



D1.13: Development of materials for trainings and inter-regional demonstrations of CCs – revised version

WP1 – Competence Centres and Technical Expertise Management

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Table of Contents

Executive summary.....	6
1 Introduction.....	7
2 Method.....	7
3 Results and Discussion.....	9
3.1 Training courses by Service Category	9
3.2 Training courses by Area	10
3.2.1 Area in detail.....	10
3.3 Training courses by Type.....	11
3.3.1 Online or in person	11
3.3.2 Course type	12
3.4 Training courses by Consortium membership	13
3.5 Training courses by Country	14
3.5.1 Overall.....	14
3.5.2 Partner only training courses	15
3.6 Training courses by Cluster	16
3.6.1 Consortium Members only	16
3.6.2 All Training courses per Cluster	17
3.7 Training courses by Language.....	18
3.8 Pre-qualifications and Target Audience	18
3.9 Training courses by Cost	19
4 Conclusions and Recommendations.....	22
5 Annexes.....	24
Annex I: List of offered trainings/courses.....	24



Table of Figures

Figure 1: Bar plot of the number of training courses, by service.....	9
Figure 2: Bar plot of the number of training courses, by area.....	10
Figure 3: Bar plots of the number of training courses, by (top) online or in person; (bottom) online or in person, with breakdown by service.....	11
Figure 4: Bar plots of the number of training courses, by type.....	12
Figure 5: Bar plots of the number of the number of training courses, by (top) consortium membership; (bottom) consortium membership with further breakdown by service.....	13
Figure 6: Bar plot of the number of training courses, by country.....	14
Figure 7: Bar plot of the number of training courses, by country: (top) considering only consortium and associated members; (bottom) considering only in person training courses from consortium and associated members.....	15
Figure 8: Map showing the different clusters of countries, as per the organization of the project...	16
Figure 9: Bar plot of the number of training courses, by cluster.....	17
Figure 10: Bar plot of the number of training courses, by cluster, including those from non-members.	17
Figure 11: Bar plot of the number of training courses, by language.....	18






Executive summary



With regard to training and education three related deliverables will be produced. In the first step (D1.13) an overview will be given of existing training that can be used. In the second step (D1.11) the agROBOfood network needs for training will be identified. Based on the needs and availability of training material in step 3 there will be set up some specific training activities that will be reported in D1.12).

The main purpose of this Deliverable (D1.13) is to map available training courses to support companies, digital innovation hubs and competence centres in the digitalisation and use of robotics in the agri-food sector. This was done by an online search of relevant courses, which were catalogued in a spreadsheet containing information such as area of interest, type of service, training location, organizer, consortium membership, type of training, used language, target audience, required pre-qualifications, duration and cost. The catalogued courses can be referenced from a webpage on the project website, with filter functionalities to search by topic, language, etc.

Analytics key points:

-  Current imbalance in area of interest, provided courses by country, provided courses by language;
-  Most training courses are provided by non-project partners;
-  Online courses (e.g. webinars and MOOC) could be an outcome in the COVID19 global pandemic;

Recommendations:

-  Launch more training courses to bridge the gap between countries and languages;
-  Online training courses, webinars, summer school or course modules could provide solutions in regards to travel limitations due to the COVID19 pandemic;












1 Introduction

The main objective of the agROBOfood project is to establish a pan-European network of Digital Innovation Hubs (DIHs) and Competence Centres (CC) to support companies in digitization and adoption of robotics in the agri-food sector, by connecting various stakeholders. To this end, a set of training courses in three service areas - technology, business, and ecosystem, will be highly important in transmitting knowledge in these fields to the users. Moreover, companies, end users, digital innovation hubs and competence centre's operating in agriculture will require training tailored to their requirements and backgrounds. Apart from training the ultimate users (e.g. farmers and food processors), relevant training courses are also required for competence building for the DIH colleagues, to be able to conduct the planned experiments and impart training to the end users. The aim of this Deliverable (D1.13) is to map the current trainings and courses that are given by the current partners (DIH/CC) of the agROBOfood network. In two consecutive deliverables we will address the need and development of additional training for our partners, new associated partners and end-users in the regional clusters (D1.11) and the effect of these trainings when they will be implemented (D1.12). More elaborate strategies to deal with these trainings especially on validating them will have to be developed in consultation with consortium members.

2 Method

A spreadsheet of the agROBOfood catalogue developed within “WP 6. Building a sustainable network of agri-food robotic DIHs” was downloaded on the 11th of February 2020 from the Basecamp environment (agROBOfood project management and communication tool). This spreadsheet was used to identify which associated and consortium partners were likely to offer course modules or training programs. The selection was made based on the given description of the services provided by the partner stated on the spreadsheet. Work experience with any of the partners was also included in the selection. The spreadsheet consisted of 97 DIH/CC names and after selection this was reduced to 41. These 41 were split between two researchers of Wageningen University and Research. The split was based on work experience with the partners and language skills of the researchers.

Following this selection, a desk search was conducted and a spreadsheet was made using Microsoft Excel. The internet was used to collect information on any available course modules or trainings. Information was retrieved using the website of the partners, a search engine or e-mail contact. For each of these spreadsheet entries the following information was gathered, if available:

-  **Area of interest**, such as computer vision, drones, data science, robotics, ...;
-  **Service**, the kind of service provided: Technology, Business or Ecosystem;
-  **Location**, whether the course module or training was conducted on a specific location (e.g. at a farm, at a company, online or elsewhere);
-  **Organizer**, who organizes the course module or training;
-  **Partner**, whether the organizer is a partner of agROBOfood or not;
-  **Type**, what kind of course module or training it is such as MOOC (Massive Open Online Course), Summer School, MSc Module, BSc Module, ...;
-  **Language**, in which language the course module or training is given;
-  **Target audience**, what the target group of the course module or training is;
-  **Prequalification's**, if there is any prior knowledge required for the course module or training;
-  **Duration**, the duration of the course module or training in hours, days or weeks;
-  **Cost**, what the cost of the course module or training is, if applicable;

These trainings were also used to fill the basic training webpage on the project website <https://agrobofood.eu/training-catalog/> with filters for searching the available course, based on topic, language, etc.

3 Results and Discussion

The research resulted in 94 training courses which were found to be relevant to the three service categories - technology, business, and ecosystem. The graphical results reported here were obtained through processing using the Python PANDAS package. It must be noted that one course may have more than one area, such as robotics and data science, and may be offered in more than one language or even in more than one country.

3.1 Training courses by Service Category

Figure 1 presents bar graphs for the number of training courses per service category (technology, business, and ecosystem). It can be seen that there is a large number of training courses available for technology, but not as many for the business and ecosystem services.

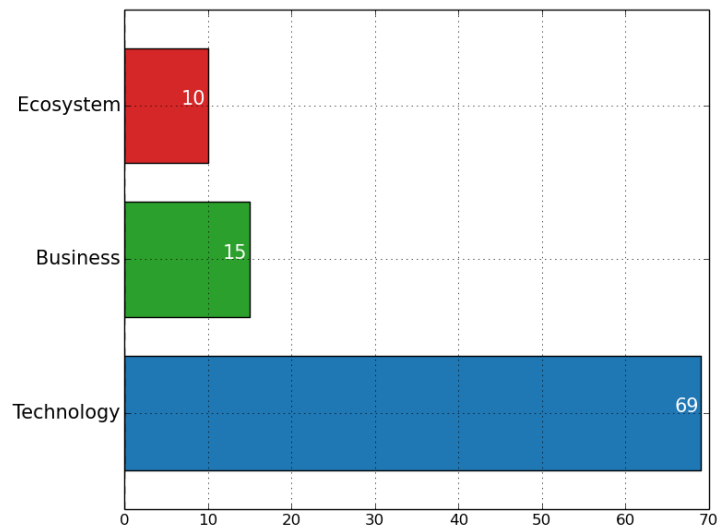


Figure 1: Bar plot of the number of training courses, by service.

3.2 Training courses by Area

The bar graph of the number of courses per area is shown in Figure 2. The areas were assigned to a course based on its description and keywords, and there can be more than one area for a course. Based on the trend observed from the graph by service, as expected, the technological areas of robotics and data science dominate this graph.

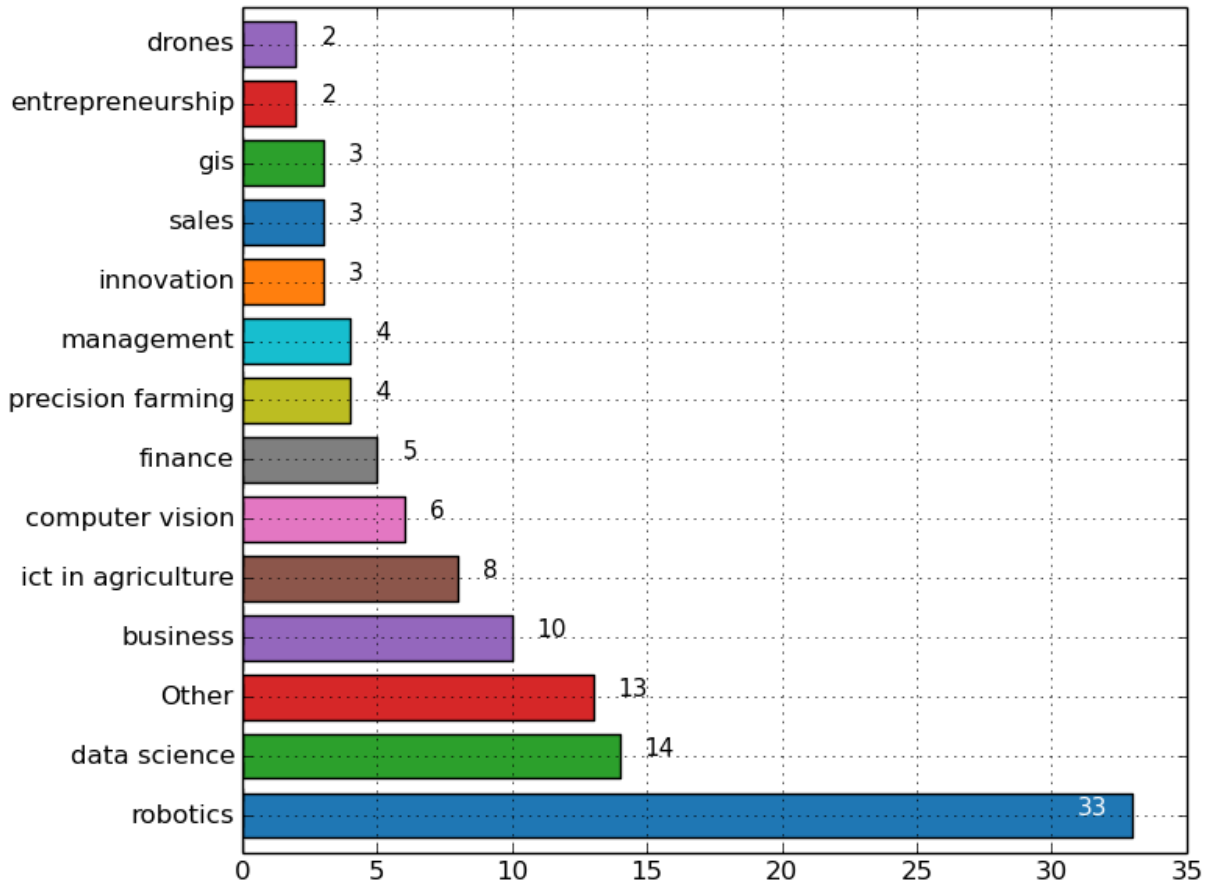


Figure 2: Bar plot of the number of training courses, by area.

Areas which had just one training course each were agricultural science, agricultural mechanisation, digital technology, phenotyping, embedded systems, nanotechnology, automotive manufacturing, economics, viticulture, industrial technology, biosystems engineering, agricultural engineering. Most of these are broad areas, whereas others specified are more specific in scope.

3.2.1 Area in detail

Agricultural automation is addressed broadly. There are courses on robotic hardware, software (Robot Operating System, TU Delft), industrial robotics which could help pre and/or post-harvest (Curso de Programación de robots KUKA/ABB, Eurecat Academy; Agri-Robotics, University of Lincoln) and the overall problem of applying robotics to agri-food tech applications (Agri-Robotics, University of Lincoln; Automatics in Agriculture, University of Novi Sad).

3.3 Training courses by Type

The available training courses range from relevant university modules to online courses (MOOCs). While online courses such as the ones on Coursera have the advantage of not requiring physical presence, most other types require attendance physically. Further, even within online courses, MOOCs can be self-paced, whereas webinars require attendance at a specific time. Therefore, a comparison is made on two levels: (1) online or requiring physical presence, and (2) by type (university module, summer school, etc).

3.3.1 Online or in person

The breakdown between courses that are online and those requiring physical presence is presented in Figure 3(top). Figure 3(bottom) presents a breakdown of these numbers, by service. It can be seen that there are roughly twice as many in person training courses as online ones, and that this trend does not vary much across services.

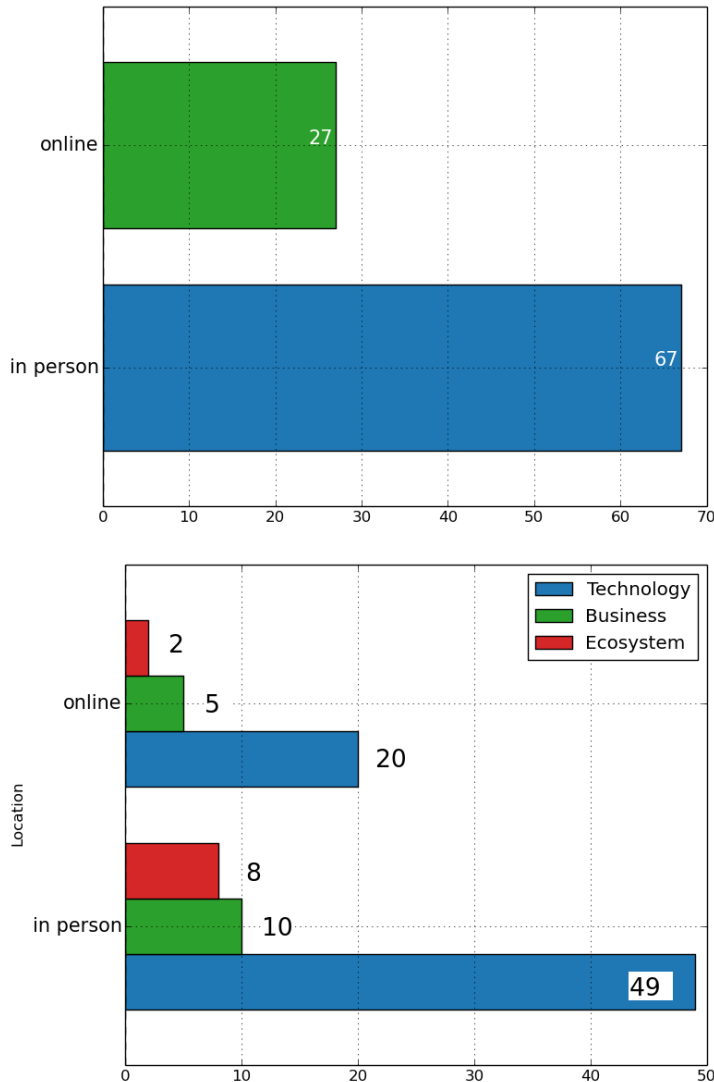


Figure 3: Bar plots of the number of training courses, by (top) online or in person; (bottom) online or in person, with breakdown by service.

3.3.2 Course type

Figure 4 presents a bar graph of the number of training courses per course type. The type with the most courses were the summer schools/short courses which typically last between one and three weeks. The next highest numbers were for MOOCs and individual masters level modules.

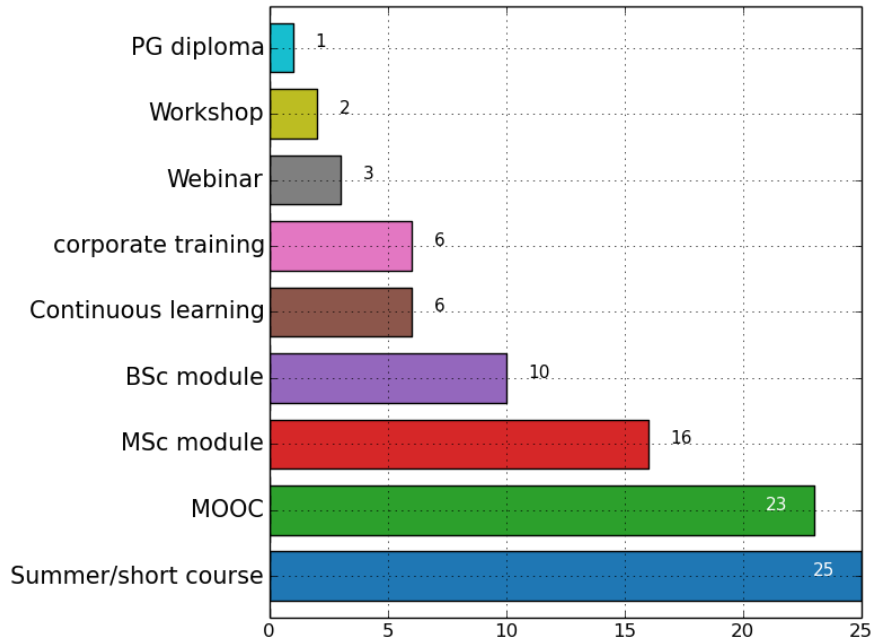


Figure 4: Bar plots of the number of training courses, by type.

3.4 Training courses by Consortium membership

In Figure 5, the number of courses is shown for the consortium partners, associated members, and non-members (external). Figure 5(b) presents a further breakdown across these three groups, by service. It can be seen from Figure 5(a) that roughly more than one third of all training courses are from external organizations. Further, it can be seen from Figure 5(b) that while technology training courses are available within the consortium and associated members, there are very few trainings in the business and ecosystem services.

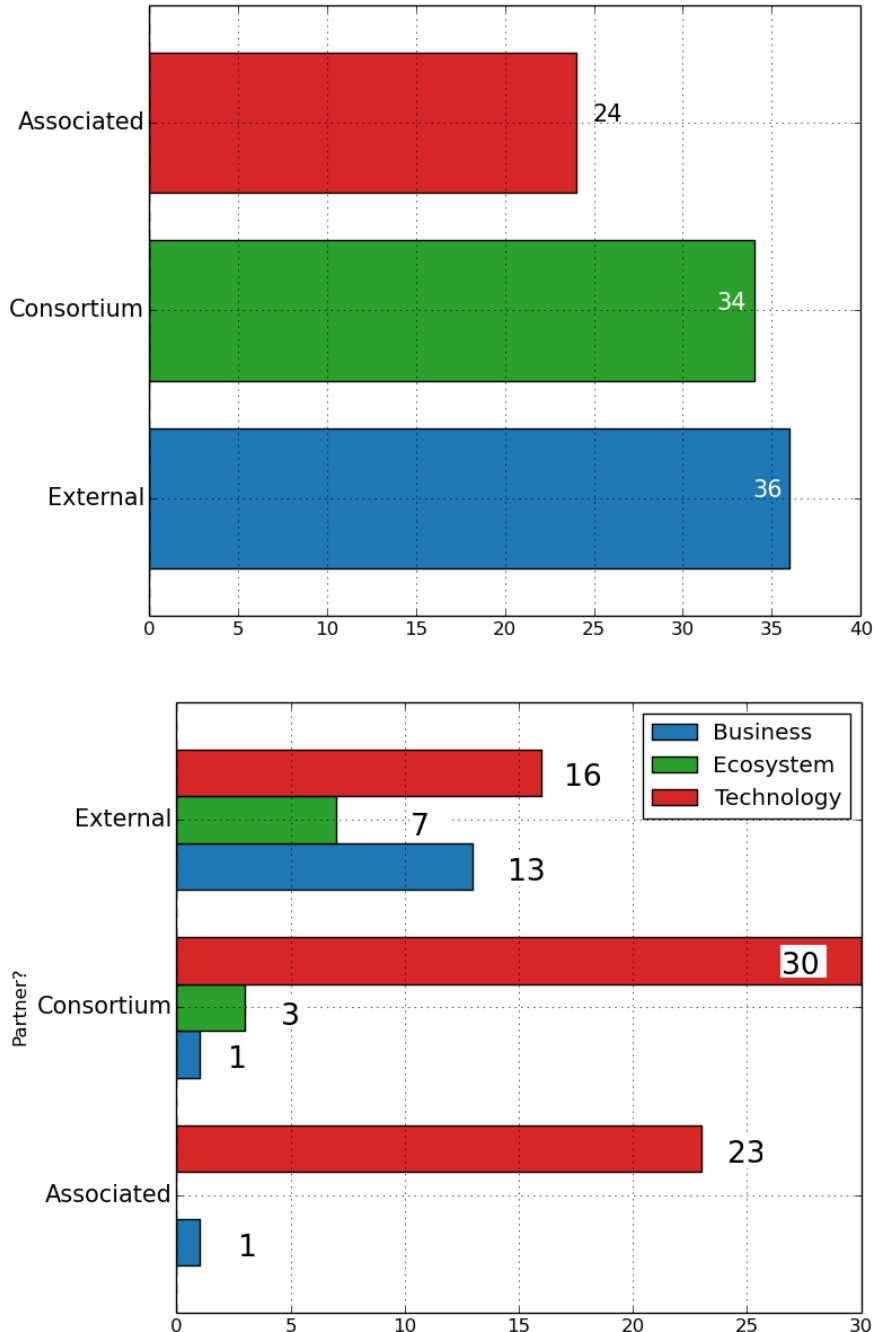


Figure 5: Bar plots of the number of the number of training courses, by (top) consortium membership; (bottom) consortium membership with further breakdown by service.

3.5 Training courses by Country

3.5.1 Overall

The overall number of courses per country is shown in Figure 6. These numbers include both online and in-person courses, and those offered by both consortium members and non-members. It can be seen that Spain has the most training courses, followed by the Netherlands, both being considerably above the rest. The online courses from non-European countries namely, the USA, Mexico, and Australia are shown grouped together under the category 'Outside Europe'.

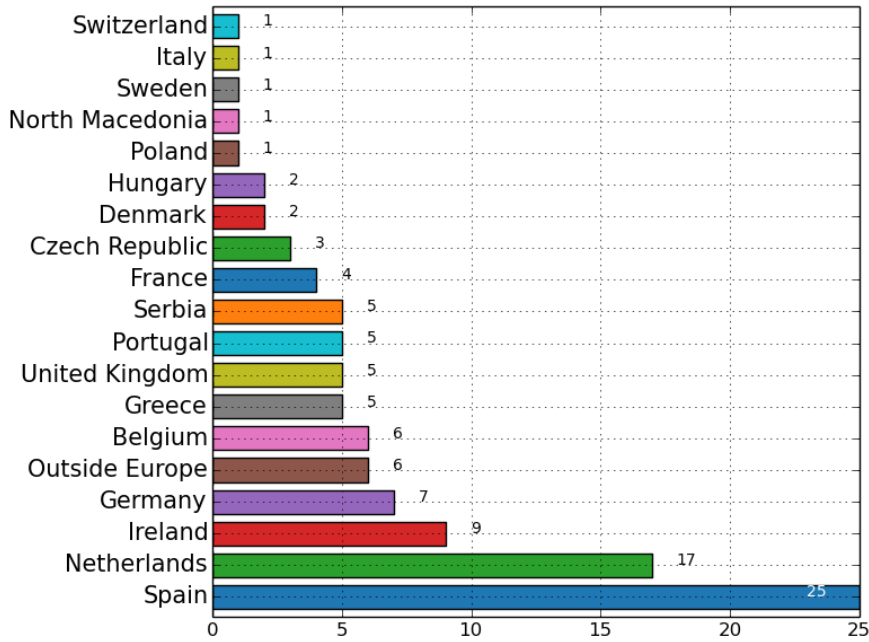


Figure 6: Bar plot of the number of training courses, by country.



3.5.2 Partner only training courses

Refining the bar graph from Figure 6 to only include courses from consortium partners and associated members leads to the bar graph in Figure 7(a). Further refining to include only in-person training courses is shown in the bar graph in Figure 7(b). Again, Spain has the highest number of courses, followed by the Netherlands. There is an imbalance seen between these two countries on one hand and the rest. By including non-consortium training courses, the tally of some countries such as France and Serbia improves.

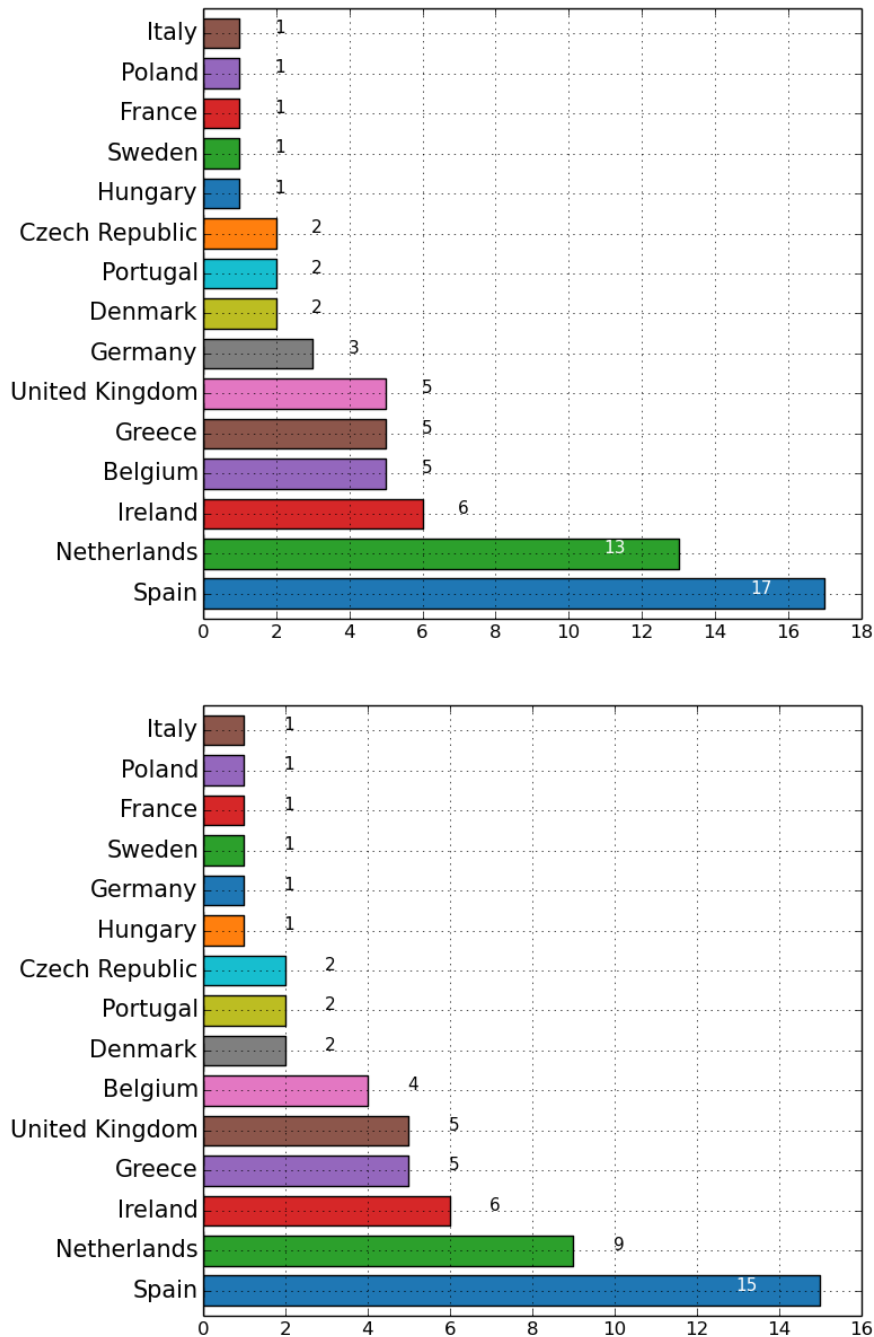


Figure 7: Bar plot of the number of training courses, by country: (top) considering only consortium and associated members; (bottom) considering only in person training courses from consortium and associated members.

3.6 Training courses by Cluster

The clusters of countries that have partners in the agROBOfood project are shown in the map in Figure 8. For each cluster, all the training courses organized by consortium or associated members were summed and presented in the bar graphs. For the sake of comparison, another graph is presented which includes external training courses.

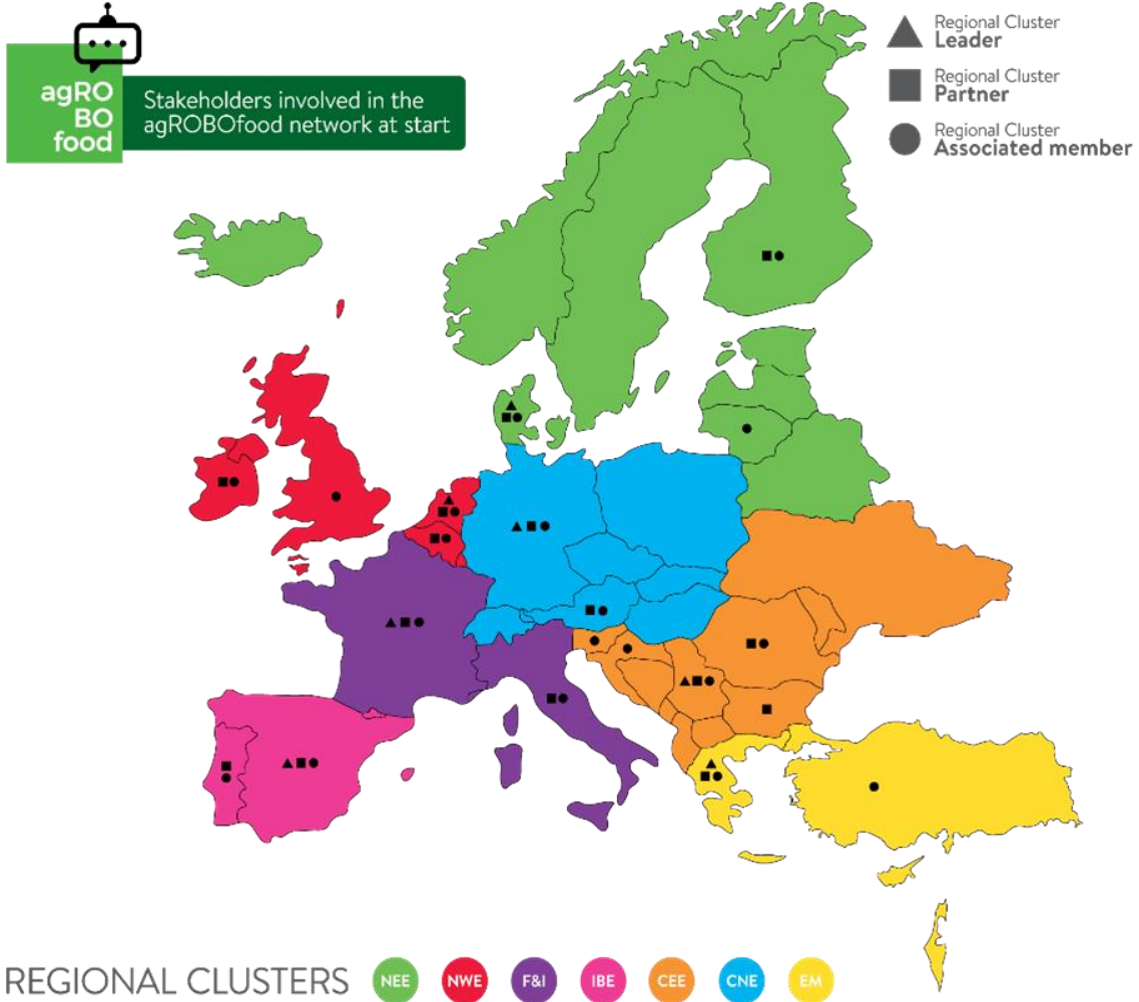


Figure 8: Map showing the different clusters of countries, as per the organization of the project.

3.6.1 Consortium Members only

Figure 9 shows the number of courses per cluster. Only those training courses which were offered by consortium partners or associated members were included in this plot. Both online and in-person trainings were included. It can be seen that the clusters North West Europe (NWE) and Iberia (IBE) have a large number of training courses offered by the consortium. This is in line with the breakdown by countries, which showed that Spain and the Netherlands are the countries with the most training courses. On the other hand, the Central Eastern Europe (CEE) and France and Italy (FI) clusters have no trainings or very few available.

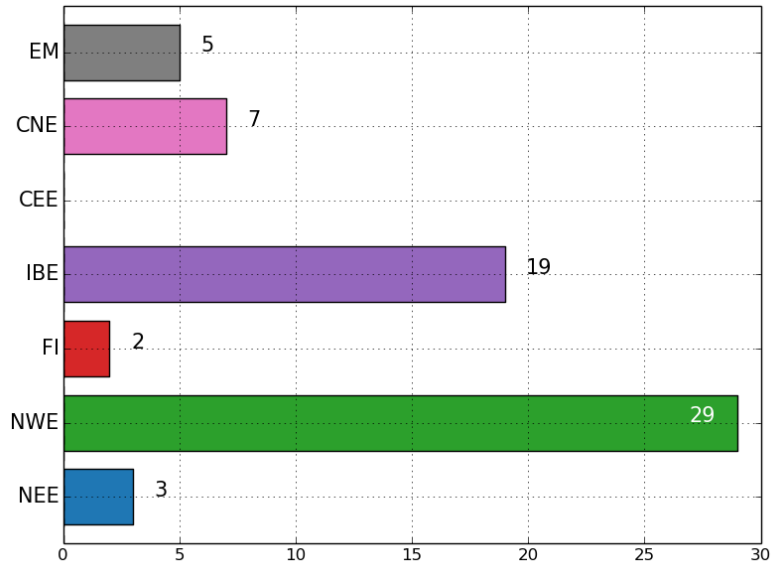


Figure 9: Bar plot of the number of training courses, by cluster.

3.6.2 All Training courses per Cluster

In Figure 10, the number of courses per cluster is presented, this time by including all training courses for the countries within each cluster. For example, relevant courses from the Faculty of Agriculture, University of Novi Sad, Serbia which is a partner of Biosense, a consortium member, are now included. The NWE and IBE clusters still dominate the available training courses, whereas the North Eastern Europe (NEE) cluster has the fewest number.

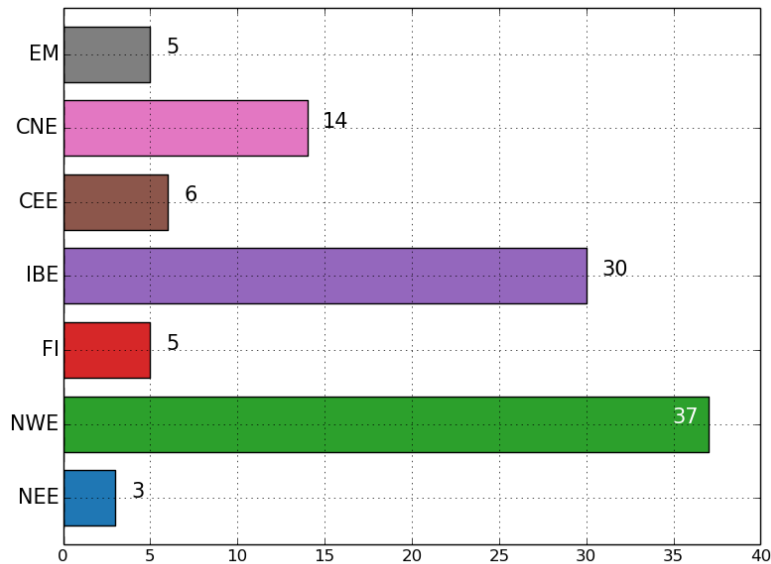


Figure 10: Bar plot of the number of training courses, by cluster, including those from non-members.

3.7 Training courses by Language

The bar plot of the number of courses per language is shown in Figure 11. It can be seen that the largest number of courses are offered in English. After English, Spanish has the next highest number of courses, followed by Catalan, and then jointly by Dutch, Greek, and Serbian. Polish, Macedonian, and Swedish had just one course in each of them, and are collectively shown as others in the plot.

This shows that there are already several organizations offering courses in English, rather than the respective country's language. Indeed, English has emerged as the common lingua franca for the scientific research community, but for the purpose of training farmers or SMEs, the language imbalance will have to be addressed.

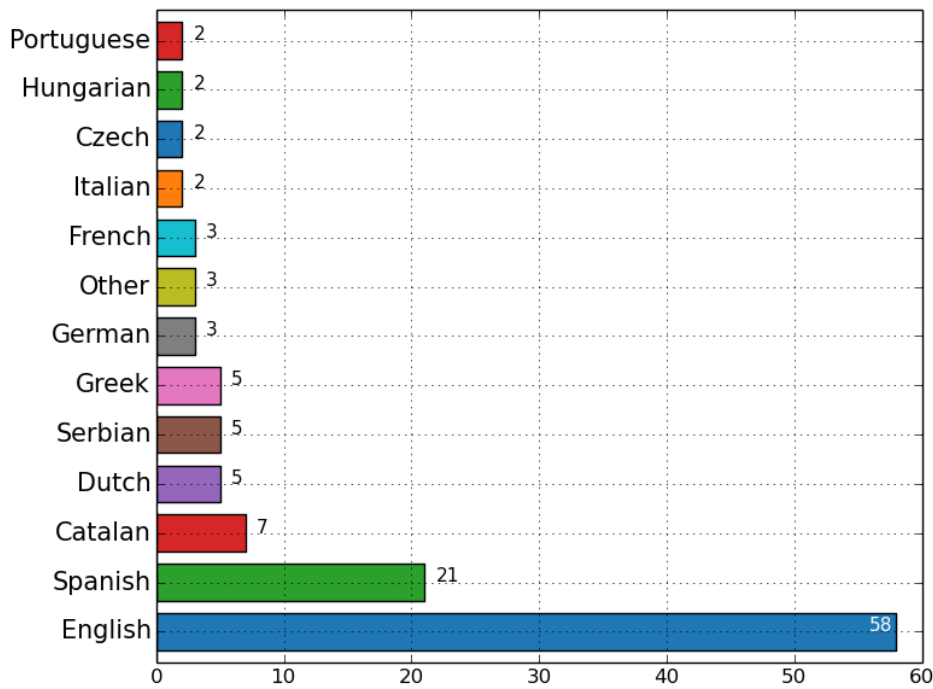


Figure 11: Bar plot of the number of training courses, by language.

3.8 Pre-qualifications and Target Audience

The pre-qualifications and target audience for the training courses were difficult to analyse numerically, due to the fact that most non-academic courses or trainings either did not specify them at all or assume some professional experience in the area.

The catalogued university modules at the MSc level assume an undergraduate degree in the respective field, or relevant knowledge such as mathematics, programming, and machine learning. The BSc level courses assume fundamentals in the respective field of study such as agricultural science or engineering, in addition to mathematics and programming.

MOOCs generally assume prior knowledge and experience in programming in Python, R, or C++ for areas such as data science and robotics.

3.9 Training courses by Cost

Analysis on the basis of cost is not easy in this case because out of the 94 training courses, the cost information was not available for 43 of them, and the fact that durations specified vary between those defined in terms of hours and those in terms of days or weeks. Further complication is caused by the fact that some trainings such as the one from Robotnik/constructsim are free for clients who have purchased the robots. Comparing the costs on the basis of type of course however does provide some useful insight. All course costs are in euros. The fees specified in British pounds and Danish Kroner were multiplied by exchange rates (1.148 and 0.134), which are subject to change over time.

Figure 12 shows that the median cost for MOOCs for technology are the lowest, among the different types of courses. For the business service, there was just one MOOC whose cost was considerably lower than that of summer or short courses as seen in Figure 13, however, there was also a relevant workshop (organized by CEMA) which was free of charge. For the ecosystem service, there were only summer/short courses, the boxplot of whose costs is shown in Figure 14. It can be noted from Figure 12, 13, and 14, that the costs of summer schools/short courses tend to vary widely.

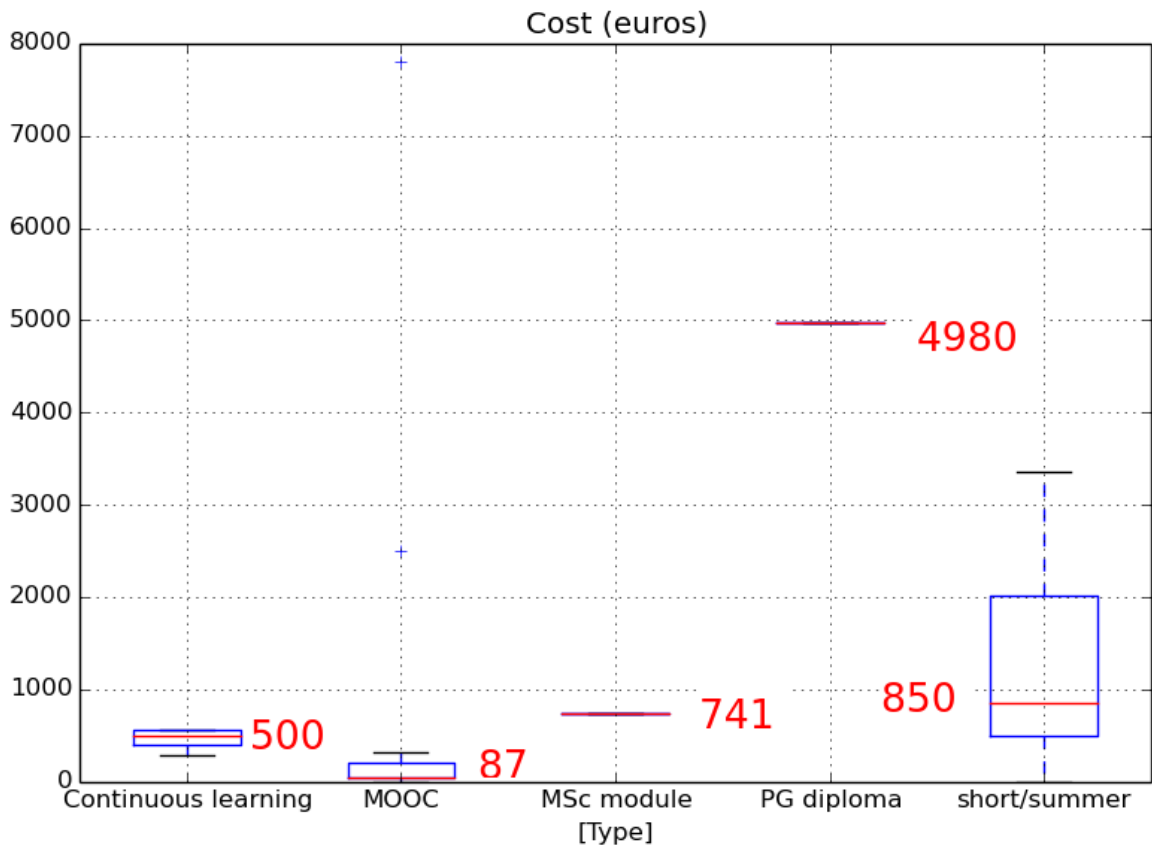


Figure 12: Box-plots of costs in euros for different course types, for the technology service. The median values are shown overlaid.

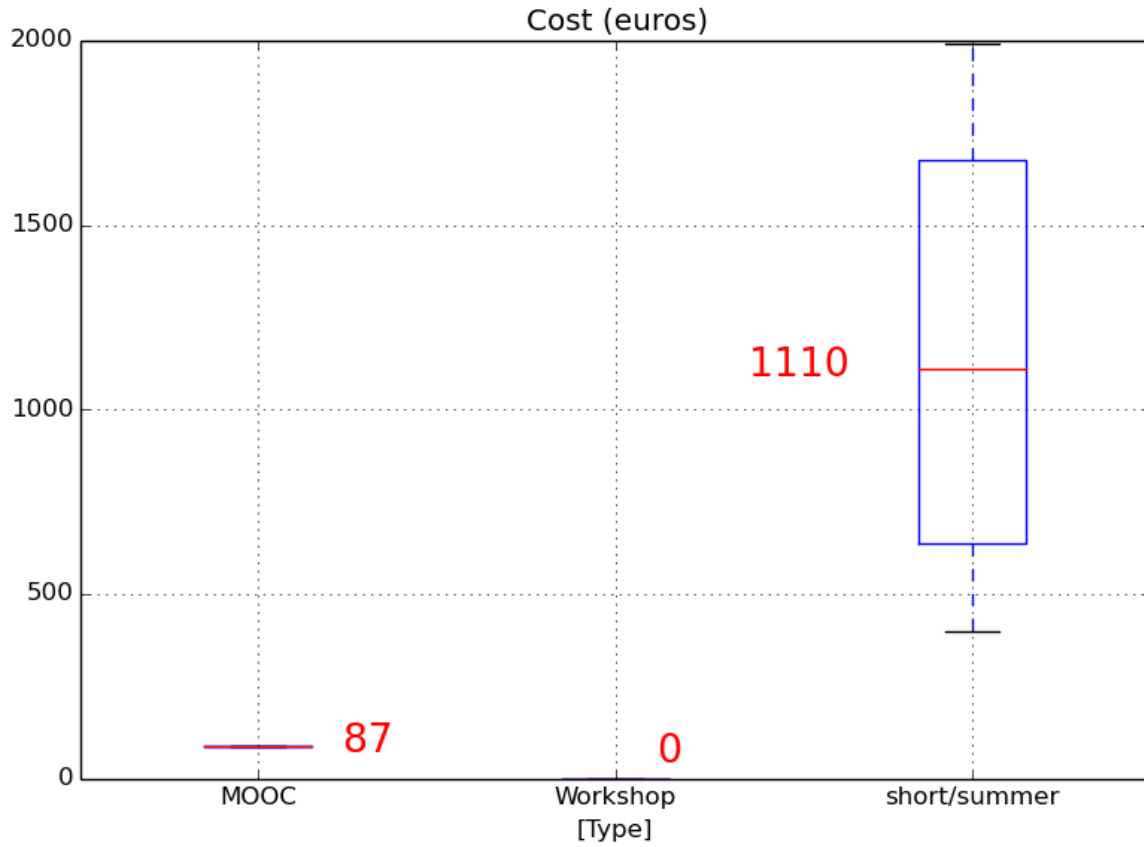


Figure 13: Box-plots of costs in euros for different course types, for the business service. The median values are shown overlaid.

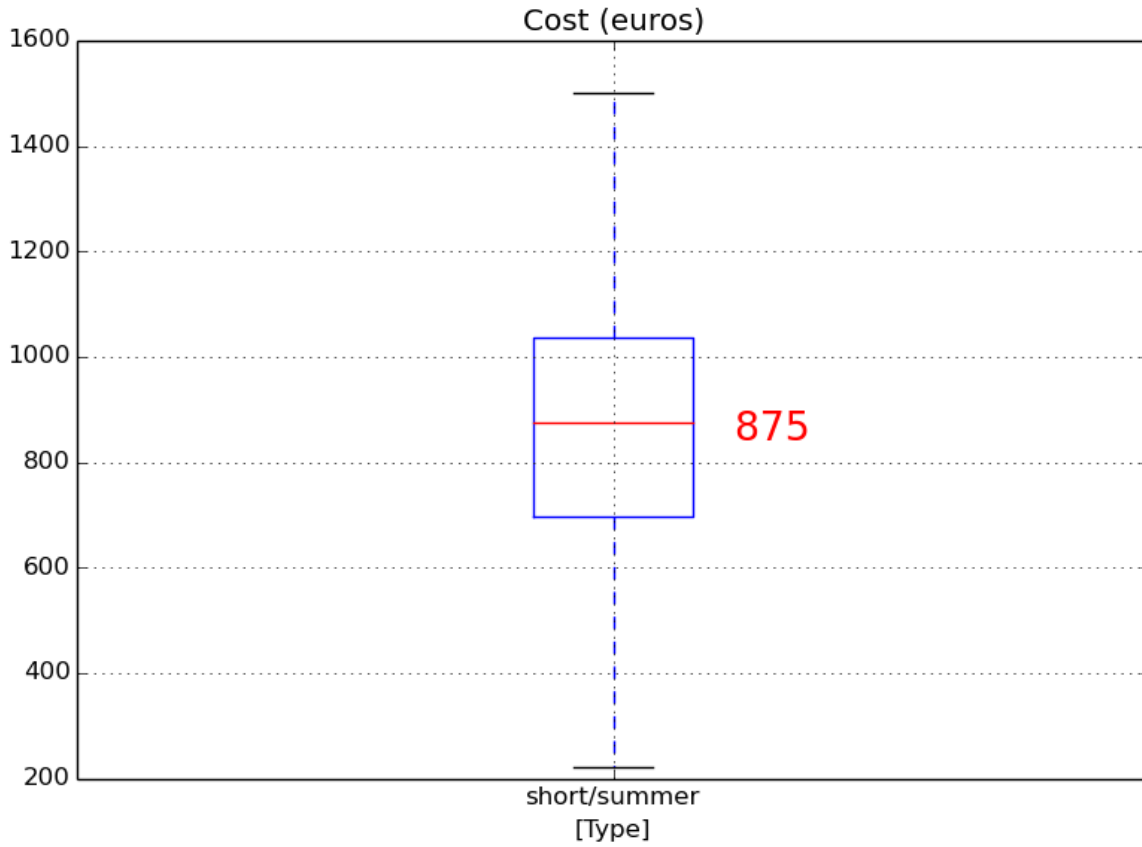


Figure 14: Box-plots of costs in euros for different course types, for the ecosystem service. The median values are shown overlaid.

4 Conclusions and Recommendations

The information about training materials are gathered to be used to help the members of the agROBOfood network to mature their knowledge and processes. The materials were carefully clustered for the user convenience. Thus making possible to choose from the type of courses for technological, business or ecosystem services upgrade and target the weak spots. Based on the results in the previous section, the following conclusions can be drawn:

1. Imbalances exist in the number of training courses with respect to
 - 1.1 Service: technology has a large number of courses available whereas the business and ecosystem services have very few ones available. This is also reflected in the areas of the courses.
 - 1.2 With the respect to the topics necessary for the implementation of robotics in agri-food, there were no courses found in the sectors greenhouse farming or ocean. Three training courses were found for arable farming and one on fruits (vineyard).
 - 1.3 Country and Cluster: Some countries such as Spain and the Netherlands have a significantly larger number of courses than the rest, whereas the France and Italy (FI), Central Eastern Europe (CEE), and North Eastern Europe (NEE) have very few.
 - 1.4 Language: A large number of courses are available in English. Spanish comes second, owing to a large number of training courses offered by Spanish consortium members, but no other language could cover the entire spectrum of areas for necessary training. The fact that trainings are likely to be in English rather than the respective country's language may not be a problem for academic research groups or large companies, but will have to be bridged for training SMEs.
 - 1.5 There is also a large variability in the cost of training. In particular, short/summer courses tend to vary considerable in their costs. MOOCs for technology have a significant lower median cost than other types of courses, and have a smaller variance.
2. External organizations which are not agROBOfood consortium or associated members offer a large number of relevant training courses in topics relevant to the services.
3. Online courses (MOOCs and webinars) have quite a few relevant offerings in the technological, business, and marketing areas. These courses may be advantageous in that they avoid travel and all the more relevant during situations such as the current Covid19 pandemic. They are however still subject to the imbalance in language.

The following recommendations are therefore made:

1. There is a need to launch more training courses to bridge the gap with regards to countries and languages as well as the sectors necessary for the implementation of robotics in agri-food.
2. Whereever available, the external training courses may be leveraged to make more efficient the effort in bridging these gaps. MOOCs in particular can be cost effective options.
3. To this end, university modules in the respective country and taught in the respective language are a good starting point. They will have to be adapted to a short course or summer school version, that runs continuously, rather than over a period or semester.

D1.13: Development of materials for trainings and inter-regional demonstrations of CCs

4. Online learning in the topics where it is possible, has several offerings, mainly in the English language. Some universities, including WUR, are conducting teaching online to deal with the social distancing lockdown due to COVID19. Therefore it may be useful to record and reorganize such modules.
5. The gathered training materials data will be used to help the members of the network to mature their knowledge and processes.
6. A procedure/mechanism needs to be defined on how to handle the process of adding a new training to the list or website. Right now the admin of the website needs to verify the authenticity of a new course, whose information is submitted in a specific template, before adding it to the webpage database. It would also be necessary to assess the quality/level of the course content. Finally, a strategy needs to be developed on how to decide if a course was useful in practice, for example if the knowledge gained is being applied in practice in a certain time from the course.

5 Annexes

Annex I: List of offered trainings/courses

 Full list can be found in the agROBOfood main folder on Basecamp

Title	Areas	Service	Organizer	Partner?	Type	Language	Source
Administración de Proyectos: Principios Básicos	management	Business	Tecnológico de Monterrey, UCI	No	MOOC	Spanish	Link
Advanced robotics	Robotics	Technology	UoL	Associated	MSc module	English	Link
AEF Technical Training	ICT in agriculture	Technology	AEF	Consortium	MOOC	German, Italian, English	
Aerial Robotics	Robotics	Technology	UPenn	No	MOOC	English	Link
Agri Teach 4.0	ICT in agriculture	Technology		No	Training	English, Hungarian, Macedonian	Link
Agricultural Engineering	Agricultural Engineering	Technology	ILVO	Consortium		Dutch, English	Link
Agricultural Mechanisation	Precision Farming; GIS	Technology	ITT	Associated	BSc module	English	Link
Agricultural Mechanisation	Agricultural Mechanisation	Technology	WIT	Consortium	BSc module	English	Link
Agricultural Science and Precision Farming	Agricultural Science; Precision Farming	Technology	ITT	Associated	BSc module	English	Link
Agri-Robotics	Robotics	Technology	UoL	Associated	MSc module	English	Link
Análisis de datos: Llévalo al MAX()	Data Science	Technology	TU Delft	Consortium	MOOC	Spanish	Link
Applied Data Science with Python	Data Science	Technology	DTI	Consortium	Short course	English	Link
Applied Data Science with R	Data Science	Technology	DTI	Consortium	Short course	English	Link
Automatics in Agriculture	robotics; automation	Technology	University of Novi Sad	No	BSc module	Serbian	Link
Automation and Robotics	Automation; Robotics	Technology	ITT	Associated	BSc module	English	Link
Automotive Manufacturing Engineering	Automotive Manufacturing	Technology	ITT	Associated	BSc module	English	Link
Autonomous Navigation for Flying Robots	Robotics; Computer vision	Technology	TUM	No	MOOC	English	Link
Big data analytics and modelling	Big Data	Technology	UoL	Associated	MSc module	English	Link

D1.13: Development of materials for trainings and inter-regional demonstrations of CCs

Big Data Strategies to Transform Your Business	Data Science	Technology	TU Delft	Consortium	MOOC	English	Link
Big data streams	Big Data	Technology	TU Delft	Consortium	Short course	English	Link
Biosystem Engineering	Biosystems Engineering	Technology	KU Leuven	Associated	Short course	Dutch	Link
Business Model Innovation	business	Business	HEC Paris	No	MOOC	English	Link
Catalan School of Vine Pruning	Viticulture	Technology	INNOVI	Consortium	Training	Catalan, Spanish, English	Link
CEMA	Innovation	Business	CEMA and partners	Consortium	Workshop	Depends on country	Link
Certificate in statistics and data analysis	Data Science	Technology	WIT	Consortium	Short course	English	Link
Client ROS Training	robotics	Technology	Robotnik	Consortium	MOOC	English	Link
Computer Vision	Computer Vision	Technology	UoL	Associated	MSc module	English	Link
Corporate Finance	finance	Business	Europa-Universität Viadrina	No	Summer school	English	Link
Corporate Finance	finance	Business	Solvay Summer School	No	Summer school	English	Link
Curso de Programación de robots ABB	Robotics; automation	Technology	Eurecat Academy	Consortium	Continuous learning	Spanish, Catalan	Link
Curso de Programación de robots KUKA	Robotics; automation	Technology	Eurecat Academy	Consortium	Continuous learning	Spanish, Catalan	Link
Data Scientist for Energy and Security	Data Science	Technology	Fraunhofer Academy	Consortium	Short course	German, English	Link
Digital Economy Summer School	business	Ecosystem	Barcelona GSE	No	Summer school	English	Link
Diseña, fabrica y programa tu propio robot	Robotics	Technology	UPV	No	MOOC	Spanish	Link
DRAXIS Environmental Software and Databases	ICT in agriculture	Technology	DRAXIS	Consortium	Training	Greek, English	Information provided by e-mail
DRAXIS Environmental Software and Databases	ICT in agriculture	Technology	DRAXIS	Consortium	Training	Greek, English	Information provided by e-mail
Drones for Agriculture	Drones	Technology	WUR	Consortium	MOOC	English	Link
Economics of Agriculture	economics	Ecosystem	University of Novi Sad	No	BSc module	Serbian	Link
Entrepreneurial Management	management; entrepreneurship	Business	University of Novi Sad	No	BSc module	Serbian	Link
Europe as a Business Network, Ecosystem and Industry	business	Ecosystem	Utrecht Summer School	No	Summer school	English	Link
Financial Risk Management	business	Business	ISCTE-IUL	No	Summer school	English	Link
Formação avançada (Advanced training)	Industrial technology; Management	Business	iMan Norte Hub	Associated	Short course	Portuguese	Link
Foundations of robotics	Robotics	Technology	UoL	Associated	MSc module	English	Link



D1.13: Development of materials for trainings and inter-regional demonstrations of CCs

FTE-35306 Machine Learning	Data Science	Technology	WUR	Consortium	MSc module	English	Link
Future Proof - Ondernemendheid voor professionals	entrepreneurship	Business	Maastricht Summer School	No	Summer school	Dutch	Link
Gaiasense Smart Farming	Precision Farming	Technology	Gaiasense	Associated	Training	Greek, English	Information provided by e-mail
Gaiasense Smart Farming	Precision Farming	Technology	Gaiasense	Associated	Training	Greek	Information provided by e-mail
Geographic Information Systems	GIS	Technology	KU Leuven	Associated	MSc module	English	Link
GRS-34806 Deep Learning in Data Science	Data Science	Technology	WUR	Consortium	MSc module	English	Link
Hello World with ROS	Robotics	Technology	TU Delft	Consortium	MOOC	English	Link
ICT Biochain trainings	ICT in agriculture; finance; business	Ecosystem	ICT-Biochain	No	Webinar	English	Link
Image Analysis for Plant Phenotyping	Computer vision; phenotyping	Technology	WUR	Consortium	Summer school	English	Link
INF-33806 Big Data	Data Science	Technology	WUR	Consortium	MSc module	English	Link
Infografía y visualización de datos	Data Science	Technology	Eurecat Academy	Consortium	Continuous learning	Spanish, Catalan	Link
Information and Communication Technologies in Agricultural Engineering	ICT in agriculture	Technology	University of Novi Sad	No	BSc module	Serbian	Link
Innovation and Future Thinking	business	Business	IED Barcelona	No	Summer school	Spanish	Link
Innovation Management	innovation	Business	Erasmus University	No	MOOC	English	Link
Innovación Colaborativa	innovation	Ecosystem	Eurecat Academy	Consortium	Short course	Spanish	Link
Interuniversitair Micro-Electronica Centrum vzw (IMEC)	Nanotechnology; digital technology	Technology	IMEC	Associated	Short course	English	Link
Introducción a la robótica e industria 4.0	Robotics	Technology	Universidad Anahuac	No	MOOC	Spanish	Link
Introducción a la visión por computador: desarrollo de aplicaciones con OpenCV	Computer Vision	Technology	UC3M/Robocity2030	Associated	MOOC	Spanish	Link
Introducing Robotics	Robotics	Technology	QUT	No	MOOC	English	Link
Introduction to Robotics Design	robotics	Technology	U Twente	Associated	MSc module	English	Link
L'impact investing, la finance qui change le monde Specialization	finance	Business	ESSEC Business School	No	MOOC	French	Link
Managing the Digital Transformation	business	Ecosystem	Berlin International University of Applied Sciences	No	Summer school	English	Link
Marketing	sales; business	Business	University of Novi Sad	No	BSc module	Serbian	Link
Marketing Strategy	sales	Ecosystem	IE Business School	No	MOOC	English	Link
Máster en Robótica	Robotics	Technology	Eurecat Academy	Consortium	PG diploma	Spanish	Link
Master Software Engineering for Embedded Systems	Embedded systems	Technology	Fraunhofer Academy	Consortium	MOOC	English	Link



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Metodologías y análisis de datos en R	Data Science	Technology	Eurecat Academy	Consortium	Continuous learning	Spanish, Catalan	Link
Microsoft Training on AI	AI	Technology	AGIT FIEK	Associated	Workshop	Hungarian	Link
Project Management: From Theory to Practice	management	Business	Utrecht Summer School	No	Summer school	English	Link
Regulating Robotics & Drones	robotics	Technology	U Twente	Associated	MSc module	English	Link
Robot to Human, From Physical to Digital	robotics	Technology	IAAC Catalunya	Associated	MSc module	English	Link
Robotcraft	Robotics	Technology		No	NA	English	Link
Robotic Vision	Robotics; Computer vision	Technology	QUT	No	MOOC	English	Link
Robótica móvil autónoma para la industria	Robotics	Technology	Eurecat Academy	Consortium	Continuous learning	Spanish, Catalan	Link
Robotics Summer School	Robotics	Technology	ETHZ	No	Summer school	English	Link
Robotics: Vision Intelligence and Machine Learning	Robotics	Technology	UPenn	No	MOOC	English	Link
Robots and Manipulators	robotics	Technology	AGRIS	Associated	MSc module	Czech	Link
Robots de Campo	Robotics	Technology	UC3M/Robocity2030	Associated	MSc module	Spanish	Link
ROS Training	Robotics	Technology	Robovalley	Consortium	Short course	Dutch, English	Link
Sensors for measurement and regulation	robotics	Technology	AGRIS	Associated	MSc module	Czech	Link
Simulação e Controlo de Drones 2020	robotics	Technology	IST	No	MOOC	Portuguese	Link
S'initier à la robotique	Robotics	Technology	Magic Makers/INRIA	No	MOOC	French	Link
Técnicas de Negociación	sales	Ecosystem	Eurecat Academy	Consortium	Short course	Spanish	Link
Tecnologías de la Información Geográfica aplicadas a estrategias y soluciones orientadas al negocio	GIS; Data Science	Technology	Eurecat Academy	Consortium	Continuous learning	Spanish, Catalan	Link
The Digital Ecosystem: A Strategic Vision	business	Ecosystem	Universidad Politécnica de Madrid	No	Summer school	Spanish	Link
Valorización y creación de modelos de negocio para la Industria 4.0	business	Ecosystem	Eurecat Academy	Consortium	Short course	Spanish	Link
Vehículos Aéreos no Tripulados	Drones	Technology	UC3M/Robocity2030	Associated	MSc module	Spanish	Link
Venture Capital	finance	Business	RWTH, Aachen	No	MOOC	German	Link
Visum	Computer Vision	Technology	INESCTEC	Consortium	Summer school	English	Link
Webinar: Opportunities for ICT in the biomass sector	ICT in agriculture	Technology	ICT-Biochain	No	Webinar	English	Link
Webinar: Train the trainer and ICT-BIOMASS platform launch	ICT in agriculture	Technology	ICT-Biochain	No	Webinar	English	Link



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