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Training and Advising FEFTS Material – 1st Update

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Document Summary

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Abstract

The study and promotion of currently available FEFTS is critical for reducing agriculture's reliance on fossil energy. As one of AgroFossilFree's main goals, FEFTS will be collected, screened, and assessed in order to be included in AgroFossilFree's training materials inventories, which will serve to enhance stakeholder knowledge and provide incentives to minimize fossil fuel consumption.

The acquisition of FEFTS training materials was divided into three phases. Phase one defined the specific FEFTS categories. During phase 2, the consortium conducted research with the aim of collecting and cataloging relevant training materials under FEFTS categories. This was followed by an initial screening of the uploaded FEFTS by the task leader. In phase 3 the registered training materials will be reviewed and incorrect, duplicate, and incomplete entries will be removed thereby ensuring data integrity and supporting effective analysis in AgroFossilFree's subsequent phases.

The analysis found that the majority of training materials collected have multiple technical applications and that improvements in as well as renewable energy production have a relatively equal distribution between themselves while soil carbon sequestration is less common. More specifically, regarding renewable energy production, nearly all training materials referred to production systems with the largest categories being solar (photovoltaics) and biomass (biogas/biomethane production). Regarding improvements in energy efficiency, the training materials mostly refer to the category 'efficient tool' while regarding soil carbon sequestration, the training materials are mainly focused on tillage systems.

Overall, the collection and incorporation of FEFTS training materials into the AgroFossilFree repository was successfully completed within the expected timeframe. This achievement will contribute to the effective operation of the AgroFossilFree platform and support the overall transitionaway from fossil fuel dependence in EU agriculture. This report is the updated version of D.2.11. The results presented here are incorporated with the results of the previous version.

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1. Introduction

1.1 Background Information

The instruments needed to address cleaner and more efficient energy production and usage in agriculture are referred to as Fossil-Energy-Free Technologies and Strategies (FEFTS). To categorize FEFTS, the energy user/consumer within farming processes must first be identified, this indicates the agricultural technology application for which the specific FEFTSis used and relates to the energy-related uses of agricultural technology. Then, FEFTS are classified based on whether they provide (i) Clean Energy that replaces fossil energy which is concerned with the sources, types, methods, and storage of energy utilized in agriculture; (ii) an Energy Efficiency Improvement in comparison to conventional technologies/practices which refers to the methods and tools used to improve energy efficiency in farming activities; (iii) Soil Carbon Sequestration, which is concerned with agricultural methods that can reduce the impact of fossil energy and associated GHG emissions by supporting improvements in the amount of carbon stored in soil. This is an auxiliary category as it is mainly a GHG compensation strategy rather than a fossil fuel reduction strategy. Table 1 lists all of the FEFTS categories and subcategories.

Table 1: FEFTS categories and level 1 and level 2 subcategories.

FEFTS category	Level 1 sub-category	Level 2 sub-category
Energy User/Consumer	**Agricultural technology applications**	heating and cooling of buildings
		process heat/cold
		lighting
		agricultural field practices
		vehicles
		tools
		energy sales to external consumers
Clean Energy Supply	**Renewable Energy Sources**	solar
		wind
		hydro
		geothermal
		bioenergy
		free energy
	Energy types	heating
		cooling
		electricity
		mechanical energy
		chemical energy
	Energy Technologies	photovoltaics
		solar thermal
		wind mills
		hydropower
		heat pumps
		geothermal
		solid biomass conversion
		biogas / biomethane production
		liquid biofuels production
	Energy Storages	heat storage
		electricity storage

		cold storage
		intermediate bioenergy carriers
Energy Efficiency Improvement	**Energy savings**	efficient buildings
		efficient vehicles
		efficient tools
		precision agriculture
		precision livestock farming
		conservation agriculture
Carbon sequestration	**Carbon sequestration**	soil organic cover
		tillage (Conservation Agriculture + CTF)
		nutrient management
		crop diversification
		soil and water conservation techniques
		fire management
		grassland management

Practical procedures are addressed in the FEFTS level 2 sub-category (for details, see FEFTS level 3 sub-category from Deliverable 2.1, Table 4 to Table 10).
The primary goal of this deliverable is to present FEFTS training content that the whole consortium together with external stakeholders have registered according to the FEFTS categories listed above, as well as to provide an analysis based on the current collection status. The content presented in this report is updated in order to include the new training material that were added during the second FEFTS collection process.

1.2 Methodology

WIP and other partners followed three phases to register FEFTS training materials in order to construct a user-friendly AgroFossilFree (AFF) database.
All AFF partners conducted desk research (internet search) during Phase 1 (Initial Identification) to locate relevant and applicable FEFTS training materials. The overall goal of this phase was to identify a wide variety of publicly available materials and techniques (complete solutions, hardware, software, methodologies, components, and procedures) that reduce EU agriculture's reliance on fossil fuels. This research was based on the three-level classification (and, in particular, the keywords/terms of level 3) provided in Deliverable 2.1. In terms of targeted sources, all training materials are primarily provided by the FEFTS organization and institute and are beneficial to a variety of stakeholders (individual farmers, producers associations, energy generators, contractors, advisory services, companies, industry and even policy makers).
In phase 2 the consortium gathered and uploaded all relevant FEFTS training materialsthrough an online survey (Google Forms) creating a training material repository. This repository is used for the FEFTS analysis in Chapter 3 of this report. It should be mentioned that during the second FEFTS collection process, the use of the Google forms was discontinued. Instead, users can now submit their FEFTS directly in the AgEnergy Platform.
Finally, the survey results and acquired metadata from earlier phases were scheduled to be reviewed during Phase 3 with the goal of removing incorrect, duplicate, and incomplete entries (Data Aggregation) thereby ensuring data integrity and supporting effective analysis in AFF's subsequent phases. The screening of the second batch of FEFTS will done following the same methodology with the first batch. This is scheduled to start in October.
As stated in all of WP2's deliverables (D2.2, D2.5, D2.8, D2.14), the screening process for the first batch began prior to the platform's launch once the first internal milestone of submitted FEFTS training materials (37 materials) in the inventory had been reached (until the end of September 2021). This ensured that the AgEnergy platform contains high-quality and relevant FEFTS training materials. This screening process builds upon a preliminary step whereby the task leader reviewed all uploaded records, in each FEFTS category, for duplicate, incorrect,

and incomplete entries. "Incomplete entries" are defined as those that lacked a thorough description and information, which renders evaluation difficult. When incomplete entries were located, additional information was requested from partners in order to successfully complete the registration process. In cases that entries were not sufficiently updated these were removed from the inventory entirely.
Certain criteria Acceptance and exclusion criteria were established in order for all Task Leaders to complete the screening process. To accomplish this, Task Leaders held regular meetings (using the Microsoft Teams platform) to discuss the issue and agree on the screening approach for each FEFTS type. During these discussions, it was resolved to form a FEFTS Quality Committee made up of WP2 Task Leaders. This Committee's main responsibility is to screen all FEFTS submitted to the platform. It should be noted that, based on the approach used by each Task, the FEFTS supplied by each Task Leader were already verified for appropriateness before being included in the inventory. As the database is publicly accessible, all interested and relevant parties are allowed to continually submit new information. These submissions will be kept private until they are approved by the FEFTS Committee, this continual screening process ensures that the information publicly available on the platform is accurate, reliable and relevant to AFF's objectives.

2. Survey

A detailed description of the structure of the survey is available in Deliverable 2.1. The survey's form contains four basic groups of questions (see Annex). The first component contains general information about the recognized FEFTS training material, such as the name and category of the FEFTS, as well as basic information about the individual registering the FEFTS, his or her contact email, and affiliated organization. The second section contains more specific details on the FEFTS training resources, such as the title of the material and other information about the organization. The FEFTS specification (such as the most relevant agricultural domains and keywords) and the application field are discussed in the third part. The fourth component, which contains precise information on the type of FEFTS being submitted, is the most important. The three relevant categories, from which users have to choose, for this component are clean energy supply, energy efficiency improvement, and soil carbon sequestration, each with sub-categories. The final component of the form is a review process of the FEFTS training materials where the user must answer several questions on the socioeconomic, environmental, and general status of the relevant FEFTS training materials.
It is important to note that the survey's structure, as well as the FEFTS analysis described in Chapter 3, are both dependent on the framework developed in D2.1. (see Table 3 in D2.1). Furthermore, as previously mentioned, the use of Google Forms for the survey has been discontinued. Instead, partners can now directly submit their FEFTS in the AgEnergy platform. The submission section on the platform follows the same structure with the Google forms survey.

2.1 Data Collection – Partner's Role

By the end of August 2022, a considerable number of new training materials had been registered by the consortium. The consortium worked in a unified manner with all beneficiaries contributing and by August 30th, 2022, 98 training material had been successfully registered on the platform. In total, more than half of the targeted 1700 FEFTS (of any type) to be registered by the end of the project had already been registered to the repository

Table 2. Overview of collection status (second batch)

	Scientific Papers	Commercial Technologies	Training Material	Financing Mechanisms	Research project	Total
Planned	252	233	65	80	50	680
Collected	256	258	63	60	61	698

The entire identification and registration process was supported by an online thread in Microsoft Teams platform which served as a helpdesk for questions about FEFTS training materials registration.

2.2 Acceptance and exclusion criteria

For the case of FEFTS training material, each individual registration had to have clear agricultural application potential, represent innovative energy saving techniques or represent clean energy supply (production or storage) technologies. In general, the most appropriate training materials have strong educational features supporting FEFTS adoption. In terms of the exclusion criteria, entries that did not support reductions in fossil fuel use in agriculture were ruled invalid. Invalid registrations from the first collection period were excluded and are not part of the analysis.

2.3 General information about the collected FEFTS

In this section, general information about the organization of the collected FEFTS training material will be presented. The types of training material are shown in Figure 1, and the languages of them are presented in Figures 2 and 3.

As shown in Figure 1, most of the training material refers to e-learning, accounting for 34 out of 98 entries and manuals with 32 entries. Training materials related to websites account for the third largest number of entries followed by leaflets and brochures. There is one entry for a drawing type FEFT which was added during the second registration period. On the other hand, there are no new entries for serious games. Most new entries were made in the biggest categories while there were 4 to 6 new entries for case studies, presentations, webinars and videos/photographs. It should be mentioned that the category E-learning course is now the category with the majority of the answers whereas during the first batch manuals prevailed. This can be explained due to the major shift on online courses that are more easily accessible after the Covid-19 period.

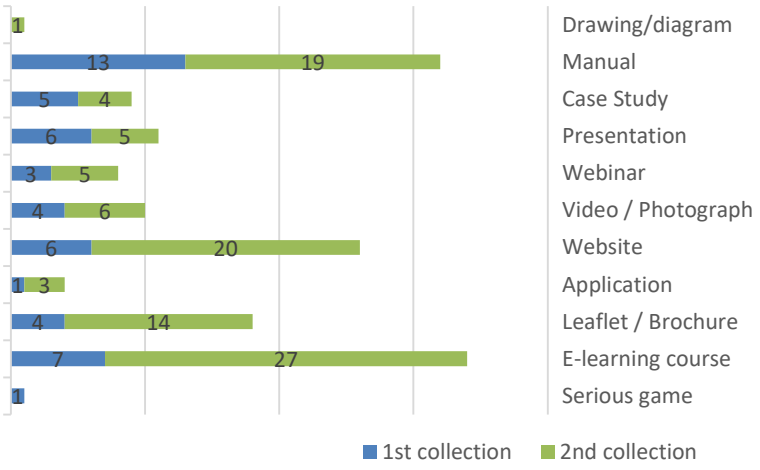

Figure 1: Different types of training material

Regarding the language distribution of the training materials during the first batch, 38% were in English, 28% in German, 13% in Polish, 10% in Greek, 8% Danish and 3% for Castellano during the first registration period (Figure 2). Figure 3 shows the updated language distribution. English and German still account for more than 50 % of the language distribution. Italian and Dutch are new available languages and account for 5% together. Greek accounts for 5% less than during the first collection period, Polish and Danish for 2% less.

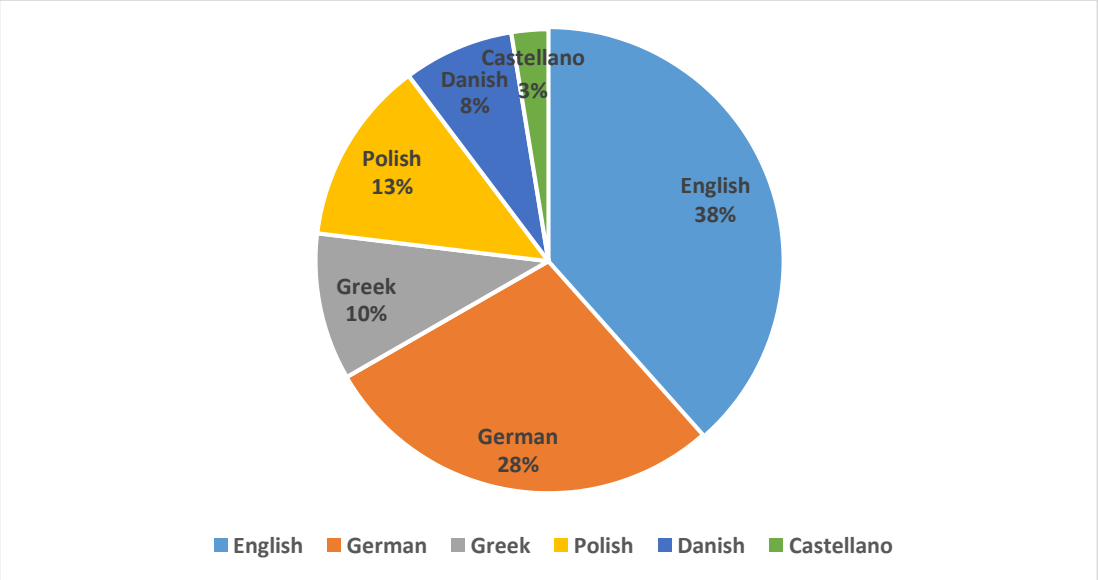

Figure 2. Percentages of different languages of training material for 1st round of collection

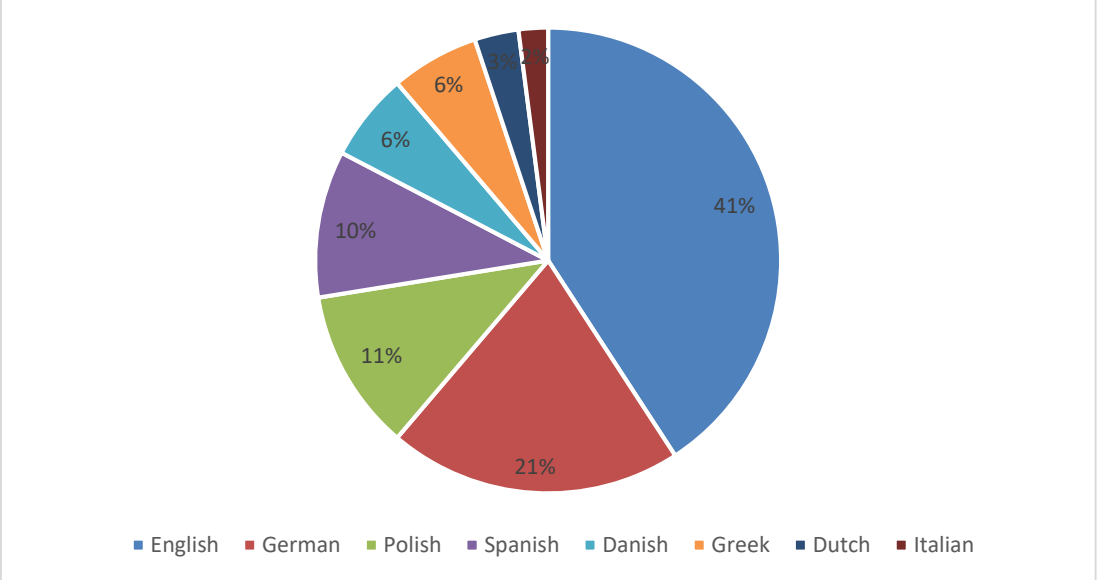

Figure 3. Percentages of different languages of training material for 2nd round of collection

3. FEFTS Analysis

3.1 FEFTS specifications and applied sector

The vast majority of the training materials registered are relevant to multiple user groups. Overall, the most important user group for the collected training materials are farmers with 90 out of 98 training materials directly intended for them (Figure 4). This is followed by advisory services with 65, producer associations with 50, policy makers with 43, companies with 42, energy generators with 28, contractors with 27 and industry with 26 relevant training materials. Other users, such as teaching facilities and agronomists are also included in this analysis. Other user groups account for 19 training materials. Overall, it can be seen that the user groups mainly stayed the same.

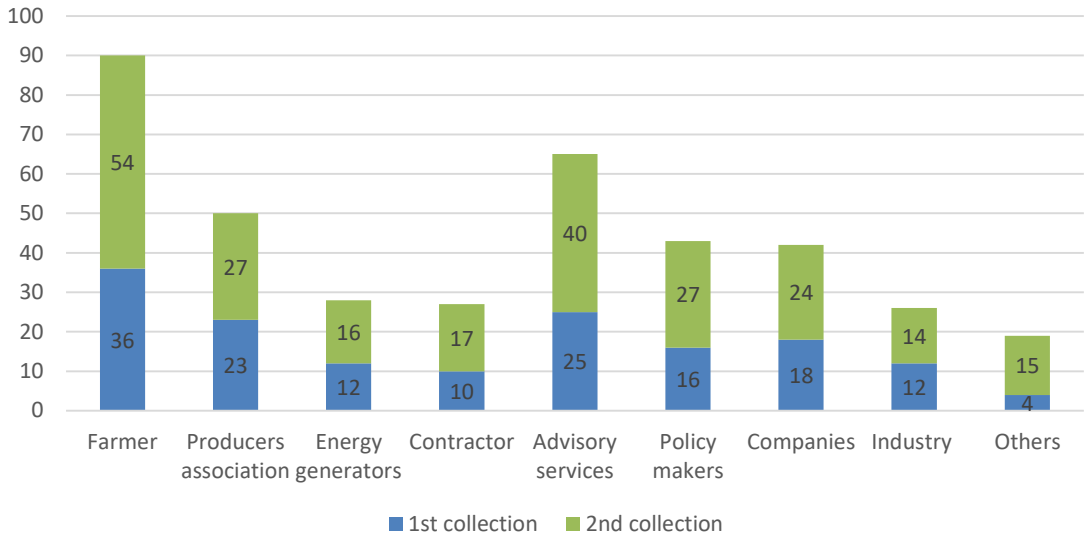

Figure 4. User groups for which the training materials are intended

Figures 1, 3 and 4 illustrate that the collected training materials are mostly aimed at farmers, with the goal of improving and assisting farmers in reducing their reliance on fossil fuels primarily through the distribution of manuals and the provision of online courses. This is particularly important as it is crucial that reductions in fossil fuel dependence are adopted and driven by farmers themselves. The languages of these training materials are mostly in English and German, which are relevant to a large proportion of the EU's population. It is important to note that language should not be a hurdle in the adoption of FEFTS and that the use of online translators and other services can improve accessibility further. It is also significant that producer associations and advisory services are the second largest user groups for these training materials as they are important connectors between industrial FEFTS technologies and therefore deal with and combine information from a plethora of training resources.

Figure 5 demonstrates the registered FEFTS training materials' solution type. This figure illustrates that the largest number of FEFTS training materials referred to methodologies (40), followed by complete solutions (20), software (16), procedure (14) and hardware (5). 32 training materials were labelled as 'other' which refers to handbooks, guidelines, and advice. During the second collection period mainly methodology, other, complete solutions and software FEFTS were added. No major changes occurred in the ranking during the second batch.

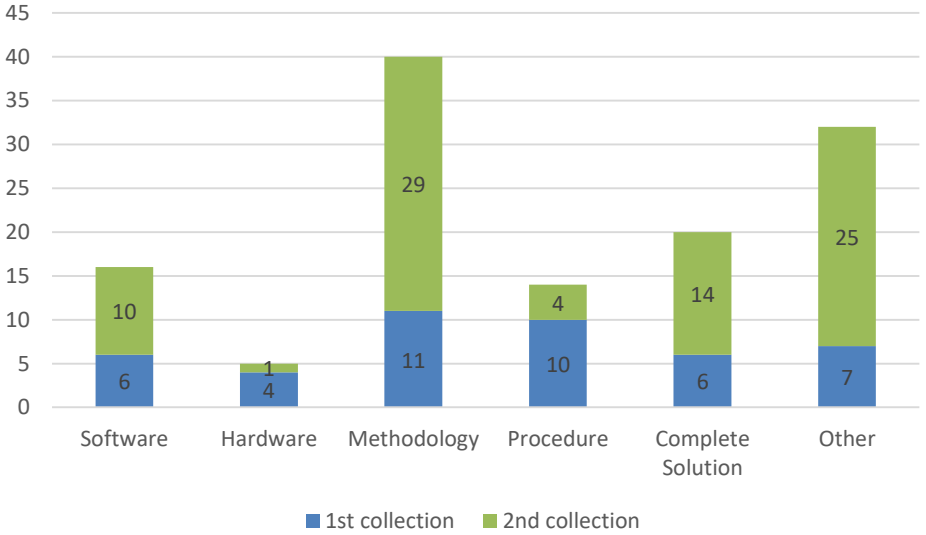

Figure 5. The type of collected FEFTS training material

Regarding the categorization of these training materials according to agricultural domains (open field agriculture, livestock and greenhouse), our analysis indicates that 51 are relevant to open-field agriculture, 66 to livestock, and 67 to greenhouses. This finding is particularly relevant as open-field agriculture is the largest agricultural domain in the EU, followed by the livestock and greenhouse sectors. These training materials are often also applicable to multiple domains simultaneously with 54 out of 98 being relevant to all three domains (Figure 6).

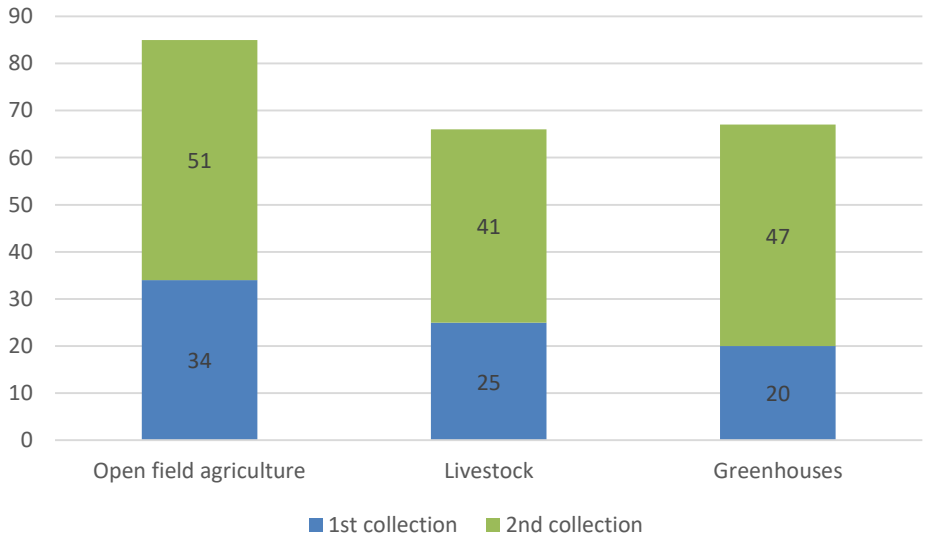

Figure 6. The agricultural domain of the collected FEFTS training materials

3.2 FEFTS application field

In Figure 7 the types of agricultural application of the collected training materials for both collection periods are presented. This figure shows that, during the first collection period, most of the training materials (23) have multiple technology applications, followed by agricultural field practices (9), energy sales to external consumers (2), heat sales to direct heating (1), energy provision (1), and tools (1). During the second collection process the category multiple technology applications was merged with the category Other. This means that this category, of 41 solutions, includes FEFTS that could not be categorized among the existing categories as well as some entries that have not yet been correctly categorized. Apart from this group, energy provision and agricultural field practices are the main training material available with 30 and 29 entries. Next are heating and cooling of agricultural constructions (10), tools (7), heat sales to district heating (6) and energy sales to external consumers, vehicles and lighting with two entries each. There is one entry for heat/cold processing.

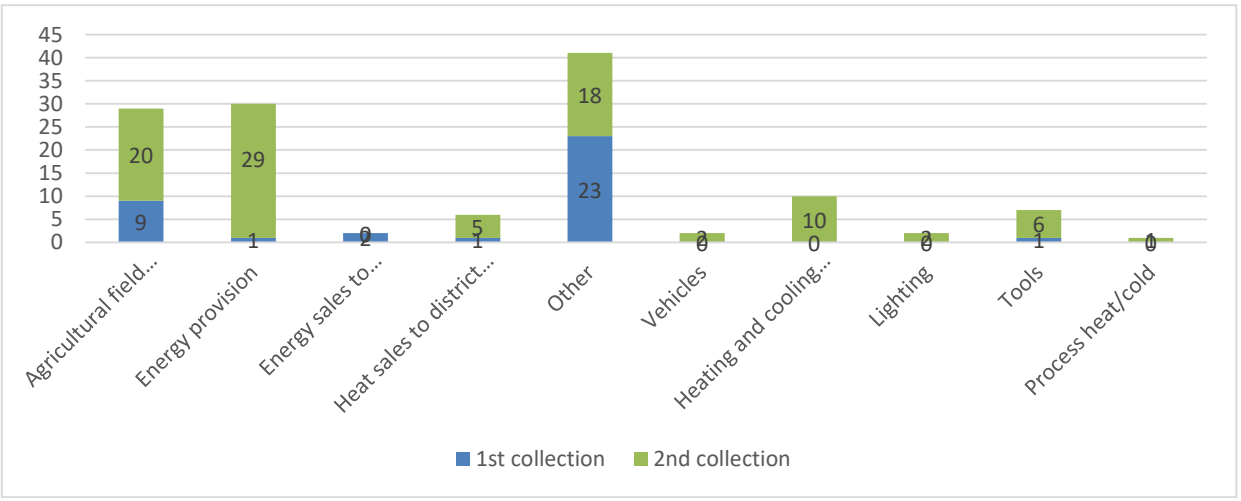

Figure 7. Types of agricultural application of collected FEFTS training materials

As already mentioned and illustrated in Figure 7, FEFTS training materials tend to belong (in terms of where they can be applied) to multiple sectors. It is important to note however, that during the first months of the FEFTS registration process, if the user chose 'multiple technology applications' then the survey would skip the categorization in 'relevant application fields.' This was found to be problematic, as it caused part of the commercial FEFTS (Task 2.4) not to be categorized adequately. To address this issue and provide the best possible categorization, the Google Forms survey was modified such that if multiple technological applications were selected, the user would be requested to select the most applicable type for this FEFTS (clean energy supply or energy efficiency improvement or soil carbon sequestration). As a result of this modification entries that were categorized prior to this modification are not included in section 3.3. The majority of the FEFTS collected are correctly categorized. However, there are some entries that will be corrected during the 2nd screening procedure.

Figure 8 shows the distribution of the collected training material per FEFTS category. During the first batch, among the solutions, 12 were for energy efficiency, 10 for clean energy production and 8 for soil carbon sequestration during the first collection period. The new numbers after the second collection are: 36 for clean energy supply, 65 for energy efficiency improvement and 17 for soil carbon sequestration. While the number of entries was close for all categories during the first selection period, there is an increase in entries for clean energy supply and energy efficiency improvement while there are significantly less entries for soil carbon sequestration. The fact that energy efficiency improvement is the leading category shows the trend that is emerging, with all the difficulties Europe is facing at the moment, where alternative methodologies to already existing technologies are found to be effective.

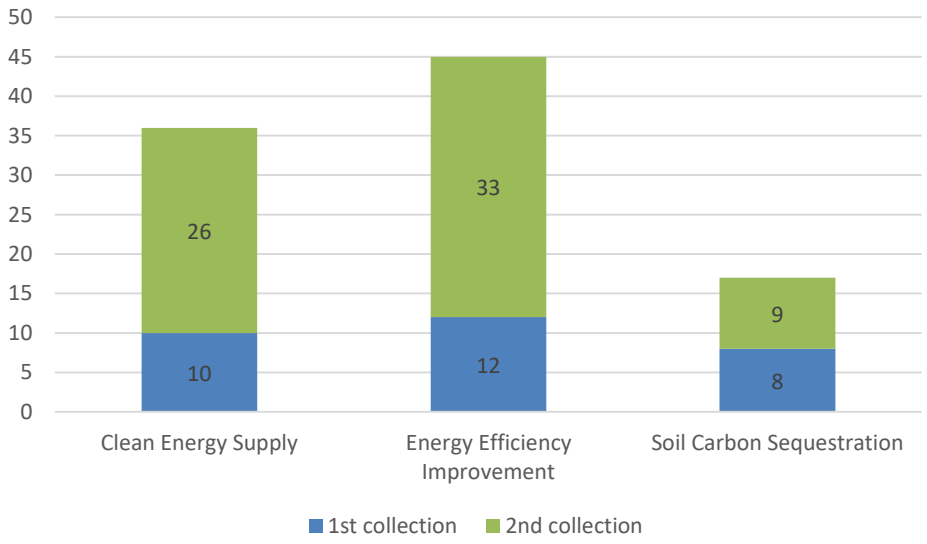

Figure 8. Type of the training material per FEFTS category

3.2.1 Clean Energy supply

35 out of 36 clean energy supply training materials are registered as energy production systems. The one remaining is registered as an energy storage system. In this section the analysis of the Clean Energy Supply FEFTS is presented. Figure 9 shows that most of the training materials refer to solar and biomass systems as well as other technologies. Sewage treatment plant gas and biogas accounts for 3 entries, wind for 2 and geothermal training material for 1.

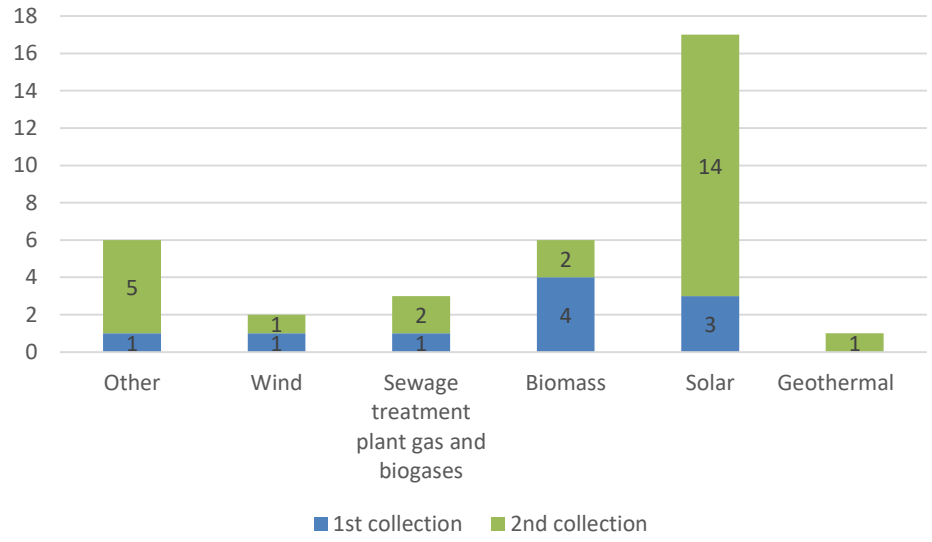

Figure 9. The renewable energy sources of Energy production system

Regarding the specific technologies (Figure 10) for energy production system, related to Figure 9, most of the training materials are relevant to photovoltaic (17) systems and biogas/biomethane production (4). Training materials relevant to small wind turbines with the power range 1-50KW solid biomass conversion, solar thermal, heat pumps, geothermal, wind turbines and solid biomass conversion were also submitted. Solar thermal (2), heat pumps (1) and geothermal (1) related technologies were solely added during the second collection period while there were no new entries for biogas/biomass production related training materials.

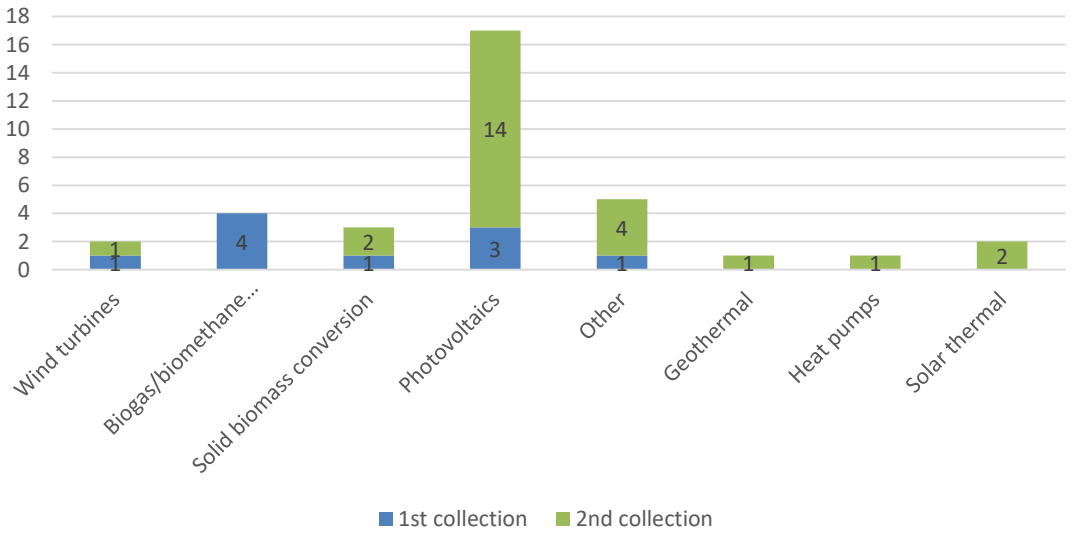

Figure 10. Specific technologies for Energy production systems

Among the photovoltaic training materials registered, most of them refer to PV-arrays (Figure 11). No change has occurred between the ranking of these categories during the second batch.

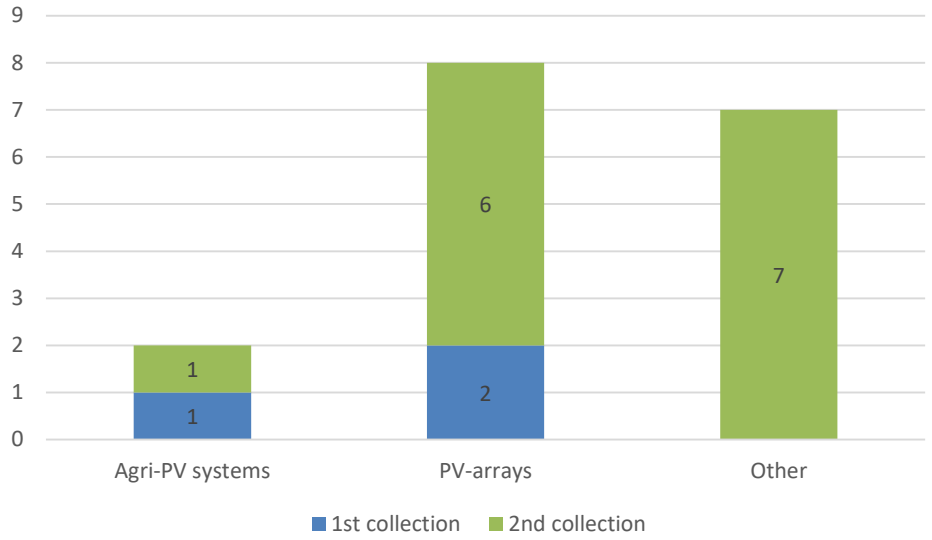

Figure 11. The submitted training material of the photovoltaic technology type

3.2.2 Energy Efficiency Improvement

Figure 12 illustrates the type of energy improvement efficiency each training material refers to. This figure shows that most training materials refer to efficient tools, followed by precision agriculture, efficient buildings, conservation agriculture, effective vehicles and precision livestock farming. Efficient vehicles and not further specified categories are new and had no entries during the first round of collection. Not further specified training materials are the biggest group with 15 entries.

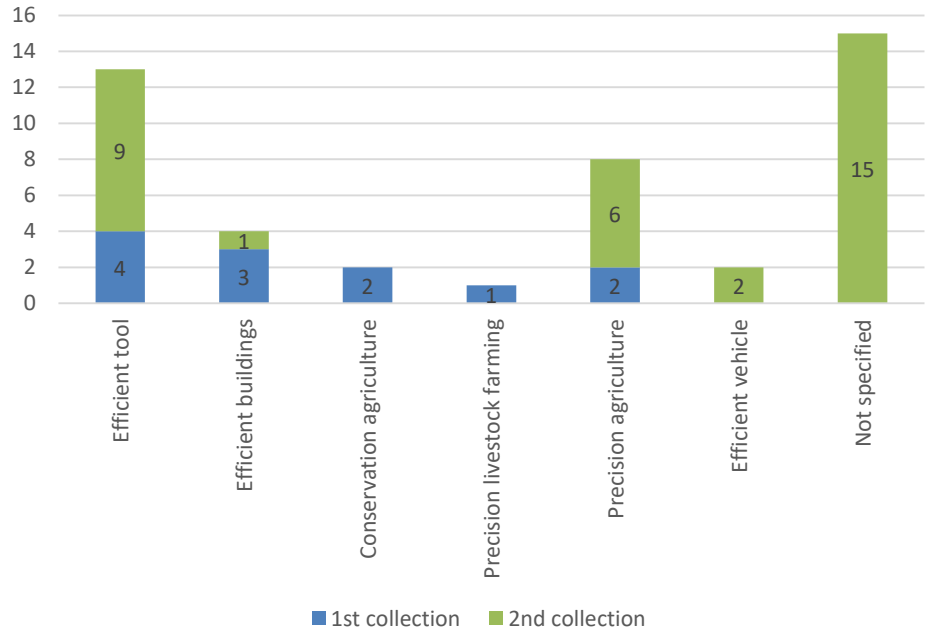

Figure 12. The submitted training materials of the energy improvement type

3.2.3 Soil carbon sequestration

Figure 13 and 14 show the distribution of techniques for soil carbon sequestration. Tillage is still the biggest category with now 8 entries. Soil and water conservation techniques gained 3 more entries and have now 4 in total. Soil organic matter still has one entry while the entry for crop diversification was deleted during the screening phase. Nutrient management (1), grass management (2) and not specified training materials were added during the second

collection period.

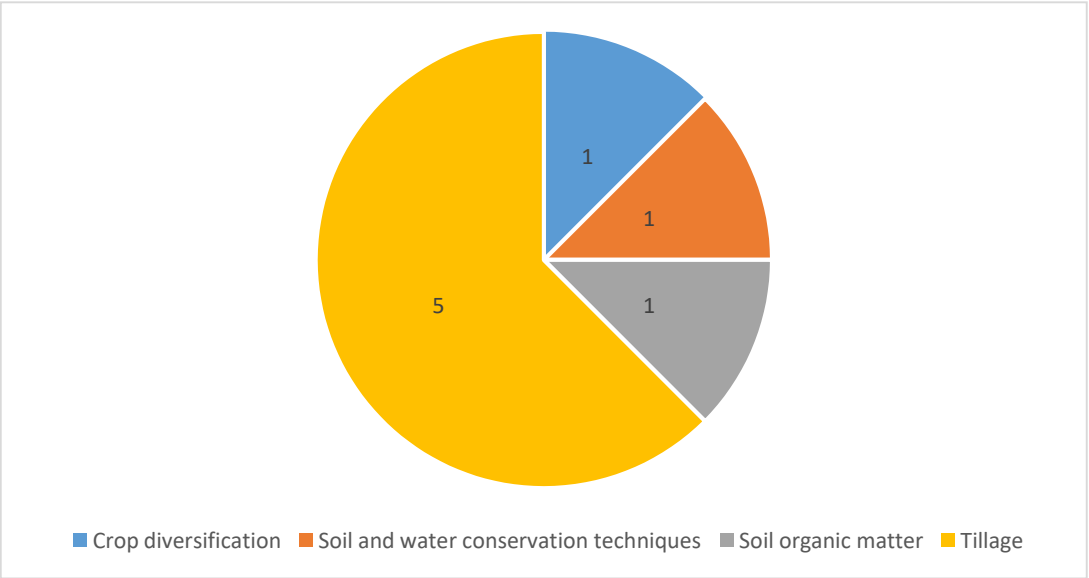

Figure 13. The materials collected based on carbon sequestration method for first collection round

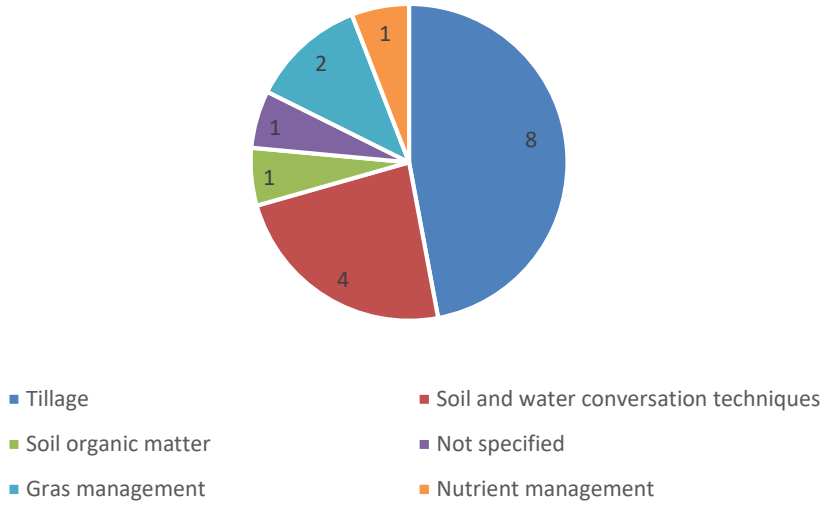

Figure 14. The materials collected based on carbon sequestration method for 2nd collection round

4. Conclusion and Reflection

In conclusion, this deliverable has shown how FEFTS are collected, screened, assessed and included in AFF's inventory on training materials inventories. This process and these training materials are important as they will serve to enhance stakeholder knowledge and incentives to minimize fossil fuel consumption. In this report the updated results of all the training material gathered in both collection processes are presented.

The acquisition of FEFTS training materials was divided into three phases. The first step defined the FEFTS categories. During phase 2, the consortium conducted research with the aim of collecting and cataloging relevant training materials under FEFTS categories. This was followed by an initial screening of the uploaded FEFTS by the task leader. In phase 3 the registered training materials were reviewed and incorrect, duplicate, and incomplete entries were removed thereby ensuring data integrity and supporting effective analysis in AgroFossilFree's subsequent phases. This methodology will be repeated for the FEFTS collected during the 2nd collection procedure.

The consortium as a whole successfully registered 98 relevant training materials. The majority of the training resources are in English or German and are offered as manuals or online courses primarily for farmers, advisory services, and producer associations. The majority of the FEFTS training materials collected are Methodologies or Procedures with the most relevance for open-field agriculture, but also include aconsiderable focus on the livestock and greenhouse sectors.

The analysis found that the majority of training materials collected have multiple technical applications and that they have a relatively equal distribution between the FEFTS categories 'improvements in energy efficiency' and 'renewable energy production' while 'soil carbon sequestration' is the smallest category. More specifically, regarding renewably energy production, nearly all training materials referred to production systems with the largest category being solar (photovoltaics). Regarding improvements in energy efficiency, the training materials are mostly not specified while regarding soil carbon sequestration, the training materials are mainly focused on tillage systems.

Overall, the collection and incorporation of FEFTS training materials into AgroFossilFree was successfully completed within the expected timeframe. This achievement will contribute to the effective operation of the AgroFossilFree platform and support the overall transition away from fossil fuel dependence in EU agriculture.

In order to reach our KPI of 1700 registered FEFTS in the AgEnergy Platform the whole consortium will continue contributing new FEFTS. Following this report another updated version will be produced showing the latest results.

Annex

Annex 1: Training Material retrieved from survey

The following link is the online spreadsheet which contains all the training materials retrieved from both collection processes until August 2022.
https://docs.google.com/spreadsheets/d/1NU4J08GXusngT8PT_qUesEPjEhSbhl2kRDV4jbA8T0Y/edit#gid=753060192

Annex 2: Training Material Survey

As it was mentioned in the document the usage of the Google Forms survey was discontinued. Instead, partners can now access directly the AgEnergy Platform and submit their FEFTS by simply creating a free account firstly. The following link is the AgEnergy Platform link.

https://platform.agrofossilfree.eu/en