SWG SCAR-AKIS Policy Brief on

New approaches on Agricultural Education Systems

Introduction

The Strategic Working Group (SWG) of the Standing Committee of Agricultural Research (SCAR) on Agricultural Knowledge and Innovation Systems (SWG SCAR AKIS4) decided on 14-15 June in Brussels, to write this Policy Brief. The group zoomed in on one of the cross-cutting topics identified in its 4th mandate: exploring the **"New approaches on Agricultural Education Systems".**

The purpose of this position paper is to bring the importance of agricultural education within the AKIS to the scene and to better understand the evolving needs of education. Especially since the set-up and implementation of the EIP-Agri and the promotion of the interactive innovation model in the EU agriculture in AKIS, are evolving. The role that the different actors within AKIS performed in the past, is changing, due to these evolving needs of the farmers and the framework conditions that allow a further interaction between the different AKIS actors. E.g. digitization, less farmers but better trained, as reflected in the recent SCAR AKIS reports and in the outcomes of different FP7 and H2020 related projects (such as PRO-AKIS and AgriSpin). This paper contributes to identifying main drivers for the agricultural education systems and its evolving needs within the interactive innovation model. It provides food for thought for the H2020 multi-actor approach and also for national and regional education engaged at different levels (tertiary, secondary and primary formal education and lifelong training).

Since the specific context in each Member State may differ and this policy brief was made by a group, it cannot state individual positions of the participating Member States' experts. This policy brief represents the consensus of the SWG SCAR AKIS as a think tank. The conclusions of the discussions were endorsed in the 30-31 May 2017 meeting in Bonn and provide food for thought for all involved in the future of education services in Europe.

Evolution of farmers' educational needs

As stated in the report *Economic returns to formal agricultural education*[1], farmers' needs are evolving quickly. They face a future of challenges and opportunities, marked by an increased demand for food and non-food products. They have to produce in a more efficient and profitable manner, in a volatile market environment and at the same time, they have to live up to sustainability requirements.

The education profile of EU farm managers is improving. In fact, the trend indicates that there will be fewer farmers but they will have higher qualifications. In 2005, 79, 5% of European farm managers relied on practical experience as their main qualification, while in 2013 this percentage had decreased to 69%. In countries like Germany, France and the Netherlands, this percentage was around 30% in 2013. In Ireland, in this same period (2005-2013), the percentage of farm managers relying on knowledge based practical experience only, decreased from 69% to 50% (see Table A1 in Annex 1). As shown by Heanue and O´Donoghue (2014), farms that are managed by better skilled professionals, achieve higher yields and profits. They also confirm that private and social returns on investment in agricultural education, are high. Farming systems are evolving towards value chain and cross-sectoral approaches. More integrated production processes and multi-functioning organisational networks need different skills.

[1]Heanue, K. and O'Donoghue, C. (2014) *The Economic Returns to Formal Agricultural Education*, Teagasc. Oakpark. ISBN: 978-1-84170-613-9. The report is available at http://www.teagasc.ie/publications/2014/3374/index.asp

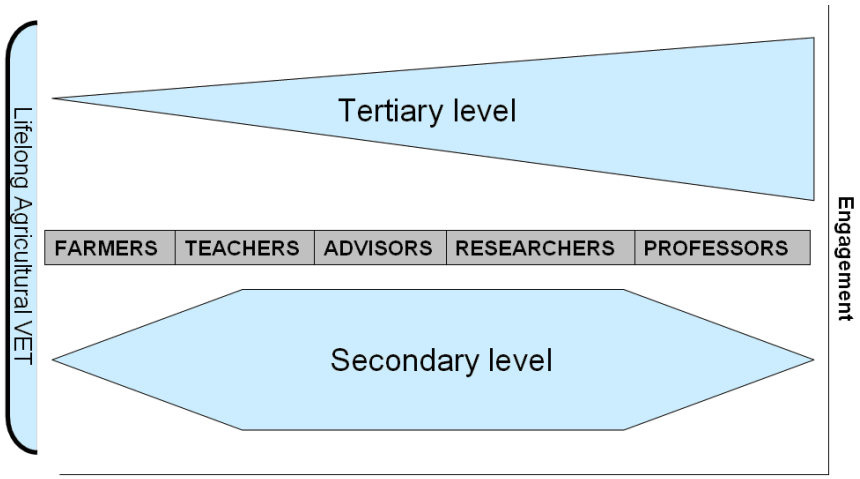
We notice the following challenges for the agricultural education sector in Europe[2]:

- hard, basic skills and technical knowledge stay key, but continuous input is needed to upkeep this knowledge
- more attention is paid to soft skills, entrepreneurship and willingness to learn, adapt and evolve;
- scale enlargement;
- diversification of business models;
- process innovation;
- cooperation and networking;
- inter-disciplinary understanding;
- collective cost reduction and quality improvement;
- political sensitivity to different views of different stakeholders;
- meeting consumer demands such as high quality, sustainable and locally produced products.

Evolution of the agricultural education system

1. *Actors in the agricultural educational system*

Agricultural actors have different degrees of education (see Graph 1). As explained in Annex 1, not many farmers follow tertiary education. Although the trend from the last decade is that the number of farmers with higher education degrees is increasing, the percentage is still rather low in relation to the total number of farm managers. Although there is not a direct link between successful farming and tertiary education, farmers with tertiary level education could have an exemplary role in promoting a higher level of education among peers, especially among young students who want to become farmers.



Actors in the agricultural education system

[2]CEDEFOP Skillsnet Sector Flash on Agrifood, Feb. 2008.

Graph 1: Agricultural actors' degrees of engagement.

2. ***Connecting education stronger with the AKIS and its actors***

AKIS are evolving and this also implies an evolution of their education component in relation to other AKIS actors. For example, vocational and lifelong training programmes are developing stronger connections between research and education, allowing researchers, teachers, lecturers and other actors, such as advisors, to work more closely together. Within this context the interactive innovation model promoted at EU level via the EIP-Agri, should contribute to the further enhancement of these linkages and interactions among different knowledge players. The involvement of actors from education systems in interactive innovation projects within the EIP-Agri framework, is of relevance for the further development, dissemination and uptake of the innovative project results. It enables stronger long-lasting effects through embedding the results in curricula and thereby strengthening the impact of projects. It can be of interest to learn from different novel education initiatives developed in different EU MSs which involve education in multi-actor projects such as EIP-Agri. A few examples are mentioned below.

3. ***New forms of education***

Old paradigms based on 'presential' education, when the student is actually present in the class room, are being enriched with new innovative pedagogic methods and remote learning. Examples are: blended learning (integrating presential and virtual methodologies), mobile learning (when students work from different devices like tablets, notebooks and smart mobiles), and flipped classrooms (when students develop videos for fellow students to gain better comprehension on a certain topic).

Initiatives for innovating education

Different initiatives have been tested to innovate education wit a view to adapt it to the farmers' present and future needs.

1. ***Developing better connections between researchers and teachers****: the example of* ***BOGO*** *and* ***WURKS*** *- the Netherlands*

Two Dutch examples are the programmes BOGO and WURKS (Wageningen UR Knowledge Share) for knowledge transfer between (WUR) research and education. The aim of the programmes is to update educational material and to innovate curricula. The main target groups are universities for applied sciences, higher vocational, secondary vocational and prevocational education. However, there were also projects that aimed at improving vocational trainings for (current) agricultural entrepreneurs. During the period 2013-2015, 40 projects were conducted in the BOGO-programme addressing several topics in plants, horticulture, animals, livestock, food and nature. Several products were developed such as readers, chapters, presentations, digital learning methods such as video, guest lectures, masterclasses, etc. Agricultural sectors were involved because the knowledge needs of different centres for expertise and innovative entrepreneurship formed the basis for the projects. The programmes allow better connections between researchers and teachers in particular.
Lessons learned:

- networks of researchers and teachers from different education levels, learning together;
- quality improvement of innovative education content;
- difficulty to get teachers 'out of the class room';
- not all researchers and teachers speak the same language.

It is important to note that the BOGO programme cooperated with the specialized centre for the development of teaching material in the Netherlands (ontwikkelcentrum.nl).

2. ***Bridging the gap between agricultural research and farm advice:*** *the example of* ***Advanced Training Partnership (ATP)*** *- Wales-UK*

The motivation of ATP, developed by Aberystwyth University with 4 other universities in Wales, is to bridge the gap between agricultural research and farm advice (in the ruminant agriculture value chain). Its aim is to provide access to cutting edge research findings and give clear overviews of topics relevant to agriculture. The training comprises postgraduate distance learning modules which can be built towards a range of postgraduate qualifications. It is mainly oriented on advisors and sometimes on farmers as well and creates opportunities for combining work with education.

Lessons learned:

- The ATP started with 6 month on-line modules, but it did not work. Now there are modules of 12-14 weeks which allow students to discuss the topics amongst themselves;
- The programme allows people to learn at a high level whilst still working. This means that they have a context for what they are learning and in many cases, they can directly and immediately begin integrating their new acquired knowledge in their work.
- They started both with presential workshops and on-line training. Now, only on-line training is provided as they have concentrated on more in-depth learning, giving people skills to acquire new knowledge, rather than just providing them with contents;

3. ***Strengthening linkages between university professors, researchers and advisory services: Mixed technological Networks (RMT in French)****- France*

RMT concept was launched after the approval of the Agricultural orientation law in 2006. This programme contains the participation of different actors from research, development and education with 3 qualified technical institutes or chambers of agriculture, 1 agricultural school, and 1 agricultural high school or 1 research institute. This initiative allows to develop stronger linkages among university professors, researchers and advisory services. Around 30 RMT addressing cross-cutting agricultural challenges are running in France.

Main activities**:**

- delivering new knowledge to teachers;
- gain technical knowledge;
- build relationships between people coming from different worlds;
- have a different operational approach;
- provide information support;
- involve teachers in the creation of new trainings.

A key characteristic of RMT is that a time release is sometimes granted for teachers, in order to be involved in the RMT. They have to apply through a call for proposals.

RMT has (inter alia) the following education objectives:

- changing the education programmes;
- building new trainings and curricula;

- creating specific modules in high schools;
- working with regional authorities and participation in the development of rural areas;
- go further on experimentation while integrating students;
- communicating agricultural issues.

4. *Building advisors' capacity - Master in Agricultural Innovation Support* *(MAIS) - Ireland*

MAIS was organised by Teagasc & the University College Dublin-Ireland, during the time period 2010-2015. The programme is oriented on those who are willing to work as agricultural advisors or education officers. There are two options: innovation support, and extension and innovation. The first option is based on traditional delivery whereas the latter is based on blended learning. The first programme includes a 15 month placement in a Teagasc advisory office or agricultural college, whereas the second has a 24 month placement. The program comprises the following characteristics:

- advisory & education focused research – topics put forward by Teagasc staff;
- the opportunity to learn the practical work of knowledge transfer and agricultural education;
- 2 supervisors (UCD and Teagasc);
- regular round table seminars.

Lessons learned:

- students want to work in advisory services, the apprenticeship is highly valued;
- the student's own motivation and enthusiasm are critical aspects;
- performing well on most of the critical competencies, especially in terms of knowledge of advisory systems, approaches and skills for advisory work;
- experience from the students' feedback shows that this programme allows students to: 1) develop their ability as advisors and identify farmer's individual problems,
  2) come up with solutions that are both within the farmers' means and capabilities and will have an effect on the field;
- the programme shows successful results during its evolution, with a high employment rate of the MAIS graduates within the **sector.**

5. *Involvement of students through gamification* *– the* ***MezőGÉPész*** *contest – Hungary*

Gamification is an interesting tool to get students more involved in learning, especially younger, less self-conscious students (pre-university). A good example is the Mezőgépész initiative which has vocational school students in agricultural engineering, as target group. The project is part of the awareness raising programme called «Be an agricultural engineer » (Legyél te is mezőgépész: http://mezogepesz.hu/miert-legyel-mezogepesz). Through this programme, a contest was initialised by Agro Napló, a monthly agricultural magazine, which cooperated with MEGFOSZ (National Association of Agricultural Tool & Machine Dealers). The contest was supported by the Hungarian Ministry of Agriculture. The contest exists of three rounds for 3-5 member groups of vocational school students (15-21 years) in agricultural engineering. All these schools are managed under the authority of the Ministry of Agriculture. From 2015 and onward, the contest had immanent success. In the first experimental season there were 15 teams organised by 10 schools. In the second season 47 teams were formed by 32 schools. In the first round a community was built around the contest (see the Facebook group: mezogepeszek). This Facebook community now has more than 15.000 members. It is a vibrant professional discussion forum for agricultural engineering students, teachers and agricultural companies. In the second round, BINGO was established. During 16 days, a slogan had to

be published related to agricultural machinery each day. Teams had to send in photos or videos related to these daily slogans. The third round consisted of an online test compiled by MEGFOSZ member companies. After three online rounds, the best 6 teams were invited to the live finale at AGROmashEXPO, Hungary's biggest trade fair for agricultural machinery. The first prize to be won, was a trip to the SIMA exhibition in Paris, supported by the Hungarian Ministry of Agriculture. For more information, see: https://www.facebook.com/megfosz/videos/1889530101259395.

The most important effect of this contest was the continuous involvement and active learning by a large and growing number of vocational school students. Key success factors were:

- the use of social media as a natural communication channel for the young students involved. The teachers understood the importance of this and they involved social media from the beginning;
- the gamification element and the prizes to be won through the contest, increased the motivation among students;
- the involvement of companies and the AGROmashEXPO, meant that they could show their skills in front of a lot of people and most importantly, in front of possible future employers.

SWG SCAR-AKIS recommendations for transformation of the agricultural education system

A people centred interactive approach connecting production with consumption

Agricultural production and consumption form the seeds for our existence. It is important that people are knowledgeable how to both produce and consume agricultural products. Agriculture should be seen as a solution for socio-economic and societal challenges. Societal awareness on the importance of agriculture should be stimulated, starting at an early age. In education this means that activities and knowledge of agriculture ought to be taught at primary school level already.

To achieve future-proof agriculture, education should focus on three levels: 1) the individual level, to develop talent and skills, 2) the economic level, regarding the labour market, with a focus on entrepreneurship for agri & food and innovation, and 3) the social level regarding connectivity, transition, sustainability and green goals. Changes in agricultural education systems should be derived from a people centered-approach. This means putting people, behaviour, connectivity, interaction, values and learning at the heart of the development of agricultural education. Human capital in agriculture has to be considered as: talent, labour, change-agents and critical consumers - human capital for a responsive approach.

Basic agricultural education for efficient valorisation of new developments and innovation

To be able to dynamically reflect the trends and needs of the sector and society, a multi-actor approach in education should be stimulated. However, there is still a lack of basic agricultural education, particularly in Eastern European countries. Many new education tools address technical novelties but omit the gap with basic knowledge and skills, preventing efficient valorisation of these novelties. Hence, it is not only about developing new tools and methods for education. Within EU education systems, there should remain sufficient attention to providing basic agricultural knowledge and skills and to making learning techniques more interactive and effective. Vocational training should provide a broader range of skills for farmers but it is important not to lose practical knowledge and skills out of sight, sometimes neglected, even at this level. Furthermore, curricula need to be able to adapt to regional/local needs and capacities and should connect with up to date knowledge sources.

Teachers, trainers, advisors and researchers should cooperate with the farming community and policy makers on both (re)defining agricultural education and training, as well as agricultural related policies on education. This can help to better reflect on new and emerging challenges for education and training programmes. In this setting, industry could be considered as a stakeholder rather than a decision maker. Experiences should be shared between MSs regarding approaches to involve education, advice and the farming community in policy making on education.

Cross-sectoral education

Similar to the AKIS as a whole, also agricultural education is evolving towards a broader approach. This means that education is not only focused on teaching agricultural technical skills pur sec. Many agricultural schools are already focusing on cross-sectoral education within the curricula, including nature management, agro-ecology, climate change, interaction with food or bio-based chains etc. One advantage of this trend is the acknowledgement that agricultural sectors do not operate in a vacuum. They are part of the wider management of rural areas and encompass value chain issues and green growth. Cooperative education with other sectors such as health, ICT, water (e.g. management, technology) should be stimulated to respond to future challenges. However, the focus on basic agricultural skills and the quality of agricultural education should not be undermined because of cross-sectoral approaches.

Lifelong learning

Lifelong learning forms the frontline for innovation. It consists of formal learning, informal learning and non-formal learning. More attention should be paid to lifelong learning training adapted to farmers, advisors, professionals and entrepreneurs' needs. Focus on multi-actor instruments to enhance lifelong learning, like e.g. masterclasses that could be developed by researchers, teachers/education and advisors together with agricultural entrepreneurs. Farm advisors need to develop more skills and experience in enhancing peer to peer learning initiatives (e.g. study groups). Peer-to-peer learning could be fostered through field schools, groups exchanging skills and expertise and inter-disciplinary workshops for both conventional and organic farmers. Stimulating peer to peer learning amongst farmers is important in lifelong learning, also with regard to the facilitating role of advisors. Especially when resources for advisory services are diminishing.

Students learn better in real live practical settings

Further to stimulating peer-to-peer learning amongst famers, initial education systems in the different member states should incorporate practical learning projects with agricultural enterprises ('practice learning'). This includes making it procedurally possible that students learn (more) outside the classroom, next to (general) traineeships. Research results show that students learn a lot from practical settings in which they work for, or together with enterprises (see also the ATP and MAIS initiatives above). They gain many different competences. In general, they are very enthusiastic about working in real life business cases. The entrepreneur gains by getting fresh, open minded ideas and interested new 'work forces'. Students are not hindered yet by work experience.

ICT tools can enrich teaching methods

Classical on site learning is needed, particularly in regions where access to internet is difficult. However, blended learning could be further developed by making use of ICT tools, to enhance the agricultural education system. The ATP example shows that full time interactive on-line education methods increase the targeted population (this was oriented mainly on advisors). It is predicted that more people in rural areas who live far away from knowledge and training centres, will make use of digital education methods in the future. However, for a successful learning process, on-line learning tools should focus on providing adequate conditions for interaction and exchanging knowledge and views among the participants. The experience of the INOVISA entrepreneurship programmes illustrates that methodologies which allow

students to prepare the lessons beforehand, with focus on exchanging ideas and experiences during presential lessons, are very effective.

Promote multi-actor cooperation through EU instruments for knowledge and innovation

Education should be positioned as an active partner in (regional and international) ecosystems for learning and innovation. Linkages and interaction between research, education and advisory services, should be enhanced for learning and innovating. Education and schools could be developing into knowledge centers or institutes with an important function in bridging knowledge and SMEs in the agri-food system, if knowledge input and interaction with those who generate new knowledge is incentivized to a greater extent in education. Policy makers play an important role to integrate instruments and to facilitate cooperation between different knowledge players and public authorities, to enhance synergies.

Transnational exchanges between farmers, advisors, teachers, students, researchers and other actors through instruments like ERASMUS+ or specific Thematic Networks in H2020, should also be stimulated. To realise this, it is important that there are interpreters or other methods utilised to overcome language barriers.

Teachers and students should not only be involves on academic level in (H2020) multi-actor projects. Thematic networks and EIP-Agri Operational groups can arrange permanent interaction for impact. Hence it is important that instruments stimulating multi-actor agricultural developments and innovation are analysed or redefined, for education to be able to participate and become more involved in innovation and multi-actor projects and activities. Students are the entrepreneurs of tomorrow. They form the new drivers towards a future-proof agriculture.

ANNEX 1

Table 1. Evolution agricultural training of farm managers: numbers per country in basic, practical and full training

GEO/TIME	2005					2010					2013				
	Total	Basic	Practical		Full training	Total	Basic	Practical		Full training	Total	Basic	Practical		Full training
Belgium	51.540	12.260	26.940	52%	12.340	42.850	9.160	22.360	52%	11.330	37.760	7.450	22.310	59%	8.000
Bulgaria	534.610	22.860	506.290	95%	5.470	370.490	9.610	357.820	97%	3.070	254.410	3.360	236.300	93%	14.750
Czech Rep.	42.250	8.260	23.360	55%	10.630	22.860	4.480	9.910	43%	8.470	26.250	4.910	12.250	47%	9.090
Denmark	51.680	20.380	28.700	56%	2.590	42.100	18.340	21.670	51%	2.090	38.830	:	38.830	100%	:
Germany	389.880	89.210	122.940	32%	177.730	299.130	165.230	94.000	31%	39.910	285.030	151.690	91.010	32%	42.340
Estonia	27.750	2.920	18.610	67%	6.210	19.610	2.740	12.450	63%	4.420	19.190	2.660	11.590	60%	4.940
Ireland	132.670	22.460	91.950	69%	18.260	139.890	21.170	96.510	69%	22.210	139.600	35.620	70.290	50%	33.680
Greece	833.590	42.250	788.640	95%	2.700	723.060	22.790	697.910	97%	2.360	709.500	39.050	666.260	94%	4.190
Spain	1.079.420	99.300	966.590	90%	13.530	989.800	136.610	838.040	85%	15.150	965.000	155.710	793.600	82%	15.690
France	567.140	62.190	258.930	46%	246.020	516.100	148.170	256.390	50%	111.550	472.210	152.260	181.560	38%	138.380
Croatia	:	:	:		:	233.280	6.540	221.700	95%	5.030	157.450	:	:		:
Italy	1.728.530	140.900	1.534.520	89%	53.110	1.620.880	1.472.370	80.510	5%	68.010	1.010.330	917.260	31.270	3%	61.790
Cyprus	45.170	2.630	42.270	94%	270	38.860	2.050	36.650	94%	170	35.380	2.460	32.740	93%	180
Latvia	128.670	15.680	84.850	66%	28.140	83.390	10.330	51.270	61%	21.790	81.800	10.750	47.800	58%	23.240
Lithuania	252.950	48.370	174.780	69%	29.800	199.910	35.020	139.920	70%	24.970	171.800	33.110	112.300	65%	26.390
Luxembourg	2.450	340	1.080	44%	1.030	2.200	320	870	40%	1.010	2.080	250	790	38%	1.040
Hungary	714.790	34.960	619.130	87%	60.710	576.810	65.290	492.390	85%	19.140	491.330	70.670	403.620	82%	17.040
Malta	11.070	30	11.020	100%	20	12.530	1.060	11.300	90%	170	9.360	1.130	8.160	87%	80
Netherlands	81.830	54.490	23.360	29%	3.990	72.320	46.690	20.840	29%	4.790	67.480	43.290	18.980	28%	5.210
Austria	170.640	33.580	88.610	52%	48.450	150.170	33.690	78.030	52%	38.450	140.430	31.820	70.410	50%	38.210
Poland	2.476.470	548.850	1.522.990	61%	404.640	1.506.620	320.990	814.450	54%	371.180	1.429.010	288.830	746.140	52%	394.030
Portugal	323.920	33.930	285.660	88%	4.330	305.270	31.810	268.560	88%	4.900	264.420	39.160	218.720	83%	6.540
Romania	4.256.150	269.040	3.942.630	93%	44.490	3.859.040	81.490	3.761.970	97%	15.580	3.629.660	113.750	3.498.870	96%	17.040
Slovenia	77.170	16.370	55.580	72%	5.220	74.650	19.940	48.040	64%	6.670	72.380	27.640	36.220	50%	8.520
Slovakia	68.490	7.700	58.490	85%	2.300	24.460	3.670	18.640	76%	2.150	23.570	3.550	17.840	76%	2.180
Finland	70.620	23.110	41.940	59%	5.570	63.870	22.200	35.790	56%	5.890	54.400	20.920	27.800	51%	5.680
Sweden	75.810	11.860	50.370	66%	13.580	71.090	8.600	49.130	69%	13.360	67.150	7.740	46.500	69%	12.900
United Kingdom	286.750	31.640	220.170	77%	34.940	186.800	19.430	144.330	77%	23.040	185.190	30.160	126.390	68%	28.640
Iceland	:	:	:		:	2.590	840	1.030	40%	730	:	:	:		:
Norway	53.000	4.770	27.430	52%	20.760	46.620	12.430	27.240	58%	6.950	43.270	7.810	30.750	71%	4.720
Switzerland	63.630	:	:		:	59.070	30.580	13.150	22%	15.340	:	:	:		:
Montenegro	:	:	:		:	48.870	1.850	46.220	95%	810	:	:	:		:

Source: EUROSTAT, 2016.