). Additionally, Facebook is most popular for the category 30–40 years old (rather weak correlation of 0.15 with a p -value of 0.038). When comparing the gender, female participants prefer meetings and study days (rather weak correlation of 0.14 with a p -value of 0.05) more than male participants. In contrast, male participants generally prefer Twitter (moderate correlation of 0.21 with a p -value of 0.0037) and LinkedIn (rather weak correlation of 0.17 with a p -value of 0.019) more than female participants.

The results presented in Figure 1 show the lack of interest in social media as a tool to find relevant information. As reported in the study of Warde 2017, social media is a strong vector to stimulate access to project outcomes [33]. This was also confirmed by Sharma and Kaushik (2019) who highlighted the efficiency of social media for virtual interaction with farmers and advisors in Ireland [34]. However, they often show a short message (a teaser) and do not provide enough technical details. This might have led participants to not consider them as the most optimal channel among all the other options. In any case, several studies confirmed channels such as Twitter appeal to time-constrained farmers. Its use with other forms of face-to-face interaction as part of a blended learning approach is recommended [35].

In contrast to social media, Figure 1 shows that more attention was devoted to technical magazines, newsletters and project websites. In fact, through those channels, actors immediately have access to a larger amount of information. However, TN newsletters are used more as a communication tool rather than a dissemination one [16]. The fact that they are preferred to social media might be because to sign up for a TN newsletter only requires an email account, i.e., there is no need to create a profile on a social platform. This is influenced by the social-cultural background of actors and their age [31]. Our results confirm that age and gender influence the preference of social media. Even if the TN website is useful and appreciated by participants, based on the study conducted in the EURAKNOS project, it seems that dissemination materials with technical content and best practices are not always easily accessible on those websites. A lot of materials are produced, but users may struggle to identify which information and materials are specifically dedicated to them.

Figure 1 confirms once again the unquestionable importance of face-to-face meetings [36]. The fourth report of the SCAR (Standing Committee on Agricultural Research) Strategic Working Group (SWG) AKIS also confirms that ‘on-field events, meetings and peers discussions are valued very much for their strong outreach while at the same time providing a means for further connections between diverse actors’ [21]. The advantage of organizing events is that they serve multiple purposes as the possibility to use local languages and networking. This may encourage actors to discuss and further develop ideas, retrieving relevant information for their practice. TNs are already promoting such events since farmers tend to prefer information and advice discussed and delivered in face-to-face meetings and discussions, preferably by trusted sources such as peers or known advisors. Not only for finding new information but also for learning from peers, those events can have mutual benefits. TNs often organize events (e.g., on-farm demonstrations, workshops) to show and discuss their outcomes. Those events are the perfect opportunity in which actors can provide their knowledge to a TN that will collect, elaborate and harvest the tacit knowledge that is disclosed during F2F interaction.

The benefits of physical meetings cannot be completely replaced by technology. However, digital tools and platforms, if successful, can enhance networking. Mills et al. (2019) suggested how Twitter hashtags are creating the possibility for interaction, developing virtual networks of practice concerning sustainable soil management [35]. In general, the core aim of such digital platforms is to bring actors together from different European areas to exchange and discuss specific topics, solutions and best practices. In a sense, this can be seen as a ‘digital face-to-face interaction’. Platforms can be seen as an enabling environment for knowledge exchange where key intermediary actors such as advisors and educators can help those who need to increase their skills [37]. Nevertheless, for the digital platform to be successful, actors will need to find the content on the platform relevant and useful for their daily work.

3.3. What Kind of Content and Format Would You Prefer to Find When You Search for Your Information?

Figure 2 shows which type of content the participants prefer to find while searching for information. The most popular categories were presentation of best practices (71%), guidelines/tutorials/guides (62%), factsheets/practice abstracts/infographics (64%) and research articles (61%). Educational material and policy briefs are the least popular types of content.

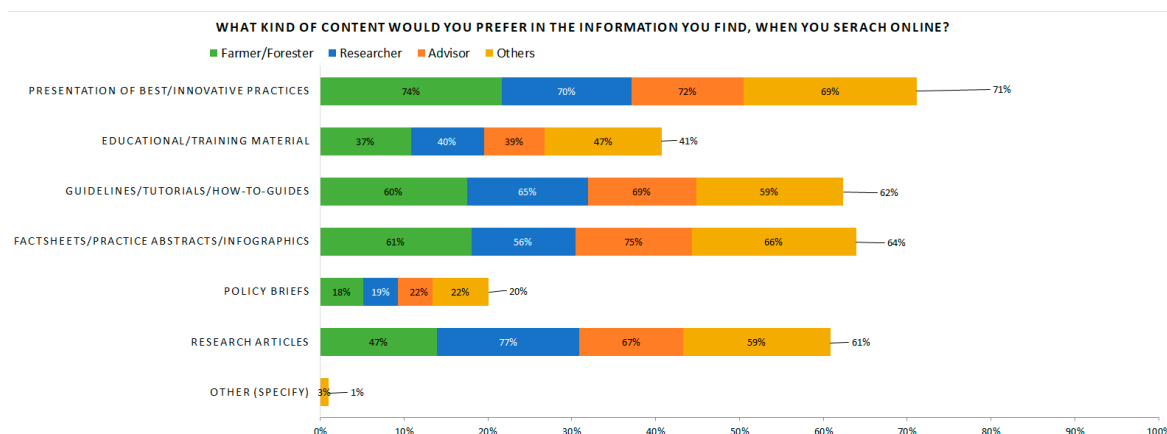


Figure 2. Participants’ responses regarding the preferred typology of content while searching for information.

Farmers and foresters are less interested in research articles, whereas researchers are more interested in them (rather weak correlation of 0.17 with a p -value of 0.016). Moreover, educational training material is more popular in the age group of 20–30 years old (rather weak correlation of 0.18 with a p -value of 0.012), factsheets/practice abstracts/infographics are more popular in the age group of 40–50 years old (rather weak correlation of 0.17 with a p -value of 0.019) and policy briefs are more popular in the age group of 50–60 years old (rather weak correlation of 0.17 with a p -value of 0.021), relative to other age groups. No significant differences in preferences were found according to the gender of the participants. Figure 3 shows which type of format in which participants prefer to find information. Text was clearly most preferred, with 87% of votes. Moreover, presentations, videos and images were also commonly preferred. In contrast, datasets, software and audio received the lowest levels of interest.

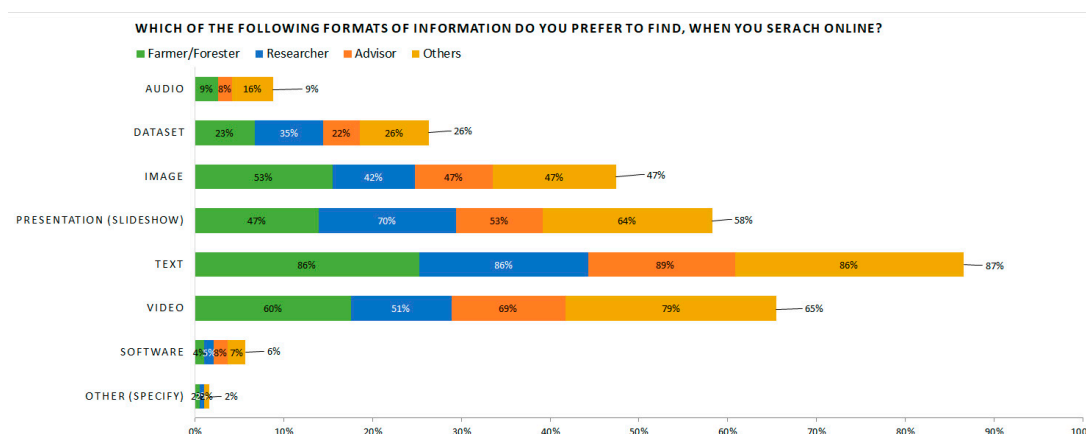


Figure 3. Participants’ responses regarding the format in which information are preferred to be found.

Farmers and foresters like presentations and slideshows less than other actor categories (rather weak correlation of -0.14 with a p -value of 0.048). Moreover, researchers like audio and video less than the other actor categories (rather weak correlations of -0.17 and -0.16 with p -values of 0.022 and 0.026, respectively).

The majority of digital outputs provided by TNs relates to text-based and presentation-based formats (e.g., factsheets, practice abstracts, research/technical articles, press releases, handbooks, guides/tutorials and reports) [16]. Hence, the fact that text is confirmed to be the most preferred format by survey participants should drive TNs to produce more materials based on practical expertise, providing technical knowledge to be applied and adapted to different contexts and needs. This can motivate farmers and other interested users to apply and further innovate to tackle technological, economic and ecological problems and embed them in everyday farming practice. For example, farmers/foresters might prefer to find practical solutions to be applied in the field, while advisors might prefer to find the recent policy and sector-related developments and localized solutions for specific business and technical problems. More research will be needed in the investigation of these aspects, as the preferences of those categories of actors can change based, for example, on their age or level of education.

Based on the outputs of the EURAKNOS project, video-based materials are available at a lower rate [17]. However, they are becoming more frequently used as part of project C&D activities of TNs. They play an increasingly important role in the agricultural and forestry sector as they are an excellent way to show the direct experiences of practitioners [38]. Nevertheless, despite the large number of videos that have been produced by TNs, only a few of them have reached a high number of views. Hence, most have not reached a wide public, decreasing the actual impact of the TNs’ outputs. The study of Feo et al. (2021) suggests that future TNs prioritize practical content and farmers as a speaker, translating the video in more than one language. Additionally, the study stresses the importance of integrating those kinds of materials in a user-friendly digital knowledge platform linked to demonstration activities and peer-to-peer exchange to improve the sharing of knowledge. This will enhance impact in agricultural and forestry innovation in the longer term.

The use of audio-based material (e.g., podcasts) is becoming more popular as a tool for dissemination in TNs. However, studies regarding the use of podcasts for knowledge exchange are limited. In their study, Rose, Boon and Schillings (2021) identified potential disadvantages (e.g., loss of visual information associated with a lack of active demonstration) of podcasts compared to videos [39,40]. Hence, a more in-depth study of whether those materials are effectively useful for TNs knowledge exchange is needed to consider their efficiency if integrated as material in the digital platform.

As a general statement, it is important to keep into consideration that even when those relevant TN outcomes are successfully stored in a digital platform, it remains vital to continue providing ‘traditional extension’ with F2F meetings [41]. The use of digital tools,

such as a platform, can facilitate and improve the quality of the co-creation process and is the most likely way to encourage farmers to translate TN knowledge into action. However, the way the content is structured and presented in the platform will be a significant user-friendliness-related asset (e.g., support during the navigation, possibility to give feedback).

If successfully developed, the knowledge platform might also overcome one of the most challenging issues that TNs have to face: the language barrier. Although such a platform has undoubted benefits, several challenges and potential obstacles should be taken into account. For example, Internet access, rigid cultural backgrounds that might cause resistance to accepting the changes and lack of technical skills are some of them. Thus, this highlights the importance of working in a multi-actor environment where potential gaps can be compensated. Finally, it is important to remember that there are differences among users. This means that not all farmers/foresters, advisors, researchers and other actors have the same needs and skills (this, for example, depends on the socio-economic background, access to infrastructure). The EUREKA project is working on tracing those differences, taking into account that dimensions and challenges that users face across the EU represents a ‘snapshot’ of information and may not necessarily reflect the more complex environment that continuously changes around them [42].

3.4. What Language Would You Prefer to Search for Your Information?

Figure 4 shows what language the participants prefer when looking for information. English was confirmed to be the most preferred one with 62% of preferences. French, German and Spanish had low percentages of interest. Participants coming from those corresponding countries likely voted for them as their mother tongue language. Similarly, it does not come as a surprise that the category ‘Other’ collected 51% of the replies. Participants typically completed the category ‘Other’ specifying they would prefer to search for information in their mother tongue as a preferred option (e.g., Swedish, Finnish, Danish, Estonian, Croatian, Romanian, Italian, Polish and Portuguese).

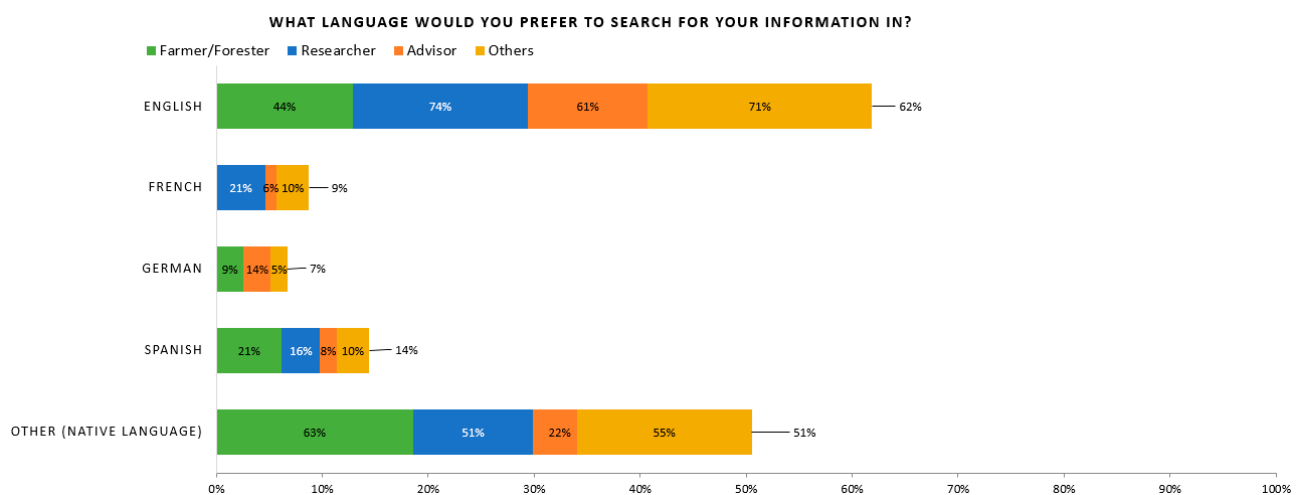


Figure 4. Participants’ responses on the preferred language when looking for information.

Farmers generally answered English less often than other actor categories (moderate correlation of -0.23 with a p -value of 0.0009). This result clearly indicates the language barrier. Age is also negatively correlated with the preference for the English language (moderate correlation of -0.24 with a p -value of 0.000272).

The language issue represents one major challenge for TNs for communication and especially dissemination of their results. Even if the TNs made their best to be as accurate as possible in making their outcomes, user languages (i.e., the languages that the farmers, advisors, policymakers and consumers understand) remain an important barrier to properly reaching the expected targets [10]. Once the audience, message and the right strategy of

engagement are identified, TN outputs should be translated in the language of actors that were involved in the TN's activities (both directly and indirectly). This enables cross-cultural communication in different countries [43,44]. In the case of both video and text-produced materials, one should be careful with automatic translators. Many TNs used those tools to save time and budget, but the result is not always optimal. It would be advisable to translate material with the help of a native speaker present in the TN consortium. This native speaker should avoid the use of complicated terminology and should assure a smooth and easy-to-understand language. Once again, the MAA comes into the picture when sharing relevant information with farmers/foresters that are more familiar with their local language or dialects. For example, other farmers/foresters or advisors can translate the needed knowledge for their practice whenever it is necessary.

3.5. If You Have the Opportunity to Be Involved in a Project, in What Part of the Project Would You Like to Participate?

Figure 5 shows in which part of the project the participants would like to be involved (if given the opportunity). Most participants (71%) answered that they prefer to be involved in project workshops and meetings. A total of 52% prefer to be involved in the conceptualization phase of the project by bringing their own experiences. To a lesser extent, participants want to be involved in dissemination activities (35%) or the exploitation of project results (29%).

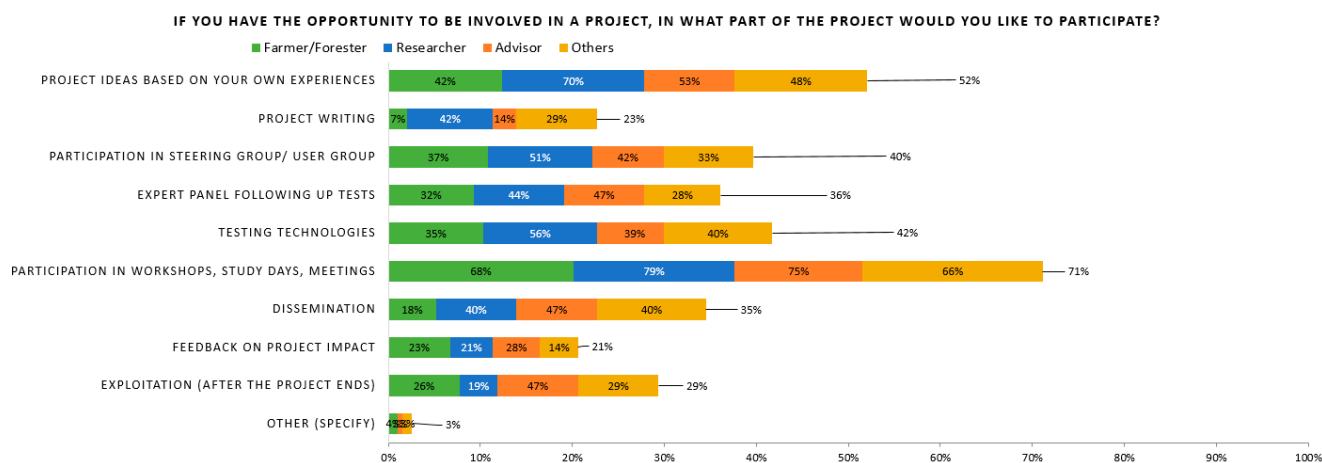


Figure 5. Participants' responses regarding their desired involvement in TNs.

In comparison with other actor categories, farmers generally do not want to be involved in project writing (moderate correlation of -0.24 with a p -value of 0.0008), nor dissemination (moderate correlation of -0.23 with a p -value of 0.001). Advisors are generally more interested than other groups in the exploitation of project results (rather weak correlation of 0.19 with a p -value of 0.009) and feedback on project impact (moderate correlation of 0.24 with a p -value of 0.0008). Lastly, researchers are more interested in project ideas based on their own experiences (rather weak correlation of 0.19 with a p -value of 0.009), project writing (moderate correlation of 0.24 with a p -value of 0.0007) and testing technologies (rather weak correlation of 0.15 with a p -value of 0.035).

There is a negative correlation between the age and the interest to be involved in testing technologies (rather weak correlation of -0.16 with a p -value of 0.0108). Moreover, young people in the group of 20–30 years old are less interested in feedback on project impact (rather weak correlation of -0.14 with a p -value of 0.04) and exploitation (rather weak correlation of -0.16 with a p -value of 0.026) than other age groups. Female participants are more interested to participate in workshops, study days and meetings (moderate correlation of 0.21 with a p -value of 0.003), as well as in the dissemination of project activity results (moderate correlation of 0.21 with a p -value of 0.004).

The involvement and the participation of actors during the different stages of a TN represent a challenge for TNs. As reported by Feo et al. (2022), there is no 'one size fit for all approach' in terms of actors' engagement [9]. Additionally, it explains how in the conceptualization phase of a TN (when the project is written), farmers and foresters are not sufficiently engaged. The answers collected in the survey show that the category of farmers/foresters is willing to share their experiences while the project is conceptualized (project ideas based on your own experience). This confirms the effort that future TNs should make in involving the target users in the co-creation process of the shaping of the project. This will allow incorporating farmers' and foresters' needs into the project's objectives and activities.

Moreover, the outcome of this survey confirms that farmers and foresters are willing to participate in TN events (e.g., workshops, CEVs, on-farm demonstrations, study days and focus groups). However, most of the time, only farmers/foresters belonging to the categories of 'innovators' and 'early adopters' are engaged in TNs, meaning that only a small segment of the active farmer community is reached [9]. These activities allow actors to bring in their valuable practical experience, share tacit knowledge with their peers and other actors, as well as expand the knowledge in a broader geographical range. Several studies confirm as well that farmer-to-farmer interactions are major channels of knowledge sharing and innovation in the AKIS [45,46].

The participation of farmers/foresters may be ensured and stimulated by providing financial compensation for their absence on the field. Working together with advisors and other actors, TNs should make them aware by showing concrete potential benefits if they are active actors, influencing the co-creation process instead of passive users. Their presence in TNs' activities, combined with the presence of other actors such as students, can contribute to the educational process, adding a valuable source of practical experience and ideas for students. TNs should encourage those kinds of exchanges (farmers/foresters–students–educators). In fact, together with farmers and mentored by educators, students can co-develop potential scenarios with farmers and be engaged with them in long-term planning, ensuring the effective use of TN outcomes (e.g., testing technologies, expert panel following up tests).

4. Conclusions

Providing ready-for-practice materials in an easily accessible and user-friendly way is one of the challenges of H2020 TNs to promote agriculture and forestry innovation. Those materials are the result of the co-creation and the knowledge exchange among TN actors, and collecting them in one single point of access (online platform) may allow TN outputs to be more FAIR. The ultimate goal is to stimulate the interest in the implementation and exchange of knowledge and innovative practices in farming and forestry at the European level. The design of such an online platform is inseparable from the MAA and an efficient C&D as they represent the effective interaction and collaboration among actors that allows the creation of such a tool.

Regarding C&D materials and channels, based on the preferences expressed from participants in the survey, future TNs may implement the release of channels or tools such as technical magazines, newsletters and project websites. Those materials should work in parallel with the use of social media, although they are not the most preferred channel to find new knowledge. F2F peer-to-peer interactions are confirmed to be an important way of retrieving information from the majority of participants.

However, one approach does not exclude the other, a good balance of the use of all available tools might increase TN's impact. Regarding the content, the majority of digital outputs provided by TNs relate to the text and presentation-based formats and videos, which were confirmed to be the most preferred by the three main categories of actors.

Regarding the MAA, TNs are already involving actors such as farmers/foresters and advisors in their activities. However, more effort should be spent in involving them while TNs are conceptualized since they are willing to participate in project ideas by contributing

their own experience. As such, this may allow to tackle specific needs and provide a sense of inclusion even before the start of the project.

The results presented in this paper are a valid starting point to understand which content should be stored in a digital online platform that can group and collect all the relevant TN outcomes. At the same time, the platform stimulates the exchange among peers and other categories of actors that are not fully involved in TNs' activities yet. The language barrier was confirmed to be an aspect to not underestimate since farmers/foresters are keeners to search for information in languages different from English. Hence, once the audience, message and the right strategy of engagement are identified, TN outputs should be translated in the language of actors that were most involved in the TN's activities.

Additionally, more research is needed in the investigation of the need for actors that reply to this survey in a non-considerable number (e.g., students, educators, industries and policymakers). Moreover, an investigation on different actors' profiles based on, their age, level of education, small and big scale, agricultural/forestry specific areas should be performed. This has the potential to tailor not only TNs' activities (e.g., discussion and focus groups), but also research and extension organizations, to differentiate and tackle specific interests from older generations and young farmers.

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References

1. Wrzaszcz, W.; Prandecki, K. Agriculture and the European green deal. *Probl. Agric. Econ.* **2020**, *365*, 156–179.
2. Norström, A.V.; Cvitanovic, C.; Löf, M.F.; West, S.; Wyborn, C.; Balvanera, P.; Bednarek, A.T.; Bennett, E.M.; Biggs, R.; De Bremond, A.; et al. Principles for knowledge co-production in sustainability research. *Nat. Sustain.* **2020**, *3*, 182–190. [CrossRef]
3. EIP-AGRI. Horizon 2020 Multi-Actor Projects. 2017. Available online: www.eip-agri.eu (accessed on 9 December 2020).
4. European Parliament; European Council. Regulation (EU) of the European Parliament and of the Council of 2 December 2021—The common agricultural policy. *Off. J. Eur. Union* **2021**. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R2116> (accessed on 25 March 2021).
5. AND; Coffey; Directorate-General for Agriculture and Rural Development (European Commission); Eder; SPEED; SQW; Chever, T.; Fotheringham, J.; Vukovic, M.; Hetherington, A.; et al. *Evaluation Study of the Implementation of the European Innovation Partnership for Agricultural Productivity and Sustainability*; Publications Office of the European Union: Luxembourg, 2016. [CrossRef]
6. Ruoslahti, H. Complexity in project co-creation of knowledge for innovation. *J. Innov. Knowl.* **2020**, *5*, 228–235. [CrossRef]
7. Faure, G.; Knierim, A.; Koutsouris, A.; Ndah, H.T.; Audouin, S.; Zarokosta, E.; Wielinga, E.; Triomphe, B.; Mathe, S.; Temple, L.; et al. How to Strengthen Innovation Support Services in Agriculture with Regard to Multi-Stakeholder Approaches. *J. Innov. Econ. Manag.* **2019**, *28*, 145–169. [CrossRef]
8. Fieldsend, A.F.; Cronin, E.; Varga, E.; Biró, S.; Rogge, E. 'Sharing the space' in the agricultural knowledge and innovation system: Multi-actor innovation partnerships with farmers and foresters in Europe. *J. Agric. Educ. Ext.* **2021**, *27*, 423–442. [CrossRef]
9. Feo, E.; Spanoghe, P.; Berckmoes, E.; Pascal, E.; Mosquera-Losada, R.; Opdebeeck, A.; Burssens, S. The multi-actor approach in thematic networks for agriculture and forestry innovation. *Agric. Food Econ.* **2022**, *10*, 1–24. [CrossRef] [PubMed]
10. EURAKNOS. Deliverable 2.3-WP2. Report on Used Communication and Dissemination Tools, and Information Channels of TNs. 2020. Available online: https://euraknos.fra1.digitaloceanspaces.com/production/deliverables/D2.3_20200531_Report_on_used_C_and_D_tools_and_communication_channels_of_TNs.pdf (accessed on 9 December 2021).

11. Marín-González, E.; Malmusi, D.; Camprubí, L.; Borrell, C. The Role of Dissemination as a Fundamental Part of a Research Project: Lessons Learned from SOPHIE. *Int. J. Health Serv.* **2017**, *47*, 258–276. [CrossRef]
12. Scherer, J.; Weber, S.; Azofra, M.; Ruete, A.; Sweeney, E.; Weiler, N.; Sagias, I.; Haardt, J.; Cravetto, R.; Spichtinger, D.; et al. Making the Most of Your H2020 Project. Boosting the Impact of Your Project through Effective Communication, Dissemination and exploitation. *Eur. IPR Help.* **2018**, 1–36. Available online: <https://op.europa.eu/en/publication-detail/-/publication/3bb7278e-ebf3-11e9-9c4e-01aa75ed71a1> (accessed on 9 December 2021).
13. EC. Annotated Model Grant Agreement. 2015. Available online: https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_v2.0.1_en.pdf (accessed on 9 December 2021).
14. EC. Horizon Europe Programme Guide—EU Grants: HE Programme Guide: V1.5. 2021. Available online: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf (accessed on 12 February 2022).
15. Lee, S.Y.; Díaz-Puente, J.M.; Vidueira, P. Enhancing rural innovation and sustainability through impact assessment: A review of methods and tools. *Sustainability* **2020**, *12*, 6559. [CrossRef]
16. Feo, E.; Bodin, P.; Burssens, S.; Mosquera-Losada, R.; Tourner, L.; Guichaoua, A.; Duschesne, R.; Spanoghe, P. Communication, Dissemination, and the use of social media in H2020 Thematic Networks. In Proceedings of the International Agriculture Symposium, Jahorina Mountain, Bosnia and Herzegovina, 8–11 October 2020; pp. 1–6.
17. Feo, E.; Mareen, H.; Burssens, S.; Spanoghe, P. The Relevance of Videos as a Practical Tool for Communication and Dissemination in Horizon2020 Thematic Networks. *Sustainability* **2021**, *13*, 13116. [CrossRef]
18. EURAKNOS. Explorer’s Guide to Thematic Networks How to Design and Implement Thematic Networks. Ghent, Belgium, 2020. Available online: <https://euraknos.fra1.digitaloceanspaces.com/production/deliverables/Explorers-guide-interactive-EN-FINAL.pdf> (accessed on 12 February 2022).
19. Burssens, S.; Palczynski, L.; Rasmussen, I.; Stock, A. Sustainability of Thematic Networks for Agricultural and Forestry Innovation: Recommendations From The Euraknos Project. 2020. Available online: <https://euraknos.fra1.digitaloceanspaces.com/production/deliverables/EURAKNOS-Policy-Brief.pdf> (accessed on 9 December 2021).
20. Klerkx, L.; Jakku, E.; Labarthe, P. A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. *NJAS-Wageningen. J. Life Sci.* **2019**, *90–91*, 100315. [CrossRef]
21. SCAR AKIS. Preparing for Future AKIS IN EUROPE—4th Report of the Strategic Working Group on Agricultural Knowledge and Innovation Systems. 2019. Available online: https://scar-europe.org/images/AKIS/Documents/report-preparing-for-future-akis-in-europe_en.pdf (accessed on 9 December 2021).
22. EC. Proposal for a regulation of the European Parliament and of the Council establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural. *Off. J. Eur. Union* **2018**, *216*, 143.
23. EURAKNOS. Deliverable 4.1-WP4. Report on the Added Value and Feasibility of Developing a New Standardised e-KRP Based on End-User Needs. 2019. Available online: https://euraknos.fra1.digitaloceanspaces.com/production/deliverables/D4.1_20200512_Report_on_added_value_and_feasibility_of_eKRP.pdf (accessed on 9 December 2021).
24. Bentley, J.W.; Van Mele, P.; Barres, N.F.; Okry, F.; Wanvoeke, J. Smallholders download and share videos from the Internet to learn about sustainable agriculture. *Int. J. Agric. Sustain.* **2019**, *17*, 92–107. [CrossRef]
25. Harwin, K.; Gandhi, R. Digital Green: A Rural Video-Based Social Network for Farmer Training (Innovations Case Narrative: Digital Green). *Innov. Technol. Gov. Glob.* **2014**, *9*, 53–61. [CrossRef]
26. Hardy, C.; Vanev, D.; Alfoldi, T.; Tippin, L. Good Practice Guidelines for Virtual Demonstration; PLAID Project—Peer-to-Peer Learning: Accessing Innovation through Demonstration; Directorate-General for Agriculture and Rural Development, Belgium. 2020. Available online: <https://ec.europa.eu/research/participants/documents/downloadPublic/VVljZjY5TWcvTkDzUHTUVuR1hwZfZoOUdPWUhtZm5IaUIUbU9FZHfZYWRvTjRZbjR1TFJRPT0=/attachment/VFEyQTQ4M3ptUWNGNjjoTEhxN2hnTWZpbGQ1czJBYUc=> (accessed on 9 December 2021).
27. Van Mele, P.; Okry, F.; Wanvoeke, J.; Barres, N.F.; Malone, P.; Rodgers, J.; Rahman, E.; Salahuddin, A. Quality farmer training videos to support South–South learning. *CSI Trans. ICT* **2018**, *6*, 245–255. [CrossRef]
28. Van Campenhout, B.; Spielman, D.J.; Lecoutere, E. Information and Communication Technologies to Provide Agricultural Advice to Smallholder Farmers: Experimental Evidence from Uganda. *Am. J. Agric. Econ.* **2020**, *103*, 317–337. [CrossRef]
29. Sodagar, H.; Rezaee, M.E.; Rezaei, H. Forester Navigation Application (FNA): Mobile Training in Environmental Organizations. *Interdiscip. J. Virtual Learn. Med. Sci.* **2021**, *12*, 73–75.
30. Kendall, M. A New Measure of Rank Correlation. *Biometrika* **1998**, *30*, 81–93. [CrossRef]
31. McKillop, J.; Heanue, K.; Kinsella, J. Are all young farmers the same? An exploratory analysis of on-farm innovation on dairy and drystock farms in the Republic of Ireland. *J. Agric. Educ. Ext.* **2018**, *24*, 137–151. [CrossRef]
32. Jack, C.; Adenuga, A.H.; Ashfield, A.; Wallace, M. Investigating the Drivers of Farmers’ Engagement in a Participatory Extension Programme: The Case of Northern Ireland Business Development Groups. *Sustainability* **2020**, *12*, 4510. [CrossRef]
33. Warde, P. Agricultural Enlightenment: Knowledge, Technology and Nature. *Eur. Hist. Q.* **2017**, *47*, 750–752. [CrossRef]
34. Das V., J.; Sharma, S.; Kaushik, A. Views of Irish Farmers on Smart Farming Technologies: An Observational Study. *AgriEngineering* **2019**, *1*, 164–187.

35. Mills, J.; Reed, M.; Skaalsveen, K.; Ingram, J. The use of Twitter for knowledge exchange on sustainable soil management. *Soil Use Manag.* **2019**, *35*, 195–203. [[CrossRef](#)]
36. Norton, G.W.; Alwang, J. Changes in Agricultural Extension and Implications for Farmer Adoption of New Practices. *Appl. Econ. Perspect. Policy* **2020**, *42*, 8–20. [[CrossRef](#)]
37. EIP-AGRI. EIP-AGRI Seminar: New Skills for Digital Farming—Final Report. In Proceedings of the EIP-AGRI Seminar ‘New Skills for Digital Farming’, Aranjuez, Spain, 5–6 February 2020.
38. Bentley, J.W.; Van Mele, P.; Rashid, H.A.; Krupnik, T.J. Distributing and Showing Farmer Learning Videos in Bangladesh. *J. Agric. Educ. Ext.* **2015**, *22*, 179–197. [[CrossRef](#)]
39. Rose, D.C.; Chivers, C.-A.; de Boon, A.; Schillings, J.; Smith, R.; Lishman, L.; Bliss, K. Videos and Podcasts as Potential Approaches for Knowledge Exchange with Farmers: Testing Their Potential Role in ELM. Project Report. Agriculture. 2021. Available online: <https://eprints.glos.ac.uk/9457/> (accessed on 9 December 2020).
40. Rose, D.C.; Wheeler, R.; Winter, M.; Lobley, M.; Chivers, C.-A. Agriculture 4.0: Making it work for people, production, and the planet. *Land Use Policy* **2020**, *100*, 104933. [[CrossRef](#)]
41. Bliss, K.; Padel, S.; Cullen, B.; Ducottet, C.; Mullender, S.; Rasmussen, I.A.; Moeskops, B. Exchanging knowledge to improve organic arable farming: An evaluation of knowledge exchange tools with farmer groups across Europe. *Org. Agric.* **2018**, *9*, 383–398. [[CrossRef](#)]
42. Small, B.; Stahlmann-Brown, P.; Munguia, O.M.D.O. Values, trust, and management in New Zealand agriculture. *Int. J. Agric. Sustain.* **2015**, *14*, 282–306. [[CrossRef](#)]
43. Bentley, J.; Van Mele, P. Sharing ideas between cultures with videos. *Int. J. Agric. Sustain.* **2011**, *9*, 258–263. [[CrossRef](#)]
44. Fry, P.; Thieme, S. A social learning video method: Identifying and sharing successful transformation knowledge for sustainable soil management in Switzerland. *Soil Use Manag.* **2019**, *35*, 185–194. [[CrossRef](#)]
45. van Mierlo, B.; Arkesteijn, M. Collective analyses of barriers to and opportunities for sustainable development using the Innovation System Framework. In *Towards Sustainable Agriculture and Food Chains in Peri-Urban Areas*; Poppe, K.J., Termeer, C., Slingerland, M., Eds.; Wageningen Academic Publishers: Wageningen, The Netherlands, 2009; p. 139. [[CrossRef](#)]
46. Rose, D.; Sutherland, W.; Parker, C.; Lobley, M.; Winter, M.; Morris, C.; Twining, S.; Ffoulkes, C.; Amano, T.; Dicks, L. Decision support tools for agriculture: Towards effective design and delivery. *Agric. Syst.* **2016**, *149*, 165–174. [[CrossRef](#)]