PLANET

Co-funded by the Erasmus+ Programme of the European Union

PLANET – PLan for Agriculture reNewable Energy Training

D1.1 - Report on the competence gap analysis	
Document description:	This report will sum the lack of skills up existing in the agriculture sector. It will be targeted to the 4 skills that will be taught in the PLANET training
Partner responsible:	CRAB
Due date:	Saturday, 30 June, 2018
Work package title:	Needs identification and training design
Task title:	Analysis of the competence gap
Status (F: final; D: draft; RD: revised draft):	F

Agreement Number 2017-3177/001-001

PLANET – PLan for Agriculture reNewable Energy Training

Table of Contents

1. Task description

All partners will contribute to this task by exposing the lack of competencies they observed regarding the skills to run day-by-day the RES plants in the agricultural sector. These skills based on the relevant experiences achieved by the consortium, related to maintenance, management, financing, logistics and legal tasks.

The consortium with the help of CONFAGRI and COPA-COGECA will identify and analyse skills gap regarding RES plants management and upkeep. Additional sources of information will be some research papers available at country level like the project with reference number [4]. These papers will be a starting point to analyse the competence gap by the partners.

Enquiries on skills gap will also rely on the studies and research work available on this issue. Partners that participate in IEE [1,2,3] and national RES projects in agriculture will share their knowledge and will look for research evidence on RES related skills needs thanks to studies already performed.

CONFAGRI will coordinate meeting with stakeholders to determine the gaps. The meeting will be organised locally by partners of the same country, because the RES exploited in different countries may vary depending on incentives and on local environmental and political conditions.

Emphasis will be put on skills required by farmers. CRAB will enquire on the skill gap and will organise surveys, that will be translated in country languages by UNITO, AERES, and AGRAR+ as it has close links with farmers and advisors in France.

If possible, this enquiry will be supported by information available thanks to previous Sector Skills Alliances (SSA).

The objective is to clearly identify what skills are required for farmers to cope with the management and maintenance of RES plants in their professional environment.

2. Genesis

The starting points for the Consortium's work on the identification of skills and knowledge presented in the next section "Competencies descriptions" were of several kinds:

- taking into account the target audiences
- understanding the very different roles of operators according to the RES
- identifying the real needs of the exploitation of RES plants in biogas, biomass and solar energy as well as for ICT

With regard to audiences, the initial demand mentioned four distinct targets:

- Farmers (already owning a RES plant; wishing to develop one)
- Agricultural organizations (wishing to develop the skills of their employees)
- Agricultural advisers and training organizations (wishing to broaden their offer and adapt to new demand)
- Students (who will be concerned in their future professional life)

Even if the topics are the same for everyone, diversified target audiences may nevertheless raise the question of the relevance of the content for everyone. This is why, in this project, we focused on the skills and knowledge needed to manage a RES plant on a daily basis. Indeed, it concerns everyone, starting with the farmers or future farmers (students) themselves but also the members of agricultural organizations who need this skills and knowledge to do their work efficiently and safely. This also concerns advisers or future advisers (students) since they are/will have to provide their expertise to farmers and training organizations, who must therefore be familiar with daily practices as well as the farmers.

The partners in our project, in their specialty, work closely with RES plant operators. They all therefore know what these audiences need to acquire or complete the skills and knowledge necessary for their work. By exchanging, we were able to realize that operating a biogas, biomass or solar installation (photovoltaic and thermal) does not require the same involvement for the farmer. Indeed, on the one hand, a solar installation is mainly "controlled" by the installer to whom the operator will systematically call in case of a problem. The farmer must necessarily know how his RES plant works, but it is not him who will intervene to solve difficulties. On the other hand, a biogas unit involves the operator very significantly. Not only must he/she understand the functioning of his/her plant in a theoretical way, but he/she must also be able to make it work correctly (legislation, digestate...), prevent risks, repair the installation if necessary or call upon the most competent people at the right time who can solve a more important problem. Noting this, it appeared to us early on that the 4 modules could not have exactly the same shape. Nevertheless, we kept in mind the pedagogical modalities "reverse class" and "blended-learning" expected in the project.

These observations discussed and recorded, we asked ourselves how we should formulate these skills/knowledge for each of the 4 expected modules. We needed a common expression to maintain consistency. At the same time, it is important that our project is validated at European level and therefore that the identified skills/knowledge are recognized. These two reasons (common language and European recognition) very quickly led us to the European Skills/Competencies, Qualifications and Occupations (ESCO). The competent partners in each of the fields therefore sought all the skills/knowledge that it was necessary to acquire in order to operate a RES plant. For ICT, the work has been the same with a basic principle: that our public must master in order to be able not only to use IT but also to understand it and to be able to grasp it in their training and in their work.

Based on their experience in contact with farmers on their RES plant, in training (for those who provide training) and on studies already carried out, each partner has therefore identified the ESCOs that already exist

and that partially or entirely express the skills/knowledge to be acquired according to the actual context of the renewable energy concerned. Some of them have been reformulated to best reflect reality, but the skill/knowledge acquired corresponds to the ESCO cited. When the identified skills/knowledge did not exist in the ESCOs, we suggested them, which was the subject of an official request to the services concerned. The objective is of course to create a training programme whose pedagogical objectives created from the competencies/identified are as relevant as possible. In particular, it emerged from the common knowledge to be acquired. This is why we have created an additional training part, entitled "Introduction module", which aims to provide a global overview of the situation of renewable energies in agriculture today.

All the skills/knowledge identified and validated internally by experts represented a very large mass. This is why it seemed appropriate to us to divide them into "essential" and "optional". This was done with the understanding that the main objective is to enable farmers to operate their RES plant. It is therefore thanks to the expertise of all the partners as well as the surveys conducted and submitted to more than 200 people that this "essential"/ "optional" classification was achieved.

3. Competencies descriptions

First, we propose a common core named “introduction module” concerning the three types of RES to enable trainees to become familiar with RES. Then, the competencies that farmers need to master concern ICT skills in order to be technically able to follow the training concerning either solar energy, biomass or biogas. Finally, we propose a description of specific skills for each type of RES.

3.1 Introduction module

Non-renewable energy sources : Nonrenewable energy sources come out of the ground as liquids, gases, and solids. We use crude oil to make liquid petroleum products such as gasoline, diesel fuel, and heating oil. Propane and other hydrocarbon gas liquids, such as butane and ethane, are found in natural gas and crude oil. [1] **Not available in the ESCO database.**

Renewable energy technologies : The different types of energy sources which cannot be depleted, such as wind, solar, water, biomass, and biofuel energy. The different technologies used to implement these types of energy to an increasing degree, such as wind turbines, hydroelectric dams, photovoltaics, and concentrated solar power.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ff8413360-6114-40de-a276-c59b764b9913&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/f8413360-6114-40de-a276-c59b764b9913

Situation of energy market : The trends and major driving factors in the energy trading market, energy trades methodologies and practice, and the identification of the major stakeholders in the energy sector. **Not available in the ESCO database.**

Energy mix : The energy mix is the distribution of the different sources of primary energy consumed in a given geographical area. **Not available in the ESCO database.**

Cost comparison energy sources : comparison of costs between non-renewable energies and renewable energies. **Not available in the ESCO database.**

Climate protection and goals, EU and national : The decisions and conditions for applying the rules for climate protection at national and European level (reduction of greenhouse gases, increased support for renewable energies, reduction of energy consumption, etc.) **Not available in the ESCO database.**

[1] US eia (Energy Information Administration) : https://www.eia.gov/energyexplained/?page=nonrenewable_home

3.2 ICT Skills

3.2.1 Essential skills/competencies

Use a computer: Use computer equipment or digital devices to facilitate quality control, data management, and communication. Follow instructions given by a computer programme, create computer files or documents.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F1007aa13-9f18-4bcf-96f3-e108c40baf69&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/1007aa13-9f18-4bcf-96f3-e108c40baf69

Use ICT peripherals: Use the physical parts or components of information technology equipment such as monitor, mouse, keyboard, storage devices, printers or scanners.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fec4b8a2b-c20c-4c0f-bef0-fcc1f5f42c40&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/ec4b8a2b-c20c-4c0f-bef0-fcc1f5f42c40

Use digital device operating systems: Use the functions and tools provided by the operating system to access resources and run applications.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F35f1be97-06c4-4367-a067-7e0e94f2fa70&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/35f1be97-06c4-4367-a067-7e0e94f2fa70

Carry out internet research: Execute efficient search on the internet in order to gather relevant information and share it with others.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F75ef4eed-fe57-47fd-92e9-e63f3121d5b8&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/75ef4eed-fe57-47fd-92e9-e63f3121d5b8

Use online communication tools: Use digital tools which enable various forms of communication over Internet, such as e-mail, instant messaging, Voice over Internet Protocol, social networks, while following netiquette rules and protecting one's reputation and digital identity.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F5f1dd9f6-dcb4-4384-88c9-f9f6a75305c9&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/5f1dd9f6-dcb4-4384-88c9-f9f6a75305c9

Store digital data and systems: Use software tools to archive data by copying and backing them up, in order to ensure their integrity and to prevent data loss.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F611ed16b-99bf-4840-9cab-f55d1d286e0a&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/611ed16b-99bf-4840-9cab-f55d1d286e0a

Use microsoft office: Possess the ability to work with the standard programs contained in Microsoft Office at a capable level. Create a document and do basic formatting, insert page breaks, create headers or footers, and insert graphics, create automatically generated tables of contents and merge form letters from a database of addresses (usually in Excel). Create auto-calculating spreadsheets, create images, and sort and filter data tables.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ff683ae1d-cb7c-4aa1-b9fe-205e1bd23535&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/f683ae1d-cb7c-4aa1-b9fe-205e1bd23535

Use of specific software for RES plant management: Efficiently use the specific software to manage the RES plant and interpret the results correctly. **Not available in the ESCO database.**

Internet of Things : understanding and use of the interconnection between the Internet and objects, places and physical environments.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ff049d050-12da-4e40-813a-2b5eb6df6b51&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/f049d050-12da-4e40-813a-2b5eb6df6b51

3.2.2 Essential knowledge

Office software: The characteristics and functioning of software programs for office tasks such as word processing, spreadsheets, presentation, email and database.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fcf310cff-0d28-4dbc-9dbb-cc500a3196c2&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/cf310cff-0d28-4dbc-9dbb-cc500a3196c2

System backup best practice: The procedures related to preparing for recovery or continuation of technology infrastructure vital to an organisation.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F47ca0da1-cae5-4395-ae6b-fd97b9ff48d3&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/47ca0da1-cae5-4395-ae6b-fd97b9ff48d3

ICT safety: Personal protection, data protection, digital identity protection, security measures, safe and sustainable use.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F426ceaba-6867-481c-bb6b-aee3933da7d2&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/426ceaba-6867-481c-bb6b-aee3933da7d2

3.2.3 Optional skills/competencies

Install software: Install machine-readable instructions, such as computer programs, in order to direct the computer's processor to perform a certain set of actions.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc8de8023-ab8a-402b-a828-b2b57cd3b2f7&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c8de8023-ab8a-402b-a828-b2b57cd3b2f7

Maintain computer hardware: Diagnose and detect malfunctions in computer hardware components and systems and remove, replace, or repair these components when necessary. Execute preventative equipment maintenance tasks, such as storing hardware components in clean, dust free, and non-humid spaces.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc77db25e-bb51-4a10-b2ad-99b48b1b4a37&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c77db25e-bb51-4a10-b2ad-99b48b1b4a37

Use agricultural information systems and databases: Use relevant information systems and databases to plan, manage and operate agricultural enterprise and production. Information systems and databases may include lists of plants, seeds, fertilizers, pesticides, livestock etc., but also monitoring systems for farm facilities, greenhouses etc. and keeping account of products quality, quantity etc.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ffdc388ba-c8f4-4455-a55f-ffdf29b05f5f&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/fdc388ba-c8f4-4455-a55f-ffdf29b05f5f

Type on electronic devices: Type fast and flawless on electronic devices such as computers in order to ensure a quick and accurate data entry.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fd181042e-c531-4461-af7c-4071c53418fe&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/d181042e-c531-4461-af7c-4071c53418fe

Perform backups: Implement backup procedures to back up data and systems to ensure permanent and reliable system operation. Execute data backups in order to secure information by copying and archiving to ensure integrity during system integration and after data loss occurrence.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fcf3e976d-2c3e-495c-a874-f9e8a66d3b48&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/cf3e976d-2c3e-495c-a874-f9e8a66d3b48

Carry out practical tasks with smart devices: Use devices autonomously connected to the network and internet such as smart TVs, robots, smart refrigerators to perform autonomous tasks.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F0d715b0e-3026-40b9-aa9e-09f1d59054cf&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/0d715b0e-3026-40b9-aa9e-09f1d59054cf

3.2.4 Optional knowledge

Computer technology: Computers, computer networks and other information technologies and equipment that can store, retrieve, transmit and manipulate data.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fddc3119d-1d6e-4324-9125-a3380d299ac5&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/ddc3119d-1d6e-4324-9125-a3380d299ac5

Data storage: The physical and technical concepts of how digital data storage is organised in specific schemes both locally, such as hard-drives and random-access memories (RAM) and remotely, via network, internet or cloud.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fa7f0fbe0-c546-4f30-8e41-34a58c64567e&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/a7f0fbe0-c546-4f30-8e41-34a58c64567e

ICT encryption: The conversion of electronic data into a format which is readable only by authorized parties which use key encryption techniques, such as Public Key Infrastructure (PKI) and Secure Socket Layer (SSL).

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fd32db06e-bd06-4415-a7ab-1b0ee68caa9a&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/d32db06e-bd06-4415-a7ab-1b0ee68caa9a

PLANET – PLan for Agriculture reNewable Energy Training

3.3 Solar power plant owner

3.3.1 Essential skills and competencies

Thermal

Maintain heating systems : Control heating fluid pressure, check and clean filters, heating fluid sampling, check valves, pumps and actuators... **Not available in the ESCO database.**

Monitor gauge : Oversee the data presented by a gauge concerning the measurement of pressure and temperature.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F285cac9e-dad3-4b7b-848f-9bd2860ae345&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/285cac9e-dad3-4b7b-848f-9bd2860ae345

Operate water-heating equipment : Operate water-heating equipment, such as electrical equipment and heat exchangers.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F988f696e-01c9-4aa5-b024-4aa96505ee0c&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/988f696e-01c9-4aa5-b024-4aa96505ee0c

Operate pumps : Operate industrial pumps

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F1864d4a3-eb9c-44f2-84f3-77137db21aeb&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/1864d4a3-eb9c-44f2-84f3-77137db21aeb

Read heat meter : Interpret the measuring equipment which records the consumption of thermal energy by measuring heat transfer fluid and temperature changes, and record the results correctly.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fd646a68c-b0f7-4b1d-87eb-3d1f5d224554&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/d646a68c-b0f7-4b1d-87eb-3d1f5d224554

Read water meter : Interpret the measuring instruments which measure the consumption and reception of water in facilities or residences, and note down the results in a correct manner.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F698ff0a8-5811-4035-8064-1a96240fa190&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/698ff0a8-5811-4035-8064-1a96240fa190

Monitor valves : Monitor and accordingly adjust the valves in order to allow a specific amount of liquids into the machine.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ff4349677-549e-419a-8f8e-eb10bfe10720&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/f4349677-549e-419a-8f8e-eb10bfe10720

Photovoltaic

Self-diagnosis :

- Professional and personal goal of the farmer :
  - total sale
  - self-consumption on sale in surplus or without injection
- Profile of the farm :
  - Analyse investment capacity
  - Analyse orientation and number of buildings
  - Electricity consumption : The different factors which are involved in the calculation and estimation of electricity consumption in a residence or facility, and methods in which electricity consumption can be lowered or made more efficient.
  - Analyze the electricity production of a photovoltaic power plant at a given location (sunshine depending on the geolocalisation of the farm)
  - Qualify the electricity production of a photovoltaic power station over different periods : year, month, day, hour.
  - Identify the key points of vigilance to optimize the photovoltaic solar plant installation project : administrative, technical, legal, fiscal, town planning, insurance

Not available in the ESCO database.

Thermal and photovoltaic

Maintain electronical equipment : Check electronic equipment as undulator. Detect malfunction and call troubleshooter to fix it.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F386774ac-fe5b-431a-b485-9aec0bf5c09e&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/386774ac-fe5b-431a-b485-9aec0bf5c09e

Maintain control system : Check and maintain control elements as undulator. **Not available in the ESCO database.**

Manage contracts : Negotiate the terms, conditions, costs and other specifications of a contract. Oversee the execution of the contract, agree on and document any changes.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F92721092-fe7c-4689-96bd-4f02385bc0e7&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/92721092-fe7c-4689-96bd-4f02385bc0e7

Manage budgets : Plan, monitor and report on the budget.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F21c5790c-0930-4d74-b3b0-84caf5af12ea&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/21c5790c-0930-4d74-b3b0-84caf5af12ea

Assess financial viability : Revise and analyse financial information and requirements of projects such as their budget appraisal, expected turnover, and risk assessment for determining the benefits and costs of the project. Assess if the agreement or project will redeem its investment, and whether the potential profit is worth the financial risk.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fe95058a6-e139-42e7-a470-72038a606649&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/e95058a6-e139-42e7-a470-72038a606649

Perform risk analysis : Identify and assess factors that may jeopardise the success of a project or threaten the organisation's functioning. Implement procedures to avoid or minimise their impact.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F1dd23dba-dd00-45ab-abf4-642902538317&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/1dd23dba-dd00-45ab-abf4-642902538317

3.3.2 Essential knowledge

Thermal

Industrial heating systems : Heating systems fuelled by gas, wood, oil, biomass, solar power, and other renewable energy sources and their energy saving principles, applicable specifically to industrial buildings and facilities.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc49eb4a4-7b5f-44e6-b346-7153879ac86b&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c49eb4a4-7b5f-44e6-b346-7153879ac86b

Photovoltaic

Photovoltaic technology :

- Photovoltaic principle
- Peak power concept
- Operation of a photovoltaic power plant
- Producible in kWh on different time steps
- Materials
- Implementation of materials
- Material recycling
- Guarantees

Not available in the ESCO database.

Thermal and photovoltaic

Solar energy : The energy which originates from light and heat from the sun, and which can be harnessed and used as a renewable source of energy using different technologies, such as photovoltaics (PV) for electricity production and solar thermal energy (STE) for thermal energy generation.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F05e5e14f-ffa6-4106-b311-c6335ccc2bd2&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/05e5e14f-ffa6-4106-b311-c6335ccc2bd2

Electricity : Understand the principles of electricity and electrical power circuits, as well as the associated risks.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc8ac1986-38fa-43b2-89dc-50a4beeb420e&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c8ac1986-38fa-43b2-89dc-50a4beeb420e

Electrical power safety regulations : The compliance with safety measures which need to be taken during the installation, operation, and maintenance of constructions and equipment which function in the generation, transmission, and distribution of electrical power, such as the appropriate safety gear, equipment handling procedures, and preventive actions.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F6360d655-3494-45f6-bfc6-d5f63afc355b&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/6360d655-3494-45f6-bfc6-d5f63afc355b

Operation management : Maintenance, monitoring, quality management, benchmark, plant optimisation, health and safety precautions, fire prevention, troubleshooting, data backup, supporting computer programs. **Not available in the ESCO database.**

Administrative : Town planning procedures, rules relating to the obligation to purchase. **Not available in the ESCO database.**

Techniques : Technical data specific to each device (module, inverter, integration system). Ex: cable section. **Not available in the ESCO database.**

Legal : Legal structuring according to the objectives and the situation of the project developer and tax consequences. **Not available in the ESCO database.**

Economy : Financing: business plan, subsidies, investment, insurance. **Not available in the ESCO database.**

Communication : Exchanging and conveying information, ideas, concepts, thoughts, and feelings through the use of a shared system of words, signs, and semiotic rules via a medium.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F15d76317-c71a-4fa2-aadc-2ecc34e627b7&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/15d76317-c71a-4fa2-aadc-2ecc34e627b7

3.3.3 Optional skills and competences

Thermal

Maintain hydraulic systems : Perform routine maintenance on systems which use pressurised fluids to provide power to machines and equipment.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F8eebf05f-4495-4fd5-b1f0-cb85750295be&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/8eebf05f-4495-4fd5-b1f0-cb85750295be

Stand high temperatures : Stand high temperatures while keeping concentration and efficiency under demanding circumstances.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ffeaefe50-fcbe-4c5f-acbd-580724bf6ba2&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/feaefe50-fcbe-4c5f-acbd-580724bf6ba2

3.3.4 Optional knowledge

Principles of insurance : Understand the principles of insurance, including third party liability, stock and facilities.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fab927ee8-acd9-41c2-aef0-2020364a1003&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/ab927ee8-acd9-41c2-aef0-2020364a1003

Fossil fuels : The types of fuels which contain high doses of carbon and include gas, coal, and petroleum, and the processes by which they are formed, such as the anaerobic decomposition of organisms, as well as the ways in which they are used to generate energy.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc564a8dc-e6b3-48a1-bb6c-674f6ce37215&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c564a8dc-e6b3-48a1-bb6c-674f6ce37215

Electric current : Flow of electric charge, carried by electrons or ions in a medium such as an electrolyte or a plasma

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F57869946-cec2-4121-981c-84c9846c58d0&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/57869946-cec2-4121-981c-84c9846c58d0

PLANET – PLan for Agriculture reNewable Energy Training

3.4 Biogas plant operator for (co-)digestion of manure

3.4.1 Essential skills and competencies

Manage delivery of raw materials : Receive raw materials from the suppliers. Check for quality and accuracy and move into the warehouse. Make sure that raw materials are adequately stored until they are required by the production department.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F360e1c45-d335-4a19-b717-e1932927a72b&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/360e1c45-d335-4a19-b717-e1932927a72b

Collect samples for analysis : Collect samples of materials or products for laboratory analysis.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F4bbb309f-9162-49b9-93da-fb2c371e5c5f&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/4bbb309f-9162-49b9-93da-fb2c371e5c5f

Preserve samples : Preserve collected and labelled samples of raw materials and other food products. Preserve samples applying chemical or physical methods.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fff9ed77c-f19c-41d8-8b11-a382c6819e8d&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/ff9ed77c-f19c-41d8-8b11-a382c6819e8d

Maintain professional records : Produce and maintain records of work performed.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F7837ef5c-2c81-4a89-8227-b4d4f1f7331e&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/7837ef5c-2c81-4a89-8227-b4d4f1f7331e

Ensure compliance with environmental legislation : Monitor activities and perform tasks ensuring compliance with standards involving environmental protection and sustainability, and amend activities in the case of changes in environmental legislation. Ensure that the processes are compliant with environment regulations and best practices.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F089ee650-297e-4716-87d1-440743b70a0d&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/089ee650-297e-4716-87d1-440743b70a0d

Recognize the hazards of dangerous goods : Be aware of the threats posed by potentially dangerous goods such as polluting, toxic, corrosive, or explosive materials.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F907039e2-5b33-4ea5-96ca-b6082711b491&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/907039e2-5b33-4ea5-96ca-b6082711b491

Maintain biogas plant : Perform routine maintenance and repairs on equipment which treats energy crops and waste from farms, called anaerobic digesters. Ensure the equipment functions correctly in the transformation of biomass to biogas.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F8e01e994-0e09-4fbb-a76b-7f615678cc7d&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/8e01e994-0e09-4fbb-a76b-7f615678cc7d

Ensure equipment maintenance : Ensure that the equipment required for operations is regularly checked for faults, that routine maintenance tasks are performed, and that repairs are scheduled and performed in the case of damage or flaws.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc927ec6e-9082-4b22-afd3-0c4e219eaf73&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c927ec6e-9082-4b22-afd3-0c4e219eaf73

Resolve equipment malfunctions : Identify, report and repair equipment damage and malfunctions; communicate with field representatives and manufacturers to obtain repair and replacement components.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F1de6b87b-2c7d-49aa-bcc0-3b2ef75f064f&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/1de6b87b-2c7d-49aa-bcc0-3b2ef75f064f

Ensure correct gas pressure : Ensure the necessary, usually constant, pressure of gas which is part of a machine or tool, such as torching equipment, used to process metal workpieces during metal fabrication processes.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F8fea133a-8e3d-4ae6-89b6-94961445ee85&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/8fea133a-8e3d-4ae6-89b6-94961445ee85

Monitor valves : Monitor and accordingly adjust the valves in order to allow a specific amount of liquids (such as ammonia sulfuric acid or viscous soap) or steam into the mixer or machine.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ff4349677-549e-419a-8f8e-eb10bfe10720&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/f4349677-549e-419a-8f8e-eb10bfe10720

Monitor CHPs (electric generators) : Monitor the operation of combined heat and power installation in order to ensure functionality and safety, and to identify need for repairs and maintenance.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ff7a4fb1d-d951-4c4c-8643-3212c0958f71&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/f7a4fb1d-d951-4c4c-8643-3212c0958f71

Monitor biogas upgrade installations : Monitoring and checking of biogas upgrade installations. This includes gas quality checks, safety issues, monitoring spare and wear parts and repairing works. **Not available in the ESCO database.**

Maintain records of maintenance interventions : Keep written records of all repairs and maintenance interventions undertaken, including information on the parts and materials used, etc.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F182915aa-3470-433a-9b12-347511befcde&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/182915aa-3470-433a-9b12-347511befcde

Optimise production processes parameters : Optimise and maintain the parameters of the digestion process such as flow, temperature, pH, EC, DS, ODS and pressure.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F0f0698e7-04e4-4bf7-9af2-e3191147525a&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/0f0698e7-04e4-4bf7-9af2-e3191147525a

Adapt the ration (inputs in the digester) according to analyzes and observations : The purpose of this operation is twofold:

- guarantee production stability (quality of the gas and digestate) according to the arrivals of raw material. In particular, balance the intakes of digestible matter, nitrogen, sulfur.

- monitor the emergence of problems and fix them

Not available in the ESCO database.

Manage plans for the utilisation of organic by-products and manure : Implement plans for the utilisation of manure and organic by-products. Ensure that plans for the utilisation of manure/organic by-products are in accordance with relevant legislation, codes of practice and cropping policies. Ensure that systems are in place to protect humans and animals from the dangers of working with organic by-products such as slurry grasses. Monitor the utilisation of organic by-products/manure and take appropriate action if problems are identified.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F8f98653a-4aee-4619-91c7-0cdc2f8e225a&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/8f98653a-4aee-4619-91c7-0cdc2f8e225a

3.4.2 Essential knowledge

By-product legislation : The applicable legal rules on temperature, waste materials, traceability, labelling, trading, and the transport of animal origin products. **Not available in the ESCO database.**

Regulatory obligations concerning the different registers : Understand, abide by, and apply the regulatory obligations concerning the registers (input/output ; labour law ; sanitation ; risks...) **Not available in the ESCO database.**

Risk management : The process of identifying, assessing, and prioritising of all types of risks and where they could come from, such as natural causes, legal changes, or uncertainty in any given context, and the methods on dealing with risks effectively.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F6eff134b-e34f-4d6e-a6e8-5e47cf2228d0&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/6eff134b-e34f-4d6e-a6e8-5e47cf2228d0

Preventive procedures for controlling environmental impact : The procedures are to be distinguished according to the type of installation and risk assessment. **Not available in the ESCO database.**

General operation of the installation : The anaerobic digestion unit consists of multiple mechanical and electrical equipment and often several automated systems that manage the feed and the flows between the tanks.
The farmer-biogenerator must know the general operation of the facility, the links between the different parties. **Not available in the ESCO database.**

Maintenance procedures of each equipment : The must know the maintenance procedures of the installed equipment. **Not available in the ESCO database.**

Measuring devices and their characteristics : Characteristics of the devices and the principles of metrology (operation and calibration of measurement devices). **Not available in the ESCO database.**

Corrective measures according to the different types of malfunctions : Acidosis, alkalosis, H2S poisoning, 02, heavy metal poisoning and disinfectants, digestion too fast. The findings on the consequences (drop in biogas production and its quality, increase in H2 partial pressure, CO2 level, decrease in Full Alcalimetric Title (= measurement of buffer capacity) ... **Not available in the ESCO database.**

Digestates (characteristics and agronomic use) : Characteristics of digestates and their agronomic uses. **Not available in the ESCO database.**

Optimal conditions for anaerobic digestion : A variety of parameters may affect the biological digestion process. An operator has to know the impact of several parameters on the process as well as a ‘safe’ range of the parameters. **Not available in the ESCO database.**

Economic feasible operation of plant : What are the key factors to obtain a proper profit out of the plant? Special attention should be paid to the measures which could be taken to guarantee the economic feasibility. **Not available in the ESCO database.**

3.4.3 Optional skills and competencies

Operate boiler : Operate sealed vessels which contain fluids which are heated or vaporized, not always up to boiling, for heating or power generation, such as in utilities. Ensure safe procedures by monitoring the blower auxiliary equipment closely during operations, and identifying faults and risks.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F68bb49f4-59b7-489e-8903-4aea01fb5fc3&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/68bb49f4-59b7-489e-8903-4aea01fb5fc3

Operate biogas meter : Use measuring equipment which is capable of measuring in a biogas atmosphere in order to measure biogas emissions, more specifically of methane and carbon dioxide levels.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fb322a6f0-8c28-478e-97ca-1e593d1a20c1&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/b322a6f0-8c28-478e-97ca-1e593d1a20c1

Use remote control equipment : Use a remote control to operate equipment. Watch the equipment closely while operating, and use any sensors or cameras to guide your actions.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F58c3ed60-c06b-47c0-b213-4e3608608644&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/58c3ed60-c06b-47c0-b213-4e3608608644

Maintain facility security systems : Ensure that proper and functional security systems are in place, including alarm systems, fire alarms, sprinklers and emergency exits.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F5bee9f92-221e-44e8-81b8-20edcd741077&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/5bee9f92-221e-44e8-81b8-20edcd741077

Analyze a co-products tracking slip : Ensure the nature of the co-products arriving on the farm and verify its provenance and traceability. **Not available in the ESCO database.**

Use additional grindings, aerobic degradation or fermentation stages : Use additional grindings, aerobic degradation or fermentation stages to optimize the methanogenic potential. **Not available in the ESCO database.**

Manage relations with the neighborhood : Maintain good relations with the neighborhood to guarantee biogas plant acceptance. **Not available in the ESCO database.**

Put the digests on the market : The digestate has a waste status. Switching to product status can provide income complementary to the biogas plant, as well as the flexibility of use.
To be placed on the market, the digestate must enter into an existing standard or be subject to an application for a provisional authorization of sale (homologation).
The three main principles of placing on the market are :

- efficiency: the product must have recognized agronomic value, the producer must publish a document of recommendation (doses, precautions of use, conditions of application and of storage)
- safety: the product must be safe for humans and the environment. The producer must constantly monitor the quality of its product and publish a data sheet of security
- constancy: the product must be of constant composition over time, homogeneous and stable during the recommended shelf life

Not available in the ESCO database.

3.4.4 Optional knowledge

Quality assurance procedures : The procedures to inspect a product or system to ensure that it is according to specifications and requirements.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F1177c6f5-09c5-4c35-873c-afd22d170ad3&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/1177c6f5-09c5-4c35-873c-afd22d170ad3

Electric generators : The principles and operations of devices that can convert mechanical energy into electrical energy, such as dynamos and alternators, rotors, stators, armatures, and fields.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc8c18b8d-a813-49f8-a702-689564dcf8b2&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c8c18b8d-a813-49f8-a702-689564dcf8b2

Electrical power safety regulations : The compliance with safety measures which need to be taken during the installation, operation, and maintenance of constructions and equipment which function in the generation, transmission, and distribution of electrical power, such as the appropriate safety gear, equipment handling procedures, and preventive actions.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F6360d655-3494-45f6-bfc6-d5f63afc355b&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/6360d655-3494-45f6-bfc6-d5f63afc355b

Electricity : Understand the principles of electricity and electrical power circuits, as well as the associated risks.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc8ac1986-38fa-43b2-89dc-50a4beeb420e&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c8ac1986-38fa-43b2-89dc-50a4beeb420e

Grid connection : Gathering information about the connection the gas and electricity grids. How does connection to the grid works and what should be checked before and during supplying to the grid. **Not available in the ESCO database.**

Calibration: Every biogas installation contains gas analyser(s) and a variety of sensors. To ensure a proper measurement each device should be calibrated regularly. This section teaches how to perform the calibrations. **Not available in the ESCO database.**

PLANET – PLan for Agriculture reNewable Energy Training

3.5 Solid biomass heating plant operator

3.5.1 Essential skills/competencies

Maintain the biomass system : Maintain the system for heating, hydraulics, district heating network, main operation and transfer stations. **Not available in the ESCO database.**

Maintain heating systems : Control heating fluid pressure, check and clean filters, heating fluid sampling, check valves, pumps and actuators... **Not available in the ESCO database.**

Maintain electronic equipment : Check electronic equipment. Detect malfunction and take measures to prevent damage.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fba45db8f-34e8-4f29-af0b-e6645e1d693f&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/ba45db8f-34e8-4f29-af0b-e6645e1d693f

Maintain control system : Check and maintain control elements. **Not available in the ESCO database.**

Monitor valves : Monitor and accordingly adjust the valves in order to allow a specific amount of liquids into the machine.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ff4349677-549e-419a-8f8e-eb10bfe10720&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/f4349677-549e-419a-8f8e-eb10bfe10720

Perform risk analysis : Identify and assess factors that may jeopardise the success of a project or threaten the organisation's functioning. Implement procedures to avoid or minimise their impact.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F1dd23dba-dd00-45ab-abf4-642902538317&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/1dd23dba-dd00-45ab-abf4-642902538317

Read heat meter : Interpret the measuring equipment which records the consumption of thermal energy by measuring heat transfer fluid and temperature changes, and record the results correctly.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fd646a68c-b0f7-4b1d-87eb-3d1f5d224554&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/d646a68c-b0f7-4b1d-87eb-3d1f5d224554

Read water meter : Interpret the measuring instruments which measure the consumption and reception of water in facilities or residences, and note down the results in a correct manner.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F698ff0a8-5811-4035-8064-1a96240fa190&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/698ff0a8-5811-4035-8064-1a96240fa190

Ensure equipment maintenance : Ensure that the equipment required for operations is regularly checked for faults, that routine maintenance tasks are performed, and that repairs are scheduled and performed in the case of damage or flaws.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc927ec6e-9082-4b22-afd3-0c4e219eaf73&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c927ec6e-9082-4b22-afd3-0c4e219eaf73

Monitor gauge : Oversee the data presented by a gauge concerning the measurement of pressure and temperature.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F285cac9e-dad3-4b7b-848f-9bd2860ae345&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/285cac9e-dad3-4b7b-848f-9bd2860ae345

Operate boiler : Operate sealed vessels which contain fluids which are heated, not always up to boiling, for heating, such as in utilities. Ensure safe procedures by monitoring the blower auxiliary equipment closely during operations, and identifying faults and risks.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F68bb49f4-59b7-489e-8903-4aea01fb5fc3&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/68bb49f4-59b7-489e-8903-4aea01fb5fc3

Operate water-heating equipment : Operate water-heating equipment, such as electrical equipment and heat exchangers.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F988f696e-01c9-4aa5-b024-4aa96505ee0c&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/988f696e-01c9-4aa5-b024-4aa96505ee0c

Perform troubleshooting : Identify operating problems, decide what to do about it and report accordingly.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F334e3e49-fb02-4051-809a-f06adfdc1c40&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/334e3e49-fb02-4051-809a-f06adfdc1c40

3.5.2 Essential knowledge

Biomass plant technology :

- Installations: Heating, hydraulics, district heating network, mains operation, transfer stations
- Electrical, measuring, control and regulation technology
- Boiler technology
- Power generator
- Cooperation technology (solar, PV, heat pump)
- Conveyor technology

Not available in the ESCO database.

Operation management : Maintenance, monitoring, quality management, benchmark, plant optimisation, health and safety precautions, fire prevention, troubleshooting, data backup, supporting computer programs. **Not available in the ESCO database.**

Raw material : Raw material sources, wood preparation for wood chips production, logistics, fuel quality and quantity measurement, fuel purchasing, wood and biomass market, residue management/ash utilization, inventory method, resource sustainability management method, possible valuation methods. **Not available in the ESCO database.**

Types of wood : Types of wood, such as birch, pine, poplar, mahogany, maple and tulipwood.

3.5.3 Optional skills and competencies

Maintain measuring systems : Check meters (electricity, water, heat, pressure...) **Not available in the ESCO database.**

Maintain hydraulic systems : Perform routine maintenance on systems which use pressurised fluids to provide power to machines and equipment.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F8eebf05f-4495-4fd5-b1f0-cb85750295be&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/8eebf05f-4495-4fd5-b1f0-cb85750295be

Ensure sanitation : Keep workspaces and equipment free from dirt, infection, and disease by removing waste, trash and providing for appropriate cleaning.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F0c944316-12f6-4949-a156-a03dbaae790f&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/0c944316-12f6-4949-a156-a03dbaae790f

Present reports : Display results, statistics and conclusions to an audience in a transparent and straightforward way.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fd0f2f8a7-d935-4a6d-8e54-dcc3e5e2cbeb&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/d0f2f8a7-d935-4a6d-8e54-dcc3e5e2cbeb

Stand high temperatures : Stand high temperatures while keeping concentration and efficiency under demanding circumstances.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Ffeaefe50-fcbe-4c5f-acbd-580724bf6ba2&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/feaefe50-fcbe-4c5f-acbd-580724bf6ba2

Manage contracts : Negotiate the terms, conditions, costs and other specifications of a contract while making sure they comply with legal requirements and are legally enforceable. Oversee the execution of the contract, agree on and document any changes.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F92721092-fe7c-4689-96bd-4f02385bc0e7&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/92721092-fe7c-4689-96bd-4f02385bc0e7

Principles of insurance : Understand the principles of insurance, including third party liability, stock and facilities.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fab927ee8-acd9-41c2-aef0-2020364a1003&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/ab927ee8-acd9-41c2-aef0-2020364a1003

Manage budgets : Plan, monitor and report on the budget.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F21c5790c-0930-4d74-b3b0-84caf5af12ea&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/21c5790c-0930-4d74-b3b0-84caf5af12ea

Manage logistics : Create a logistic framework for transporting goods, execute and follow up the logistics processes and guidelines.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F953c0b65-537a-42fe-a90b-26cd36c64361&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/953c0b65-537a-42fe-a90b-26cd36c64361

3.5.4 Optional knowledge

Biomass conversion : Conversion process whereby biological material becomes heat through combustion or biofuel through chemical, thermal, and biochemical methods.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fb115cabc-c030-45b2-ac8e-922d45716183&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/b115cabc-c030-45b2-ac8e-922d45716183

Electricity consumption : The different factors which are involved in the calculation and estimation of electricity consumption in a residence or facility, and methods in which electricity consumption can be lowered or made more efficient.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F21c27eba-bd1f-42f5-a1d5-c250227030f7&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/21c27eba-bd1f-42f5-a1d5-c250227030f7

Fossil fuels : The types of fuels which contain high doses of carbon and include gas, coal, and petroleum, and the processes by which they are formed, such as the anaerobic decomposition of organisms, as well as the ways in which they are used to generate energy.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2Fc564a8dc-e6b3-48a1-bb6c-674f6ce37215&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/c564a8dc-e6b3-48a1-bb6c-674f6ce37215

Communication : Exchanging and conveying information, ideas, concepts, thoughts, and feelings through the use of a shared system of words, signs, and semiotic rules via a medium.

https://ec.europa.eu/esco/portal/skill?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Fskill%2F15d76317-c71a-4fa2-aadc-2ecc34e627b7&conceptLanguage=en&full=false#&uri=http://data.europa.eu/esco/skill/15d76317-c71a-4fa2-aadc-2ecc34e627b7

Economy :

- Financing: business plan, subsidies, investment, insurance
- Business administration: accounting, controlling, reporting
- Business development: marketing / customer acquisition, -loyalty and -satisfaction

Not available in the ESCO database.

Law :

- Contract law: financing, lease, easement, raw material supply, community, heat supply contracts, ...
- Legal entity, liability issues
- Construction and plant permission
- Labor and social insurance law
- Waste legislation

- Tax law
- Documentation for authorities
- Privacy regulation

Not available in the ESCO database.

4. Lack of competencies

4.1 Based in the partners' experience and research papers

Solid biomass :

The corresponding fields with knowledge deficit of the operators are individually different, depending on experience, pre- and further education. The range from training interested in the practice reaches from start-up entrepreneurs who are interested in the matter and intend to build a facility to long-term operators of plants that wants to familiarise themselves with the latest developments.

It can be reported from the long-term project support and training practice that deficits can be present in all areas.

It can be expected that, given the modular structure of the training content, these will be selected in accordance with the interest and prevailing knowledge gaps.

Agricultural anaerobic digestion plants:

Cattle farmers (and farm workers) are the most relevant group for the biogas training courses. In most cases, farmers are the owner, investor and operator of the biogas plant. From experiences, the knowledge deficit is present at a widespread of fields. PLANET should particularly support and deliver educational material at the following fields :

- Environmental impact awareness (emissions (noise, methane, odour and nutrients)
- Daily operation control (logbook, maintenance, checks)
- Business Case management (opportunities, financial control)
- Safety (toxicity, biogas, external)
- Process control
- Subsidy and legislation management
- Administration

ICT:

The ICT knowledge deficit of the operators are individually different, depending on experience, pre- and further education. The vocational students (primarily farmers advisor, but not limited to them) are the most relevant group for the ICT training course, however, the ICT course can be considered a preparatory course for all the other courses in the PLANET training, in fact the basic IT skills are useful both in the management of biogas plants, in biomass plants and also in solar systems.

To understand the students' lack of knowledge, a pre-test will be performed, through which the students will be directed to the correct contents.

From experience, the lack of knowledge is commonly found in:

- Use computer equipment or digital devices to facilitate quality control, data management, and communication.
- Use software tools to archive data by copying and backing them up, in order to ensure their integrity and to prevent data loss.
- Use the standard programs contained in Microsoft Office at a capable level to create a document and do basic formatting, create auto-calculating spreadsheets, sort and filter data tables; with the aim to be able to make reports, collect data and elaborate it for the management of a RES plants.
- Personal data protection, security measures to protect the data of the RES plants.
- Use of smart connected devices, useful for monitoring the RES plants.

Solar thermal and photovoltaïc :

Both grain-farmers and livestock farmers are considered as candidates for the solar training courses. Solar thermal will more likely be targeted by livestock farmers, especially slaughterhouses (where needs in hot water are important and constant throughout the year) whereas photovoltaïc will be targeted by any farmer with some need in electricity or new building. From experience, the lack of knowledge is commonly found in

- Project Diagnosis : how to define one’s motivation (energy needs, investissement capacity)
- Project steps : how to report the different steps of a solar project on a timeline from the feasibility study to the run of the power plant
- Economy : how to estimate the inputs and outputs of a solar project and the impact on tax and finance of the farmer
- Run of power plant : how to deal with commissioning, monitoring, maintenance and recycling steps of a solar plant

Co-funded by the Erasmus+ Programme of the European Union

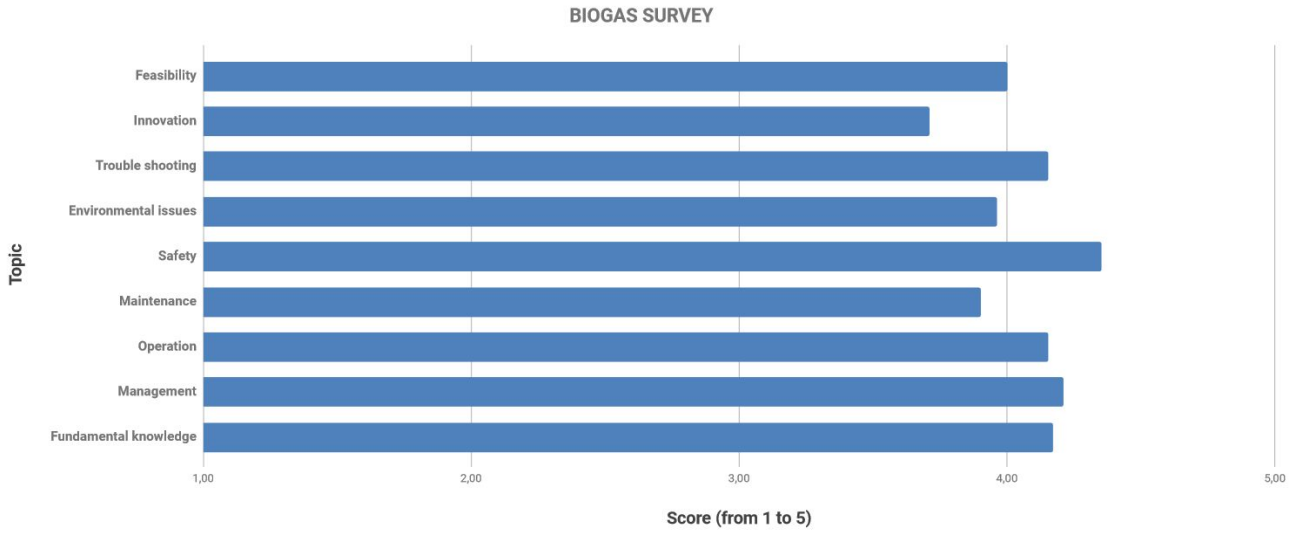
4.2 Based on surveys

Four questionnaires were completed in English. The idea was to gather from the people surveyed (stakeholders of renewable energies in agriculture: farmers, advisers, specialists ...) their opinion about the importance of the above-mentioned skills in the training of farmers. It is these skills that are questioned through questions in Likert scale format. Each skill could be rated from 1 "useless" to 5 "essential".

Once the question format was validated in English, the questionnaires were translated into each language (French, Italian, Dutch, German). Each partner was asked to submit the questionnaire in his own language to 10 people. Each questionnaire in all languages received between 48 and 56 responses for a total of more than 200 surveys completed.

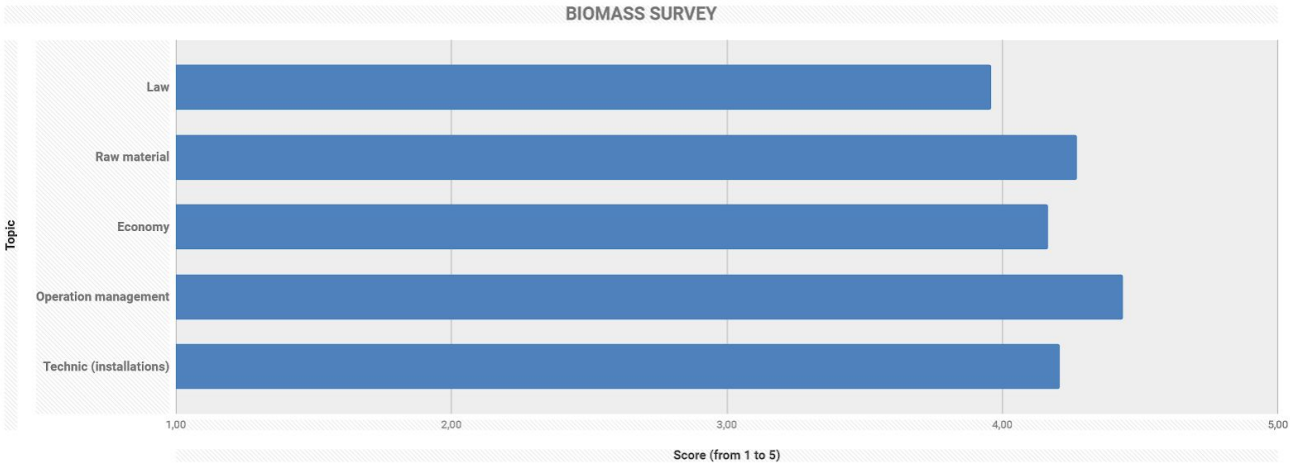
Out of 5, almost no skill is judged below 3.5. It is therefore possible to deduce that all subjects are important with some variations :

<u>Biogas and biomethane</u>



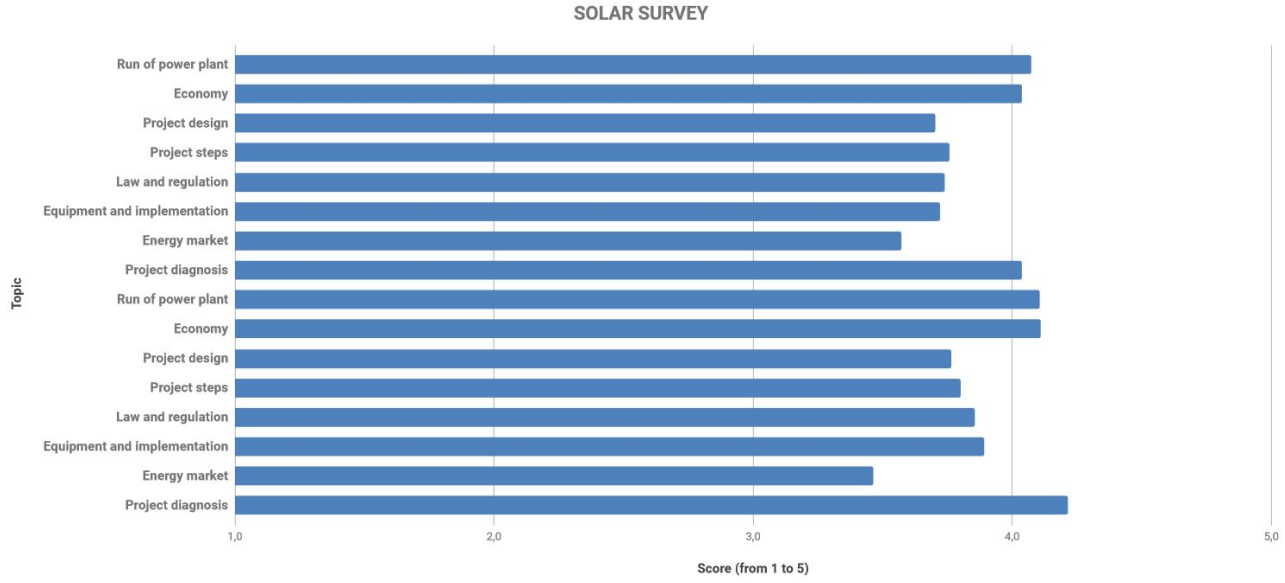
All subjects are above 4. So they all seem essential to the people surveyed.

Solid biomass



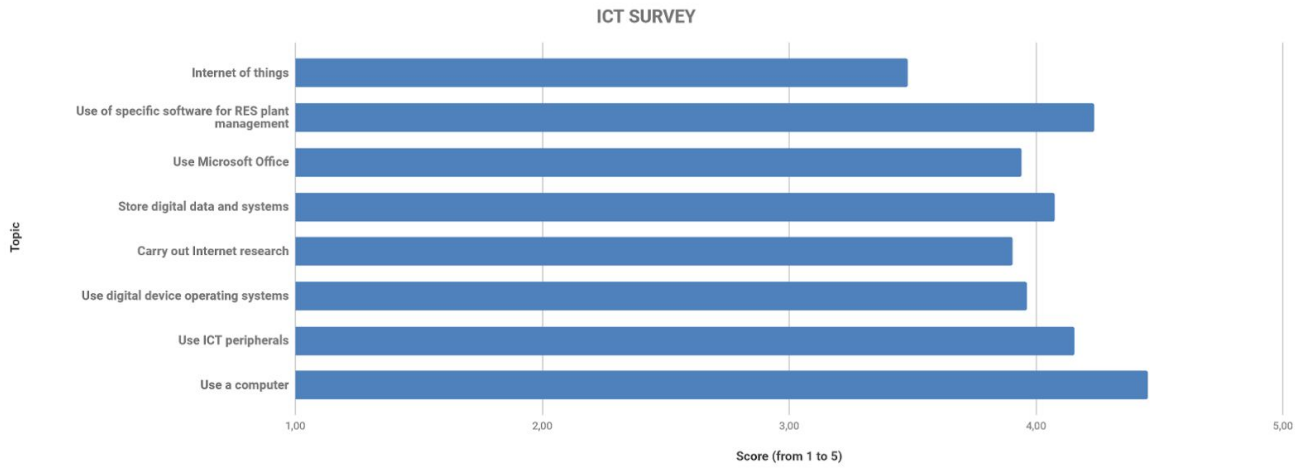
"Law" is a little below 4. So this is a topic that seems less essential than others to the people surveyed.

Solar energy



The topics are detailed and the "market" seems less important than the rest of the topics.

ICT and software skills



Here, it is the "Internet of Things" that is less well rated compared to other topics.

Few subjects are therefore rated less well than others. The partners have therefore decided that all subjects will be addressed in the training but that the less recognized subjects as essential would benefit from fewer hours of training.

Following the links per country language of the surveys:

ENGLISH
Training in the operation of a biogas plant (https://goo.gl/forms/FxKSwEVvxQ2lnyvD2)
Training in the operation of a solid biomass heating plant (https://goo.gl/forms/TXaoCL8YY7DdJoWn2)
Training in the use of computers (https://goo.gl/forms/YyJPiFmcMxlh4UJR2)
Training in the operation of a solar power plant (https://goo.gl/forms/DmvSkH33UVmt2YL42)

DUTCH
Training van een zonne-energiecentrale (https://goo.gl/forms/TXubKJTaLbKRpyQe2)
Training in het gebruik van computers (https://goo.gl/forms/Jy71AySaNgOfq6xW2)
Training in de werking van een biogasinstallatie (https://goo.gl/forms/miyW0xeRrbU5iQvW2)
Training in de werking van een vaste biomassa-verwarmingsinstallatie (https://goo.gl/forms/oW7KV6txKVEzeqlw2)

GERMAN
Training zur Verwendung von Computern (https://goo.gl/forms/x7EYWM9UaLWPzPyU2)
Training zum Betrieb einer Biomasse-(Nahwärme) Heizanlage (https://goo.gl/forms/V7Eq9LxqqXhzIp1B2)
Training zum Betrieb eines Solarkraftwerkes (https://goo.gl/forms/btlhlpQg39hFsyk73)
Training zum Betrieb einer Biogasanlage (https://goo.gl/forms/UYUQbucChwoRXWw13)

FRENCH
Formation à l'exploitation d'une centrale de biogaz (https://goo.gl/forms/d6MVaCnOfDtrEMzm2)
Formation à l'informatique (https://goo.gl/forms/gchtkhIKQaEd6y802)
Formation au fonctionnement d'une centrale solaire (https://goo.gl/forms/H0HbscLEvZkyoZxJ2)
Formation au fonctionnement d'une centrale de chauffage à biomasse solide (https://goo.gl/forms/OkfH3xSGG4Tf3ldg1)

ITALIAN
Training sulla formazione per il funzionamento di un impianto a biogas (https://goo.gl/forms/h4cnTffrrP0tvpUn1)
Training sulla formazione di operatori di impianti ad energia solare (https://goo.gl/forms/mOCj4BY9HT5a78I32)
Training di formazione nel funzionamento di un impianto a biomassa solida (https://goo.gl/forms/GcaujrY9hXydVXM12)
Training sull'utilizzo dei computer (https://goo.gl/forms/dK6gZyYfRbr8Dwuk1)

4.3 Based on workshops

During the workshops held in the various countries, farmers, "officials" from the agricultural sector, people concerned by renewable energies in agriculture expressed their views on the content of the modules (introduction, biogas, biomass, solar and ICT). Various relevant remarks emerge from this.

The introductory module was generally very well received because it allows the participants to get into the subject to get a general idea and their own opinion on renewable energies. In particular, the importance of security and relation between climate and RES were stressed. Two points of vigilance have been put forward: this module must remain very general and the figures must be updated very regularly.

The biogas module was well received, especially with regard to the timing. However, some reservations have emerged, particularly about the future of technologies and biogas in general. In addition, one of the concerns is that environmental issues concerning biogas are hotly debated. It is therefore important to include in the program environmental permits, methane emissions from barns, environmental safety, the effects of digestate on soils and the agricultural aspects of these facilities. It was also pointed out that it might be appropriate to devote time to explanations regarding dismantling and conversion. Moreover, a biogas plant requires a lot of investment time. Therefore, it is important to talk about it during training.

The biomass module was considered to be exhaustive and well organized. Biomass requires a holistic view of the exploitation to optimize the plant or even improve the exploitation to make the most of the plant. However, a point was made about the sustainability of this type of installation when the larger ones are widely debated.

The solar module seems complete even if the organization was not always considered very clear. Some stressed the importance of further study of technological developments in this area. From a practical point of view, some highlighted that there were many days planned in the field and that it was possible to make it shorter. Indeed, solar seems to be the least time-consuming renewable energy to produce. Nevertheless, the importance of putting it into practice was highlighted.

The ICT module was very well received and is considered complete and well organized. It could be useful for some farmers but not sure that all of them will agree to participate.

In summary, the project is widely validated by stakeholders both in its structure and its completeness. In the current context of increased awareness of climate change, this type of training is even considered very important. In addition to the remarks already mentioned, several suggestions emerged. In particular, it is important to keep it simple so that all participants can keep up. It would be necessary to start with a simple and clear global vision of each theme before going into each of them in more detail. It could also be interesting, for example, to provide two levels of training: a complete one for students and a more compact one for farmers (the volume presented seems too large). Moreover, training such as this one must open the debate so that farmers can best adapt their choices to their own situation. The importance of debating the future of these renewable energies was also stressed, in particular by discussing the tools that governments should use to promote them.

5. Conclusion

The competences for each renewable energy and ICT have been identified thanks to the experience of each partner of the Consortium. The idea was to start from the trades actually exercised by farmers producing biomass, biogas and solar energy to bring out the main lines of skills to acquire. For ICT, the skills to be acquired must meet the needs that farmers will have in the training. The main lines identified have been further developed according to the ESCO skills. All of them did not exist and were therefore proposed.

Once the skills were validated by all the partners, it was a question of having them validated by the stakeholders. For this, three steps:

- specialist partners have based their experience and research to make a needs analysis

- from a quantitative point of view, questionnaires were constructed on a Likert scale (1 = "useless", 5 = "essential") based on the skills identified and were submitted to stakeholders in all partner countries

- from a more qualitative point of view, meetings were organized with stakeholders in a same country to refine their point of view on the needs of farmers wishing to engage in renewable energies based on outlines of the modules

It is clear from all of this work that the skills identified are all important at fairly close levels. Those that may have been a little less recognized as essential will still be part of the device but to a lesser extent. We can

then deduce that all topics should be addressed during blended-learning training either online or face-to-face and will be dug during visits and trainees periods interns.

Therefore, the work already started, continues with the identification of the resources of the partners available, internally, resources that are intended to fulfill the objectives of each identified competency.