



Report on industrial FEFTS Solutions – 1st Update

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Abstract

This document presents the registered industrial Fossil Energy Free Technologies and Strategies (FEFTS) solutions in the inventory of AgroFossilFree and gives an initial analysis based on current collection status. Until August 2022, 436 (178 from the first batch) industrial technologies are registered by the consortium. The majority of the collected technologies are from Europe. Most attention is paid to open-field agriculture, but livestock and greenhouses are also vital. Improvements in energy efficiency, as well as renewable energy production and soil carbon sequestration, are all important, hence many technical applications are common. Most of the technologies focus on farmers, as well as producers' associations, companies and industry. These technologies are mainly complete solutions and hardware and can mostly be used in open field agriculture. However, many technologies also can be implemented for livestock and greenhouses. The agricultural applications of collected technologies are mostly agricultural field practices and energy provision. Most of the FEFTS are under the energy efficiency improvement category and the least in soil carbon sequestration. Overall, collected commercial technologies can directly reduce fossil energy use through the reduction of building electricity consumption and indirect energy inputs reduction through pesticide, fertilizer and tillage reduction. The process of registration of industrial FEFTS is continuous and will go forward until the end of the project lifetime to build an informative platform for everyone to access. This is the first update for Del.2.8; further report (at Month 36) will reflect revised results until then.

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1. Introduction

1.1 Background Information

Novel Fossil-Energy-Free Technologies and Strategies (FEFTS) that are related to more sustainable energy production and use, have been developed by industry and research entities. More specifically, they refer to the tools that are required to address cleaner and more efficient energy production and use in all kinds of agricultural activities. The main focus of this document, is to provide a report about the commercial FEFTS solutions that are collected as part of the AFF repository. These kinds of FEFTS can (or could potentially) be used by a wide variety of agricultural stakeholders towards defossilization of EU agriculture.

According to the methodology and standards provided by D2.1, an already existing commercial technology or strategy could be considered as FEFTS, after an initial identification, where its specific characteristics are effectively categorized in a series of fields of interest:

- a) the agricultural application field (for which purpose the energy is produced/used)
- b) the way that they promote/contribute to defossilization:
 - (i) Supply of Clean Energy (either for energy production or storage) to substitute fossil energy
 - (ii) Energy Efficiency Improvement in comparison to conventional technologies/practices
 - (iii) Soil Carbon Sequestration which is an auxiliary category that mainly plays a Greenhouse Gas (GHG) compensation role (rather than green energy production or fossil fuel reduction (or elimination) means).

In more detail, Clean Energy Supply is primarily subdivided to energy production and storage systems, then the Renewable Energy Source type, the type of used energy (electrical, kinetic, chemical, etc.) and finally the specific technology used. The Energy Efficiency Improvement category is subdivided to the specific kind of energy improvement (efficiency on buildings, vehicles, tools, precision agriculture or livestock farming, etc.) and the corresponding technologies used for the aforementioned purposes. Soil Carbon Sequestration is further analyzed in terms of methods such as soil organic matter, minimum/ no tillage, nutrient management, crop diversification, etc. The FEFTS categories and subcategories are presented in Table 1.

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

		Energy Technologies	mechanical energy	
			chemical energy	
			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		

Under FEFTS level 2 sub-category, practical methods are clarified (for details, see FEFTS level 3 sub-category from Deliverable 2.1, Table 4 to Table 10).

Main aim of this deliverable is to update the previous report (D2.8) and present all the industrial FEFTS solutions registered, by both the consortium and outside companies, according to FEFTS categories above and give an analysis based on current collection status.

1.2 Methodology

In order to create the AgroFossilFree (AFF) database in a use-friendly way, WIP and other partners followed the three phases methodology that was developed in D.2.1 in order to register commercial FEFTS (Fossil-Energy-Free Technologies and Strategies).

During Phase 1 (Initial Identification), all AFF partners conducted desk work (internet search) in order to identify commercial FEFTS. The whole concept was to identify all kinds of such technologies and strategies (complete solutions, hardware, software, methodologies, components, and procedures) that promote the defossilization of EU agriculture and are commercially available. This was done by creating search queries (using popular search engines) on the internet based on the 3 level categorization (and especially keywords/terms of level 3) provided also on Deliverable 2.1. In terms of sources targeted, all the commercial technologies mainly come from FEFTS manufacturers and retailers and are useful for a series of stakeholders (individual farmers, producers associations, energy generators, contractors, advisory services, companies, industry and even policy makers).

During Phase 2 (Survey), the consortium collected commercial technologies either using an online survey document (a Google Forms was used for the first FEFTS collection process – 1st batch) or through AgEnergy platform environment (during second collection process – 2nd batch) which contains all necessary information that were used in Chapter 3 (Analysis). During

the second FEFTS collection process, the Google Forms survey was discontinued and the consortium and all interesting stakeholders directly registered FEFTS through the AgEnergy platform exclusively. According D.6.5 - 2nd Meeting Minutes, the Project Management Team (CERth) together with WP2 and WP5 partners decided to prepare means of communication (letter, email, video) including clear benefits for companies to join the platform in order for all partners to communicate the same/similar message while engaging with potential stakeholders. In this way, the contribution of commercial products by the manufacturers/companies themselves were significantly reinforced (especially after the launch of AgEnergy platform). In this context, a promotional letter was provided to all AFF partners so that they could send/share with commercial FEFTS producers/manufacturers of their choice (see Annex).

In this way, externals (companies/manufacturers) could directly submit their technologies to the Google Forms (for the time being) and in the AgEnergy platform after its launch. Apart from that, INI created a video (see Annex) to attract companies and stakeholders to register their FEFTS.



Figure 1. Promotional video

Finally, during Phase 3 (Data Aggregation), the survey results and collected metadata from previous phases was cleared of malicious, duplicate and incomplete entries in order to ensure data integrity and unbiased analysis in later phases of the AgroFossilFree project.

As it is clearly stated in all the deliverables of WP2 (D2.2, D2.5, D2.8, D2.11, D2.14), after the beginning of FEFTS registration process and the achievement of our first internal milestone of submitted commercial FEFTS (200 products) in the inventory (until the end of September 2021), the screening process was scheduled to begin before the launch of the platform. In this way, the AgEnergy platform was filled with high quality and relevant innovative commercial FEFTS. As first step all records were initially 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. This initial screening round was carried out for each FEFTS category by the corresponding Task Leader. In the case of commercial FEFTS (industrial products), WIP was responsible for the procedure (and will continue to be in charge for the second batch of FEFTS as well). In order for all the Task Leaders to complete the screening process, acceptance and exclusion criteria had to be set. To do so, frequent meetings between the Task Leaders were arranged (through Microsoft Teams platform), in order to discuss the matter and agree on the screening procedure for every FEFTS type.

During these meetings, it was decided that a FEFTS Quality Committee consisting of the Task Leaders of WP2 would be set for the aforementioned purpose. The main role of this Committee is the screening of all the FEFTS submitted on the platform. It should be mentioned that the FEFTS submitted from each Task Leader were already checked for their

appropriateness, to be uploaded in the inventory, based on the methodology followed by each Task. Our database is open for public entry so that interested stakeholders are able to input additional data. Their entries remain unpublished until they are validated by the FEFTS 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.

For the collection of the second batch of FEFTS, partners registered them directly on the AgEnergy platform. A guidance was created to help partners in this process (Figure 2). The aforementioned screening procedure will also take place for the 2nd batch of collected FEFTS in due time.

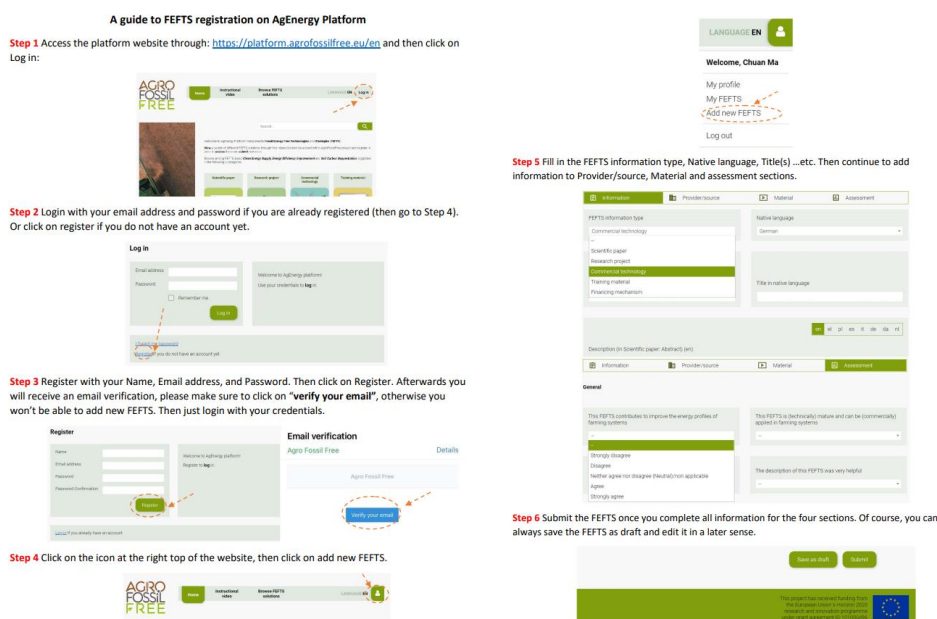


Figure 2. A guide to FEFTS registration on AgEnergy Platform

2. Survey

The structure of the conducted survey is extensively defined in Deliverable 2.1. The form (see Annex) consists of 4 basic sets of questions. The first section is about general information of the identified commercial FEFTS such as the FEFTS name and category, as well as some basic information of the person registering the FEFTS, his/her contact email and the respective organization. The second section is about more detailed information on the commercial FEFTS such as the product name and general information about the manufacturer/company (such as the number of employees, headquarters' address, etc.). The third section is about the FEFTS specification (such as the most applicable agricultural domains, keywords) and the application field. The fourth section is the most important one as it consists of detailed information on the type of FEFTS that is being submitted. The three categories to choose from are: Clean Energy Supply, Energy Efficiency Improvement and Soil Carbon Sequestration, followed by specific sub-categories. The last section is the general assessment of the FEFTS. In this section, the user must answer some questions on the socioeconomic, environmental and general status of his/her FEFTS based on the available information.

It should be mentioned here that both the structure of the survey as well as the analysis of the FEFTS that are presented in Chapter 3, are based on the structure established on D2.1. A basic schematic of this structure is already provided in Table 1. The AgEnergy platform's submission form follows the same structure as the one provided via the online Google survey.

2.1 Data Collection – Partner’s Role

By the end of August 2022, 692 FEFTS instead of 680 (initially planned) were collected in total. Among this, 258 commercial technologies were collected. Table 2 shows the number of new FEFTS achieved per category as well as the goals set for the second batch.

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

2.2 Acceptance and exclusion criteria

For the case of commercial FEFTS, they had to have clear agricultural application potential, represent innovative energy saving or clean energy supply (production or storage) technologies. In general, the most appropriate commercial technologies or strategies are the ones having strong potential to be used by a farmer in his/her farm (i.e. energy saving market-ready FEFTS solutions, new ways to produce energy in a sustainable way, etc). Regarding the exclusion criteria, as invalid records were considered entries without clear alternative solution for the fossil fuel use in agriculture.

2.3 General information about the collected commercial FEFTS

In this section, general information about the companies of the collected commercial FEFTS will be presented. The origin country of the companies is shown in Figure 3. Following this, in Figure 4 the sizes of the companies is presented.

As shown in Figure 3, for the second batch, most of the companies (manufacturer’s origin or headquarters’ basis in case of international companies) come from the Netherlands (53), tightly followed by Germany (48). In addition there are FEFTS originated by other countries as well, such as Spain (24), Denmark (22) and England (19). Italy and Poland both have 17 companies that have commercial products presented on the AgEnergy platform.

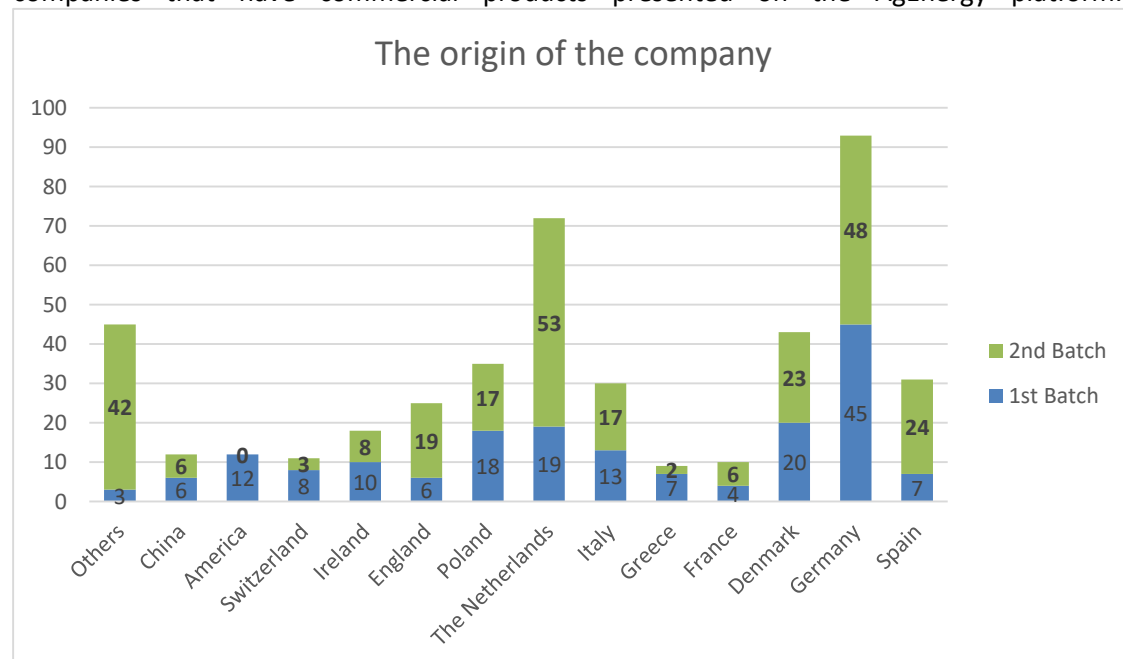


Figure 3. The collected companies’ origin countries

Figure 4 presents the size of the companies. As this data is not published by most of the companies, hence 133 (75%) of them remains unknown. Other than that, 14 (8%) companies have 51-250 employees. 31 (17%) companies have more than 251 employees.

For the second batch, still most companies' sizes remain unknown (50%). 17 companies have 1 to 10 employees, 50 companies with 11 to 50 employees, 51 companies have 51 to 250 employees, and 60 companies have more than 251 employees.

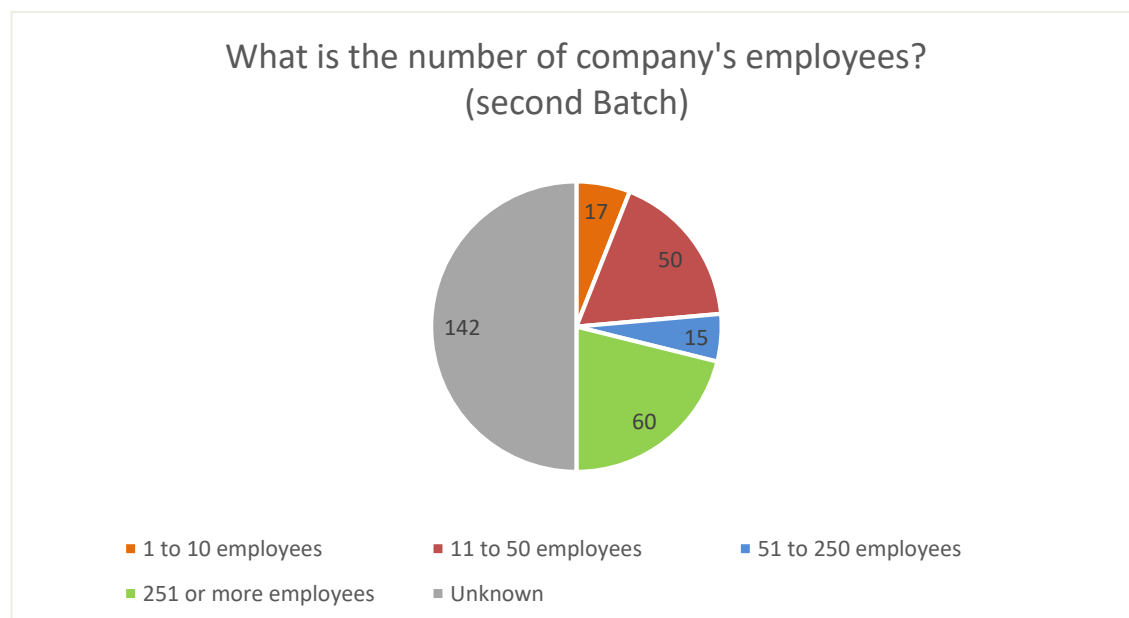
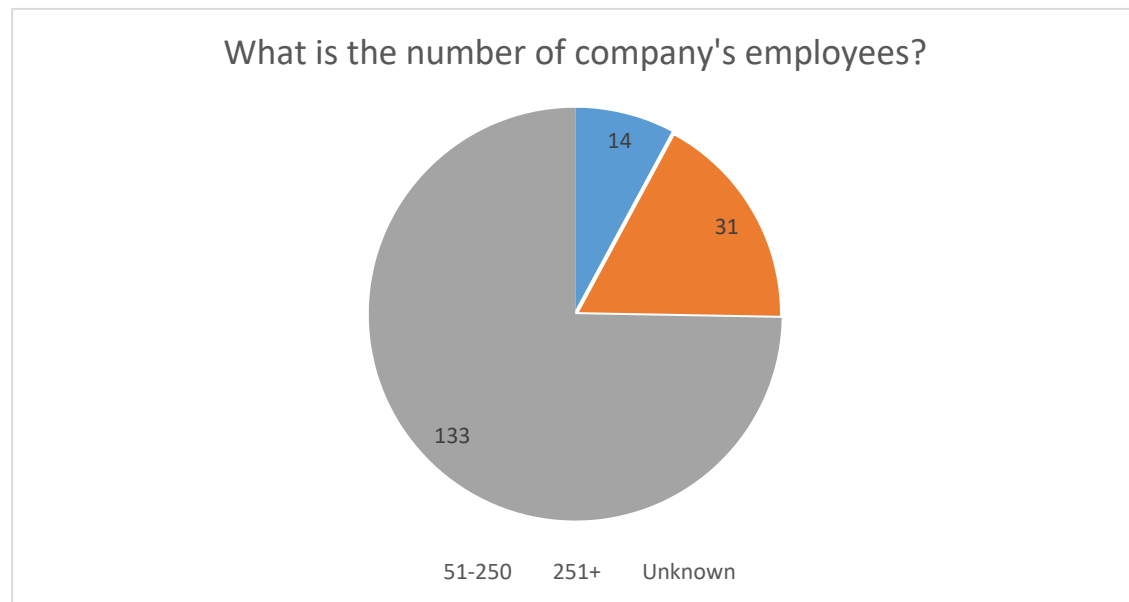


Figure 4. The number of the collected companies' employees

3. FEFTS Analysis

3.1 FEFTS specifications and applied sector

Figure 5 shows the intended users of collected commercial FEFTS technologies (for each FEFTS, multiple users' categories that fit to its use could be selected). For the first batch, farmers appear to be the ones that will be the most interested stakeholders for the collected FEFTS, as 171 different FEFTS are targeted to their needs. Industry, producers' associations and companies are the second most interested types of stakeholders (84, 77, 71 FEFTS respectively). Energy generators are also important, as 49 technologies are intended for them. Contract and advisory services appear to be of less interest regarding these technologies with only 24 and 18 technologies for them respectively. Finally, 9 FEFTS could be considered as important ones for Policy makers.

For the second batch, still most of the FEFTS collected (251) target on farmer's needs, as it is always our focus. This is followed by producers' association, of which 125 FEFTS serve their interest. Companies and Industry are also important stakeholders' categories, as 88 and 69 FEFTS could be quite interesting for them respectively. Energy generators, contactors and advisory services have 33, 16 and 23 FEFTS targeting on them. Finally, there are 3 FEFTS that could be of consideration for policy makers, and 11 for other audience.

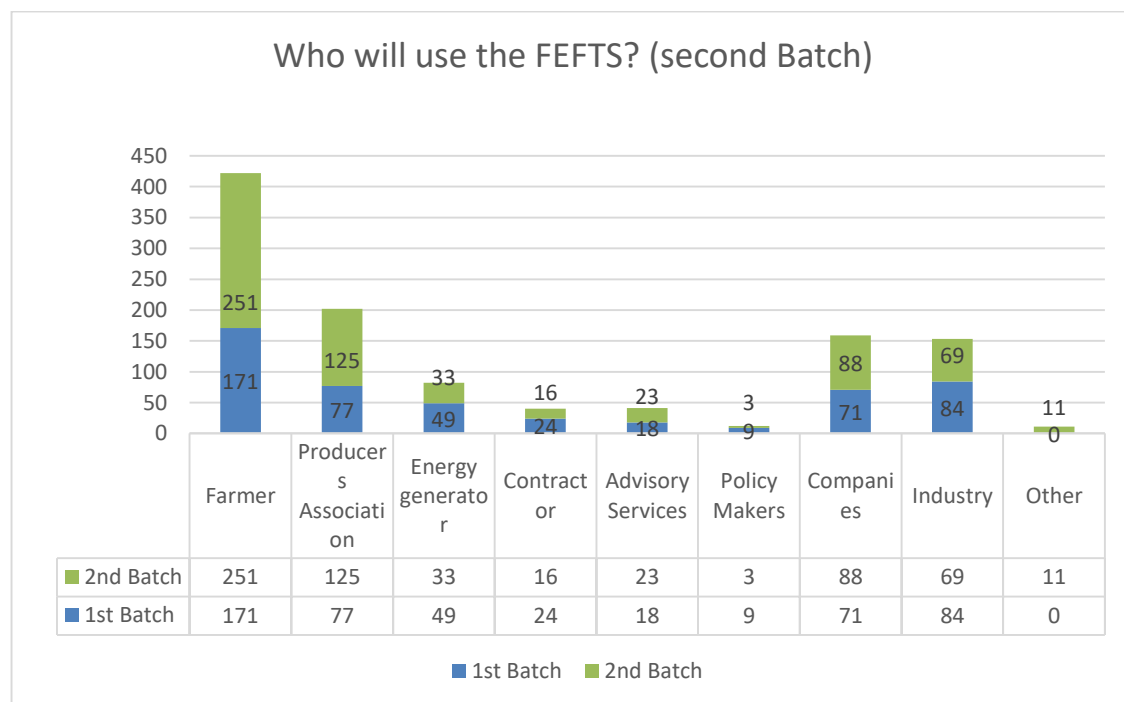


Figure 5. User groups for which the commercial technologies are intended

Next, the FEFTS technology type is analyzed (Figure 6). The majority of the commercial FEFTS submitted are complete solutions (152) and hardware (112). Whereas, 17 commercial technologies are software, while 6 are methodologies and 9 are procedures.

For the second batch, there are more hardware solutions (144) than complete solutions (103). More software solutions appeared than the first batch. On the one hand, this might be due to our effort to enhance the platform the platform and incorporate more digitalized services and tools, but also due to the current growing trend of digital technologies use. The rest of commercial FEFTS are methodologies (4), procedures (6) and of other type (3).

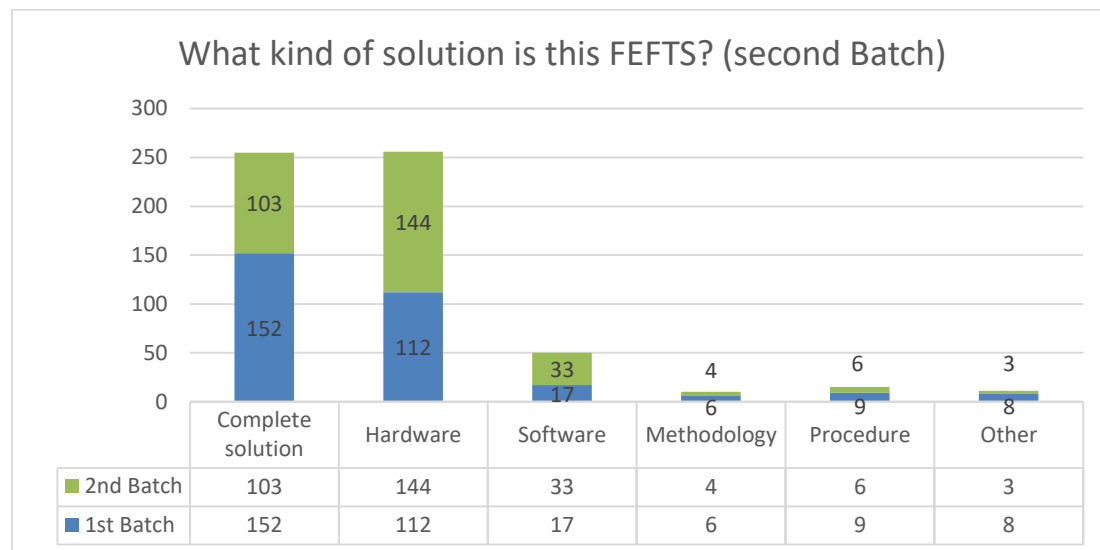


Figure 6. The type of collected commercial FEFTS

Regarding the agricultural domain of these FEFTS (open-field agriculture, livestock facilities and greenhouses), most of the commercial FEFTS are suitable and can be used in applications of open-field crop production (127). 96 of the collected technologies can be applied in livestock buildings and 85 are applicable in greenhouses. This shows that most of the technologies are accessible in multiple agricultural domains (see Figure 7).

For the second batch, most of the commercial FEFTS can be used directly in livestock buildings, while 140 are for open-field agriculture applications and 127 for greenhouses. However, the overall ranking of these categories remained the same. Most of the commercial technologies can be used in multiple domains and this is the reason the results do not sum up to the total number of Commercial FEFTS submitted.

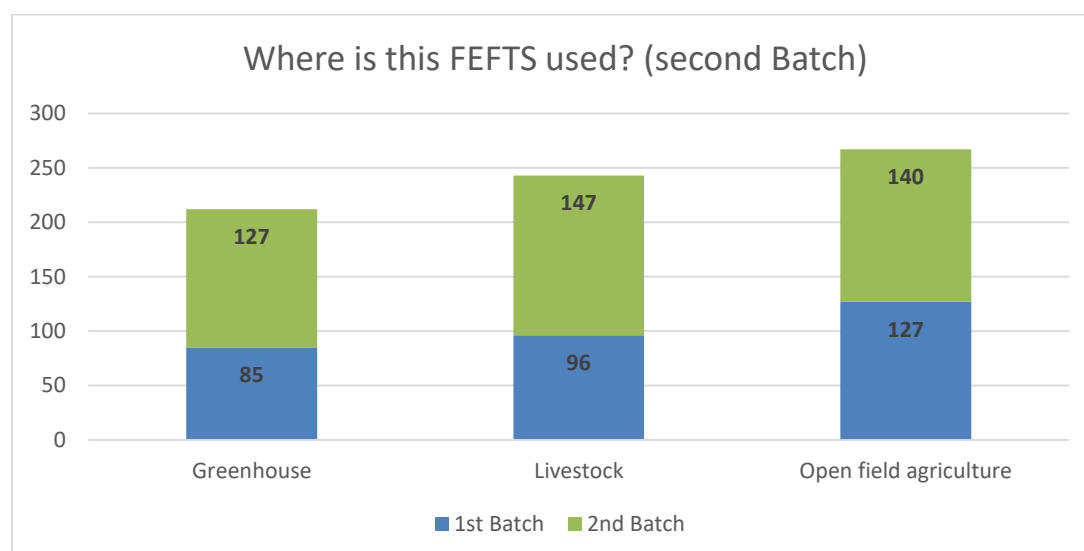


Figure 7. The agricultural domain of the collected commercial FEFTS

3.2 FEFTS application field

In the next diagram (Figure 8), the types of agricultural application of the collected commercial technologies are presented. Most of the technologies are agricultural field practices, multiple technology applications and energy provision, with 40, 38 and 37 commercial products respectively. Heating and cooling for agricultural constructions get 22 technologies supported, while both energy sales to external consumers and vehicles have 13 technologies registered

each. 7 technologies are registered under tools, 4 for process heat/cold and 3 for lighting. It should be mentioned that during the 1st screening procedure, all the FEFTS that were listed as multiple technology applications were categorized correctly as now the platform allows users to choose more than one category for a FEFTS.

So for the second batch, most of the technologies are agricultural field practices, energy provision and heating and cooling of agricultural constructions, with 77, 78 and 42 commercial products respectively. Tools get 34 technologies supported, while vehicles have 19 technologies registered. 10 technologies are registered under lighting, 6 for process heat/cold and 5 for heat sales to district heating. There are no energy sales to external consumers FEFTS in this batch.

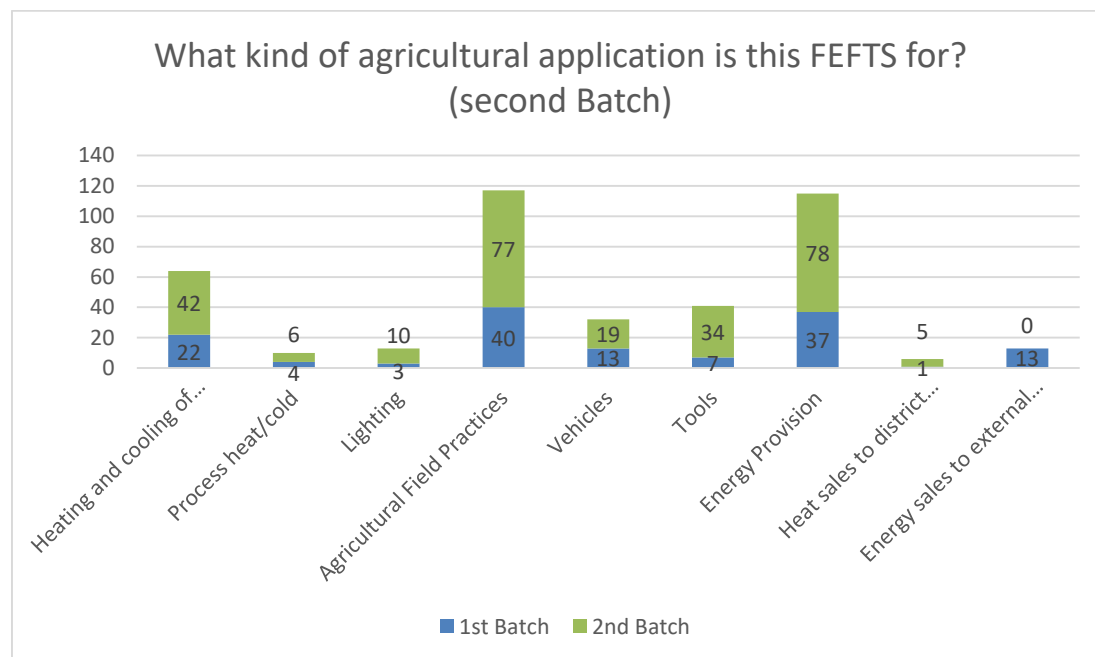


Figure 8. Types of agricultural application of collected FEFTS commercial technologies

Regarding the types of the collected commercial products, during the first batch, it can be seen in the next figure that most of them (56%) are under the Clean Energy Supply category, with 95 available solutions, followed by 65 commercial products listed under Energy Efficiency Improvement, with the ratio of 38%. Soil Carbon Sequestration had the least registration, with 9 products which correspond to 6% of the total submissions. For the second batch, more than half of the commercial technologies (144) are for Energy Efficiency Improvement (the current geopolitical condition might have an impact on this change), with 89 FEFTS being on clean energy supply, and only 25 for Soil Carbon Sequestration.

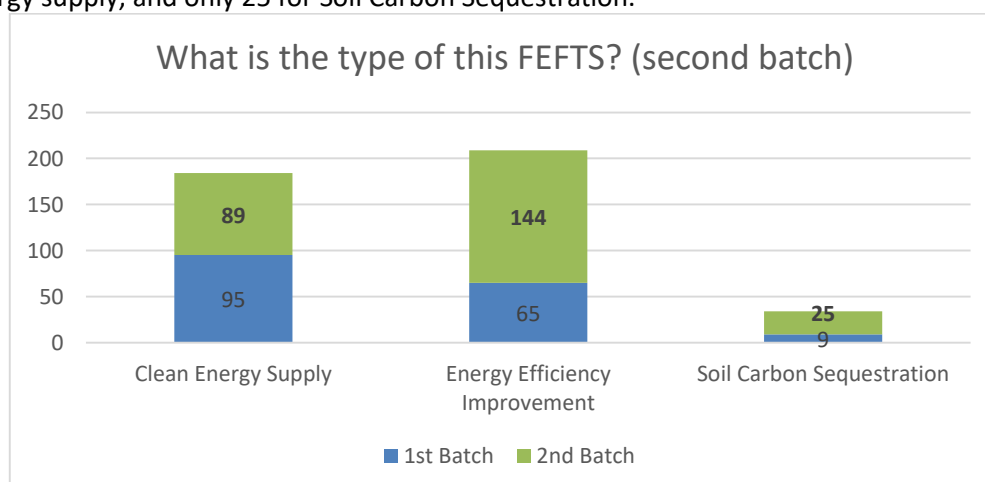


Figure 9. Type of the collected commercial FEFTS technologies

It is clear that during the next period of the project Soil Carbon Sequestration is a category that could be further enhanced. However, it has to be taken into consideration that Carbon Sequestration in general is related more with applying specific practices and methodologies rather than purchasing and implementing commercial products that are available on the market.

3.2.1 Clean Energy supply

The figure below shows the energy type of the technologies under the Clean Energy Supply category. Energy Production System Technologies are mostly registered for the first batch (87, 92%), while Energy Storage Systems stand for 8% (8 products listed in total). For the second batch, the situation is similar to the first batch, with 85 commercial technologies registered under Energy Production Systems category, while 4 FEFTS under Energy Storage Systems.

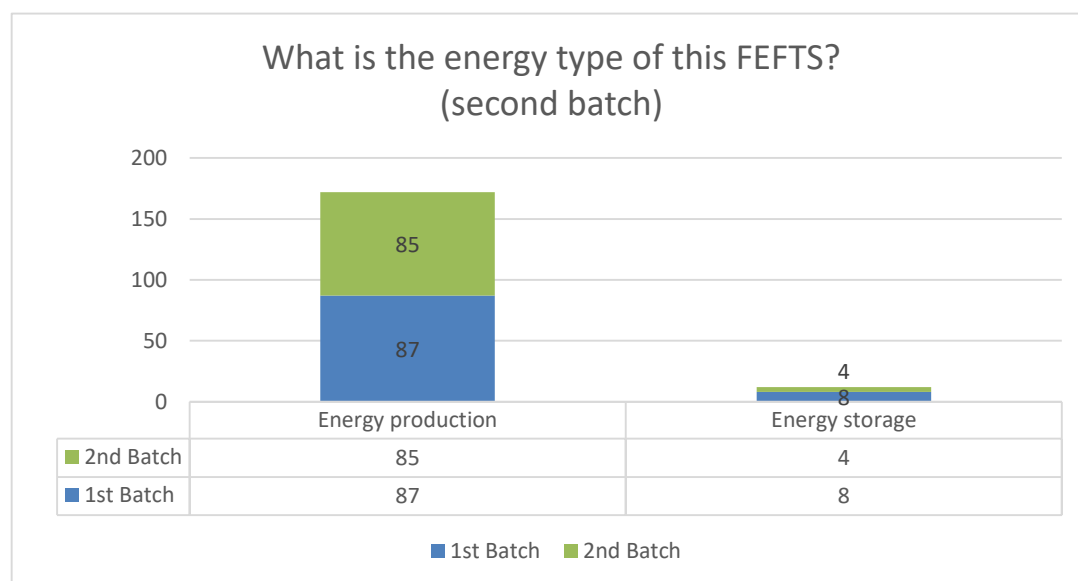


Figure 10. The Energy type of collected FEFTS commercial technologies

As Energy Production System is the predominant type of technology, it is important to analyze the next category which is the renewable energy that is used. Figure 11 shows that, for the first batch, the renewable energy source that most FEFTS used was solar energy (29 out of 87), followed by wind energy and biomass, with 17 (out of 87) products registered in each one of them. Sewage treatment plant and biogas category had 10 commercial products registered.

For the second batch, the renewable energy source that most FEFTS use is still solar energy (35), followed by biomass (16), with 12 commercial technologies using wind energy and 7 of them using sewage treatment plant gas/biogases. Geothermal energy had 3 products registered, and hydroelectric and aerothermal both had 1. No commercial FEFTS used hydrothermal and marine energy in the second batch.

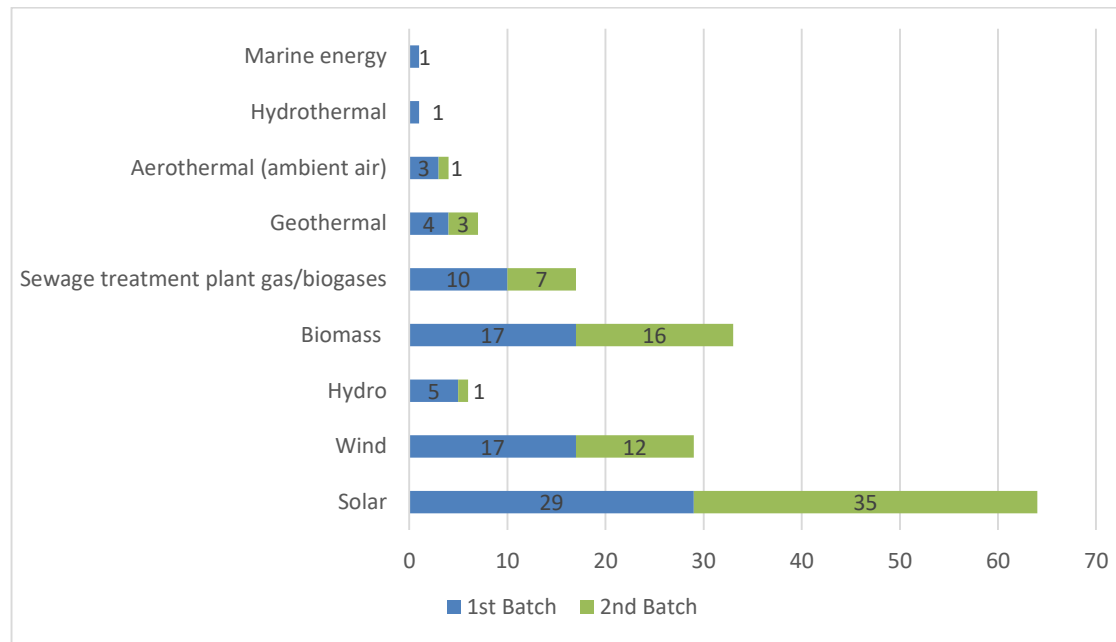


Figure 11. The renewable energy sources of Energy production system

Figure 12 below shows the renewable energy sources that are used in Energy Storage Systems. For the first batch, 5 storage systems were dedicated to biomass, 1 to solar energy (complete solution combining batteries and PV panels), with 2 based on other kind of sources. For the second batch, solar (2) and electricity (2, categorized under “other”) are used as energy sources. It is clear that Energy Storage Systems is a category that should be further enhanced with the addition of more FEFTS during the next period of the project, in order to achieve a greater diversity of the available storage solutions.

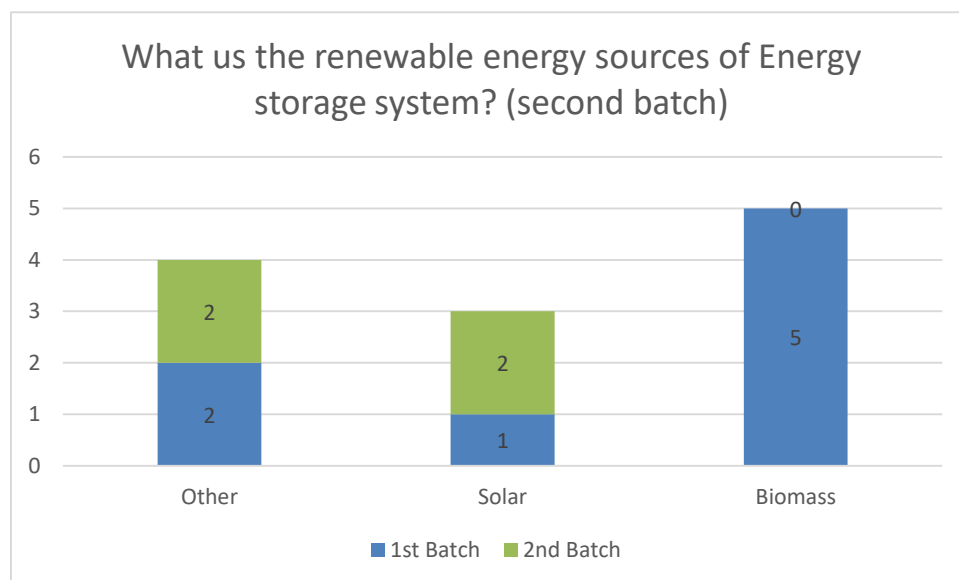


Figure 12. The renewable energy sources of Energy storage system

Regarding the specific technologies for Energy Production Systems, based on Figure 13, most of them are photovoltaics (24), wind turbines (17) and technologies based on solid biomass conversion (17). For the second batch, most of the energy production system used photovoltaics (32), solid biomass conversion based technologies (14) and wind turbines (13).

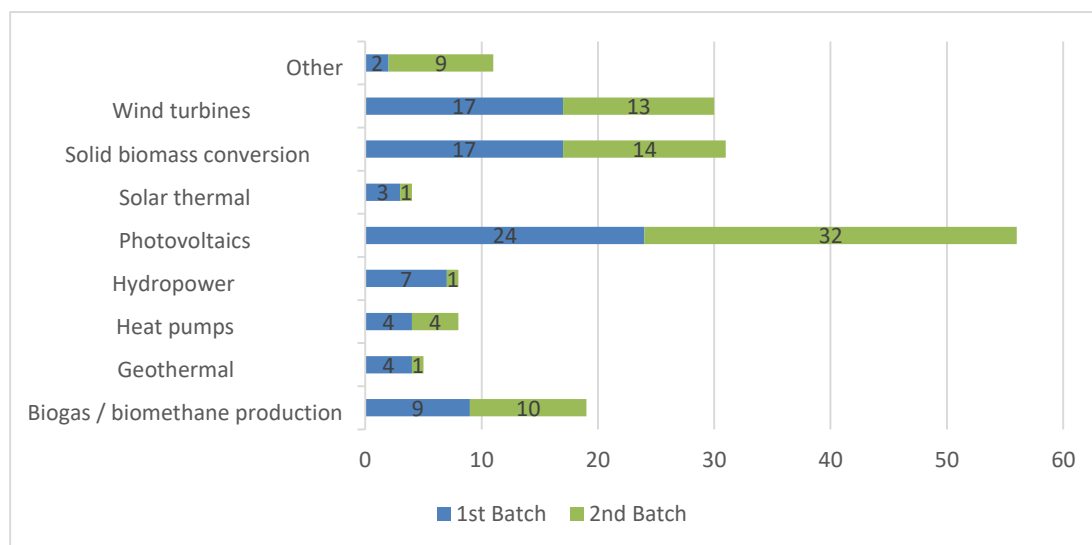


Figure 13. Specific technologies for Energy production systems

Among Photovoltaics, for the first batch, 11 of them were about Agri-PV systems, 10 of them were about PV-arrays. Only 2 were PV on tools and vehicles (Figure 14). For the second batch, 13 of them are about PV-arrays, 11 of them are about Agri-PV systems. Only 1 are PV on tools and vehicles and PV mounting system. It is evident that PV arrays overall are slightly more than Agri-PV systems.

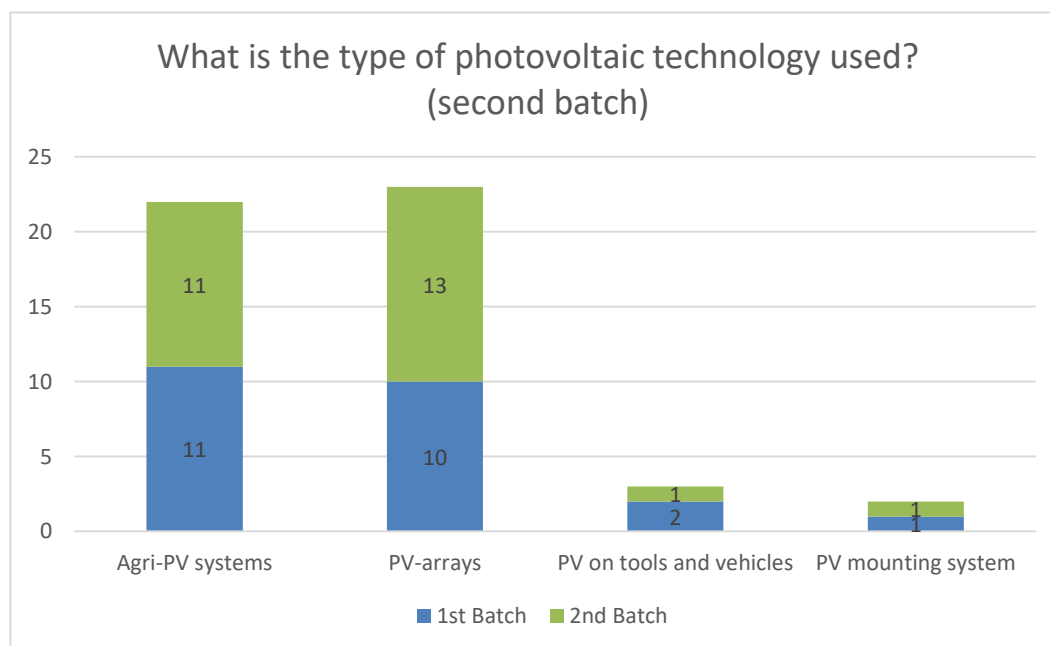


Figure 14. The submitted commercial technologies of the photovoltaic technology type

As it was shown in Figure 13, wind turbines were the second biggest category during the first batch when referring to specific technologies for Energy Production Systems. As a result, a further analysis of this category was done. Figure 15 shows the energy range of the collected wind turbine technologies, during the 11 of them were small wind turbines ranging from 1-50 KW, 4 of them were medium wind turbines ranges from 50-999KW. This graph, in correlation with Figure 5, shows that mostly farmers tend to invest in small wind turbines for the farms to produce the energy required to cover their needs. Whereas bigger solutions tend to be used from companies and industries (where selling energy to the grid is of much more interest). The second batch of commercial FEFTS collected more large turbines (11) than the first batch, with equal amount of small and medium wind turbines (5 for each). There are different types of

wind turbine solutions because our objective was to fill all the categories that had not been addressed in the first batch.

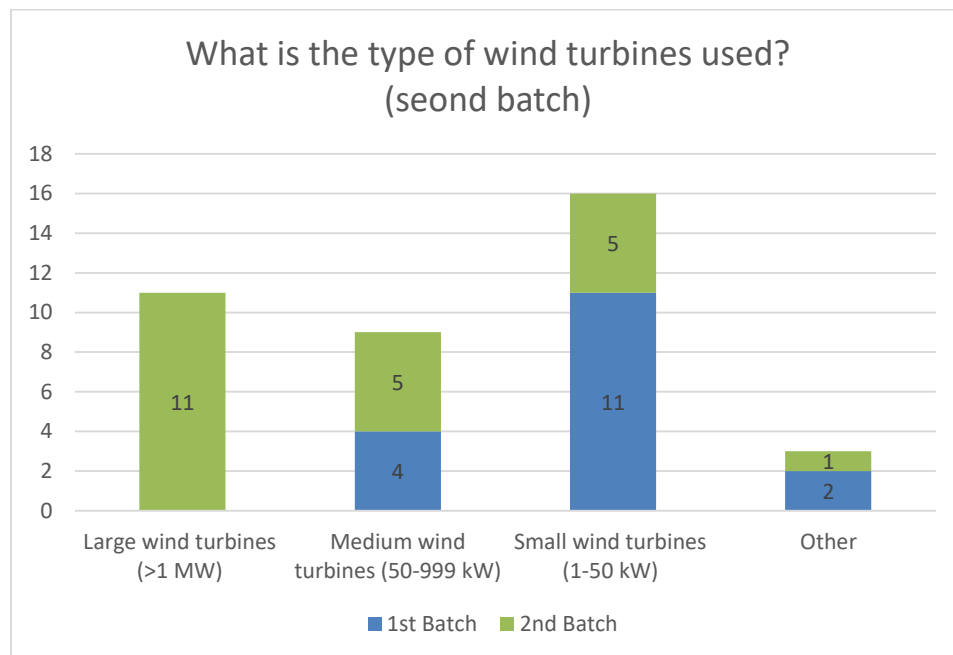


Figure 15. The submitted commercial technologies of the wind turbine type

Regarding solid biomass conversion technologies, during the first batch, technologies operating with agricultural residues were registered the most, with 14 solutions dedicated. Technologies applicable for wood chips, energy crops and pellets have 8, 9 and 7 technologies submitted. In addition, 5 technologies were suitable for wood log operation (under biomass) (Figure 16).

For the second batch, there is 1 FEFTS using agricultural residues, 1 using wood chips and 1 for wood logs. 2 of the commercial technologies use Pellets. During the second batch, only a few new solutions in this category were listed.

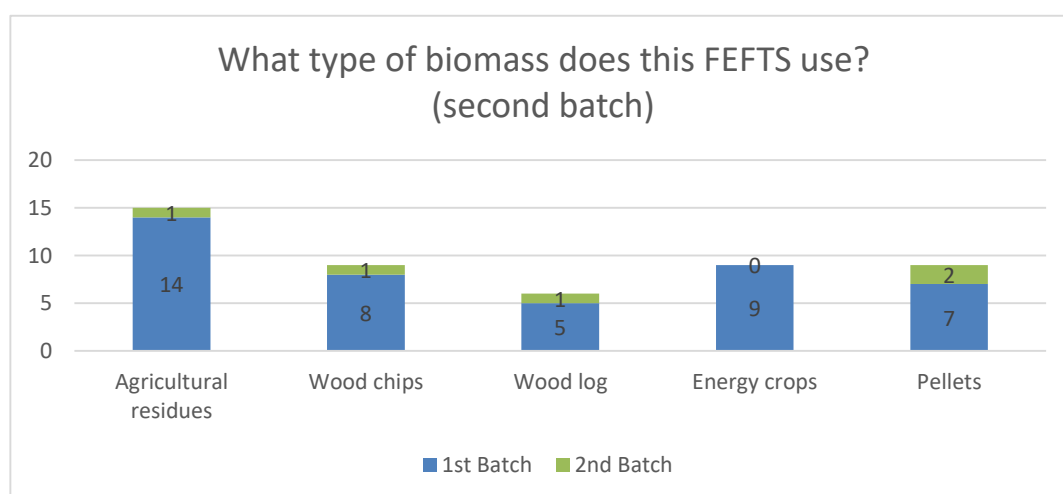


Figure 16. The submitted commercial technologies of the biomass technology

Figure 17 shows the specific technologies for Energy Storage Systems. During the first batch, 5 of them were on intermediate bioenergy carriers, other 3 were on electricity storage. For the second batch, all the 4 energy storage systems are about electricity.

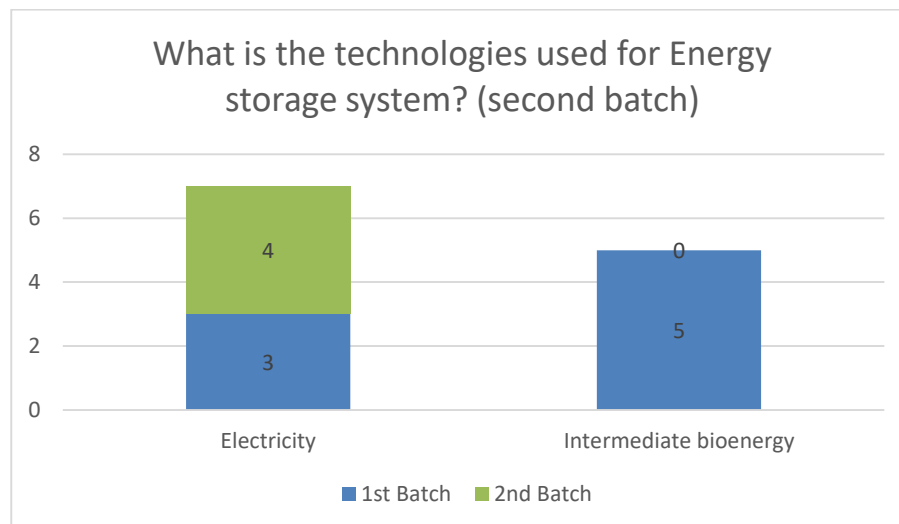


Figure 17. Specific technologies for Energy storage system

3.2.2 Energy Efficiency Improvement

Despite Clean Energy Supply category, FEFTS related to Energy Efficiency Improvement are also inventoried. It can be seen from Figure 9 that 55% of the registered commercial technologies are for energy improvement measures.

Analyzing the results from this category it can be seen that during the first batch most technologies were for precision agriculture and efficient tools (18 solutions for each category). Efficient vehicles were also important with 15 technologies registered. Precision livestock farming and efficient buildings were submitted with 2 and 8 technologies separately. The detailed results are presented in Figure 18. For the second batch, it is clear that precision agriculture (44) and efficient tools (35) still take up a large percentage of the Energy Efficiency Improvement category. 27 new technologies related to efficient buildings are also registered. FEFTS dedicated to efficient vehicles and precision livestock farming are also submitted with 17 and 11 technologies respectively.

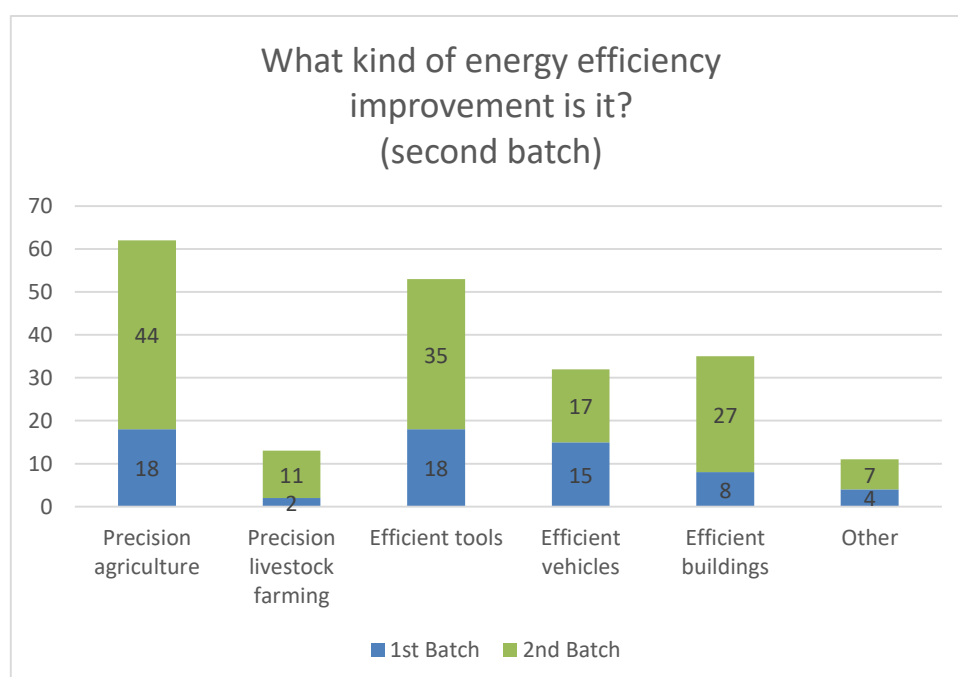


Figure 18. The submitted commercial technologies of the energy improvement type

By analyzing further the efficient vehicle category, the majority of answers were dedicated to

tractors (electric and methane). Another type of efficient vehicles were drones, lifts and maintenance systems for efficient tire pressure adjustment (to avoid soil compaction). The next category is precision agriculture, with the majority of the products being dedicated to pesticide reduction, followed by seed, fertilizer and manure reduction. The remaining 4 answers do not follow into the aforementioned categories and were listed as “Other”. The last category that can be further analyzed is the efficient tools. The majority of the products gathered are about the livestock sector (such as milking machines, feeding machines, refrigerators and heat recovery units), followed by open field agriculture applications (such as irrigation pumps, drip systems, dryers, no tillage drill) and greenhouses (such as virtual greenhouse simulations (for management of greenhouse productive activities)).

3.2.3 Soil carbon sequestration

As shown in Figure 9, not many technologies are registered under Soil Carbon Sequestration category. Figure 19 illustrates that for the first batch, most of the technologies inventoried were referring to tillage practices and equipment (10, which accounted for 77% in total), other technologies such as nutrient management, soil organic matter and soil and water conservation techniques had only 1 registered solution by the consortium.

For the second batch, there are more different types of soil carbon sequestration methods collected. The most technologies collected were referring to tillage practices and equipment, with a number of 11 in total. Other methods collected, such as nutrient management and soil and water conservation techniques, are collected 5 and 4 times separately. There is also 1 commercial technology regarding soil organic matter. It is evident that efforts were oriented on including FEFTS and completing all the categories that lacked a listing for commercial FEFTS.

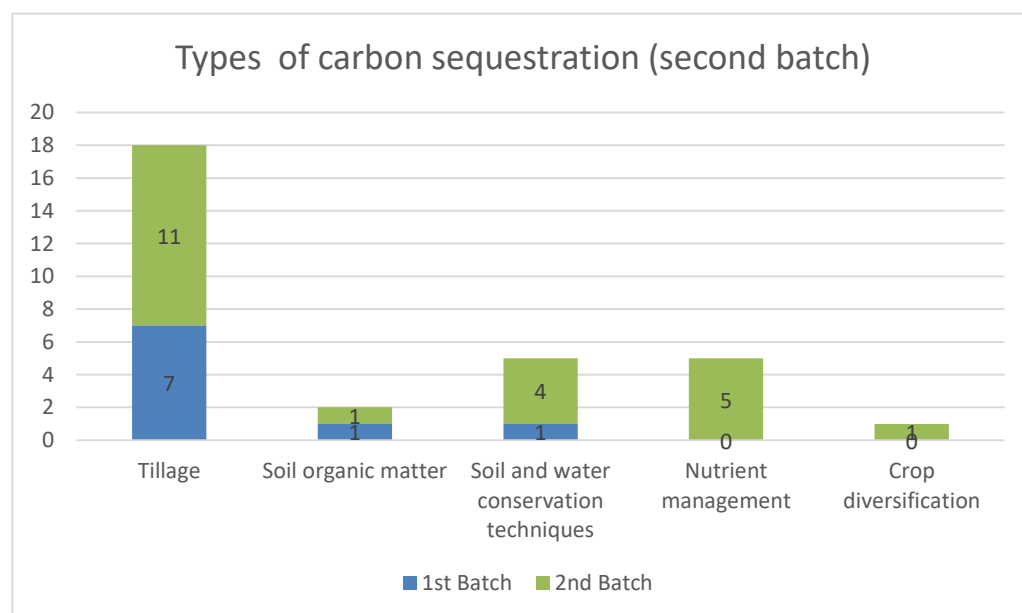


Figure 19. The technologies collected referring to carbon sequestration methods

3.3 FEFTS Environmental Assessment Result

Overall, when combining the 3 aforementioned categories (Clean Energy Supply, Energy Efficiency Improvement and Soil Carbon Sequestration), fossil energy reduction is achieved either directly or indirectly.

Regarding the direct energy inputs, during the first batch, a great number of FEFTS could provide direct fossil energy use reduction through buildings' electric consumption (61), followed by buildings' heat use (48), tractors and vehicles fuel consumption (45) and tools and

equipment electricity consumption (38). From Figure 20, it can be seen that for the first batch most of the commercial products were dedicated to solutions about buildings and efficient heating conditions while reducing electricity consumption.

For the second batch, a large number of FEFTS reduce fossil-energy use directly through tools and equipment electricity consumption (67). Other FEFTS, reduce fossil-energy use mostly either reducing tractors' and vehicles' fuel consumption (45), or through buildings' electricity consumption reduction (44). Some of the collected FEFTS reduce fossil fuel usage through reducing tools and vehicles fuel consumption (30) and building's heat use (8). Due to the availability of additional products on the market and the shifting demand pattern from farmers and other stakeholders, the rank among the various categories has altered from the first batch to the second.

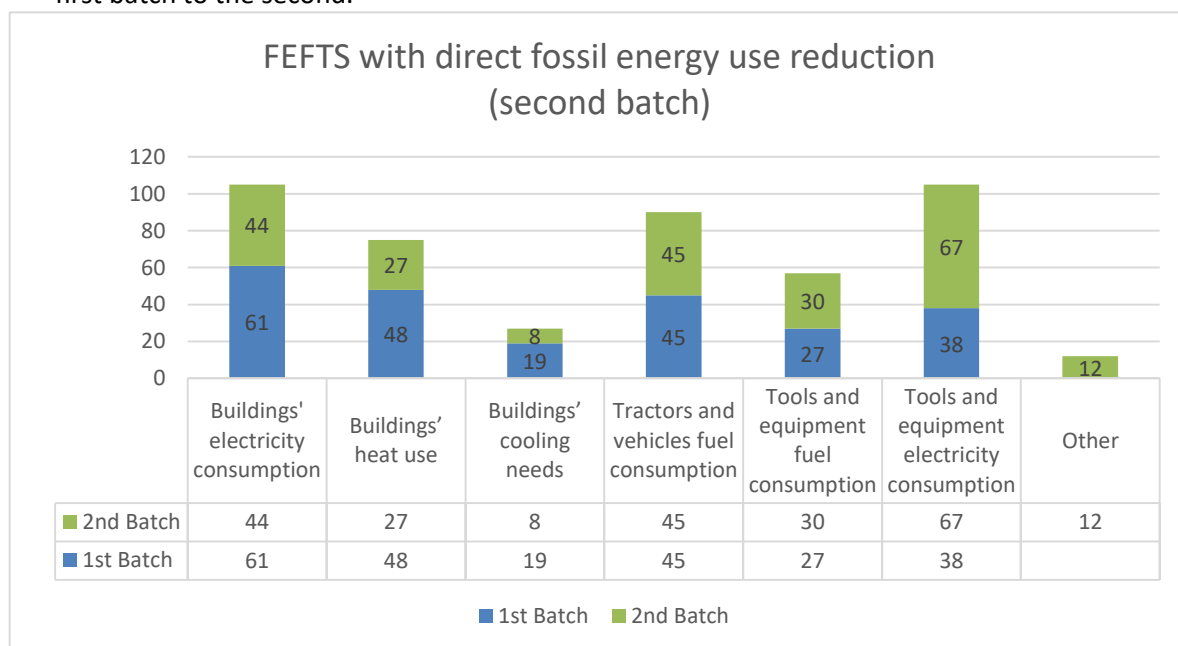


Figure 20. How collected FEFTS reduce fossil energy use directly

Regarding the indirect energy inputs, for the first batch, it is evident from Figure 21 that, fossil energy use was reduced indirectly mostly through pesticide reduction (22), fertilizer reduction (21) and tillage reduction (20), followed by animal health care. By analyzing this figure, it can be seen that pesticide, fertilizer and tillage practices were the dominant indirect energy inputs. This corresponds with the results of AgroFossilFree's report D.1.1 on energy consumption in EU agriculture, thus showing the need for commercial products specifically dedicated to reducing these inputs.

For the second batch, most of the technologies reduce fossil energy use indirectly through fertilizer, pesticide and feed reduction, with a number of 26, 24 and 19 respectively. Other reduction aspects, such as medicine reduction (7), animal health care (6), manure reduction (6) and tillage reduction (6) also play a role in this regard. There is only 1 commercial technology concerning indirect reduction of fossil usage through seed reduction.

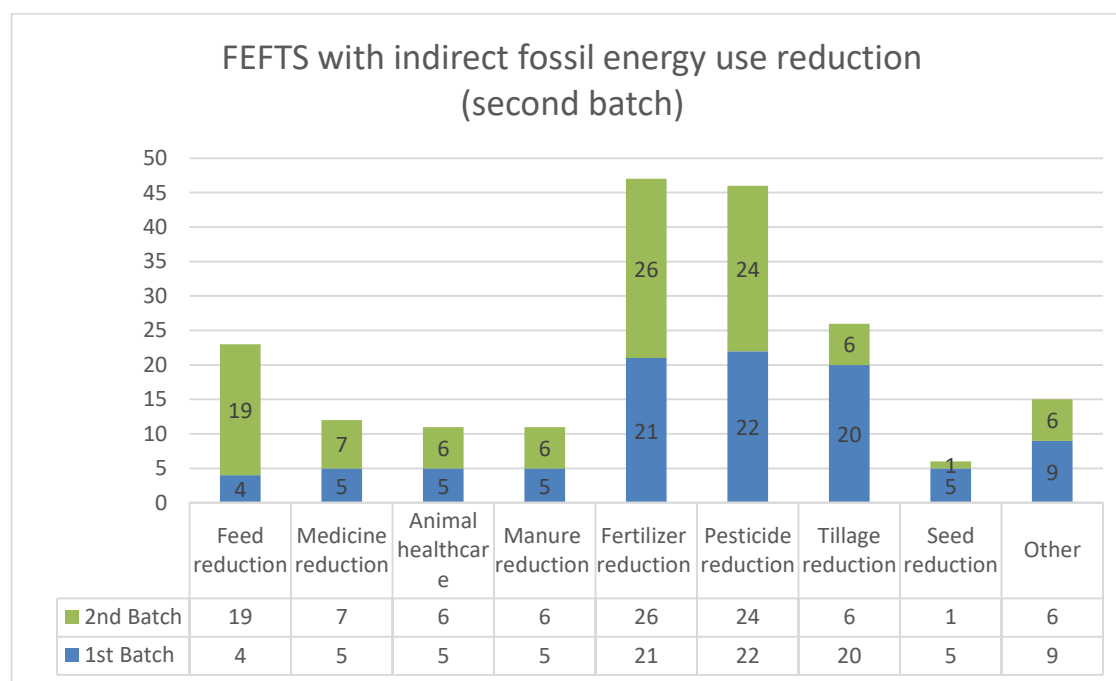


Figure 21. How collected FEFTS reduce fossil energy use indirectly

4. Conclusion and Reflection

The awareness and promotion of currently available industrial FEFTS technologies is crucial for reducing agriculture's reliance on fossil energy. As it is the endpoint of the reduction of fossil use, and with a good development it will stimulate more research and innovations to happen, to form a positive circle.

In this project, industrial FEFTS technologies are continuously collected, screened, and assessed to be included in AgroFossilFree's platform, which will serve to fulfil the need of related consumers and incentive to minimize fossil fuel consumption.

In conclusion, this deliverable has shown how FEFTS are collected, screened, assessed and included in AFF's inventory on commercial technologies inventories. This process and these commercial technologies are important as they will serve to minimize fossil fuel consumption.

During the second batch, a goal of 233 commercial technologies was set, the consortium was able to collect 258 industrial technologies. Many of the collected technologies are from Europe, especially Germany and the Netherlands, and are from companies with many employees. The majority of attention is paid to livestock farming applications, but open-field crop production and greenhouses' operations are also very well represented in the inventory. Improvements in energy efficiency, as well as renewable energy production and soil carbon sequestration, are all important, hence many technical applications are common. More than half of the commercial technologies are for energy efficiency improvement, this might be caused by the current geopolitical condition. In total 436 Commercial FEFTS solutions are registered in the AgEnergy repository and the majority of them are already made publicly available.

Regarding the screening procedure, the same approach will be followed for the second FEFTS batch as the first FEFTS collection progress. For next Phase (Data Aggregation), the registered technologies will be cleared of malicious, duplicate and incomplete entries in order to ensure data integrity and unbiased analysis in later phases of the AgroFossilFree project. Furthermore, in order to reach the KPI of 1700 FEFTS, partners will keep on collecting and submitting FEFTS in the coming months so as for the AgEnergy platform to be up to date. Also, 1 more update report showing the progress achieved will be created.

Annex

Annex A: Commercial Products retrieved from survey

The following link is the online spreadsheet which contains all the commercial products retrieved from both batches.


https://docs.google.com/spreadsheets/d/1NU4J08GXusngT8PT_qUesEPjEhSbhl2kRDV4jbA8T0Y/edit#gid=1605918370

Annex B: Commercial Products Survey

As it is mentioned in the report, with the official launch of the AgEnergy platform the use of the Google forms survey was discontinued. Instead, all interested users can now submit their FEFTS directly in the platform's survey by simply creating a free account first. The following link is the AgEnergy platform.

<https://platform.agrofossilfree.eu/en>

Annex C: Promotional letter for the companies to register their commercial products.



Dear Sir/Madam,

Taking into consideration the profile of your company we would like to inform you about the AgroFossilFree Project (<https://www.agrofossilfree.eu/>), which is supported by the European Union through the Horizon 2020 programme, and its goals that would also benefit your entity in multiple ways.

The main goal of AgroFossilFree project is to pave the way for the de-fossilisation of the European agriculture by diminishing fossil energy dependence of all agricultural domains (open-field and controlled-environment crops and livestock). To do so, AgroFossilFree will:

- evaluate the current energy use status of EU agriculture
- assess farmers' needs and interests
- discuss solutions thoroughly with all related stakeholders through online and physical workshops
- recommend a dedicated research roadmap and policy guidelines for the EU

to achieve more efficient and alternative energy use in agricultural activities with simultaneous GHG emissions reduction.

In this context, the project's main instrument to reach out to stakeholders will be an informative and easy-to-use ICT tool, named **AgEnergy Platform**, which will provide information regarding available Fossil-Energy-Free Technologies and Strategies (FEFTS) that could be applied in the agricultural environment. As an auxiliary tool, the Platform will be accompanied by a Decision Support Toolkit (DST) to propose interventions and financing tools based on users' requirements.

AgroFossilFree is expected to become very popular due to its currently "hot" subject and its diversity of production systems and agro-climatic zones, but also due to its AgEnergy platform that is expected to:


- gain **high visibility** (EU channels, social media, etc.) for the next 3 years, plus at least another 5 years that will remain open and fully operational after the project's end
- be a **one-stop shop** for your technologies and strategies to be presented to possible customers
- contain all important information for your technology, directly given in a **single-webpage mock-up card** in an **easy and understandable** way especially for farmers as end-users
- allow your technology to be searched by end-users with multiple criteria and a DST, so to be found from the stakeholders that could act as **possible customers**

We kindly invite you to register your products in the relevant [Google Forms](#)* and consult the relevant submission [tutorial video](#)**. Your technology will be available to end-users after the launch of AgEnergy platform on October 1st, 2021.











For those of you who do not have the time to upload your technology, we can do it for you after your consent.

Yours sincerely,
AgroFossilFree Team

*Google forms link: https://docs.google.com/forms/d/1b0t99mHTATG4nV8I7XKXpX8_RdF3gG73_NRqH21/viewform?edit_requested=true&usp=sharing
**Tutorial video link: <https://www.youtube.com/watch?v=3i6aT5DgU00>



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Annex D: Video on FEFTS registration

The following link is the video that INI created to attract companies and stakeholders to register their FEFTS.

https://www.youtube.com/watch?v=ouquCgDuFsY&ab_channel=AgrofossilFree

