Lifelong Learning Programme

Transfer Methodology

AgriCom

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AT A GLANCE:

Project – Coordinator

Christian M. Stracke
University of Duisburg-Essen
christian.stracke@icb.uni-due.de

Project Officers

Bettina Pütz (NA Germany)
Barbara Schablitzky (NA Germany)

Partners

Germany:

- *Leibniz-Institute of Vegetable and Ornamental Crops)*

Greece:

- *Agro-Know Technologies*
- *Agricultural University of Athens*

Italy:

- *Società di Servizi Reali Ricerca e Formazione – Settori Agricolo, Agroalimentare, Rurale e Ambientale*

The Netherlands:

- *International Foundation for Sustainable Agriculture Training*
- *Van der Meer & van Tilburg BV*

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Project and Deliverable Outline:

What is the focus of AGRICOM?
AGRICOM establishes the first competence model for Hydroponics and Irrigation Management to be applied and validated for the management of Irrigation Management and subsequently be transferred to other fields of the water sector as well as to other branches.

What is the focus of this Deliverable?
The focus of D2.2 is the development and definition of the methodology for transfer of the WCM into the agricultural sector for the participating countries.

What are the benefits of this Deliverable?
D2.2 expands the outcome of project so far by adding the corresponding levels.

How to use this Deliverable?
This deliverable can be used in combination with D.2.1 as the theoretical basis for the development of the agricultural competence model.

What is the relationship to other deliverables and work packages?
The goal of WP2 is the transfer and adaptation of WCM into the agricultural sector, specifically to irrigation and hydroponic. WP 2 is based on WP1 and supports the work WP 3. It is the basis of D.2.3 and the other deliverables of WP2.

Conclusions and recommendations
The theoretical procedure of how to transfer the WCM into the agricultural sector in form of stakeholders, job profiles and use case scenarios has been clarified in this deliverable. In the following delivery the focus should lay on standardised definitions of existing and needed competences, clear descriptions of working places and job profiles, gap analysis of targets and actual states of competences, and the preparation and providing of training solutions.

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Abstract (for external dissemination)	The goal of this deliverable is to describe in detail the theoretical construction of the Agricultural Competence Model (ACM). This model was developed by modifying the Water Competence Model from the WACOM project into the agricultural sector. The ACM consists of four main parts: (a) the stakeholders, (b) the competences, (c) the template for job profiles, and (d) the template for use case scenarios. The templates are complemented by diagrams to describe the relation of the different stakeholders. Each use case scenario includes possible training units/modules that are described by learning outcomes. The templates can be used by each partner to describe individually the job profiles of his specific country. The usages of templates ensure that the educational levels of each job profile and training unit are comparable between the different countries. In the end the adaptation of the ACM in form of an online tool is described.

Authors / Reviewers / Contributors of this Document			
Name	**Organization**	**Country**	**Role**
Henrike Perner	Institute of Vegetable and Ornamental Crops	Germany	Author
Dietmar Schwarz	Institute of Vegetable and Ornamental Crops	Germany	Author
Cornelia Helmstedt	University of Duisburg-Essen	Germany	Reviewer

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Project Consortium Information:

Partner and Acronym	Logo	Contact
University of Duisburg-Essen (Coordinator) *UDE*	UNIVERSITÄT DUISBURG ESSEN	**Christian M. Stracke** christian.stracke@uni-due.de
Leibniz-Institute of Vegetable and Ornamental Crops *IGZ*	IGZ	**Dr. Dietmar Schwarz** schwarz@igzev.de
International Foundation for Sustainable Agriculture Training *IFSAT*	IFSAT	**Bas Timmers** bastimmers@online.nl
Van der Meer & van Tilburg BV *VDM*	VAN DER MEER & VAN TILBURG ORGANISATIEADVISEURS VOOR INNOVATIE EN GROEI	**Arjan De Bruin** deBruin@innovation.nl
Agro-Know Technologies *Agro-Know*	AGRO-KNOW TECHNOLOGIES	**Charalampos Thanopoulos** cthanopoulos@agroknow.gr
Agricultural University of Athens *AUA*	Agricultural University of Athens	**Dr. Dimitrios Savvas** dsavvas@aua.gr
Società di Servizi Reali Ricerca e Formazione – Settori Agricolo, Agroalimentare, Rurale e Ambientale *SERIFO*	SeRiFo	**Dr. Gerardo Perrotta** gerardo.perrotta@serifo.it

List of Acronyms and Abbreviations:

Acronym	Full name
ACM	Agriculture Competence Model
AGRICOM	Competence Model for the Agricultural Sector
BMBF	German Federal Ministery of Education and Research
ECVET	European Credit System for Vocational Education and Training
EQF	European Qualification Framework
NQF	National Qualification Framework
PAS 1093	Human Resource Development with special consideration of Learning, Education and Training – Competence Modelling in Human Resource Development
PLA	Peer Learning Activity
VET	Vocational and Educational Training
WACOM	Competence Model for the Water Sector
WCM	Water Competence Model
ZVG	German Central Association for Gardeners

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1. Executive Summary

The goal of this deliverable is to describe the methodology for transfer of WCM model into the agricultural sector for the participating countries (Germany, Greece, Italy and Netherlands) to prepare the creation of the Agricultural Competence Model (ACM) in D2.3. The ACM so far consists of four main parts: (a) the stakeholders, (b) the competences, (c) the template for job profiles, and (d) the template for use case scenarios. The templates are complemented by Entity-Relationship-Diagrams to describe the relation of the different data. Each use case scenario includes possible training units/modules that are described by learning outcomes. The described templates can be used by each partner to describe individually the job profiles of his specific country. The usages of templates ensure that the educational levels of each job profile and training unit are comparable between the different countries.

In addition, adaptation possibilities for the ACM are described in short. The online tool, as one possibility, is described in more detail:

The online tool will include the description of competences needed as manager or operator of a farm, as service provider or as expert of supply for the area of irrigation and hydroponics. On a web portal e.g. an employer, searching for new staff, can choose out of a list of competences adequate competences to write a plain job application. On the other hand, an employee who wants to improve his professional skills might use this tool to reveal missing competences in his job profile, a so called gap analysis. This gap analysis of course can just as well be used by an employer. The competences will be defined at different educational levels to facilitate the search for the user. The online tool will also include VET training descriptions for the targeted job profiles. This will make the user familiar with the competences or learning outcomes he will possess if he chooses to do a vocational or educational training. To lower the inhibition threshold a link to specialized VET providers will be included on the web portal.

Possible target groups for web portal but also for the ACM in general might be farm manager and operators, VET providers, the supply industry, associations, and public bodies of agriculture, education and labor, VET learner, career advisors and people from the food industry.

In conclusion it can be said that the transfer and adaptation of the WCM model into the agricultural sector in terms of stakeholders, competences, job profiles and use case scenarios should be possible. Further work will be needed to describe the competences required to perform effectively in particular roles. Especially the standardisation of existing and needed competence definitions, clear description of working places and job profiles, gap analysis of target and actual state of competences, preparation and providing training solutions will be needed.

2. General Introduction

The goal of this delivery is to support the overall goal of the second work package, to transfer and adapt WCM into the agricultural sector, by developing and defining methods for the transfer of the WCM into the agricultural sector of the participating countries.

So far in delivery D2.1, the WACOM model was described in short and compared to the modifications made for the agricultural sector.

Generally, competence modelling, such as in AGRICOM, is based on the development of a database relational model using templates for description of the data (Ghanei, 1999). These templates are complemented by diagrams to describe the relation of the different data (Entity-Relationship-Diagram). In this delivery the different components of the agricultural competence model (ACM) will be presented. This includes the collected competences, stakeholders, developed templates and diagrams.

One of the main parts of the ACM is the interaction of different competences forming a certain training unit/module. A competence includes skills, knowledge and the individual attitude and ability to perform a job, which are combined into an activity area (Fig. 1). In combination with the context in which a certain job is performed and the quality level a list of competences (competence catalogue) describe a certain competence profile. Each competence profile stands for a particular job profile. This competence profile can be used to develop VET training units/modules.

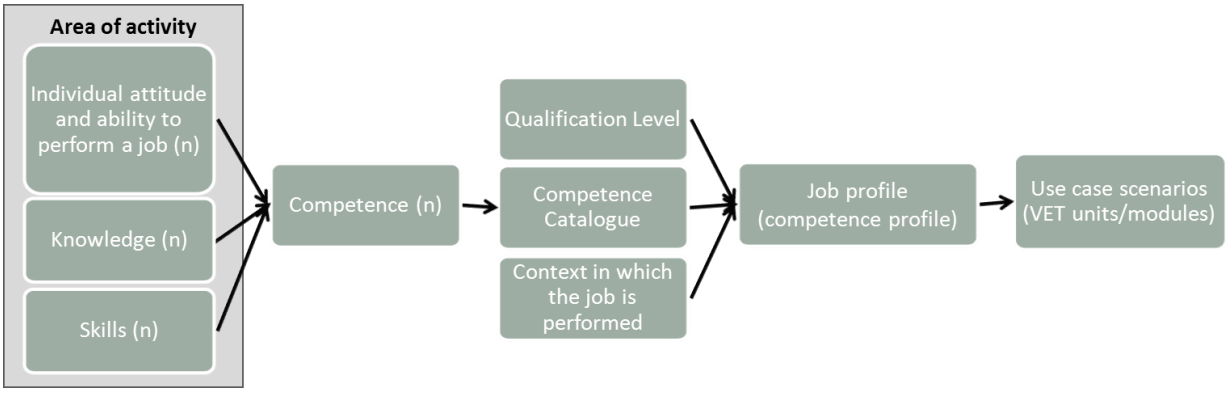

Figure 2: Example for a competence modelling pathway towards a VET training unit of the AGRICOM model. A detailed description of the competencies forms the competence catalogue. Out of this competence catalogue job profiles, including competence profiles, can be created. Using the competence profiles a use case scenario with specific training unit can be generated. (n) stand for numerous possibilities.

For competence modeling the description of use training units/modules must be described in a process oriented way (Ghanei, 1999). In order to consider all stakeholder perspectives, use case scenarios are developed. Not only the perspective is important, but also the communication pathway to describe the relation of the different stakeholders within on use case scenario (Ghanei, 1999). This is done by use case diagrams. Depending which stakeholder wants to make use of this training units, different use case scenarios are developed. One use case scenario with a matching diagram is a system to achieve one particular stakeholder need for specific competences from one particular perspective

(Jacobsen, 2011). The sum of use cases make clear what a system is going to do and what it is not going to do.

In this project it could be shown, that competences are used for several educational levels. To increase the comparability of the different competences used to create training units/modules, learning outcomes have also been included into the ACM.

In the end the user might use the AGRICOM competence model and its tools in several contexts, e.g. for the development of job advertisements, description of job profiles, or for writing a curricula. In this way, the competence model would support the need in agriculture for a better match between the labour market and VET.

3. Description of the agricultural competence model

3.1. Stakeholder

During the consortium meeting in Athen and Harderwijk, possible stakeholders were collected based on the different expertice of the partners. During the organization of the workshop, distribution of several surveys, independently of the online survey, interviews, and personal experience the partners in the AGRICOM project got a good impression which target groups might be interested in competence model for the agricultural sector. Twelve groups of possible stakeholders were identifies and listed in Table 1:

Stakeholder that might be interested in ACM
1. Agronomists related to hydroponics or irrigation in the private and public sector
2. Individual and associated growers
3. Private and public authorities related to VET
4. Learners (apprentice, students, interns, etc.)
5. Government (ministry of agriculture/education)
6. Local and regional authorities
7. VET trainers,
8. Hydroponic start-ups
9. Hydroponic technology/service provider
10. Investors in hydroponic
11. Environmental bodies
12. Experts from the supply industry

Tab. 1: Stakeholder that might be interested in ACM identified during the second consortium Meeting in Athen.

3.2. Competences

A competence consists of skills, knowledge and the individual attitude and ability to perform a job, which are combined into activity areas (Fig. 1). In personal interviews and during national consultation meetings competences for professionals in irrigation and hydroponics have been gathered and presented in delivery 1.1. Three different categories of competences have been described: *key competences, managerial or individual competences* and *professional or agricultural competences.* The professional competences have been divided into two groups, plant and water (cf.Table 2)

Using the competences for the description of job profiles revealed that the same competences are used for different levels of education. It is assumed that the same terminology can be used, but at the same time a broader knowledge is hiding behind these competences with increasing levels. To describe these differences, competences have been described in terms of general learning outcomes (ANNEX 2) and modules in D1.1.

A. <u>Key competences</u>	
Social competences	
- ability to work in a team	-willingness to learn / learning aptitude
-to be adaptable (agil)	-to be proactive
-to be creative	-speaking international languages
-capable of intercultural communication	-networking

-communicative
Communication with other farmers / farm owners / entrepreneurships
Building online community among Experts (teachers, researchers)
Practitioners (extension agriculture / grower) – farmer
IT-Competence
- Media
- Net
- e-Methods
- Learning
- Save knowledge

B. Managerial or individual competences

Knowledge of analysis (sampling and interpretation of the results)
Definition of business standards
Steering - control - knowledge
Human resource management (give appropriate orders and control)
Safety at work
Self development
Management
a) Quality management
- Product properties
- Process quality
- Control process quality (product safety)
- Control of nutrient element ratio
b) Product safety
c) Business administration
d) Resource management
Legal basic knowledge (knowledge and application)
Management
- Business administrative analysis
- Develop business plan
- Review business performance, set goals
- Monitor process against plan
- Determine and implement production plan
- Review impact against plan
- Capital investment decisions
- Develop and monitor the financial plan
- Maintain profitability

C Professional or agricultural competences

Plant
Soil science
- Identify soil type
- Adapt production method
Plant hygiene
Plant nutrition
- Identification of deficiency and excess
- Fertilization
Horticulture
- Ornamental plants
- Vegetable plants
- Cemetery
- Nursery (tree)
- Gardening and landscaping
- Pomiculture – Fruit production
- Shrubs
Agriculture
- Crop production
- Animal husbandry
- Biogenic commodities

Water
Water resources (ability to select -)
- rain water
- surface water (lake, river)
- ground water
- water recycling

- environmental conditions Water Quality Water storage Managing water costs Selection of the appropriate hydroponic system (open, close, semi-close system) Selection of the proper irrigation system (drip irrigation, selection of tubes) Selection of supporting technical equipment (e.g. desalination, disinfection, pumps) Steer irrigation technique Consideration of nutrient evaluation for optimisation of irrigation Decide on irrigation system (drip, flood irrigation etc.) Meteorology Planning of financing Irrigate as required/ potential saving of water Process control - Climate computer - Hydro computer - Sensor system Cultivation technology a) Hydroponic - Substrate - Irrigation technique b) Closed loop - Greenhouse - Open land c) Open land irrigation Plant protection in water management

Table 2 : Competences for the Agricultural Sector

From the online survey the highest interest in ACM came from experts already involved in education. The main water competences, they were interested in, corresponded with those identified in the survey distributed around the workshops (water storage/availability, water quality, nutrients). The main management competences were: determine a production plan, set business objectives, and develop financial plan.

3.3. Job profiles

The template for job profiles used for the ACM includes definition of the job profile, target group, context in which this job is performed and level. The indication of the qualification levels in this study are based on the COUNCIL DECISION of 16 July 1986 on the comparability of vocational training qualifications between the Member States of the European Community (85/368/EEC) and are in line with the RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning (2008/C 111/01) (ANNEX 3). The addition of context and level into the job profile was described as highly relevant after screening of several competence models in a desk study in D1.3. The job profile is then described by several competences, with definition and corresponding level. An example on a job profile, use case scenario and learning outcomes have been included in ANNEX 1.

AGRICULTURE Job profile	**x**
Definition of job profile "x"	

Target group of the job profile "x"		
Context in which the job is performed		
Level		
Competences contained in and required for job profile (competence catalogue)		
Name of competence	**Definition**	**Required level**
Key competences		
Individual (managerial) competences		
Professional or agricultural competences		

Table 4: Job profile of a vegetable gardener (mid-level manager) working in a hydroponic system

3.4. Use case scenarios, diagrams, and learning outcomes

The job profile alone does not describe the whole picture. It cannot describe the perspectives different stakeholders have on this job profile. A use case scenario with a matching diagram is a system to achieve one particular stakeholder need for specific competences from one particular perspective (Jacobsen, 2011). The sum of use cases make it clear what a system is going to do and what it is not going to do.

Use cases have been used to develop software systems since their initial introduction at Conference on Object-Oriented Programming Systems, Languages, and Applications in 1987(Meyrowitz, 1987). Over the years they have become the foundation for many different methods and an integral part of the Unified Modelling Language (Jacobsen, 2011). They are used in many different contexts and environments, and by many different types of team. For example use cases can be beneficial for both small agile development teams producing user-intensive applications and large projects producing complex systems of interconnected systems, such as enterprise systems, product lines, and systems in the cloud.

The use case template includes title, summary, stakeholder, stakeholders' goal, and need for individual learning pathways, competence profiles, job profiles, competence catalogue, use case procedure, and unit (cf. Table 3). It describes the path to achieve a certain goal from

different stakeholder perspective. If he is an employee that wants to achieve certain competences, it describes the way from his employer to the VET provider. On the other hand it could also show how a VET provider offers particular competences to an employee out of his pool of training units and competences.

GENERAL USE CASE TEMPLATE	
Title	A one-sentence title of the Use Case.
Summary	The summary is a brief synopsis of the Use Case.
Stakeholder(s)	A list of one or more stakeholders participating.
Stakeholder(s) goal	Statement of the stakeholder(s) goal or objective.
Need for individual learning pathways	Statement of the stakeholder(s) particular need for individual learning pathways.
Competence Profile	A list of competences that are constituted in the stakeholder(s) Competence Profile.
Job Profile	Description of the qualifications of requiring training.
Competence Catalogue	A list of competences and the activities that constitute it that are relevant and observed within the specific enterprise context.
Use Case Procedure	An ordered list of the steps taken by the stakeholder(s) that constitutes the Use Case. Each step in the procedure should be numbered, so that the steps can be referenced easily elsewhere.
Unit	Description of the unit used to structure the training curriculum and covers the stakeholder(s) needs.

Table 3: General template of a use case scenario

A diagram shows the relationship between the different stakeholders (Fig. 2). It clarifies the correspondence paths between the different stakeholders. This facilitates the creation of a database which can be saved and processed in computer based system

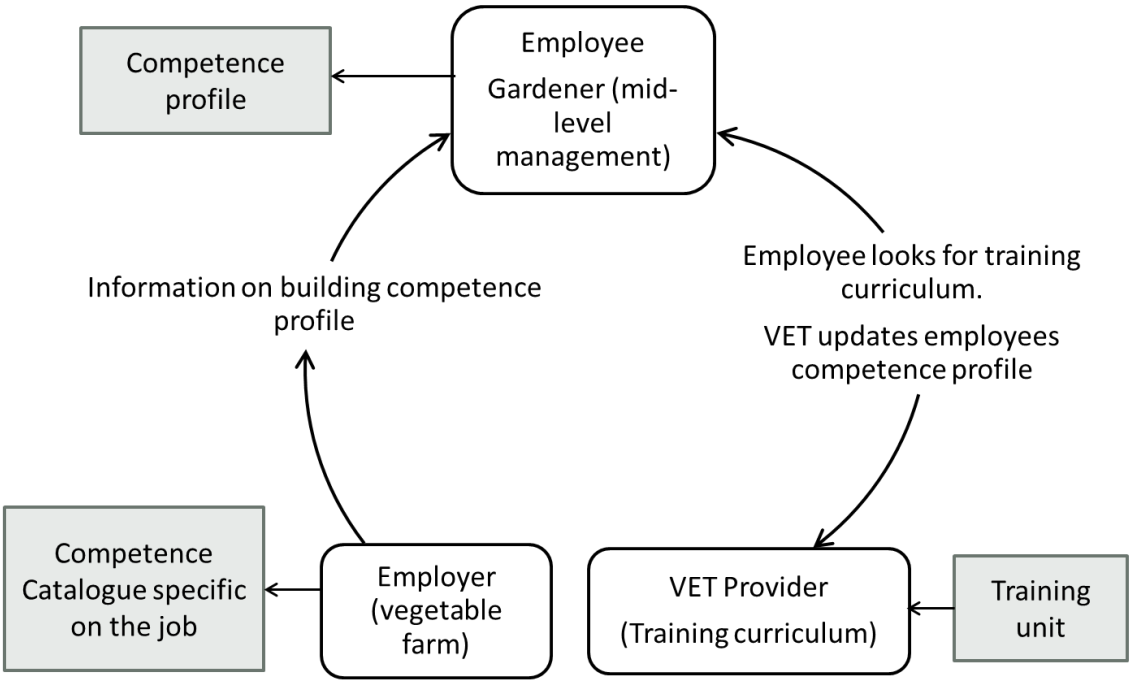

Figure 2: Use case diagram, showing the interactions paths between the different stakeholders.

The implementation of learning outcomes for the description of competences is one goal of the European Union. They hope to increase the permeability and improve the dialog between the different education institutions by implementing national qualifications frameworks (NQF) (PLA, 2009). Mapping qualifications against the same set of descriptors makes it apparent where two (or more) qualifications lead to comparable learning outcomes and what the learners need to achieve in addition. Most European countries are currently engaged in developing overarching NQFs covering all sectors of education and training. These frameworks are mainly conceived as communication or transparency tools not implying new regulations. They often fit into a wider context of lifelong learning reforms. All are based on learning outcomes which is not perceived as contrary to their non-regulatory character.

More generally speaking, by shifting the emphasis away from the institutional basis of qualifications to that of the level of learning outcomes, NQFs can change the dynamics of qualifications – by for example strengthening the learner-centred orientation or the relevance for the labour market (e.g. technological changes bring higher requirements on knowledge, skills and competence – qualifications can be upgraded when they are updated) (PLA, 2009).

A guideline for the formulation of learning outcomes (BMBF, 2012) describes learning outcomes as statements of what a learner knows, understands and is able to do on completion of a learning process. Learning outcomes are defined in terms of knowledge, skills and competence. The competence used by the BMBF differs from the competences collected and described for the AGRICOM project.

- *Knowledge* means the body of facts, principles, theories and practices that is related to a field of work or study. It is described as theoretical and/or factual knowledge;
- *Skill* means the ability to apply knowledge and use know-how to complete tasks and solve problems. They are described as cognitive (logical, intuitive and creative

thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments);

- *Competence* means the proven ability to use knowledge, skills and personal, social and methodological abilities in work or study situations and in professional and personal development. It is described in terms of responsibility and autonomy.

The general template for describing learning outcomes of use case scenarios include the title, the catalogue of competences and learning outcomes.

Titel (One-sentence title of the Use Case)	
Competence Catalogue	**Learning outcomes** He/she is able to…
…	Knowledge: … Skills: … Competences: …

Table 6: General template for learning outcomes for a use case scenario

4. Adaptation

The adaptation of the ACM to the "real world" will include four different aspects. How can the ACM be used, what will be included, who will profit from it and what is the financial potential of it?

The ACM might be used in various forms. One possibility would be to describe all job profiles in a specific company to support the search for adequate human resources. Another possible application of the ACM would be its integration into an online tool. On a web portal e.g. an employer, searching for new staff, can choose out of a list of competences adequate competences to write a plain job application. On the other hand, an employee who wants to improve his professional skills might use this tool to reveal missing competences in his job profile, a so called gap analysis. This gap analysis of course can just as well be used by an employer. The competences will be defined at different educational levels to facilitate the search for the user. The online tool will also include VET training descriptions for the targeted job profiles. This will make the user familiar with the competences or learning outcomes he will possess if he chooses to do a vocational or educational training. To lower the inhibition threshold a link to specialized VET providers will be included on the web portal.

In the third consortium meeting in Hardewijk it was agreed to include the competence profiles of four different target groups in the ACM for an online tool. The main focus will lie on the farm manager, who runs a farm and the operator, who assists the farm manager. The farm operator will not be described for the Netherlands, because this job profile does not exist in this partner country. Additionally, experts from the supply industry and from advisory service providers have been targeted as important for the area of irrigation and hydroponics. Therefore, few job profiles describing this area of expertise will also be included in the ACM. On the basis of this competence catalogue the online tool of the ACM will be run.

The competences gathered during the first year of the AGRICOM project might be especially interesting for several target groups that have been located during the consortium meeting in Athens and Harderwijk. In the first place farm manager and operators will be interested and people working for VET providers (management, teachers, trainers and facilitators), the supply industry, associations (farmers, gardeners, consumers, environmental NGOs), and public bodies of agriculture, education and labour (EU, national government). Further agronomists, advisors and commercial providers from private sector, VET learner, career advisors and people from the food industry (including distribution, wholesale retail) might also be keen on using the ACM.

After the implementation of the online tool in the world wide net the question of continuation needs to be answered. It was agreed that the users should have free access to the online tool. Therefore, stakeholders either interested in the user as customer or as future employee might be interested in the financial support of such an online tool. This might be governmental or private organizations related to job agencies, VET providers that advertise their organization on the web portal, or institution that fund long life learning programs, such as the EU, national ministries, municipality, consultancy, and NGOs.

5. Conclusion

In conclusion it can be said that the transfer and adaptation of the WCM model into the agricultural sector in terms of stakeholders, competences, job profiles and use case scenarios is possible. Further work will be needed to describe the competences required to perform effectively in particular roles. Especially the standardisation of existing and needed competence definitions, clear description of working places and job profiles, gap analysis of target and actual state of competences, preparation and providing training solutions will be needed. This will be the goal of deliverable 2.3.

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7. ANNEX 1: Job profile, use case scenario with diagram and learning outcome for a Manager of a hydroponic system

Job profile

AGRICULTURE Job profile	**Vegetable Gardener (mid-level manager) working in a hydroponic system**	
Definition of job profile „vegetable gardener (mid-level manager) of a hydroponic system“	Vegetable gardener in mid-level management is coordinating a whole production line. Autonomously pursued vocational activity - as an employee - entailing a mastery of the scientific bases of the occupation.	
Target group of the job profile	Employer/Learner/gardener	
Context in which the job is performed	Sustainable irrigation, management of a hydroponic system in the greenhouse – tomato/cucumber, 7 ha.	
Level	4	
Competences contained in and required for job profile (competence catalogue)		
Name of competence	**Definition**	**Required level**
Key competences		
Social competence	- ability to work in a team - willingness to learn / learning aptitude - to be adaptable - to be resilient - to be proactive - to be creative	3
Communicative	- speaking international languages - capable of intercultural communication - communication with colleagues	4
Handy craft skills		2
IT Knowledge	- Media - Net - e-Methods - Learning - Save knowledge	4
- Individual (managerial) competences		
Knowledge of analysis	- sampling and interpretation of results	4
Steering knowledge	- Management of the production line e.g. time management	4
Human resource management	- give appropriate orders and control staff	4

Safety at work	- Control of working procedures in view of safety	3
Management	- Quality management by controlling product properties and process quality - Business administration - Resource management	4
- Professional or agricultural competences		
Plant hygiene	- Control, observe, maintain	2
Plant nutrition	- Identification of deficiency and excess - Fertilization – preparation and distribution of nutrient solution	3
Process control	- climate computer - Hydro computer - Sensor system	3
Cultivation technology	- Hydroponic systems -usage of substrates and irrigation techniques - Cultivation in open and closed loop in the greenhouse	3
Plant protection in water management	- Knowledge of different sterilization methods in water/nutrient solution - Plant protection additives	3
Water resource management	- decide on water resource, analyze and utilization, optimize consumption	3
Steer irrigation technique	- Punctual or surface irrigation	3
Expert knowledge	Occupation in horticulture	3

Table 4: Job profile of a vegetable gardener (mid-level manager) working in a hydroponic system

Use case scenario

Employee's perspective, Gardener (mid-level manager)	
Title	An employee is looking for specific and individualized learning opportunity, in order to strengthen his professional profile.
Summary	An employee, who works on vegetable farm as a professional gardener in mid-level management, looks for a suitable training provider and request information on its training program offered. His objective is to become a specialist in hydroponic crop production in the greenhouse. He asks his employer to inform him about the skills and knowledge (competences) he needs to obtain in order to fulfill his objective. After being informed, he looks for a specific training curriculum that will provide him with the appropriate training in order to obtain the missing competences.
Stakeholder(s)	1. An employee, professional vegetable gardener (mid-level manager). 2. The vegetable farm 3. A VET provider

Stakeholder(s) goal	The employee's objective is to become a specialist in operating a hydroponic crop production system in the greenhouse.
Need for individual learning pathways	Regarding his skills and knowledge he is able to grow crops in soil in the greenhouse. He is aware of the lifecycle of plants, plant nutrient, plant protection, process control (climate), irrigation techniques in soil, control and observation of plant hygiene. He has also management qualifications, social competences and technical skills. What he needs is knowledge and skills how to operate a hydroponic system. To do so, he needs information on plant nutrition, process control (hydro computer and sensor systems), cultivation techniques in hydroponic and close loops, plant protection in water management, water resources and steering of irrigation techniques.
Competence Profile	The employee is able to: • Describe the life cycle of the crop • Identify deficiency and excess of plants • Prepare fertilizer solution • Control climate computer • Cultivate crops on soil with irrigation technique • Control and observe plant hygiene
Job Profile	Manage a hydroponic system.
Competence Catalogue	To acquire the qualification of managing a hydroponic system the employee should be able to: • Describe the life cycle of the crop • Identify deficiency and excess of plants • Prepare fertilizer solution • Control climate computer, hydro computer, sensor system • Cultivate crops in a hydroponic system (substrate, irrigation technique) and in closed loops in a greenhouse • Protect plants by water management • Decide on water resource, analyze and utilize, optimize consumption • Steer hydroponic system (fertilization in a closed loop) • Control and observe plant hygiene
Use Case Procedure	1. A professional gardener in mid-management position asks his employer to inform him about the competences (skills and knowledge) he needs to obtain in order to become a specialist in managing hydroponic systems. 2. His employer informs him about the competences he needs to acquire, based on the **Competence Catalogue** within the specific enterprise context. 3. Hence the employee looks for a specific training curriculum that will provide him the appropriate training in order to obtain the missing competences and thus become a specialist in managing hydroponic systems. So, he requests information on a VET provider's training programme. 4. The VET provider offers him a learning opportunity which contains specific units that are based on the requirements to achieve the relative and wanted qualifications. 5. The employee completes successfully the training programme 6. The VET provider updates the employee's **Competence Profile** with the acquired competences for the specific job profile.

Unit	• Soilless plant production • Fertilization and hygiene in hydroponic systems • Technical steering of hydroponic systems

Table 5: Use case scenario of a vocational training for of a vegetable gardener (mid-level manager)

Use case diagram

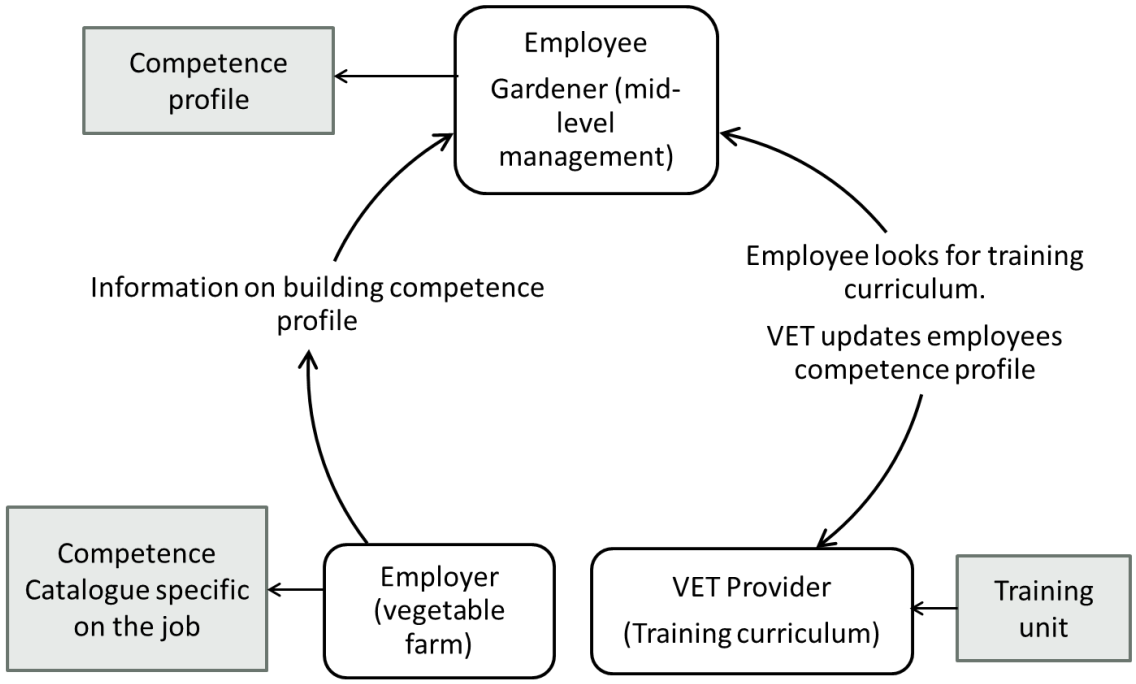

Figure 3: Use case diagram of a vocational training for of a vegetable gardener (mid-level manager)

Learning outcomes

Vegetable Gardener (mid-level manager) – working in a hydroponic system	
Competence Catalogue	Learning outcomes He/she is able to:
Control and observe plant hygiene, needed in the greenhouse	Knowledge: …follow and explain plant hygiene instructions …recognize diseases Skills: …implement and control plant hygiene instruction Competences: …communicate plant hygiene instructions and noticeable errors. …apply problem solving strategies
Cultivate crops in a hydroponic system (substrate, irrigation technique) and in closed loops in a greenhouse	Knowledge: …explain the advantages and disadvantages of non-soil cultivation systems or substrate cultures …distinguish between different substrates or non-substrate techniques Skills …implement a computer system for fertilization

	…disinfect nutrient solution …use technical equipment of non-soil cultivation systems …cultivate plants with CO_2 fertilization …explain the different harvest equipment …steer the climate in the green house Competences: …analyze data from the greenhouse as basis for adaptations for optimal plant growth.
Protect plants also in water management	Knowledge: …recognize diseases and choose the matching plant protection agent or biological method. Skills: …consider the irrigation technique and adapt the application of the plant protection agent. Competences: …consult experts in the field of plant protection
Decide on water resource, analyze and utilize, optimize consumption	Knowledge …distinguish between different water resources …decide which water resource to use, considering costs and statutory provisions e.g. for food, soil and water …optimize consumption Skills …take water samples for analysis …analyze water data and present it as a basis for decisions Competences …calculate optimal water consumption and analyze profitability
General steering of a hydroponic system	Knowledge: …explain the steering of a hydroponic system considering water, fertilization, and climate. Skills: …coordinate and explain the different computer based systems. Competences: …analyze the nutrition, water and climate data as basis for the steering of the hydroponic system.
Steer hydroponic system (fertilization in a closed loop)	Knowledge: …explain the steering of a hydroponic system in relation to fertilization in a closed loop. Skills: …implement a computer system for fertilization in a closed loop …program the mixing of fertilizer stock solution and water …prepare the water with adequate quality …adapt the pH in nutrient solution …prepare, control and adapt the fertilizer solution …interpret results from water sampling …control drain water and mat water …establish and steer different irrigation techniques Competences: …update his knowledge on hydroponic systems …transfer the climate data on the irrigational and nutritional steering of his hydroponic culture.

Table 6: Learning outcomes for use case scenario of a vegetable gardener (mid-level manager)

8. ANNEX 2: Competences and learning outcomes D1.1

Competences	Learning outcomes	
Area indication	**Operational level (3)**	**Managerial level (4)**
Water quality	Describe acceptable and unacceptable water composition for Irrigation or hydroponics	List the composition of water suitable to use in an hydroponic or irrigation system and describe corrective action to make water suitable
Water storage	List conditions under which water should be stored for use in a given situation	Describe storage options and list potential challenges to various structures and the remedies for these
Managing water costs	List the cost of water in producing a crop under given conditions	Describe methods of reducing water costs over a range of crops and conditions
Selection of the proper irrigation system (drip irrigation, selection of tubes)	Describe the use and maintenance of a specific type of irrigation system	Describe appropriate irrigation system for a given situation and list the benefits of the chosen system
Understanding of technical measures, like pH, conductivity	Describe the water characteristics and how they affect an irrigation system	List the qualities of water and describe conditions under which water characteristics benefit hydroponic systems
Planning the time and the period of the irrigation	Demonstrate the optimum times of day and quantity of water to be used under given conditions	Describe how irrigation relates to plant growth on a daily and seasonal basis and describe the decision making process as to when to irrigate
Steer irrigation technique × Control pumps	Demonstrate use of control pumps	List the advantages and disadvantages of a variety of pump types and the reason for choice of a specific pump
Steer irrigation technique × Meteorology	List meteorological conditions under which steer irrigation is most useful.	Describe how meteorological conditions effect steer irrigation technique, including how these conditions are predicted and when action is to be taken in case of a failure of prediction.

9. ANNEX 3: Level of competences used in the AGRICOM project (D1.1)

The qualification levels used in the AGRICOM project are based on the COUNCIL DECISION of 16 July 1986 on the comparability of vocational training qualifications between the Member States of the European Community (85/368/EEC) and are in line with the RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning (2008/C 111/01). When there would a significant difference or contradiction found, this will be indicated.

level	description	Agr. profession
2	A person qualified to perform mainly technical work as instructed and under some level of supervision.	Tractor driver, milkman, harvester in greenhouse
3	A person qualified to perform mainly technical work independently, not necessarily being involved with management responsibilities.	Herdsman, vegetable grower
4	A person qualified to perform technical work independently, and can make management decisions independently.	Farm manager, owner of family farm,
5	A person qualified to perform all work independently, make management decisions, study developments of the profession and present the outcome of studies to others in the sector.	Advisor, teacher, trainer, consultant

About the European project AGRICOM:

Main goal of the project AGRICOM is the transfer and population of the WACOM Water Competence Model (WCM) from the Water Sector to the Agricultural Sector.

Main objectives of AGRICOM are:

1. Identifying and analysing targeted needs and competences that are required by the labour market for specific use cases and jobs from several fields of the agricultural sector,
2. Transferring and adapting the generic WACOM competence model towards the AGRICOM competence model (ACM) allowing more agricultural use cases,
3. Pilot testing the ACM to the jobs specialisations related to agricultural uses of water resources (irrigation, hydroponics, etc),
4. Establishing the AGRICOM online community for communication, moderated discussions and exchange of project results, experiences and expertise on competence modelling for vocational education and training in the agricultural sector,
5. Establishing the AGRICOM web portal and populating it with more agricultural use cases,
6. Enhancing the transparency of the job profiles in the agricultural sector,
7. Supporting the conjunction of vocational education and training with the labour market and jobs specialisations.

Main long-term objective and addressed impact is the introduction of competence modelling to the agricultural sector to develop a first Agriculture Competence Model and to strengthen the transparency and comparability of VET opportunities through the transfer of WCM and the adaptation of ECVET and EQF.

More information about AGRICOM online:
http://www.agriculture-competence.eu

AGRICOM Contact:

Coordinator:	Christian M. Stracke
Organization:	University of Duisburg-Essen
Address:	Universitaetsstr. 9 (ICB) 45141 Essen, GERMANY
Telephone:	+49 (0)201-183-4410
E-Mail:	christian.stracke@icb.uni-due.de

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