Report on research project results on FEFTS - 1st update

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Author(s): **Magdalena Borzęcka, Małgorzata Wydra (IUNG)**

Contributor(s): **Foteini Vandorou, Konstantinos Vaiopoulos (CERTH)**

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Project coordinator: **Thanos Balafoutis - CERTH**

Abstract

AgroFossilFree project's objective is to create a framework under which critical stakeholders will cooperate to evaluate and promote currently available fossil-energy-free strategies and technologies (FEFTS) in EU agriculture to diminish in the short term and eliminate in the long run fossil fuels use in any farming process from cradle to farm gate, while maintaining yield and quality of the end-product.
The aim of the current document is to present the report on methodology and standards regarding the performance of systematic review of research results from projects on FEFTS application in agriculture or related domains.
This report is organized and structured in five distinct chapters, each one addressing a specific aspect regarding FEFTS identification, screening and analysis that were performed in the first and second stage of research projects collection. In the first part, an initial assessment of the identified projects was carried out. The second part of the report describes the conduct of a survey in order to be able to perform analyses in the next one. A summary of the works and results is provided in the fourth part. The fifth part is the annex. This report is the updated version of D.2.5 as it contains all the new Research Projects gathered during the 2nd FEFTS collection process.

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1. Introduction - Initial Identification

In the framework of Task 2.4 of WP2, and based on the instructions provided in Deliverable 2.1, the AgroFossilFree team identified over 100 research projects in the first and over 60 in the second collection period, to be included in the AgEnergy Platform. The task was carried out in cooperation with all the project partners and was coordinated by IUNG-PIB. Realization of the task included preparation of a video tutorial, which helped the project partners in selection and submission of identified research projects on FEFTS using a dedicated questionnaire. Selection of research projects was conducted according to the Rogers's method for evaluation of innovations, in a five-step decision-making process. In the first stage, general information such as project title and abstract were checked. In the second stage, detailed information about the project was studied, including specific objectives and results achieved. In the third stage of the procedure, innovativeness of each project in regards to agricultural defossilisation was investigated together with advantages and disadvantages of the solutions offered. In the fourth stage, the decision about the relevance of a given project was made. Finally, the project validation and submission was executed.

1.1. Sources' Definition of Research Projects on FEFTS and Search Limits

In order to collect research projects on FEFTS, the following repositories were chosen: CORDIS, EIP-AGRI, Interreg and LIFE projects databases, identified as the biggest and covering the widest scope of topics, hence the most probable to provide relevant search results for FEFTS identification for the purpose of AgEnergy Platform.

CORDIS stands for the Community Research and Development Information Service, which aims to foster accessibility of research results to researchers and other professionals and thus stimulate development of innovative products and solutions. CORDIS offers a repository[1] of project results provided by the European Commission, consisting of the projects funded by the EU framework programs for research and innovation. It was the primary source used in the first stage of building the AgEnergy Platform for the identification of research projects on FEFTS. CORDIS repository proved to offer a vast range of results that matched the anticipated outcome.

In the first stage of FEFTS collection, CORDIS repository offered 68 results matching the identification criteria that were submitted to the AgEnergy Platform. In the second stage, a complementary search was performed, based on a new, adjusted set of keywords that allowed for further identification of 29 more research projects relevant to the objectives of Work Package 2.

EIP-AGRI is the agricultural European Innovation Partnership for Agricultural productivity and Sustainability that aims to foster competitive, innovative and sustainable agricultural and forestry practices in accord with protection of environment and its natural resources. The EIP-AGRI project repository[2] was, therefore, chosen as a source of projects offering innovative solutions for European fossil free agriculture as it aims to "achieve more from

[1] https://cordis.europa.eu/projects
[2] https://ec.europa.eu/eip/agriculture/en/find-connect/projects

less" when it comes to management of natural resources, and works to bring together research and practice in finding new innovative solutions for European agriculture.

The LIFE program repository[3] was selected for its climate-oriented projects focusing on nature protection, clean energy transition, circular economy and climate change mitigation and adaptation – all of which are closely related to the aim of fossil energy free agriculture. LIFE program takes up numerous initiatives with the aim to foster development of clean technologies and protection of natural environment. The second stage of FEFTS collection regarding research project results was carried out based on the LIFE programme repository. It allowed for identification of 21 project results on FEFTS.

Interreg is a European Union program encouraging cooperation between countries and regions jointly addressing common problems and finding solutions in many relevant areas. The Interreg project database[4] was chosen with the aim to find universal solutions for fossil free agriculture in Europe.

The EIP-AGRI & Interreg project databases will be included in the next stages of project search for the AgEnergy Platform creation & updating. However, eligible sources for research projects are also the ones that are available in each country of AgroFossilFree partners and contain national projects of that kind.

It should also be mentioned that a part of thus far dismissed search results from LIFE and CORDIS databases consists of ongoing projects, relevant to the objective of Work Package 2, which have not yet produced satisfactory results at the moment of FEFTS collection. However, due to very promising objectives stated in projects' descriptions, those projects were not completely dismissed, but will undergo a further selection procedure in this regard in the later stage of FEFTS collection for AgEnergy Platform.

1.2. Search Queries Methodology

In order to conduct a search in the CORDIS repository, a search engine provided by CORDIS was used: https://cordis.europa.eu/search. The search queries methodology applied to research projects was based on the description provided in Deliverable 2.1, and, more specifically, on the FEFTS categories presented in the Chapter 3.2 - Description of FEFTS. The Chapter presented FEFTS as divided into main categories, level 1 sub-categories and level 2 sub-categories. Based on that categorization, the queries for each clean energy supply, energy efficiency and soil carbon sequestration were produced. Indicatively, Table 1 shows the queries regarding Renewable Energy Sources. For the rest, please follow Annex 1.

[3] https://webgate.ec.europa.eu/life/publicWebsite/search
[4] https://www.interregeurope.eu/projects/

Table 1. RES categories with assigned keywords used in CORDIS database search – 1st collection period

Level 1 RES category	Level 2 sub-categories	Keywords (to be included in the query)
Solar		agriculture/farming/farmer, energy, solar/photovoltaic
Wind		agriculture/farming/farmer, energy, wind
Hydro		agriculture/farming/farmer, energy, hydro
Biomass	Pellets	agriculture/farming/farmer, energy, biomass, pellets
	Woodchips/ wood logs	agriculture/farming/farmer, energy, biomass, woodchips/wood logs
	Energy crops	agriculture/farming/farmer, energy, biomass, energy crops
	Agricultural residues	agriculture/farming/farmer, energy, biomass, agricultural residues
Landfill gas		agriculture/ farming/farmer, energy, landfill gas
Biogas		agriculture/ farming/farmer, energy, biogas

In the second stage of FEFTS collection, the search in CORDIS repository was complemented by adding search queries including new keywords. The keywords were chosen based on the analysis of the first FEFTS collection results, with the aim to collect more project results in the less numerous categories of FEFTS. The new keywords included in the search are presented in Table 2.

Table 2. Further RES categories with assigned keywords used in CORDIS database search – 2nd collection period

Level 1 RES category	Level 2 sub-categories	Keywords (to be included in the query)
Energy type	Heating	agriculture/farming/farmer, energy, heating/cooling
	Cooling	
Energy storage		agriculture/farming/farmer, energy, storage
Energy saving/ energy efficiency		agriculture/farming/farmer, energy, saving/efficiency
Soil carbon sequestration		agriculture/farming/farmer, carbon sequestration

The search in LIFE program database, due to its different structure, was based on a different set of queries, modified to fit the filtering options offered by the Advanced Search on LIFE Projects: https://webgate.ec.europa.eu/life/publicWebsite/search/advanced. The filtering options allowed for choosing the thematic area of search (option “Select Themes”) and keywords specific to that area (option “Select Keywords”). The list of themes and keywords used for search in the LIFE database is presented in Table 3.

Table 3. RES categories with assigned themes and keywords used in LIFE database search – 2nd collection period

Thematic area	Keywords
Agriculture - Forestry	Renewable energy
	Energy efficiency/energy saving
	Energy supply/ energy production
	Clean technology
	Soil carbon sequestration
Cleaner technologies	Agriculture
	Agricultural waste
Resource efficiency	Agriculture
Natural resources and ecosystems	Agriculture
Carbon sequestration	Agriculture
Energy efficiency	Agriculture
Renewable energies	Agriculture
Energy: efficiency, saving, supply	Agriculture

1.2.1. Queries creation (CORDIS Methodology)

For each of the Level 1 categories, a query was created containing the keywords (e.g. Table 1a). For each specific query, the following filters provided by the CORDIS search engine were also chosen:

Collection: Projects

Program: H2020 OR FP7

Start date: after 01/01/2011

For most of the Level 1 categories, only one query was prepared, which provided a reasonable number of results for screening. In case of the “biomass” category, a further detailed sub-categorization was necessary, since the high number of results obtained and the initial screening suggested a large portion of research projects that may not address agricultural biomass. Therefore, a sub-categorization was introduced, specifying the biomass categories relevant for agriculture and forestry.

In the second collection period, queries were prepared based on the same methodology, one for each level 1 category. The search conducted in the 1st and 2nd collection period delivered jointly 97 project results on FEFTS.

Specific queries used for project search in each category are presented in Annex 1.

1.2.2. Queries creation (LIFE Methodology)

The search of LIFE Programme database followed the same methodology as described above. Apart from the filtering options included in Table 3, the search engine allowed also for specifying the time scope of research projects. The chosen time scope set projects starting date at no earlier than 01/01/2011. Other filtering options provided by the search engine were not used.

The search provided over 100 results, which were carefully analysed and 21 of them were then selected to be submitted to the AgEnergy Platform.

Apart from the 118 results collected from CORDIS and LIFE databases, a considerable number of research projects was collected by project partners, namely 39 in the first and 12 in the second collection period. Those projects were directly identified from various available sources and platforms of national scope.

2. Survey

The conducted survey consisted of four sets of questions described initially in Chapter 4 of Deliverable 2.1. Questions from **Section 1** referred to general information about the identified FEFTS and the person submitting the survey: organization, contact email, FEFTS category. **Section 2** questions were project specific such as project abstract, language, coordinator and their contact information, project status and funding. **Section 3** regarded FEFTS specifications such as its purpose and application field. **Section 4** consisted of specific information depending on the type of FEFTS: Clean energy production, Energy efficiency improvement or Soil carbon sequestration, followed by specific sub-categories regarding energy type, technology used etc. The last one, **section 5**, grouped questions referring to FEFTS assessment – environmental and socioeconomic - provided by the person submitting the survey and performed to the best of their knowledge, based on the available information.

The aforementioned structure of the survey as well as the analysis of the results on research projects on FEFTS, presented in Chapter 3, are based on the structure established on D2.1. A basic schematic of this structure is presented in Table 4.

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

FEFTS category	Energy	Level 2 sub-category
Energy User/ Consumer	**Agricultural technology**	heating and cooling of buildings
		process heat/cold
		lighting

Energy Supply	**applications**	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

In the second collection period, new FEFTS were submitted directly on the AgEnergy Platform, using the survey as a form incorporated in the website. The use of the Google Forms survey was discontinued. Annex 4 contains the link of the AgEnergy Platform.

2.1. Data Collection

Identification of research projects on FEFTS was a joint task of all project partners conducted under the coordination of IUNG-PIB. This condition was formulated in order to make sure all countries involved in the project are well represented in terms of collected FEFTS.

All project participants have been responsible for the collection and reporting of research projects about FEFTS. As the Task Leader, IUNG-PIB was responsible for registering European research projects. The rest of the partners were assigned the task to identify and register research projects of their countries (national scope). The target (100 research projects until September 2021 and additional 50 until September 2022) that had been set in the project's 2nd plenary meeting (25/5/2021) and the collected research projects are shown in Table 5. In total 161 Research Projects have been gathered during both collection processes (102 during the 1st collection process and 59 during the 2nd)

Table 3. Specific targets of FEFTS for the 1st and 2nd collection periods

FEFTS TYPE	Partner responsible	1st collection period targets (approx.)	2nd collection period targets (approx.)	Submitted after 2nd collection period
Scientific Papers	CERTH	500	250	x
	All other partners			
Research Projects	IUNG-PIB	100	50	**161**
	All other partners			
Commercial Technologies	WIP	200	230	x
	All other partners			
Training Material	WIP	40	65	x
	All other partners			
Financing Mechanisms	AU	50	80	x
	CERTH			
	All other partners			
	Total	~900	x	x

Table 6 shows the individual goals set for the 2nd FEFTS collection process for each category.

Table 6.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 whole identification and registration process was supported by an online thread for Task 2.3, which was created in Microsoft Teams platform to host Q&As about research projects, between the Task Leader and partners.

2.2. Screening of Research Projects on FEFTS

The selected results (from the 1st batch) were submitted by filling a questionnaire in Google Forms, and then downloaded in excel file. All the records were subjected to initial screening in order to remove duplicates or incomplete FEFTS. The first step of initial screening had already been done before the submission of Deliverable 2.5, as all records were screened in order to delete duplicate, malicious and incomplete entries. “Incomplete entries” were considered those lacking an exhaustive description and information, thus making their evaluation impossible. For these records, partners were asked to insert additional information. If not available, those entries were completely deleted from the inventory. After the initial screening the number of FEFTS in the category of research projects changed from 107 to 102.

The main screening process took place before the launch of the platform, which ensured that all the collected FEFTS fulfil the acceptance criteria discussed below, and presented information on each FEFTS are well categorized (detailed analysis of FEFTS categorization will be discussed further in this document). The final screening procedure eliminated another 3 records, giving the final result of 99 research project results on FEFTS submitted at the AgEnergy Platform. A similar procedure took place for the second period of FEFTS collection. After the collection of 64 new project results on FEFTS, removal of incomplete entries gave the result of 60 new FEFTS submitted to the Platform.

In this way, we can ensure that the AgEnergy platform is filled with high quality and relevant innovative projects. Then, another screening process was carried out before the launch of the Platform,

It should be mentioned though that our database is open for public entry so that interested stakeholders are also able to input additional data. Their entries will be unpublished until they are validated by the FEFTS Quality Committee. By doing so, the accuracy and reliability of the platform’s information regarding its relevance with the objectives of the AgroFossilFree project is guaranteed.

2.2.1. Acceptance Criteria

The applied queries gave us so far a result of over 500 international projects related to the topics determined by the keywords and realized in the period of 01/01/2011–01/01/2022 (recent projects). The screening process was conducted based on particular acceptance criteria. More specifically as appropriate entries were thought of projects which:

- Describe innovative energy saving or RES-based solutions and limiting the carbon dioxide emissions from agriculture;
- Offer practical solutions rather than theoretical knowledge;
- Are of high applicability & availability of FEFTS to farmers;
- Have TRL (technology readiness level) of at least 7 and above, offering a solution ready for implementation;

- Are of high relevance for the context of European agriculture;
- Offer clear benefits for farmers.

Any research project that does not follow the aforementioned criteria and does not clearly provide an alternative solution on the fossil fuel use in agriculture is excluded from the AgEnergy Platform inventory.

2.3. General characteristics on research projects on FEFTS

In the first period of FEFTS collection, after the completion of screening process, a number of 99 FEFTS were submitted to the AgEnergy Platform. In the second collection period, a number of 64 projects were submitted to the platform, out of which 62 passed the initial screening: 29 of them were projects selected in the complementary search of the CORDIS repository, further 21 project were selected from the LIFE Program database, and finally, 12 projects were submitted by project partners from national repositories.

The diagram below shows the share of projects selected in the first and second collection period, according to project languages.

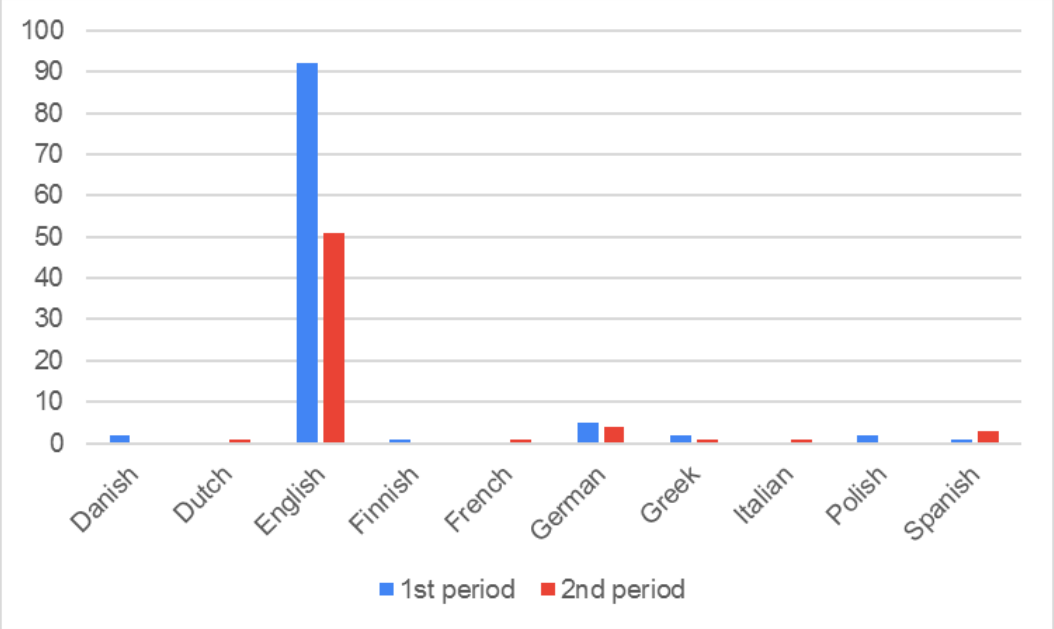

Figure 1. Classification of the research projects selected in the first and second collection period, based on the project language

After the second collection period, English language projects still constitute the largest group (Figure 1), which is made up not only by the international projects selected from the CORDIS and LIFE repositories, but also national projects that chose English as the language of their work environment. This may be an asset in making the selected FEFTS available to a larger audience. However, most of the international projects offer descriptions of FEFTS in several languages, depending on the project partners/coordinators. Nevertheless, to make the collected FEFTS available to all the potential users, the main information presented on the

AgEnergy Platform are translated into the languages of all the project partners. So far, all the 99 FEFTS submitted in the first collection period have been translated and the remaining 62 FEFTS will undergo this procedure after their final screening and validation.

Regarding the classification of the research projects based on the country of the coordinator, it is evident from Figure 2 that in the first collection period there is a wide range of European countries with Spain having the most entries, followed by Germany, France, Greece and The Netherlands. After the second collection period, the trend changed slightly: with Spain still best represented in terms of selected FEFTS, the second and third place belong to Italy and Ireland, respectively.

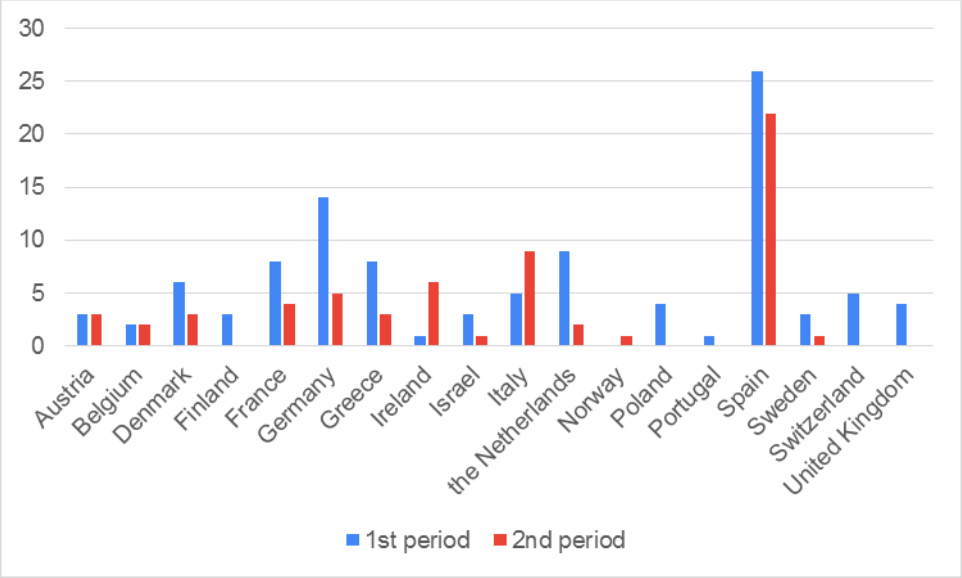

Figure 2. Classification of the research projects selected in the first and second collection period, based on the country of the coordinator

All the selected projects are recent projects, and currently 29% of them have an ongoing status. This ensures high relevance of FEFTS in terms of finding state-of-the-art answers to the current problems and avoiding outdated solutions. The share of ongoing and completed projects in each FEFTS collection period is presented in Figure 3.

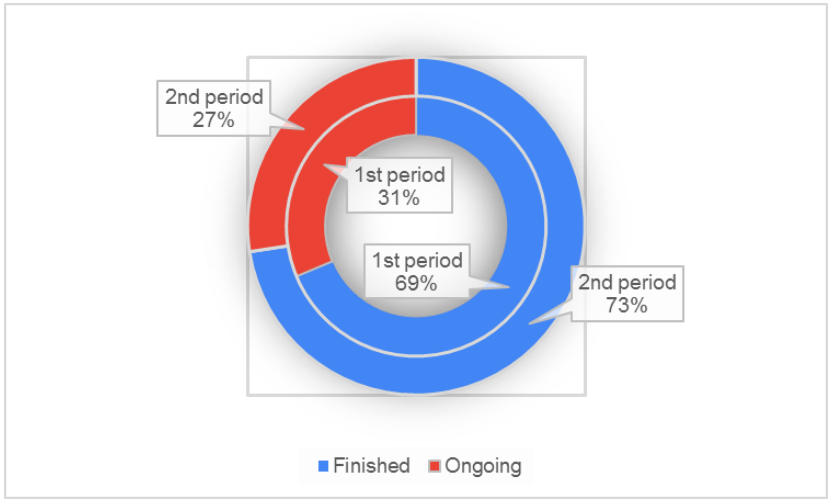

Figure 3. Classification of the research projects selected in the first and second collection period, according to the status of their completion

The grand majority of research projects received funding from the Horizon 2020 research and innovation program, namely 60% of all collected research projects, and the LIFE Program is the second most numerous position with the result of 16%. It resulted from the fact that H2020 was one of the largest recent EU funding programs but also from the fact that the main search in the first collection period was conducted in the CORDIS repository, and in the second one – in both CORDIS and LIFE databases. In the next stages of the AgEnergy Platform creation, it is expected that the numbers of projects funded from EIP-AGRI and Interreg programs will significantly increase. The numbers of collected FEFTS representing their respective funding sources are presented in Figure 4.

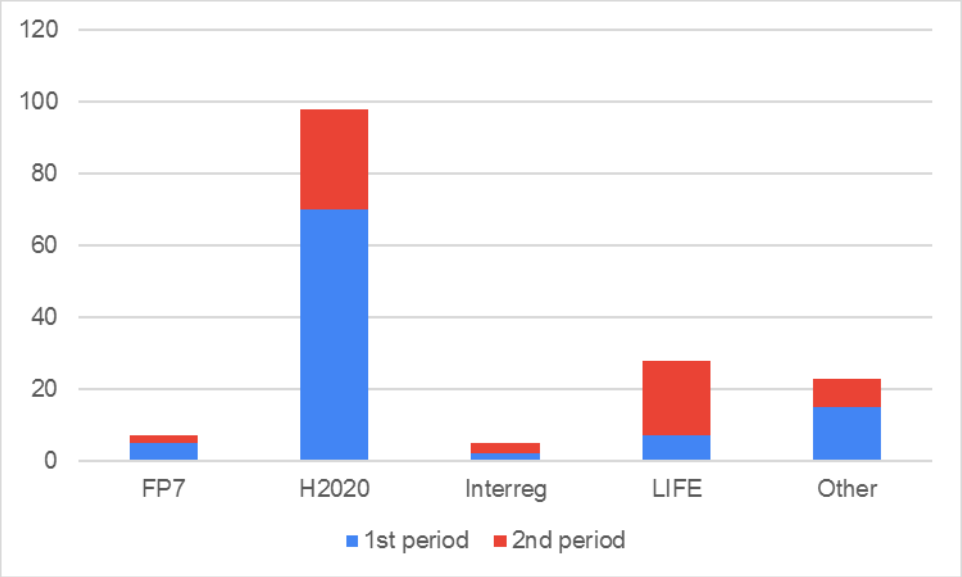

Figure 4. Classification of the research projects selected in the first and second collection period, according to their funding source

3. Projects' FEFTS Analysis

The selected projects comprise a wide range of FEFTS in terms of different types of solutions, types of clean energy sources, application field etc. This way we can ensure that the collected information will fulfil expectations of the AgEnergy Platform users and offer suitable solutions to various problems, depending on specific needs and capacity of each Platform user.

Below we present an analysis of the collected FEFTS based on their categorization. It is worth mentioning that the categorisation presented in this chapter may slightly diverge from the initial categorisation discussed in the first report on project results on FEFTS (Deliverable 2.5). The differences result from the fact that after first collection period, not all the FEFTS were assigned specific categories or their categories changed for more suitable after the screening process conducted by the Screening Committee. Some categories were also changed with the aim to facilitate filtering/searching for specific FEFTS on the website. The analysis presented below is based on a current, corrected categorisation of FEFTS both from the first and second collection period.

As the main objective of the project is to move towards fossil energy free agriculture, all the FEFTS had to be related to clean energy supply or increased energy efficiency, or enable emissions reduction through soil carbon sequestration. After the first collection period, a large part of FEFTS remained uncategorized. The screening process allowed for their proper categorization and considerably changed the size of the "soil carbon sequestration" category. The **clean energy supply** category was still the most numerous as it collected 56 FEFTS in the first and 29 in the second collection period; 19 and 17 FEFTS respectively were devoted to **energy efficiency improvement,** however, another 24 (10 more than initially estimated) in the first and 16 in the second collection period allow for increased **soil carbon sequestration,** making it second most numerous (Figure 6). Since clean energy supply is the largest category, it was further sub-categorized for the purpose of this analysis into specific energy sources.

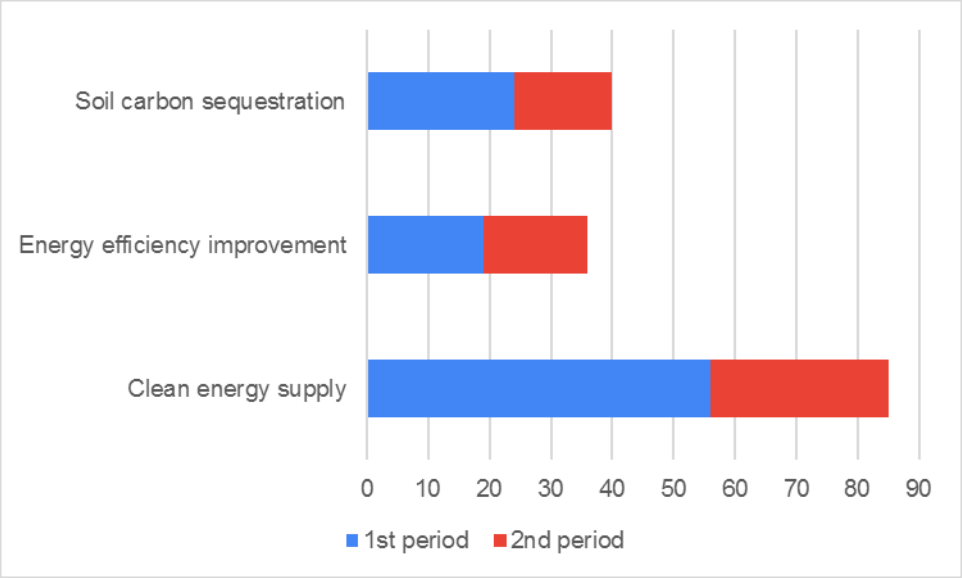

Figure 5. Classification of the FEFTS selected in the first and second collection period, according to their type

When it comes to clean energy supply, it can be further categorized into energy production or energy storage. Figure 6 shows a great disparity between those two categories, the energy production one being much more numerous in both collection periods, and energy storage represented by only 3 FEFTS. It proves there is still lack of effective technologies for energy storage that could be used in agriculture.

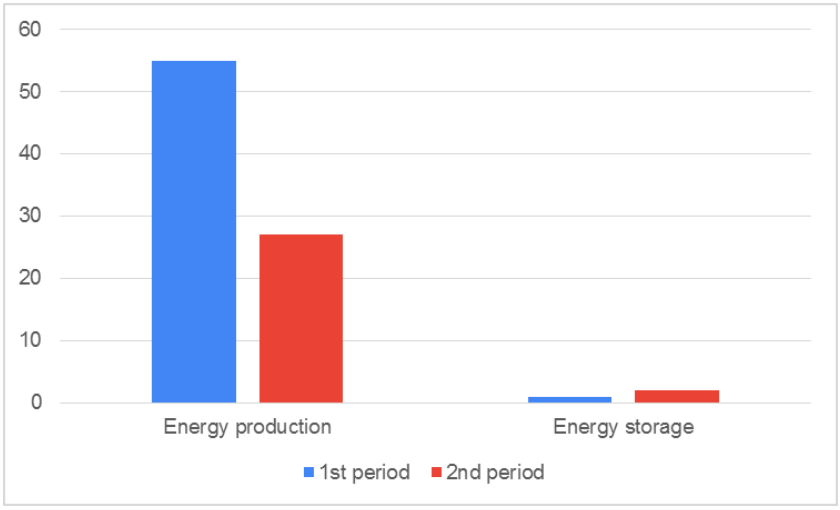

Figure 6. Classification of the FEFTS selected in the first and second collection period, according to the type of clean energy supply

When it comes to the further categorization of FEFTS offering clean energy production, in the first collection period the largest group constituted FEFTS involving **solar energy** (22 FEFTS), then **biomass** (14 FEFTS), and **sewage treatment plant gas or biogas** (10 FEFTS). The high number of solar FEFTS projects may be explained by the fact that such solutions are becoming more popular and are universal and possible to be applied in agriculture, whilst more agriculture-specific solutions appear as well. The increased number of projects on biomass, biogas and waste treatment mostly matched our expectation, since biomass for energy production is highly available in agriculture and biogas plants often use input material from agriculture, such as energy crops, crop residues or manure.

In the second collection period, the number of FEFTS in the **biomass** category increased significantly (12 new FEFTS) reaching 26 records altogether, which allowed it to become the most numerous category, before the **solar** energy that gained only 2 new FEFTS. The **sewage treatment plant gas and biogas** still remains the third most numerous category. It proves that these three energy sources are the most suitable and most available for agricultural purposes. There are still 7 FEFTS where the source of renewable energy could not be specified. They may regard universal solutions or pertain to RES as a group. The changes in category size after the second collection period are presented in figure 7.

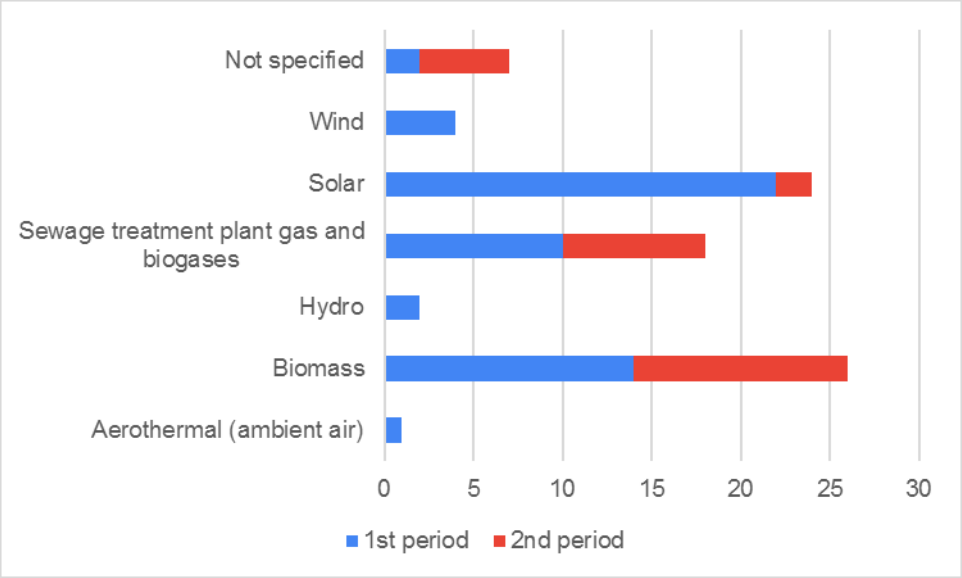

Figure 7. Classification of the FEFTS selected in the first and second collection period, according to clean energy sources

When it comes to FEFTS' users to whom specific FEFTS are dedicated, **farmers** still constitute the largest group (in 156 out of 161 projects). This was expected as FEFTS were selected with the aim to bring benefits primarily to farmers and thus encourage adoption of fossil free solutions among this group. Other categories with significant numbers of dedicated FEFTS are industry (56 FEFTS), advisory services (45 FEFTS) and producer's assoc. (39 FEFTS). Many projects offer FEFTS dedicated to various groups of users, therefore, a multiple choice was possible in the case of this question. Specific numbers of FEFTS collected in each user category are presented in Figure 8.

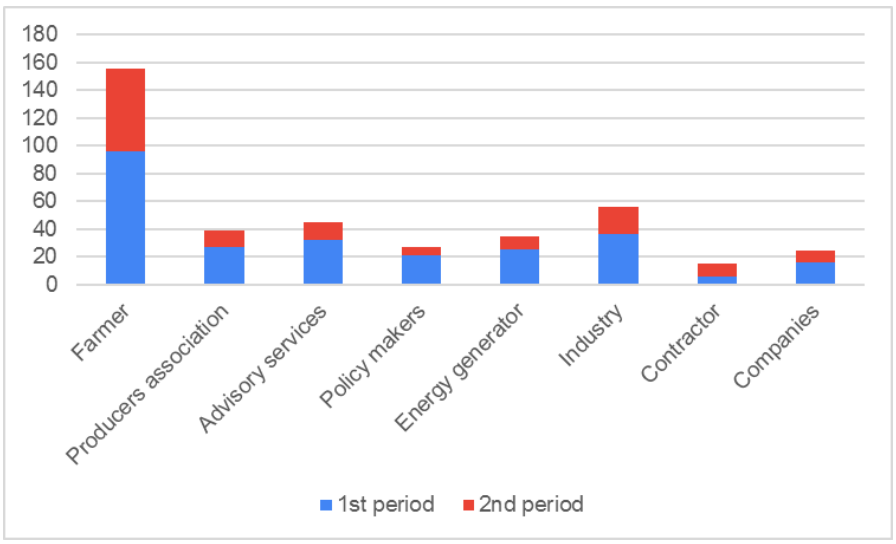

Figure 8. Classification of the research projects selected in the first and second collection period, according to FEFTS' users addressed

All FEFTS were also divided into three categories depending on their application field in the context of agricultural activity (open field agriculture, livestock and greenhouses). A multiple choice of categories was possible in this case. In the first collection period, the largest group was dedicated to **open field** agricultural practices (76 out of 99), then FEFTS devoted to **livestock** farming (41 out of 99) and almost equally large group of FEFTS were applicable in **greenhouses** (37 out of 99). As many as 14 FEFTS could be applied in all three. In the second collection period, trends remained mostly unchanged, placing the three categories in the same order when it comes to their size. Among them, 13 new FEFTS with universal application were found.

As it can be seen in Figure 9, a considerable group of FEFTS constituted solutions applicable in two or all three of those categories.

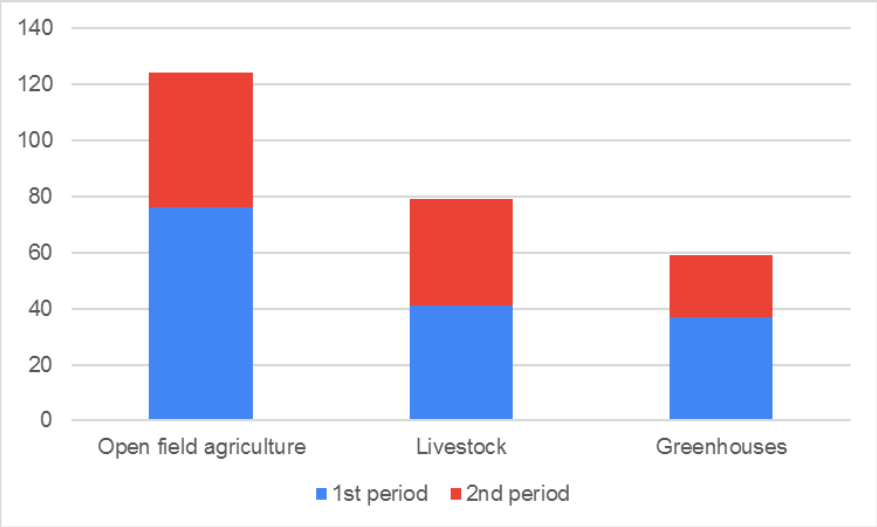

Figure 9. Classification of the FEFTS selected in the first and second collection period, according to application field

The universality of collected FEFTS is well depicted in the first collection period by the categorization based on the agricultural application type (Figure 10). Almost half of the selected projects offer FEFTS with multiple application possibilities in a wide variety of agricultural activities.

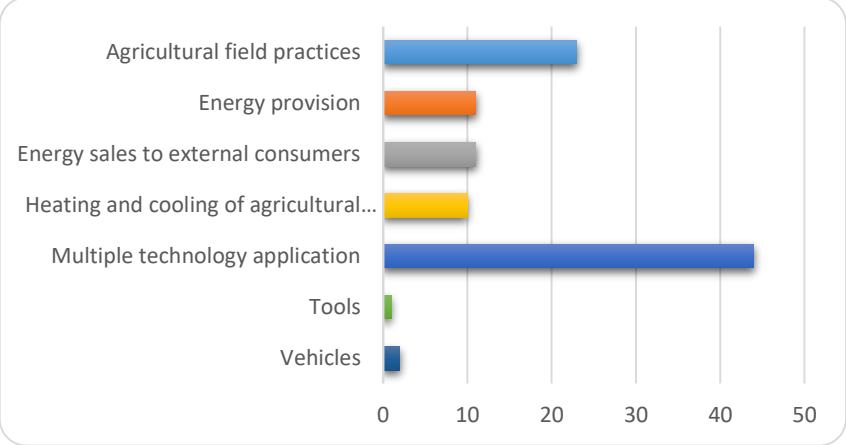

Figure 10. Classification of the selected research projects according to FEFTS' application type

Later on, during the main screening process performed afterwards by the Screening Committee, the "multiple technology application" category has been further divided based on the most important/useful application among the many, and the "energy sales to external consumers" category has been incorporated into more general "energy provision", which thanks to that became as numerous as "agricultural field practices". Still, a large group of FEFTS did not fall into any of these categories, and therefore the category of "other" application types had to be created.

In the second collection period, distribution of FEFTS into the above categories was similar, with agricultural field practices and energy provision still being the two most numerous. The comparison of FEFTS distribution in each collection period is presented in Figure 11.

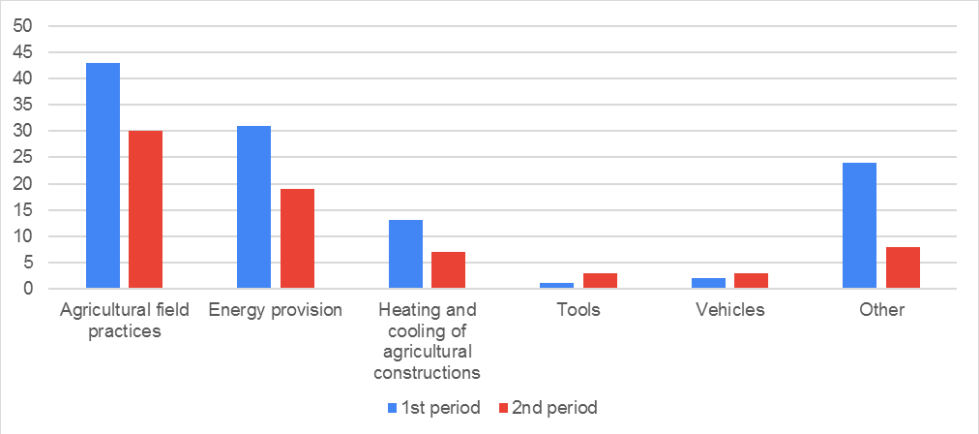

Figure 11. Classification of the research projects selected in the first and second collection period, according to FEFTS' application type

When it comes to the specific area of fossil energy use reduction, in the repository of FEFTS built in the first collection period, the most numerous among the specific application areas was "Buildings' electricity consumption" with the result of 34 FEFTS, and the second most numerous application was "Tools and equipment's electricity consumption" with 32 FEFTS. These categories remained the most numerous after the second FEFTS collection period, however, in a reversed order, since the first collected only 12 new FEFTS and the latter 25 new FEFTS. Less numerous but also significant groups constituted "Tractors and vehicles' fuel consumption" and "Buildings' heat use" with 27 and 26 FEFTS after the first collection period, and 12 and 15 new FEFTS after the second, respectively. "Tools and equipment's fuel consumption" as well as "Buildings cooling needs" categories were less numerous, but also well represented: by 14 and 9 FEFTS, respectively. In the second collection period, the first category gained a much better representation (15 new FEFTS), and the latter was increased by 7 FEFTS. In the first collection period, a considerable group was made up by "Other" areas of fossil energy use reduction, with examples such as "nutrient recycling", "bioenergy production", "pellets production", to name a few. In the second collection period this group was less numerous, but also included interesting examples, such as "shifting energy consumption", "holistic approach including renewable energy " or "creating policy measures and transformation pathways to a sustainable energy system". As it can be seen in Figure 12, electricity is the biggest direct energy consumer in agriculture, both in building's needs (controlled environment agricultural constructions) and tools equipment consumption.

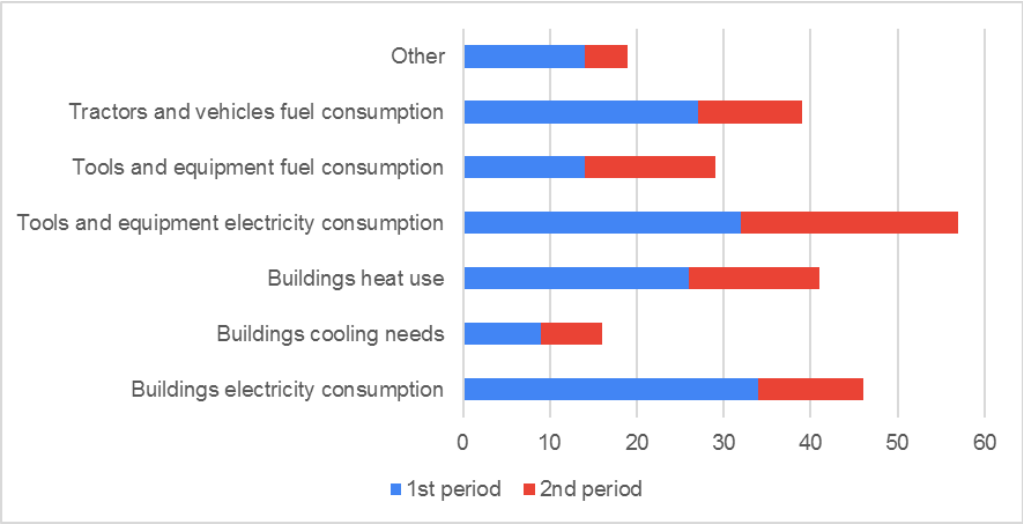

Figure 12. Classification of the research projects selected in the first and second collection period, according to the area of fossil energy use reduction

Besides the above direct energy use reduction, many of the collected FEFTS offered also indirect fossil energy reduction possibilities, such as fertilizer use reduction (30 FEFTS), manure reduction (14 FEFTS), pesticide reduction (14 FETS) or tillage reduction (12 FEFTS). This trend continued in the second collection period, with a considerable number of 27 new FEFTS offering fertilizer reduction. The second most numerous category was animal healthcare with 9 new FEFTS, which considerably increased its previous size. However, manure reduction, pesticide reduction, and tillage reduction were also well represented in the second collection period, staying the most numerous FEFTS categories after the fertilizer reduction. The results shown in Figure 13 follow the results of D1.1 of AgroFossilFree, where fertilizers were found to have the biggest indirect energy consumption input in agriculture, whilst pesticides, manure and tillage, together with fertilizer, constitute the four basic pillars of indirect energy inputs.

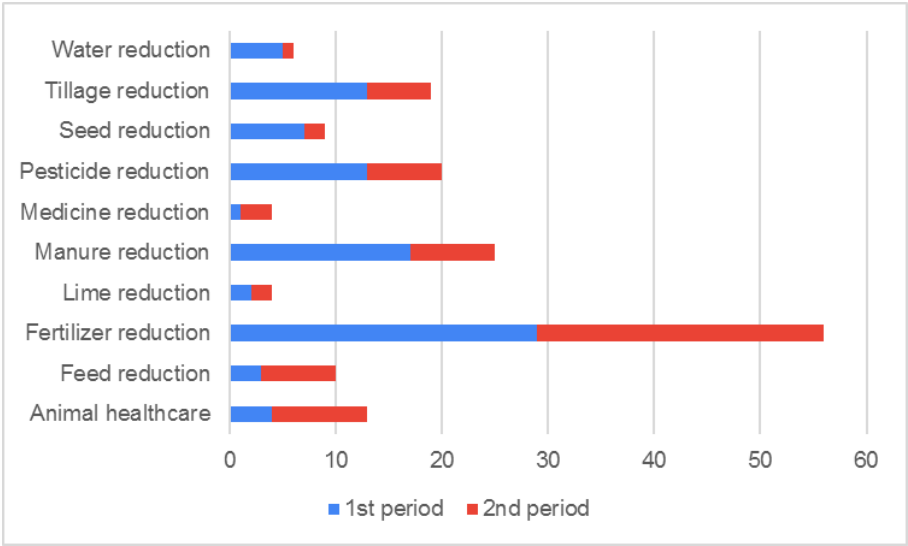

Figure 13. Classification of the research projects selected in the first and second collection period, offering additional (indirect) fossil energy reduction possibilities

The selected research project results on FEFTS were also categorised according to the type of solution. In the first collection period, the three largest groups were methodology, complete solution, and hardware, with the respective results of 48, 44 and 38 FEFTS. In the second collection period, methodology remained the largest group with 37 new FEFTS, the second largest was complete solution category with 34 results, but the third largest turned out to be procedure with 20 new FEFTS, which made it also the third largest category after both collection periods. Hardware, however, remained well represented among the collected FEFTS, with the joint result of 50 FEFTS. Software constituted the smallest group of selected FEFTS in both collection periods. There were also 4 FEFTS which could not be categorized based on the suggested types of solution.

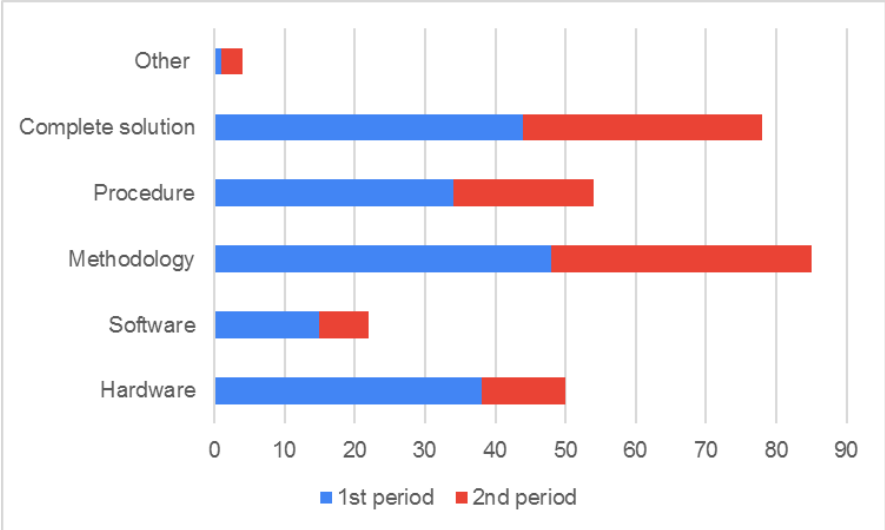

Figure 14. Classification of the FEFTS selected in the first and second collection period, according to the type of solution

It is a fact that a proportion of research projects tend to present and analyze methodologies and procedures which are mostly dedicated to energy efficiency improvement and soil carbon sequestration purposes. On the other hand, the majority of the collected research projects are related to clean energy supply (Figure 5) where, most likely, either already complete solutions or hardware for producing green energy are proposed.

3.1. FEFTS types – clean energy supply

Within the clean energy supply category, the most numerous energy sources turned out to be solar (in the first collection period) and biomass (in the second collection period) – and those are further characterized below.

When it comes to **solar energy** source, the majority of FEFTS collected in the first period concern electricity production, while only 17% regard heat production. We should keep in mind though that only one type of energy produced could have been chosen in this category. Therefore, these results show that in 22 out of 24 FEFTS electricity production prevailed, yet some of the FEFTS may be suitable for both types of energy production. Both electricity and heat constitute a large share of energy types produced by the collected FEFTS, regardless of the energy source category.

In the second reporting period, only 2 FEFTS were added to the category of solar energy source, yet it remained one of the two most numerous categories concerning renewable energy sources. Figure 15 presents the share of energy types produced from solar energy source.

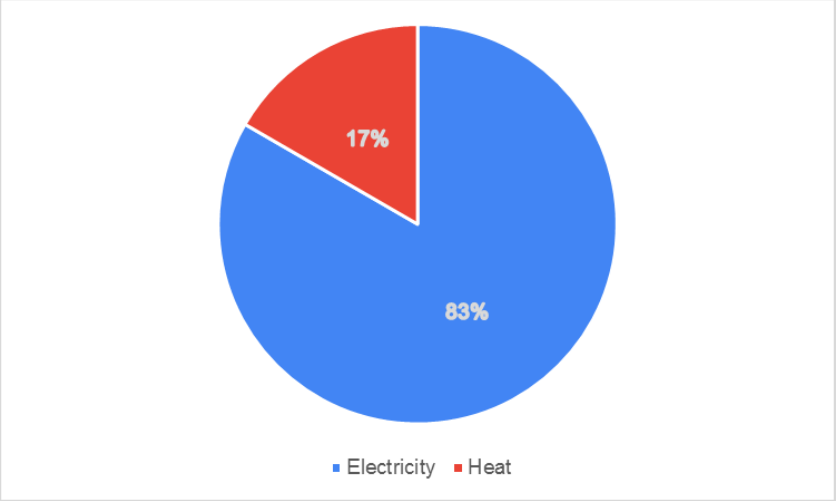

Figure 15. Classification of the FEFTS selected in the first and second collection period, according to the type of energy produced from solar energy source

Considering all the FEFTS categorized in this group both in the first and in the second collection period, almost all of them (22 FEFTS) involved photovoltaics as the main technology used for energy production. Among them, four groups could be distinguished: agri-PV systems (combined with agricultural production), PV on tools and vehicles, PV-arrays, and PV-panels (windows), which collected 9, 4, 4 and 3 FEFTS, respectively. There are 2 other FEFTS on unspecified type of photovoltaics, due to their universality in this regard. Figure 16 shows the categorization of FEFTS according to the technology used.

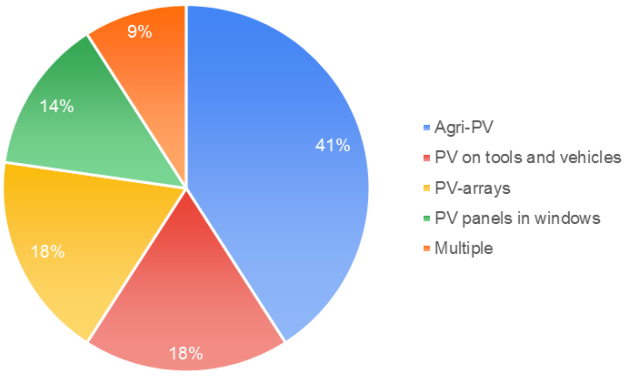

Figure 16. Classification of the FEFTS selected in the first and second collection period, according to the technology used for solar energy production

Considering that the most numerous categories are agri-PV systems, PV arrays and PV on tools and vehicles, it can be concluded that most of the FEFTS constitute solutions that could be easily implemented in a wide variety of agricultural applications, or such that can be easily adjusted to specific agricultural purposes. However, the fact that PV-panels for

windows were also found in this category proves that farmers can look for relevant solutions among more universal products already existing on the market.

The second most numerous category regarding renewable energy sources of the first collection period, and the most numerous in the second one, was **biomass**. When it comes to biomass available from agricultural sources, five categories have been identified: agricultural residues, energy crops, pellets, wood chips, and wood logs. In this category, a multiple choice of biomass sources was possible. The most numerous among them proved to be agricultural residues, which collected 19 FEFTS dedicated for this kind of biomass after both collection periods, and the second most numerous were energy crops and wood chips, each with 8 dedicated FEFTS. Categories such as pellets and wood logs were less numerous but in both cases their size doubled after the second collection period, amounting to 4 and 2 FEFTS, respectively. In the second collection period, 2 FEFTS appeared which could not be categorized based on the suggested types of biomass. Figure 17 presents categorization of FEFTS according to the type of biomass used for energy production.

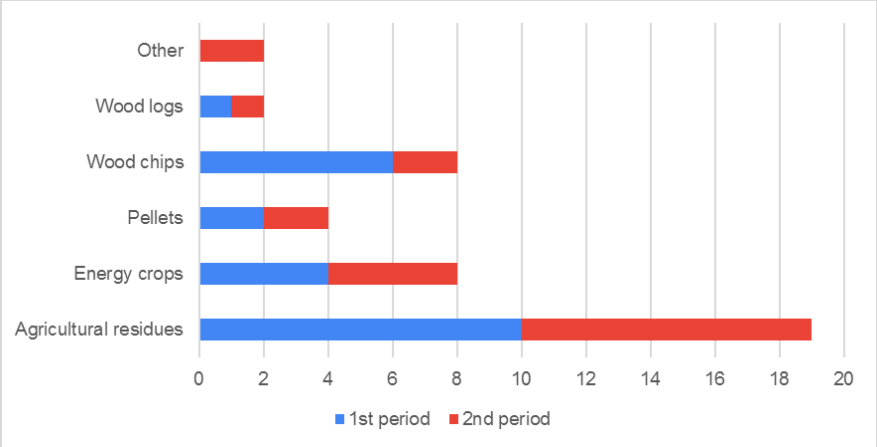

Figure 17. Classification of the FEFTS selected in the first and second collection period, according to the type of biomass used for energy production

Such allocation of FEFTS is quite reasonable, since the most numerous categories constitute the largest sources of biomass at farmers' disposal. Such FEFTS, therefore, can have numerous potential applications in agriculture. However, agricultural farms with fruit shrubs and trees, or introducing woody perennials in a form of shelterbelts, may also find the other FEFTS quite useful, as they allow utilization of woody biomass or a combination of its several types.

When it comes to types of energy produced from biomass, the most numerous category in the first collection period was chemical energy constituting 50% of all FEFTS categorized in this regard. After the second report period, it constitutes 42% of all the FEFTS in this category, but still remain the most numerous. After the second collection period, heat, which used to be least numerous, became the second best represented category among the FEFTS related to energy production from biomass, constituting 37% of all the results. The second most numerous category from the first collection period is now the third in size, namely, electricity production with the result of 21%. Figure 18 presents categorization of selected FEFTS based on types of energy produced from biomass.

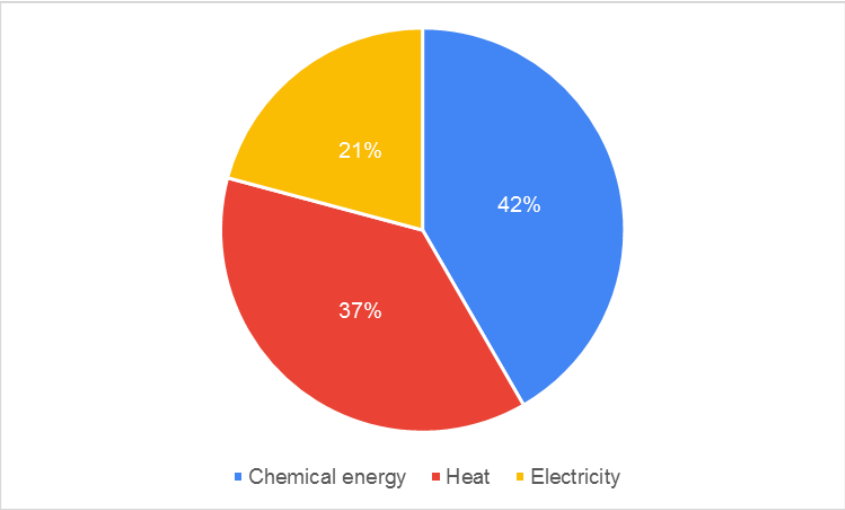

Figure 18. Classification of the FEFTS selected in the first and second collection period, according to the type of energy produced from biomass

In case of chemical energy produced from biomass, the specific technologies used for energy production comprised mostly liquid biofuel production, biogas/biomethane production. In case of heat production, solid biomass conversion was the most often chosen technology. When it comes to electricity production, both solid biomass conversion and biogas/biomethane production technologies were involved.

3.2. FEFTS types – energy efficiency improvement

As it was presented in Figure 5, as many as 36 FEFTS are devoted to energy efficiency improvement. Among the represented energy efficient measures were: efficient tool with 10 collected FEFTS (most of them identified in the second collection period), precision agriculture with the result of 9 FEFTS, efficient buildings with 4 FEFTS, precision livestock farming with 3 FEFTS, and efficient vehicle and conservation agriculture with only 2 results each. Only 4 FEFTS on energy efficiency improvement remained uncategorized as they offered other types of energy efficiency improvement.

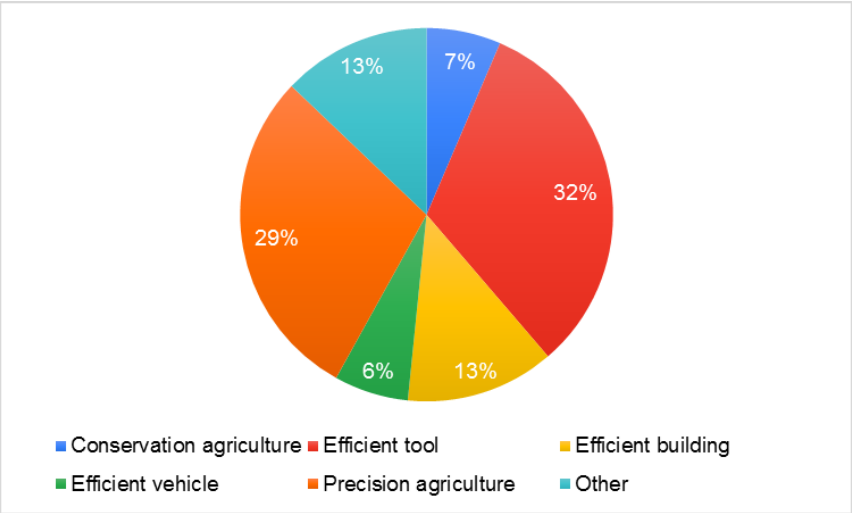

Figure 19. Classification of the FEFTS selected in the first and second collection period, according to the specific measures of energy efficiency improvement

Among the efficient tools, there can be found solutions typically used in agriculture, such as: milking machines, refrigerators, sprayers, drying machines, but also monitoring systems, fast-heating microwaves, or efficient heating and cooling appliances. When it comes to the second most numerous category, namely precision agriculture, the highest number of FEFTS regards fertilization reduction, but there are also examples of pesticide, manure, and water reduction.

3.3. FEFTS types – Soil carbon sequestration

Soil carbon sequestration was the least numerous category of FEFTS types after the first collection period, but gained the second position after the second collection period with the result of 40 FEFTS. Among the collected FEFTS on soil carbon sequestration, 15 to nutrient management practices (increase by 9 in the second collection period), 9 were devoted to tillage (increase by 3), involving tillage reduction and controlled traffic farming. Number of FEFTS on grassland management doubled and reached 6 results, and soil organic matter and soil and water conservation techniques were still represented by 1 FEFTS each. It is worth mentioning that although soil organic matter, and soil and water conservation were not numerous categories among the FEFTS specific to Soil carbon sequestration, they are still well represented in the AgEnergy Platform repository as indirect fossil energy reduction possibilities, offered additionally by FEFTS from the other categories of Clean energy supply and Energy efficiency improvement. One new FEFTS appeared in the category of crop diversification. However, 7 FEFTS still remained uncategorized which may be caused by the difficulty in identifying the prevailing option, since multiple choice was not possible in this question. Those FEFTS may offer universal solutions applicable to different carbon sequestration methods, but also fall out of the scope of the suggested categories. Figure 20

presents categorization of selected FEFTS based on the specific measures of soil carbon sequestration.

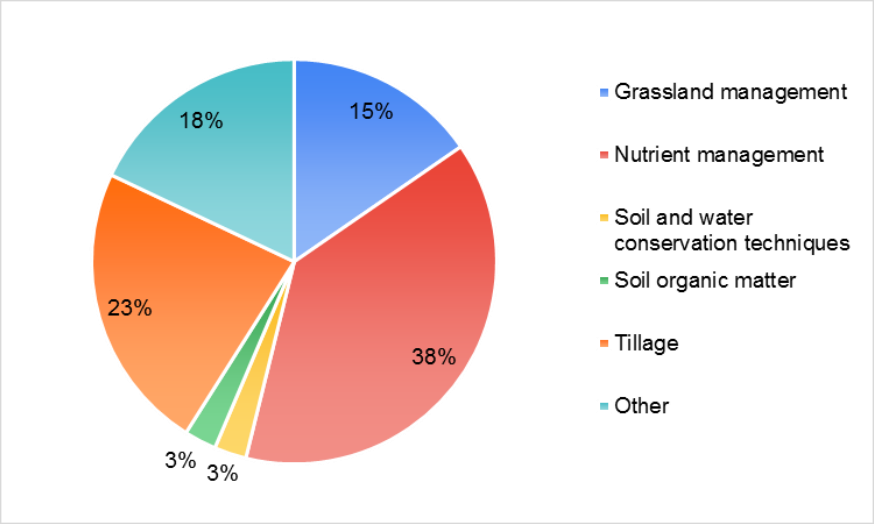

Figure 20. Classification of the selected FEFTS according to the specific measures of soil carbon sequestration

FEFTS on soil carbon sequestration did not involve further categorization of specific measures.

4. Conclusions

The first stage of identification of research projects on FEFTS was quite successful and provided satisfactory results, covering various categories and providing a wide range of solutions for fossil energy free agriculture. During the identification process, several improvements were introduced regarding the questionnaire for research projects submission that allowed for better categorization of identified FEFTS. However, the creation of the AgEnergy Platform is a continuous process that will enable not only enlarging the repository of FEFTS but also further improving the quality and availability of information to the future users of this tool. Analysis of the results collected in the first project period allowed for improvement of categorization of research project results – consisting e.g. of the incorporation of the "energy sales to external consumers" category into more general "energy provision", or a deletion of the "multiple technology application" category, which has been further divided based on the main application. The FEFTS collected in the second project period were categorized based on the amended rules. Still, in several categories discussed in the report some of the FEFTS remained uncategorized, as they offered universal solutions or other, falling out of the suggested scope. They will be further analyzed by the Quality Committee and further amendments may be introduced for the next collection period, if necessary.

Among the research projects identified so far, the most numerous are English language projects and the major funding source is the Horizon 2020 research and innovation program, which is mainly the result of conducting the first and second project search in the CORDIS

repository. Most of the collected projects are dedicated directly or indirectly to farmers and to improving the condition of agricultural environment in general. The most numerous among the presented solutions still are hardware, methodology, procedures, and complete solutions, which may be used mainly in open field agriculture, but also in livestock farming and greenhouses. Many of the identified FEFTS can find multiple applications in agriculture. Implementation of those solutions may have a significant positive effect on the reduction of fossil energy use in tools and equipment electricity consumption, buildings' electricity and heat use or tractors and vehicles fuel consumption. Among the indirect methods of fossil energy reduction, the selected projects can influence fertilizer reduction to the highest extent.

Last but not least, the consortium worked as a unified partnership with all beneficiaries contributing with their maximum effort. We achieved 161 registered research projects, which exceeded the target of 150 FEFTS, thanks to teamwork and the overall diverse contribution. Given the KPI of 1700 FEFTS (of any type) for our repository until the end of the project, both the initial goals that had been set and the vivid reaction of all partners, led to the collection of more than the half FEFTS in total. Another last update report will follow summarizing the total FEFTS gathered in the AgEnergy Platform.

5. Annex

In this section, the material used for the registration is provided in order to support what has been described in the above chapters.

Annex 1: Queries

Queries used for each RES category based on the corresponding keywords and filter options provided by CORDIS

Level 1 RES category	Level 2 sub-categories	CORDIS Query
Solar		contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND ('solar' OR 'photovoltaic'))
Wind		contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND 'wind')
Hydro		contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND 'hydro')
Biomass	Pellets	contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND 'biomass' AND 'pellets')
	Woodchips/ woodlogs	contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND 'biomass' AND (‘woodchip’ OR 'woodlog'))
	Energy crops	contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND 'biomass' AND 'energy crops')
	Agricultural residues	contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND 'biomass' AND 'agricultural residues')
Landfill gas		contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND 'landfill gas')
Biogas		contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2007-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy' AND 'biogas')
Energy type	Heating	contenttype='project' AND programme/code='H2020','FP7'

Cooling	AND startDate>=2011-01-01 AND ('agriculture' AND 'farming' AND 'farmer' AND 'heating' OR 'cooling')
Energy storage	contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2011-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'energy storage')
Energy saving/ energy efficiency	contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2011-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND ('energy efficient' OR 'energy saving'))
Soil carbon sequestration	contenttype='project' AND (programme/code='H2020' OR programme/code='FP7') AND startDate>=2011-01-01 AND (('agriculture' OR 'farming' OR 'farmer') AND 'carbon sequestration')

Annex 2: Research Projects retrieved from survey – 1st collection period

No	Project acronym	Project title
1	3Bee Hive-Tech	3Bee Hive-Tech
2	agrEE	Agriculture and Energy Efficiency
3	AGRI 4 POWER	For a sustainable future
4	agriCOlture	Livestock farming against climate change problems posed by soil degradation in the Emilian Apennines
5	Agri-PV	Agri-PV Insolight's demonstrator
6	AGROinLOG	Demonstration of innovative integrated biomass logistics centres for the Agro-industry sector in Europe
7	AgroRES	Investing in Renewable Energies for Agriculture
8	AgroStrat	Sustainable strategies for the improvement of seriously degraded agricultural areas: The example of Pistachia vera L.
9	AgrowFab (2018)	Far Infrared Radiation Smart Fabric Heating Element for GreenHouses
10	APV Obstbau	Agrophotovoltaics as a resilience concept for adapting to climate change in fruit growing
11	BABET-REAL5	New technology and strategy for a large and sustainable deployment of second generation biofuel in rural areas
12	BacBio	Mechanistic and functional studies of Bacillus biofilms assembly on plants, and their impact in sustainable agriculture and food safety
13	Bazydrill	Innovative technical solutions for grassland reseeding to improve quantity and quality of fodder for ruminants and to protect soil, water and climate.
14	BEST4SOIL	Boosting 4 BEST practices for SOIL health in Europe
15	BESTF3	Bioenergy Sustaining the Future (BESTF) 3
16	BioEcon	New Strategies on Bio-Economy in Poland
17	Biofrigas	Turning manure into fuel: a container based LBG plant for small to medium scale farms
18	BioFuel Fab	Biogas production from non-food lignocellulosic biomass waste
19	BIOGASTIGER	BIOGASTIGER® system – turning global organic waste streams into smart and clean energy
20	BioHotiTech	"Improved bio-inoculation and live plant mulching technologies for integrated horticultural crops"
21	BIOMAN	Economically efficient biogas production from manure fibres and straw
22	BioMet2020	BioMet2020
23	BioVill	Bioenergy Villages (BioVill) - Increasing the Market Uptake of Sustainable Bioenergy
24	biowave	Upscale and demonstration of a integrated novel microwave pre-treatment system for efficient production of biogas from anaerobic digestion of pig manure to create a sustainable waste management system
25	BISON	BIOMASS INTEGRATION FOR SYSTEM OPTIMISATION IN THE HÜMMLING ENERGY REGION

26	BoostCrop	Boosting Crop Growth using Natural Product and Synthesis Enabled Solar Harvesting
27	Citizen led-renovation	Citizen led-renovation
28	DualMetha	A cost-effective process for methanisation of unexploited agricultural waste.
29	Eciwind	Cost effective wind turbine of 40 kW of rated capacity
30	EKoTech	EKoTech project
31	Energy efficient straw boiler with low NOx emission	Energy efficient straw boiler with low NOx emission
32	ENORASIS	ENvironmental Optimization of IRrigAtion Management with the Combined uSe and Integration of High PrecisIon Satellite Data, Advanced Modeling, Process Control and Business Innovation
33	FLEXcoop	FLEXcoop
34	FTI Cocoon	Optimization of the production line of an innovative biodegradable water reservoir to be applied in efficient landscape-scale ecosystem restoration plans
35	Future Cropping	Future Cropping
36	GASFARM	SMALL-SCALE ANAEROBIC DIGESTION FOR AFFORDABLE, EFFICIENT AND SUSTAINABLE MANAGEMENT OF FARMS WASTE
37	GASMETRIC	New multi-parameter automaton for measurement of indoor environmental conditions in livestock exploitations
38	GRECO	Fostering a Next Generation of European Photovoltaic Society through Open Science
39	GREEN SHEEP	Demonstration and dissemination actions to reduce the carbon footprint in sheep farming
40	Green-DROP (2018-2020)	Precise subarea specific irrigation and fertilization system
41	GW-FortyForty (2016)	Gaia-Wind's Advanced Small Wind Turbine FortyForty
42	H2AD-aFDPI	Innovative and scalable biotechnology using Microbial Fuel Cell and Anaerobic Digestion for the treatment of micro-scale industrial and agriculture effluents to recover energy from waste
43	H2Agrar	Development of a green water supply for the agricultural region of Lower Saxony - Model Region Haren (Ems) / Emsland
44	HarvPell (2017)	Upscale and redesign of a mobile harvesting and pelletizing disruptive all-in-one machine
45	HyPErFarm	HYDROGEN AND PHOTOVOLTAIC ELECTRIFICATION ON FARM
46	HyPump (2016-2017)	Enabling Sustainable Irrigation through Hydro-Powered Pumps for Canals
47	HyPump (2017-2020)	Enabling Sustainable Irrigation through Hydro-Powered Pumps for Canals
48	ICaRE4Farms	Increase the capacity of Renewable Energies (RE) in Farms in the North West Europe Region by using Solar Thermal Energy
49	Impacts of Renewable Energy on European Farmers (2338 ID)	Impacts of Renewable Energy on European Farmers

50	INNOWIND (2018)	Low-cost and low-maintenance innovative mid-power horizontal axis wind turbine operable with low winds and small installation areas.
51	INSYLO	Disruptive IoT solution for optimising the animal feed supply chain
52	IoF2020	INTERNET OF FOOD & FARM 2020
53	ISAAC	Increasing Social Awarness and ACceptance of biogas and biomethane
54	KUDURA	Upscaling of a portable hybrid solution for power supply, smart waste-to-energy
55	AGROMITIGA	Development of climate change mitigation strategies through carbon-smart agriculture
56	GAIA Sense	Innovative Smart Farming services supporting Circular Economy in Agriculture
57	AGRICARBON	Sustainable agriculture in Carbon arithmetics
58	CLIMAGRI	Best agricultural practices for Climate Change: Integrating strategies for mitigation and adaptation
59	LIFT	Low-Input Farming and Territories Integrating knowledge for improving ecosystem-based farming
60	MacroFuels	Developing the next generation Macro-Algae based biofuels for transportation via advanced bio-refinery processes
61	MASLOWATEN	MArket uptake of an innovative irrigation Solution based on LOW WATer-ENergy consumption
62	MUBIC	Mushroom and biogas production in a circular economy
63	MYFOOD (2018)	An Innovative Smart Greenhouse System based on Aquaponics, Bioponics and Permaculture for Self-Production of Safe and Ultra-Fresh Food
64	N/A	Solar pumping for irrigation with solar trackers
65	NoAW	Innovative approaches to turn agricultural waste into ecological and economic assets
66	Olefine	Safe replacements for insecticides enabled by biotechnology
67	OPTIFERT (2011-2013)	Development of an automatic irrigation and fertilization system
68	PanePowerSW (2017)	Transparent Solar Panel Technology for Energy Autonomous Greenhouses and Glass Buildings
69	PanePowerSW (2020-2022)	Transparent Solar Panel Technology for Energy Autonomous Greenhouses
70	PELLETON	PELLETON – a device for production of pellets from biomass and agricultural waste for energy purposes
71	Poul-AR	Poultry manure valorization
72	Proxipel	Mobile pelletizing unit
73	PVCROPS	PhotoVoltaic Cost r€duction, Reliability, Operational performance, Prediction and Simulation
74	RES4LIVE	Energy Smart Livestock Farming towards Zero Fossil Fuel Consumption
75	RESFARM	Developing and implementing financial instruments for the mobilisation of investments in renewable energy in the agrarian sector
76	SEEMLA	Sustainable exploitation of biomass for bioenergy from marginal lands in Europe
77	SEFI	Solar Energy for Food Industry

78	SET-Nav	Navigating the Roadmap for Clean, Secure and Efficient Energy Innovation
79	SmartAgriHubs	Connecting the dots to unleash the innovation potential for digital transformation of the European agri-food sector
80	Smart-AKIS	Smart-AKIS: European Agricultural Knowledge and Innovation Systems (AKIS) towards innovation-driven research in Smart Farming Technology
81	Smartmushroom	Smart MAnagement of spent mushRoom subsTrate to lead the MUSHROOM sector towards a circular economy
82	SolAqua	Accessible, reliable and affordable solar irrigation for Europe and beyond
83	Solar-Win	Next generation transparent solar windows based on customised integrated photovoltaics
84	SPIRE	A Photovoltaic Plant with thermal co-generation
85	SPRHOUT (2018)	SPRHOUT (Solar PoweRed Horticultural Off-grid UniT) – the first economically viable off-grid energy system to power horticultural projects, boosting the transition towards sustainable food provision
86	SULTAN	SUstainabLe Tunnel Agriculture with light cascade techNology
87	SUN4GREEN (2015)	MAXIMISING SUNLIGHT RESOURCES FOR COST, ENERGY AND YIELD EFFICIENT GREENHOUSES
88	SUN4GREEN (2017-2019)	MAXIMISING SUNLIGHT RESOURCES FOR COST, ENERGY AND YIELD EFFICIENT GREENHOUSES
89	SUNINBOX (2015)	Portable SolUtioN for dIstributed geNeration in a BOX
90	SUNINBOX (2017)	Portable solar energy system powers rural development
91	sunlight2.0	Highly efficient, solar-powered irrigation pump
92	SWITLER (2016)	SWITLER: Small WInd Turbine Lightwight Efficient generatorR
93	SX1.3	Earth Observation by Autonomous Solar UAV
94	SYSTEMIC	SYSTEMIC - Circular solutions for biowaste
95	TheGreefa	Thermochemical fluids in greenhouse farming
96	TPX-Power	Waste Heat Recovery Through Near-Field Thermophotonics
97	uP_running (2016-2019)	Take-off for sustainable supply of woody biomass from agrarian pruning and plantation removal
98	Venturas (2018)	SMALL WIND ENERGY, A HIGHLY EXPLOITABLE RESOURCE
99	WASTE2WATTS	Unlocking unused bio-WASTE resources with loW cost cleAning and Thermal inTegration with Solid oxide fuel cells
100	WATERAGRI	"Water Retention And Nutrient Recycling In Soils And Streams For Improved Agricultural Production”
101	WiseGRID	WiseGRID
102	ZeoBio-NG	Innovative biogas upgrading system based on novel Zeolite adsorbent technology for producing Bio-based Natural Gas

Annex 3: Research Projects submitted to the AgEnergy Platform – 2st collection period

No	Project acronym	Project title
1	SAGRI	SAGRI – “Skills Alliance for Sustainable Agriculture"
2	PLANET	Erasmus Project PLANET Plan for Agriculture reNewable Energy Training
3	FIELDS	FIELDS – ANALYSIS OF SKILLS GAPS AND STRATEGIES FOR BIOECONOMY, DIGITALISATION AND SUSTAINABILITY
4	MilkGuard	A continuous milk disinfection system for calf feeding on-farm
5	ENFIR	ENergy efficient Far InfraRed process of manure valorisation
6	VALI	Conversion of manure to energy with the VALI solution
7	PROMETHEUS-5	Energy efficient and environmentally friendly multi-fuel power system with CHP capability, for stand-alone applications.
8	Drygair20	Energy efficient greenhouse dehumidifier for warm climate operating at wide temperature ranges (4-40° C) and free of fluorinated gases
9	inteGRIDy	integrated Smart GRID Cross-Functional Solutions for Optimized Synergetic Energy Distribution, Utilization Storage Technologies
10	ENTHALPY	Enabling the drying process to save energy and water, realising process efficiency in the dairy chain
11	ENREMILK	Integrated engineering approach validating reduced water and energy consumption in milk processing for wider food supply chain replication
12	greenGain	Supporting Sustainable Energy Production from Biomass from Landscape Conservation and Maintenance Work
13	SCOoPE	Saving COOPerative Energy
14	VegWaMus CirCrop	Developing commercial mushroom and vegetable production in an integrated food to waste to food biosystem.
15	Residue2Heat	Renewable residential heating with fast pyrolysis bio-oil
16	Schneeberger	IoT PTO Generators for Emergency Power Supply
17	DryCoolerSeeds	Optimum, sustainable solution for seed drying and conservation
18	REEEM	Role of technologies in an energy efficient economy – model-based analysis of policy measures and transformation pathways to a sustainable energy system
19	HACKS	Heating And Cooling Know-how and Solutions
20	ECO-LOGIC GREEN FARM	Design of an agricultural greenhouse for intensive growing of microalgae in fresh / seawater with a syngas production plant and organic farming of chickens and pigs outdoors.
21	AdD HyStor	Demonstration of dynamic grid stabilisation with an Adaptive-flywheel/battery Hybrid energy Storage system in Ireland and UK

22	CareSTOR	Market Uptake of Sustainable and Competitive Carbons for Energy Storage
23	Circular Agronomics	Efficient Carbon, Nitrogen and Phosphorus cycling in the European Agri-food System and related up- and down-stream processes to mitigate emissions
24	H3O	Healthy crop, Healthy environment, Healthy finances ... through Optimization
25	AgriCloud P2	Demonstration of a cloud-based precision farming management system for a sustainable and intensive agriculture to secure long-term food supply in Europe - Phase II
26	MobiLab	Development of a mobile device for the quick on-site measurement of soil nutrients
27	MobiLab	Development of a mobile device for the quick on-site measurement of soil nutrients
28	Nutri2Cycle	Transition towards a more carbon and nutrient efficient agriculture in Europe
29	HybridFarm	Eco-innovative housing solution for efficient production of slaughterpigs with limited environmental impact.
30	BBFB	Biomass to Biochar for Farm Bioeconomy
31	C-HEAT	Condensed Heat - Optimization and scaling up of an energy efficient, long-during biomass condensation boiler with curved heat exchanger
32	MAIL	Identifying Marginal Lands in Europe and strengthening their contribution potentialities in a CO2 sequestration strategy
33	SOILCARE	Soil Care for profitable and sustainable crop production in Europe
34	LIFE AMIA	INNOVATIVE COMBINATION OF WWT TECHNOLOGIES FOR WATER REUSE: ANAEROBIC-AEROBIC, MICROALGAE AND AOP PROCESSES
35	LIFE STO3RE	Synergic TPAD and O3 process in WWTPs for Resoruce Efficient waste management
36	LIFE PRIORAT+MONTSANT	Efficiency in the use of resources for the improvement of sustainability of vine and wine sector at Priorat region
37	LIFE LEMNA	DUCKWEED TECHNOLOGY FOR IMPROVING NUTRIENT MANAGEMENT AND RESOURCE EFFICIENCY IN PIG PRODUCTION SYSTEMS
38	MATCH	Smart Energy for the End-User: A Feasibility Study from Samso, Denmark
39	LIFE DOP	Demonstrative mOdel of circular economy Process in a high quality dairy industry
40	LIFE+ REWIND	PROFITABLE SMALL SCALE RENEWABLE ENERGY SYSTEMS IN AGRIFOOD INDUSTRY AND RURAL AREAS: DEMONSTRATION IN THE WINE SECTOR.
41	LIFE VINEYARDS4HEAT	Vineyards for carbon footprint reduction: a sustainable strategy to use biomass for heat & cold in wineries.
42	LIFE - F3	LIFE Farm, Fresh Fruit
43	Life+ ClimAgri	Best agricultural practices for Climate Change: Integrating strategies for mitigation and adaptation
44	LIFE+Farms for the	Farms for the future: Innovation for sustainable manure management from farm to soil

	future	
45	LIFE-Dairyclim	Feeding strategies to decrease methane emissions and carbon footprint of dairy cows in Belgium, Luxembourg and Denmark
46	LIFE WINEgROVER	Precision Agriculture System to limit the impact on the environment, on health and on air quality of grape production.
47	LIFE+ VALPORC	Valorization of pig carcasses through their transformation into biofuels and organic fertilizers
48	LIFE LiveAdapt	Adaptation to Climate Change of Extensive Livestock Production Models in Europe
49	AgroCycle	Sustainable techno-economic solutions for the agricultural value chain (AgroCycle)
50	CONVERGE	CarbON Valorisation in Energy-efficient Green fuels
51	AgroRes	Agro Res
52	ICaRE4Farms project	Supporting Solar Thermal Energy on the farm
53	Webinar	Research Insights Webinar
54	FarmZeroC	Farm Zero C
55	LIFE VineAdapt	Sustainable Viticulture for Climate Change Adaptation
56	LIFE agriCOlture	Livestock farming against climate change problems posed by soil degradation in the Emilian Apennines
57	OLIVE4CLIMATE - LIFE	OLIVE4CLIMATE - LIFE. CLIMATE CHANGE MITIGATION THROUGH A SUSTAINABLE SUPPLY CHAIN FOR THE OLIVE OIL SECTOR
58	BIOWILL	BioWILL - An Integrated Zero Waste Biorefinery
59	LIFE_FERTILIFE	Development and implementation of a result-based funding mechanism for carbon farming in EU mixed crop livestock systems
60	LIFE SEED CAPITAL	INTEGRAL USE OF OIL SEEDS TO REDUCE GREEN HOUSE GASES EMISSIONS ASSOCIATED WITH FARMING ACTIVITIES
61	LIFE-CO2-INT-BIO	CO2 emissions reduction by industrial integration and value chains creation
62	LIFE BEEF CARBON	Demonstration actions to mitigate the carbon footprint of beef production in France, Ireland, Italy and Spain

Also the link for the online spreadsheet that contains all the information of the FEFTS on Research Projects gathered so far from both collection processes is presented here.

https://docs.google.com/spreadsheets/d/1NU4J08GXusngT8PT_qUesEPjEhSbhl2kRDV4jbA8T0Y/edit#gid=904253802

Annex 4: Research Projects Survey

As it has been mentioned in the report, with the official launch of the AgEnergy platform, the use of the Google forms survey has been discontinued. Instead, all interested users can now access the platform and add their FEFTS directly by simple creating a free account. The following link is the link to the AgEnergy platform.

https://platform.agrofossilfree.eu/en