



# Vocational Education and Training for Sustainable Development (VETSD)





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Guideline



# Introduction

Among the objectives of educational policy, vocational training for sustainable development (VETSD) is of particular importance. There is however still a lack of operational criteria needed for the implementation of VETSD in vocational practice. Implementing this project is a challenge if sustainable development is understood as a constant process of equal implementation of all three dimensions of ecology, economy and social aspects and is not reduced to ecological processes alone. In addition to teaching social and scientific content, new methodological, educational and in particular systemic approaches must be tried out and implemented. This challenge also opens up the opportunity to develop an education with a high level of action competence for an improved participation. As stated explicitly in the German National Action Plan, there is a lack of concepts, guidelines and instructions for training for trainees with regard to ESD.

### There is a specific need for:

- "Qualification concepts for leaders in the relevant places of learning (vocational schools, companies, inter-company apprenticeship training, vocational promotion agencies, etc.)
- Criteria for designing teaching and learning situations that implement VETSD<sup>\*\*</sup>

The AgriTrain project contributes to the development of such concepts and is, following the AgriSkills project, the second educational package (Curriculum & Guideline) for VETSD in an ERASMUS strategic partnership. This Guideline forms a theoretical framework for the AgriTrain Curriculum (Fig.1) and promotes mutual understanding of representatives of different systems with different approaches to vocational training for sustainable development in Europe. International work was a great challenge, since the participants' individual perspectives as well as existing educational policy guidelines in the respective European countries come into play.

The results of the project provide a basis for the further development of Education for Sustainable Development as an adaptable and flexible education package.



Fig.1: Links and interconnections between Guideline and Training Curriculum.



# Sustainability in an educational context

### "Sustainability" describes processes, not objects

Due to a rather inflationary colloquial use, "sustainability" is more and more turning into a "buzzword" and an unspecific term of judgement. In order to establish sustainability as a cross-cutting topic in vocational teaching and learning in the agricultural sector, the term needs to be clarified and specified in the context of processes of natural resource use.

### Sustainability as a concept derived from forestry

A sustainable use of a resource can be compared to skimming off interest from a given capital. If the capital is diminished, the interest income is consequently reduced. If the capital is completely used up, the interest is reduced to zero. A sustainable use, on the other hand, ensures that the capital stock, which continuously generates new income, is maintained or even increased. Principles of resource use that allow using an increment, but do not destroy the basis of production itself have historically been formulated independently in different cultures. An early written example is the so-called Camaldolense Forest Code (1520) in Italy. In the German-speaking world, too, "sustainability" is in its origins a forestry term. It describes a management in which the current timber harvest does not affect the amount of present and future growth of timber and, as formulated by Hans Carl v. Carlowitz in the early 18th century, the yields are "sustainable". "Wood grows on wood" i.e. product and means of production are largely identical. Therefore, using this resource "sustainably" is only possible if sufficient "vector". "Sustainable use" then means that, while maintaining the same quality, a defined amount of wood can be harvested regularly and permanently from a defined area over a defined period.

### Sustainability in the use of other natural resources

Other resources can also "grow back" if used sustainably. For example, in order for a cork oak to be used "sustainably" for centuries, it may only be peeled off in a certain frequency allowing for sufficient recovery, as has been known and practiced since antiquity. If the harvest is carried out in an unprofessional manner, the tree, i.e. the cork producers' living "capital", is damaged and further and future yield is lost. A colorful example is provided by the purple snail, a mollusk that was destructively harvested into near-extinction in Mediterranean antiquity. In Central America, in contrast, implicit "concepts" of sustainable use limited the harvest to once a year by "milking" living (and surviving) purple snails. Even non-living resources such as water or soil may eventually regenerate, depending on type and intensity of use. Sustainable use of groundwater allows only extraction to the extent that the groundwater table can regenerate. Agricultural use of soils that is "non-sustainable" may not reduce the total area, but can severely impact soil quality. Heavy irrigation can increase yields in the short term, but may destroy the soil for any future use. In water management, too, "sustainability" means not only that the same amount can be extracted at regular intervals, but also that the quality remains the same or even improves. In the context of natural resources, those ecosystem products and services whose provision can be impacted by a particular use must always be taken into account. If, for example, large areas of forest are cleared, the spring flow or soil quality may change consequently. If cork oaks are not managed sustainably, other services provided by the tree, apart from cork production, are also lost: acorns for feeding pigs, firewood production from cut branches, or soil erosion control. Soil protection is addressed in the German Sustainability Strategy as an important goal of Agenda 2030. Oftentimes, services provided by managed ecosystems that can be impaired by unsustainable use are of an intangible nature. For instance, forests that have been cleared over large areas and may have been replanted as uniform monocultures no longer provide any recreational functions.

Guideline

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Basic management rules for sustainability following Herman Daly<sup>2</sup>

- The exploitation of renewable natural resources, for example forests or fish stocks, must not exceed their regeneration rate in the long run. Otherwise these resources would be lost to future generations
- The use of non-renewable natural resources, for example fossil fuels, must not, if possible and in the long term, exceed their alternatives (example: substitution of fossil fuels by hydrogen from solar electrolysis).
- The release of substances and energy must not exceed the natural environment's capacity to adapt in the long term (example: accumulation of greenhouse gases in the earth's atmosphere or of acidifying substances in forest soils).
- Hazards and unjustifiable risks to human health and the environment from anthropogenic (man-made) impacts shall be avoided.

In the context of Rio (1992), the English term "sustainability" was used in analogy to the original forestry concept of certain processes being "maintained" indefinitely. However, at the same time the meaning of this term was expanded and stretched far beyond what the original concept in forestry can grasp. Sustainability has been considered since as encompassing ecological, social and economic sustainability.

Ecological, economic and social sustainability are interdependent, which is especially obvious in land use: an ecosystem whose natural carrying capacity and productivity has been reduced by overuse cannot be the basis of a sustainable agriculture. Thus economic sustainability can be no longer achieved either. If, as a result, families lose their income, social sustainability is.

In a figurative sense, "the land" or "the ecosystems" of the earth may be regarded as a capital that generates a return not only of a monetary nature but includes a multitude of material and intangible services. From these "interest" some services benefit society as a whole, i.e. present and

future generations. Any type of use and management that deprives others of their share of these benefits, for example by reducing opportunities for recreation, water access or the chance of a healthy and safe workplace, is therefore "unsustainable".

**Vocational education and training for sustainable development** (VETSD) aims to implement action for sustainability as a crosscutting task in everyday working life and to draw attention to the fact that the above-mentioned aspects of sustainability play a role in every single professional activity.

Weinert (2001) defines competence as "cognitive abilities and skills that are available to individuals or that may be acquired by them to solve certain problems, as well as the associated motivational, volitional ... and social preparedness and skills to solve problems in variable situations successfully and responsibly"<sup>3</sup>.

According to this definition, the development of **sustainability competencies** requires not only the development of sustainability-related knowledge but also the development of sustainabili-

For more on the definition of sustainability competencies and the pedagogical concept as a guide for teachers and trainers

Curriculum  $|3\rangle$ 

Pedagogical concept

ty-related capacities, attitudes and willingness to act. The educational concept of action-oriented teaching and learning aims to promote the acquisition of such competencies in learner-centered **learning activities**, especially the creation of specific products. In the field of agriculture and horticulture, learning activities especially those based on professional situations at the place of acting and involving the objects to be used or worked on play a central role.

### Interactions - Sustainable management & Systemic thinking

Aspects of sustainability play a role in every agrarian activity. In agricultural education, therefore, sustainability is not a single and separate topic but a cross-cutting issue. In occupational situations in agriculture and horticulture, the interlinking of individual functions and the interaction between individual uses become particularly clear on site and in the building: excess groundwater extraction will impair forest growth and thus affect timber use. Similarly, pasture, for example, will



reduce the forest's ability to regenerate and thus ultimately limit both, timber harvest and pasture itself. **Action- and competence-oriented learning and teaching** must therefore promote awareness of the diverse and long-term effects that a particular action may have in a given situation. Approaches to problems that take into account the systemic character of the respective problem and context are referred to as systemic. The ability to act in such situations taking into account

the systemic character is called **systems competence**. The "German Sustainability Strategy" explicitly recommends "fostering the ability to think systemically and to educate for sustainability" and emphasizes that "the necessary qualifications and skills for action must be anchored in the entire education system in the sense of an "education for sustainable development".

#### Definition "Systems Thinking"

Curriculum 1 Implementation of Sustainability...

#### Problems of aims in sustainability

To ensure sustainability in management, for example of a forest, clear priorities need to be identified. Some uses are mutually exclusive or are per se "unsustainable". Geological resources, for instance, do not grow back and do not recover after use. The economic goal of producing a highly homogenous such as eucalyptus wood fibers for pulping is hardly compatible with maintaining high biodiversity. Providing a space for intensive recreational use also conflicts with biodiversity goals and species protection. A management in which the "three pillars of Rio" are all equally considered is therefore likely to remain theory. Some areas do not tolerate any kind of intervention and will be irretrievably destroyed under any form of commercial use. **Economic growth inevitably leads to increasing resource consumption.** 

What exactly sustainable management means in individual cases depends on the respective

conditions and circumstances and specific operational goals. The concept of sustainable use is often understood to be based on the assumption that production is essentially only dependent on human action. In fact, especially in agriculture, there are unforeseen events such as weather disasters, unplanned uses, fluctuations in productivity or sudden effects of climate change. Especially developments in climate change can have an impact not only on ecological sustainability but also, by impacting working conditions and health of workers, on social sustainability. Dealing with events that limit sustainability in use and change management options requires an extension of the sustainability concept or new concepts, such as "resilience". In the context of agriculture and horticulture, it is therefore obvious that new approaches in teaching and learning are needed to develop "sustainability" from a theoretical approach to a practice-related cross-sectional topic and to promote sustainability competencies.

See explanatory video "Resilience of agricultural ecosystems"

https://www.agri-train.eu/explainityresilience-of-agroecosystems/?lang=en



# Implementing concepts of sustainability in teaching and learning in a practical and action-oriented manner

The above-mentioned aspects lead to various didactic approaches to introducing the topic of sustainability into training, continuing education and further training and that consider the "green professions" local and object-related nature. These include, for example, approaches of problem-based, research-based, place-based and object-based learning. "Problem-based learning" describes learning processes that are triggered by a conflict situation or question, i.e. by a "pro-

blem". Such a problem or conflict situation, which is fruitful for learning processes, is often found in the context of agriculture in situations on site and can be developed by observation. In agriculture, the development of such a professional situation inevitably involves elements of the educational approaches addressed above.

An educational approach is provided in the Curriculum 3 pedagogical concept



# 2 The Guiding principle of vocational education for sustainable development

The guiding principle of sustainable development aims for economic prosperity (economy), social balance (social welfare) and the preservation and protection of the natural bases of life (ecology) for future generations (intergenerational justice). In the AgriTrain project we follow the terminology of "sustainable development" as defined in the UN World Commission on Environment and Development' 1987 Brundtland Report "Our Common Future"

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"<sup>4</sup>

If the aim of holistic education for sustainability is to be implemented an integration of the three dimensions of sustainability is also needed in vocational training This places a great many demands on agriculture (Fig. 2).



Fig. 2: Demands on agriculture in relation to the dimensions of sustainability.

Different requirements often come with contradictions and conflicts and demand lifelong learning processes from agricultural workers. Complex situations require a competence of systems thinking. For sustainable action, the individual has to acquire skills, but also needs an environment in which individual action is possible. This includes the ability and willingness of trainers and teachers to deal with students' opinions and viewpoints in an analytical and reflexive manner. To the extent that this process becomes permanent, teachers also become learners and both sides experience participative processes. Agricultural economic activity (production) is always set in a concrete geographical site and a specific ecosystem. A sustainable education should reflect this and employ concepts of place-based learning location. As individuals, shaped by values, consciousness, etc., the actors both influence developments, but also are subject to influences from society and the environment (Fig. 3). These can be e.g. climatic changes or influences of economy and politics. A cultural-historical approach can contribute to understand these interactions. In vocational education and training for sustainable development, the cognitive process during training and in everyday work is the result of a holistic transformative education. In addition to pure factual knowledge, it includes the development of values and skills, such as foresighted thinking, interdisciplinary knowledge, autonomous action and participation in social decision-making processes.





Fig. 3: Human cognitive processes.

### **2.1 Dimensions**

In order to promote the holistic nature of cognitive processes and learning, seven dimensions (direct and indirect influences) have been inferred within the project using the dimensions of sustainability as criteria:

- Agro-ecological dimension (environment)
- Cultural dimension (rural areas)
- Local dimension (regional/ national/ international)
- Time dimension (past present future)
- Economic dimension (supply demand > market)
- Insight-generating dimension (sustainable education and development)
- Socio-political dimension (integration into the social context)

Within the dimensions 3 Pedagogical concept, the development of skills and abilities must be fostered. This includes the technical and process knowledge to solve complex issues. Whether the seven dimensions were considered in a learning concept can be checked using specifically developed indicators.

Examples to describe the dimensions for a teaching concept can be found in the five case studies

Curriculum  $|4\rangle$  Case Studies



### 2.2 Indicators

Teaching materials or concepts need to be adapted to current developments, such as use of ICT and standards of ESD. For the review of the different fields in agriculture, we determined in this project indicators based on the theoretical and practical experiences in the short-term training courses, to assess whether teaching concepts, materials and curricula etc. meet ESD requirements for the promotion of the shaping learner competencies. The following indicators should be considered equally in everyday school and work life:

- Adult learning own motivation to pursue the topic (typical professional situation, learning situation from practice)
- Support for independent learning and discovery
- References to global realities and learners' life
- Social responsibility
- Ecology, sustainability, e.g. climate change, biodiversity, resources
- Economic dimensions, e.g. cost/benefit, supply/demand
- Social dimensions, e.g. employment, food sovereignty
- Generation of a product based on the newly acquired knowledge
- Relation to ICT
- Apply methods such as critical thinking, and especially participative ones including teamwork and other skills

The results of the two practical tests (Short Term Trainings) and an outlook on the vocational training To simplify reviewing the indicators in everyday school and work life a checklist is provided in the following paragraph.

Curriculum

Analysis of the practical test...

# Checklist, assessment and transfer

As a cross-cutting task, vocational education for sustainable development is not simple to be implemented in everyday school and work life. There are still major gaps in the literature on implementing ESD in vocational schools. Therefore, new concepts and methods are needed to support teachers. For this purpose, a checklist was developed in this project. The indicators compiled in the checklist can be used to examine the cross-cutting task of ESD in a theoretical or practice-oriented teaching concept and the associated curricula. The table does not provide a complete solution and implementation strategy, but needs to be adapted to the individual situation. The teacher or trainer can evaluate the teaching concept developed or adopted by him/ herself according to the indicators of the checklist, e.g. to what extent economic, ecological and social sustainability aspects of a VETSD have been considers.

The checklist may help to assess aspects of sustainability in the pedagogical concept

# Curriculum

The color scale ( for "achieved"- for "partially achieved and improvement desired" - for "not achieved") can be used for an initial assessment of the teaching concept but also and serve as an aid for follow-up work and further adaptation.



CHECKLIST	0	9			
Relevant indicators:					
The teaching concept or curriculum should					
trigger processes of systems thinking and system-oriented acting in learners.					
contain a pedagogical-methodical toolbox that encourages learners to be innovative and participative.					
foster professional, methodological and personal/social skills in learners.					
Further indicators:					
The teaching concept or curriculum should					
consider new and current content, trigger cognitive processes and support the development of learner personalities.					
promote ICT skills (digital competencies).					
address topics in a way that makes use of learning locations or learning situations, taking into account environmental aspects, sustainability and diversity.					
apply innovative methods tailored to teach technical and systemic content					
promote lifelong learning and allow for personal experiences and perspectives.					
help learners to assess and evaluate technical contents according to conflicting interests (e.g. farming styles with regard to water quality vs. fertilization) in order to draw their own conclusions for future action.					
be able to connect theoretical content with professional practice and current contexts (e.g. view real farm examples in their context)					
be able to relate learners' experiences in real life to the technical content.					
consider country-specific legislation and European framework directives.					
introduce the learners to the individual roles of sector-specific actors and evaluate and assess their perspectives for future decision-making processes					





Free download at : www.agri-train.eu/ interview-method/ ?lang=en



#### Transfer

The checklist may also be applied to any other area of vocational education and training, thus creating comparability within specialist topics, methods and their implementation. In joint with the pedagogical concept (Curriculum 3)) the checklist support teachers or trainers in implementing ESD in newly created teaching concepts or in reviewing existing teaching concepts in everyday school and work.

The introduction of the EQF had increased comparability in vocational education and training in Europe. However, across countries emphasis is often on different content or different methods are used. This is reflected in the case studies provided in the AgriTrain Curriculum 4.

# Sustainability in vocational education – Europe and country examples

### Vocational education in Europe

The reports by our partners illustrate that vocational training for sustainable development is still far from being standard practice, even though all EU countries, and the European Union, support the UN Decade of ESD. The European Commission itself can exert no direct influence on the individual countries vocational training systems. However, education is an important instrument to fight poverty and unemployment and to develop an innovative Europe. The Commission therefore tries to modernize the education debate and ensure transparency across the system with individual initiatives.

The Bologna Process was one of the most important and most effective EU policy initiatives in the field of education. With the development of the European Qualifications Framework (EQF) and the specification of corresponding national qualifications frameworks, the EU created a set of instruments for standardization, and classification of educational qualifications and the corresponding competencies into eight levels. A decade after the start of the Bologna process, criticism in the formal standardization of degrees (Bachelor's and Master's), has been voiced, in particular in the context of higher education.

Within the member states' educational bureaucracies, the discussion of content is still neglected, although there are important impulses, especially with regard to Vocational Education for Sustainable Development. Knowledge, skills and competencies provide a defined basis that sustainably promotes the development of vocational education and training.

### The example of Bulgaria

#### **Current situation and challenges**

Agricultural vocational training seems particularly suited for implementing Education for Sustainable Development. Bulgaria offers the conditions for sustainable agriculture. The concept of sustainability in vocational training is ecologically oriented. An agricultural system cannot be sustainable if it causes environmental damage. This is the core of the curricula and programs in agroecology. Sustainable development is discussed in various disciplines. The idea of sustainability is mainly achieved in the developing knowledge and competencies, related to the understanding of environmental problems and continuity in agricultural production. Economic and social aspects of sustainable development are not yet covered equally.

Teachers at agricultural vocational schools are striving to meet training requirements for sustain-



able development. They are continuously informed in this respect in order to better motivate their students and to arouse their interest in a possible employment in this field. Education for sustainable development takes place mainly in formal educational institutions. So far, there are only a few initiatives for sustainable development in connection with extracurricular activities.

Teachers face challenges such as a lack of current literature; lack of resources for educational projects; and slow change in social thinking and political priorities.

In addition to the European guidelines, teachers of Bulgarian vocational schools consider the National Strategy for Sustainable Development of the Agricultural Sector in Bulgaria 2014-2020. The Vocational Training Law regulates State Education Requirements (SER) for professional qualifications. It provides knowledge and skills concerning environmental protection and examines technical approaches to mitigating damage to air quality, water and soil, human life and health. ur Schadensminderung an Luft, Wasser und Boden, Leben und Gesundheit des Menschen.

### The example of Germany

In Germany, the so-called dual system (on-the-job training with accompanying theoretical instruction in vocational schools) is practiced in vocational training in the agricultural sector. Training regulations and legally binding documents are developed jointly by the social partners and established by the state by decree.

The UN Decade of Education for Sustainable Development (2005-2014) has led to a stronger focus on vocational training for sustainable development (VETSD) in the educational policy.

For school-based education, the Ministry of Education is striving for greater involvement and cooperation of the places of learning and, in order to overcome subject-oriented learning, cooperation across fields of learning. In this way, content can be interconnected and interdisciplinary cooperation promoted. The "learning field" concept is as yet only partially established in the practice of education and training. Education for formal qualifications is still characterized by subject-oriented learning. This hinders project learning or other innovative forms of teaching and learning. In order to design future-oriented, flexible learning processes, systemic approaches to develop sustainable structures of thought and action and to foster social and media skills - especially skills to act - are required.

### The example of Austria

#### **European and national guidelines**

The goals set for the UN Decade in Austria are implemented within the framework of the Austrian Strategy for Education for Sustainable Development. It aims to foster a change in awareness towards sustainability among teachers and students and to build networks with relevant actors. The strategy thus comprises the following elements: establishment within the education system, research and innovation, partnerships and networks, scenario development, competence development of teachers, monitoring and evaluation.

#### ESD in everyday teaching and work at school

Education for sustainable development is part of the curriculum. There are two clearly defined support elements at and/or between all levels of the school system: development plans and regular (performance) reviews and discussions about target agreements. Regarding ESD, (vocational) schools are encouraged to define relevant interests or needs in their development. A focus is also on the ESD themes defined by UNESCO: Biodiversity, climate change, cultural diversity, health promotion, gender equality, sustainable lifestyles, peace and human security, etc.

#### Specific aspects in national approaches to education Sustainable development in vocational education

ÖKOLOG is a program for environmental education and school development at Austrian schools initiated and supported by the Ministry of Education. Its main goal is to contribute to the Global Goals for Sustainable Development (SDGs). Approximately 570 schools (including 121 vocational schools) and universities of teacher education are working on social and ecological aspects of



sustainability. It is an essential goal to integrate different ESD topics (contents and methods) and to promote a sustainable life in schools (saving water and energy, consuming [more] organic and regionally produced food, etc.).

The Austrian Eco-label for schools and educational institutions intends to promote the commitment of all groups involved in sustainable development. In 2019, 114 school and university colleges, including 10 vocational schools, received an Austrian Eco-Label. The Austrian Eco-label is awarded to educational institutions that take the principles of sustainable development as a guideline for their work. Preventive environmental management and education for sustainable development are the key requirements of this eco-label.

### The example of Spain

over, that either come from high school or the first cycle of vocational training. It offers programs in livestock breeding, animal health, forestry, agriculture and rural development.

A non-academic trades and vocations in Spain do not necessarily require a formal vocational training qualification. Demand for qualifications is however rising.

Teachers and trainers in the agricultural sector pass various qualification routes: (1) vocational training teachers, (2) university professors, (3) teachers of courses in administration (in Andalusia IFAPA) and (4) teachers of courses required by companies. All teachers in training (except group (5), which includes students from different educational backgrounds) have a university degree in agronomy, veterinary or landscape management and a non-subject specific master's degree in teaching. In this route of qualification concepts of sustainability in the agricultural sector and sustainable development goals (SDGs) of Agenda 2030 are of varying, but generally increasing importance.

According to the 2019 Action Plan for the Implementation of Agenda 2030, the Spanish government promoted the integration of sustainable development goals (SDGs) in education, research, transfer, extension and university management. This plan also sets out objectives for integrating SDGs into vocational training and a training plan for teachers. Although vocational training does not work directly with SDGs, some agricultural training modules refer to aspects of sustainability. The Andalusian Strategy for Sustainable Development (2018) promotes intergenerational transfer of local knowledge linked connected with new knowledge to preserve the cultural and eco-social capital necessary to maintain traditional and sustainable forms of resource use. As an addition to formal training, the EU co-financed Andalusian Environmental Education Plan provides annual courses to qualify personnel in agriculture, forestry and the environment.



# 5 Application of information- and communication technologies

In the following a choice of examples from the partner countries are described, covering both

the application and the associated opportunities and risks of ICT in teaching and practice. There are different approaches to the topic in the individual contributions from practice, teaching and research. The European Commission has adopted a cross-national plan for digital education aiming to stimulate, promote and expand the meaningful use of digital and innovative forms of teaching.

See "Action Plan for Digital Literacy"
Curriculum Introduction

# **Bulgaria**

#### Results of a survey at a vocational school for viticulture and wine making / Pleven

For a long time, the use of information technology in vocational education was not considered an innovation, but a way of diversification and enrichment in teaching. Information and communication technology provides a good alternative for topics where there is a lack of sufficient information or textbooks.

"Our school, for example, has a classroom equipped with computers and internet access. The teacher offers guidance to the students, and they themselves search for material on a topic. I work with this in viticulture as well as in organic plant production. The use of information technology saves money when printing material. Furthermore, students become more focused, more responsible and get used to using the internet not only in their social networks but also for learning, even informally, out of school.

The problem in schools is that, if students show insufficient responsibility and attention, the teacher has to monitor whether everyone is really working on the topic or browsing websites. This, however, is a purely disciplinary problem. Another "problem" is that the information is usually geared for a wider audience and, not always completely accurate or scientifically up-to-date. This requires verification by the teacher and additional guidance to be provided to the students. Data security may not be guaranteed to students registering as platform users.

In conclusion, it can be said that information and communication technology provides opportunities for a variety of teaching methods. It allows individual work, saves time and resources, and is preferred and enjoyed by the students, " as summarized by the interviewed teacher.

### Germany

# A study by the Federal Institute for Vocational Education and Training (BIBB): Competence requirements for sustainability and digitization

A study conducted by BIBB<sup>5</sup> explored which skills are needed in vocational education and training in Germany to actively implement sustainability and digitization - which are both currently considered decisive for economic and social transformation processes - in vocational education and training in Germany. The occupational fields included were food, logistics, textiles and tourism. Global value chains were of particular interest in this context. The orientation was based on the competence areas defined by the German Qualification Framework for Lifelong Learning.

Competencies that were identified as necessary for the sustainability of vocational education and training in the context of digitization and that correspond to our experiences from the AgriTrain project include "Knowledge about data protection and data security", as well as skills in "handling information" and "digital competencies". In the case of personal skills, "communication skills", "analytical and networked thinking" and "knowledge transfer skills" were identified as necessary.



#### A quantitative survey of the Chamber of Agriculture Lower Saxony

Training advisors, training officers and vocational trainers of the Chamber of Agriculture of Lower Saxony from the fields of agriculture, horticulture and home economics were asked for their assessment and evaluation in a questionnaire-based survey using a checklist with test criteria and a corresponding assessment scale (smiley scale). The response rate to the questionnaires was relatively low, 19.8 % (24 persons) in the first round and 12.4 % (11 persons) in the second round returned the questionnaire. Therefore the statements made are to be considered as individual (but nonetheless important opinions) rather than representative data.

Two sections, each with eight test criteria, and one section for entering free comments were included in the survey to study the importance and benefits of ICT in vocational training:

**A:** "Company - educational institution - organization with the criteria: communication; documentation; data security; data transfer; production technology; data transparency; Work facilitation and public impact".

The consistently most frequent rating across all criteria was "high" and "medium importance". Low" and "very low" importance was only chosen in a few singular cases.

**B:** "Training - further training - further training with the criteria: training material; e-learning as a method of motivation, transfer of information, training programs; programs for technical equipment; sensitization; agriculture 4.0 and recruitment of trainees".

In this complex of questions, the criteria "training material" and "sensitization for digitization", as well as "agriculture 4.0" were given most weight.

C: Assessment and significance of ICT in agricultural training.

Data security and transparency of data storage were repeatedly cited as a problem, as was the implementation, both technically (networks, servers) and in terms of available time. There were also repeated calls for continuing education for staff and time for training.

### Austria

Digitization in agriculture has come into the focus of attention throughout Austria in recent years. Working without electronic control, computers or the Internet is rather unimaginable today. Mechanization, electronics and automation have massively increased efficiency in agriculture. Internet access has become a matter of course. Digitalization has now permeated many fields of agriculture<sup>6</sup>. This affects digitization of work processes on the farms, but e-learning and e-didactics are also increasingly used in education and extension services.

Many Austrian farms are "early adopters" and have been using modern techniques and technologies for a long time, often several applications alongside and independently of one another. This makes it difficult for education and consulting providers to keep track of current applications and uses. Although teaching of computer skills is an important element in agricultural education and training, the implementation of Agriculture 4.0 requires deeper digital skills - right up to the application of special technologies. Here the areas of education and extension must aim to keep pace in order to offer the farms the best possible support at up-to-date level.

All of Austria's education providers offer instruction or continuing education and consulting on the topic of digitization. Both the University of Natural Resources and Applied Life Sciences and the University of Agricultural and Environmental Pedagogy offer relevant subjects. The HBLFA Jose-finum Wieselburg offers the first specialized training course for digitization in agriculture. Digitization has also found its way into agricultural schools. For example, at the Raumberg-Gumpenstein Higher Federal Teaching and Research Institute for Agriculture, the use of drones in grassland farming and evaluation of satellite images are taught. The FH JOANNEUM Graz also includes these topics in its curriculum by way of a cooperation between teachers.

For agriculture, digitization provides opportunities through plot-specific production, improved data management and increased labor productivity. Further, the development of rural areas may benefit from digitization. Improved opportunities for employment and the creation of new occupational fields may reduce migration of young and well-trained people<sup>7</sup>. Austria's rural regions however lack certain technical and social infrastructure. In addition to measures that improve



technical infrastructure, the expansion of flexible training concepts and cooperation with experts is necessary<sup>8</sup>.

Farmers need a sufficient and suitable training to enable them to conduct a competent exchange of information with technology providers thus minimizing the risk of uneconomical investments in technical solutions. Knowledge required includes the basics of creation of information online, the functions of search engines and the protection of privacy online. New teaching and learning processes are designed to motivate learners to make themselves more familiar with digital technologies. This requires lifting entry barriers (e.g., participation in online training). There is a need for education and counseling to raise awareness of risks such as data misuse and security issues<sup>9</sup>. The large amount of data generated by the application of digital technologies may be used for research and training by examining sample farms for their ecological and economic efficiency, as is done, for instance, in the "Farmlife" program<sup>10</sup>.

### Spain

### Online survey on the application and use of ICT / University of Seville

As part of the AgriTrain project, an online survey among vocational school teachers in Andalusia followed by interviews was conducted. Eleven of eighteen educational institutions were represented by a total of 22 teachers. The survey included one question on the use of ICT in the classroom.

100 % of the answers addressed the use of ICT, thus reflecting compliance with the legal requirements for ICT use established specifically for the Andalusian education system.

#### Information and communication technology as an educational resource:

- Online information: 40 % of the teachers are searching for information online on a daily basis. 50 % do so regularly and the remaining 10 % only occasionally
- Apps: only 20 % of the teachers included in the survey use apps. Half of this group of app-users report a daily use and all others only occasional use.
- Technical programs: 63.3 % of the teachers surveyed use technical programs: Half of them use such programs daily, the other half only occasionally. The rest of the teachers surveyed never use technical programs in their work.
- Games: Half of the participants (50 %) use this resource. Frequency of use varies. Generally, use is rare, with most participants reporting only an occasional use.
- Videos: 86.3 % of the teachers surveyed use videos in the classroom, with half of them using them on a daily basis.

All participating schools have computer rooms. About half of the surveyed institutions have a computer room and a PC for two students. Only 23.5 % of respondents said they were able to provide one computer for each learner. Information and communication technology is fully integrated into the daily life of Andalusian vocational schools. However, access to resources, such as the number of classrooms with computers and the number of computers per learner, still needs to be increased.





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- <sup>3</sup> Weinert, F. E.: Vergleichende Leistungsmessung in Schulen eine umstrittene Selbstverständlichkeit. In: Ders. (Hrsg.): Leistungsmessungen in Schulen. Weinheim und Basel 2001, S. 27f.
- <sup>4</sup> World Commission on Environment and Development: Our Common Future. Oxford University Press, Oxford 1987; zit. nach BNE-Portal des Bundes, Internetseite: Was ist Nachhaltigkeit?: www.bne-portal.de/de/einstioeg/was-ist-bne (Zugriff: Januar 2019)
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- <sup>6</sup> BMNT (2018) Digitalisierung in der Landwirtschaft. Herausgegeben vom Bundesministerium für Nachhaltigkeit und Tourismus (BMNT), Verfügbar unter: https://www.josephinum.at/fileadmin/content/BLT/Puplikationen/1810\_01.pdf
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- <sup>8</sup> HIRT, M. (2018) Handlungsfeld 9 Aus und Weiterbildung, Beratung. In: BMNT Digitalisierung in der Landwirtschaft.
- <sup>9</sup> HIRT, M. (2018) Handlungsfeld 9 Aus und Weiterbildung, Beratung. In: BMNT Digitalisierung in der Landwirtschaft.
- 10 https://www.farmlife.at/



www.agri-train.eu











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