

# The Public's Expectations Regarding the Green Sector and Responsive Practices in Higher Agricultural Education

Paper presented at the 8<sup>th</sup> European Conference on Higher Agricultural Education held at the Czech University of Agriculture in Prague, 14 to 16 September 2006

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## **Introduction**

The public has certain expectations regarding agriculture (Scholderer, 2006), food production (Brennan, 2006), the landscape (Scott, 2006), the rural environment and safe drinking water (Kovář, 2006), sustainable forestry industries (Pitkänen, 2006), trade, and distributions practices. Since agriculture in many countries proceeds from crisis to crisis, there is not only concern about animal welfare, food safety, and sustainable production, there is also indignation, protest, and conflict. A recent example from this from the Netherlands is the scandal regarding two large cattle markets in which the Foundation Animal Right made secret pictures of abuses regarding the treatment of cows. Video pictures were shown during the evening news on television that went against the grain. Cows were beaten, devices were used to give cows (current) surges, emaciated cows, cows with overloaded udders and various downers were brought to the market. These practices go beyond the market regulations that are agreed with the trade sector. The market manager was interviewed and said that the situations depicted were exceptional, but that these incidents would be further investigated, and that when necessary appropriate measures would be taken against the traders who did this. The minister of agriculture, nature and food quality responded furiously and said that the practices shown would be scrutinized and if rules were violated, the responsible actors can anticipate legal actions. Nevertheless, the public has these pictures on its retina, together with various others of previous scandals, pests and diseases.

## **Claims of the public and responses of agricultural schools and colleges**

The public has multiple claims regarding the issues mentioned, and workers in the respective fields have to be able to cope with these. They have to understand different views, have an open mind, show integrity, and respect for other values, whilst being able to justify their own practices which need to comply with agreed rules.

Agricultural schools and colleges started to changing their identity, introducing new programs, and innovating existing programs, positioning themselves as educational institutions for life sciences, which contribute to a better world. For instance Wageningen University did this and in redefining it's image (in terms of science for impact for the quality of life); it puts among other things weekly advertorials about the commitment to helping to solve societal problems regarding food safety, the environment, landscape, health, community development in the South, etc. on the front page of one of the leading quality news papers in the Netherlands. Since four years the enrolment figures of Wageningen University are slightly increasing, which is a trend breakage compared to the years before. Draconic measures were taken during the years 1999-2003; complete programmes and about twenty five chair groups were erased. But this resulted in new and creative solutions for the tensions that were felt throughout the university, which is a good example of innovation under pressure.

## **New qualification requirements and how agricultural schools and colleges deal with these**

The changes in the public expectations lead to various new qualification requirements of graduates. New competencies are needed, such as multi-disciplinary problem solving, addressing multiple stakeholder interests, participatory approaches in innovation, interactive

methods in conflict resolution, responsive actions regarding community needs, and social responsibility in entrepreneurship, to name a few.

How do agricultural schools and colleges deal with these new demands? Several projects on this question will be presented that have been conducting during the last couple of years. In this overview the emphasis will be on content-related innovations, and not so much on organizational change of institutes of agricultural education (see for this Mulder & Kupper, 2006), nor on the sectoral approach employed in EU sponsored innovation projects in the domains of agri-food and environmental sciences (see for this Mulder, 2006).

First of all, a European review of competence needs and pertaining varieties of educational practices is presented. Next, an overview is given of various educational practices which are being used to develop new competencies, and finally, some recent projects in which innovative learning arrangements are being studied will be presented.

### **Innovation and development strategies of institutes of HAE in selected EU member states**

In a project conducted by Natalia Ernstman, strategies of various institutes of higher agricultural education in Europe are studied, strategies which are employed for developing the new competencies needed. Related to the public expectations identified by representatives of these institutes, various innovations in higher agricultural education are reviewed in this study.

Several universities (Austria – Universitat fur Bodenkultur Wien (BOKU); Czech Republic - Czech university of Agriculture (CUA); Denmark – Royal Veterinary and Agricultural University (KVL); France - Institut Supérieur D'Agriculture Rhone-Alpes; Germany – Hohenheim University and Technische Universität München (TUM); Hungary – Corvenus; Ireland – University College Dublin; Poland – Warsaw Agricultural University (SGGW) and Agricultural University of Poznań; Romania – Agricultural Science University Bucharest; Spain - la Politécnica de Madrid; United Kingdom - Newcastle University) were either visited or contacted by the researcher.

A topic list was used during the interviews that were held with the institutes. As a drawback of the study we can mention that only one or two interviews were held with the respective institutes, which of course does not give a total picture of the challenges and educational innovations in these institutes. To give such a comprehensive overview would be very costly, and at least in this project there was no budget for that. Nevertheless we think the project revealed various perspectives on the challenges, and interesting educational innovations.

An interim report was written, based on the site visits and face to face interviews, in which the findings were documented. The most important findings regarding the expectations of the public and the educational innovations, as experienced by the interviewees, were brought together in an overview of focal points. The most important focus points were selected, and information gaps were determined regarding competencies needed for the observed demands and related pedagogical/didactical solutions. This led to a refined study description and a new questionnaire. Reactions on this questionnaire were used to complement the document of focus points. This overview is added to this paper as Annex 1, and serves as the final result of the study.

There were some practical constraints when the study was conducted. First of all, the study took place during the end of the academic year 2005-2006, which of course is a difficult

period for data collection in universities. Nonetheless, the majority of the universities contacted for personal interviews were available for these interviews. Secondly, respondents said to have difficulties in answering the questionnaire, as it was too broad. Therefore the answers received were not very specific either. Lastly, the differences between universities in the East and West were vast. The extent to which the Bologna Declaration was implemented differed considerably, which made comparison between those universities rather difficult. However, comparison between the various universities was not the main intention of this study. The intention was to get a picture of challenges regarding public expectations with which institutes for HAE were confronted, and how they responded to this in terms of competencies stressed and didactic/pedagogical strategies for the competence development needed.

The results from the literature review and the interviews regarding the requirements of the public and pertaining competencies perceived by the respondents were the following. First the requirements are mentioned, which are shortly described, and then the pertaining competencies are listed.

Requirements of the public and pertaining competencies perceived by the respondents were:

#### 1. Dealing with the complexity of the contemporary society

The society is thought to be highly complex. Partly through the process of globalization, everything and everyone seems to be interconnected. Because of this interconnectedness, issues have become increasingly ambiguous. That is, there are various sides to a subject because there are more stakeholders involved, which each have conflicting needs and views (e.g. the issues of GMOs).

Pertaining competencies:

- o knowing the different sides to an issue and being able to deal with these conflicting points of views.

#### 2. Decreasing the gap between science and society

There are concerns about the supposed gap between the scientific world and the society. The public to a large extent only sees the negative side of scientific experiments and universities invest too little in the communication with society. Consequently, the public loses trust in science.

Pertaining competencies:

- o being able to get scientific information across to the society;
- o in order to effectively transfer information, a student should understand a problem in such a way that they are able to explain it in 'layman's language';
- o this means that they should understand the problem as a whole and not just focus on the details, i.e. have a holistic view of issues and problems.

#### 3. Preparing students for the increased competition

Competition has increased, also on the labour market. There used to be sufficient demand to absorb graduates from agricultural education, but this has changed. In many subsectors the absorption capacity is too small to warrant employability of all graduates in their specific fields of study. The consequence of this is that educational institutions should not only provide narrow technical knowledge, but broad qualifications for the agility of graduates in career development. Employers furthermore value personal qualifications on top of sound scientific training. This is of special importance for Easter countries, where society is suddenly confronted with the highly competitive market economy.

Pertaining competencies:

- o having communications skills, e.g. being able to present oneself, etc.;
- o a student has to go through a process of personal development in order to be a 'more complete person' when leaving the university.

#### 4. Responding to internationalization

Due to the ongoing internationalization of the agricultural sector (increasing international trade and dependency of international organizations such as the WTO and EU) people working in the agricultural sector have to be ready and able to communicate and associate with people from different cultures.

Pertaining competencies:

- being able to communicate in foreign languages;
- being able to establish contacts abroad;
- being able to communicate with people from different cultures;
- being able to participate in discussions on natural resource management in a global context.

## 5. Shifting from generalization to specialization

Due to the high competition on the world market and extremely low market value of agricultural products (the price of food products is kept artificially low through subsidies), farmers nowadays have to be extremely innovative. The traditional production system is not profitable anymore. Many small farmers all over Europe and large-scale farmers in the east are unable to compete with the strong market position and efficient production methods of highly organized and mechanized (mainly western) farmers, and go bankrupt. In order to keep in business there seem to be two options. Either farmers have to cut production costs by further enlargement of the farm; or they have to shift to specialized farm management, by finding a specific niche in the market and thereby attach an additional value to the product and that allows him to receive a higher price. In order to be able to find such niches, not the practical knowledge of production is important, but the knowledge of market and trends has become more important, combined with an ability to anticipate these trends by being innovative.

Pertaining competencies:

- being innovative/ creative;
- being able to combine activities.
- Having both practical and theoretical agricultural knowledge and experience.

## 6. Human resources development (extension - consultancy)

The agricultural sector is under continuous pressure for change. Not only do farmers have a hard time finding a production niche that enables them to survive in the current climate of world competition and 'free market' (WTO regulations). They also have to comply with a whole stock of standards and regulations enforced by the EU and they have to combine food production with other activities such as landscape and nature management. All of this requires a broad range of knowledge and skills that many farmers do not have. Consequently, there is a demand for educated and skilled consultants who can support the development of human resources in rural areas about innovative and efficient production methods, EU standards, expectations and market trends.

Pertaining competencies:

- have practical agricultural knowledge and experience;
- being able to speak on farmer's level;
- being able to convey information to the group one is targeting (e.g. through presentations/ exhibitions)

## 7. Responding to the wishes of the capricious consumer

This regards the dynamics of today's society which reflects on consumer level. Consumer patterns change continuously. Upsurges in certain products are followed by the sudden development of different trends. And the agricultural sector is bound to anticipate these changes.

Pertaining competencies:

- having analytical capacities in order to judge situations (graduates should be able to decide what is important and what is not);
- being able to see and understand the connections between things;
- being flexible in order to be able to act upon these trends;
- being able to solve problems creatively.

## 8. Decreasing the gap between the consumer and the agricultural sector

This regards the gap between the consumers (or city dwellers) and the farmers. There is a clear lack of knowledge/ interest on the consumer side with regard to agriculture and food supply. What is more, they have a one-sided, rather negative view of the agricultural sector due to recent food scandals and crises as attention is only given to the sector at times that a crisis takes place.

Another source for this gap is the world market trough which food production is increasingly detached from food consumption. Products that are produced in one part of the world are transported to the other and consumers have no relation whatsoever with the production process of the food.

The agricultural sector calls for more understanding from the consumer side, by increasing public awareness with regard to the production of food items; the consumer should understand how sensitive the production system is.

Pertaining competencies:

- being able to communicate agriculture in a positive way to the public;
- being able to transfer information to the consumers.
- In order to effectively transfer information, a student should understand a problem in such a way that they are able to explain it in 'layman's language' this means that they should understand the problem as a whole and not just focus on the details, i.e. have a holistic view of issues and problems.
- Being able to talk to different target groups (farmers, consumers etc).
- Being able to convey information to the group one is targeting (e.g. presentations/ exhibitions) address.

## 9. Dealing with the consumer paradox

This regards the dichotomy between 'consumer' and 'citizen', that causes a paradox in the consumer behaviour: consumers claim to support sustainable and healthy production methods, but at the same time demand the cheapest food products. The agricultural sector is in a fix and farmers are squirming to live up to these paradoxical expectations.

Pertaining competencies:

- students should be able to understand the different sides of agricultural issues, conflicting interests of different stakeholders (from environmental impact to producer's motives, economics, marketing), in order to understand the consumer's motives.
- As it is impossible to comply with the wishes of all groups within a society, students should decide for themselves which production process they want to support (the intensive one, in cheap products; or the more extensive one, leading to sustainable but more expensive products.) To do so, students should be aware of all the opportunities and be able to make consistent decisions.

## 10. Sustainable production/quality orientation

There is a strong demand for food that is produced in a sustainable manner. Many consumers have become more critical, they want to know where food came from (traceability of food) and under what conditions it was manufactured. Where farmers in the past were predominantly focused on the production outcome (volume and appearance), they now have an increasing interest in quality and the production process.

Pertaining competencies:

- Having knowledge on organic production;
- knowing that agriculture is more than just production by understanding the consumer part of agriculture;
- being aware of the definition of 'quality';
- being aware of environmental, health and social issues.

## 11. Considerations about GMOs

The European public is very much against genetically modified food. Consumers declare themselves openly against GMOs and demand clear instruction on packaging materials informing on GMOs.

Universities however flourish in biotechnology; both the provisions of study programs and the implementation of scientific research in this field are expanding.

Pertaining competencies

- having a basic knowledge of the issue but at the same time have a neutral opinion in order to have an overview of the risks and opportunities, so that they can come to a personal view upon the theme. This is something that they should have with regard to all issues related to agriculture and science; GMO therefore is a good field to practice.
- Being able to think critically.

It is interesting to see that topics like the bio-based economy, food security and animal welfare were not mentioned so much as challenging, whereas these are actually also important fields for which graduates need preparation, and which call for specific competencies.

Ernstman (op cit) has distinguished various educational innovations, or rather educational practices that in the HAE institutes consulted were observed as being important for the challenges and respective competence development issues identified. These educational practices are listed below, and not further elaborated here. That will be done in the next section when innovative

- Organizing language courses at university or making language courses very accessible
- Organizing subjects on intercultural education
- Organizing student-exchanges between different countries
- Inviting foreign students to a university
- Strategic networks with leading international universities
- Interdisciplinary education
- Trial stations, in which students learn the practice of agriculture (TUM)
- Merging universities with more practical educational institutes (Fachhochschule); organizing lectures together or designing joint Master programs
- Merging more practical and theoretical knowledge (TUM)
- External students (organizations) provide more practical education for students: WUR: Boerengroep; Integrand; AIESEC
- Thematic courses (KVL) AMC (WUR)
- Project oriented education to make students judge by themselves and think of solutions
- Providing a student divers stock of knowledge and opinions that students then merge in order to come to new conclusions; this gives them knowledge on both the details of an issue and an overview; for example, different scientists organize a lecture on plant, one of them will focus on cell-level, the next focuses on the plant as a production system, the third looks at the plants in relation to animals, etc.
- Problem-based learning
- Courses on communication skills
- Organising opportunities in which students practice presentations
- Multi-stakeholder projects: students are taken away from the scientific world and drawn in practice, as stakeholders come up with practical questions and issues that automatically are more holistic
- Joint lectures: a subject is taught by a consortium of different experts/lecturers; they all focus on a different component of the issue; joint lectures (TUM with BOKU and CUA)
- Education-industry collaboration
- Venture Cup and Yearly industry convention (KVL)

In the remainder of this contribution various educational innovations in the Netherlands are described which are studied in different projects, and which are aimed at developing competencies which are relevant for being able to cope with the diverse expectations of agricultural education of the public.

### **Educational, pedagogical and instructional approaches in the Netherlands**

Based on the illustrative European review (which by no means was intended to be exhaustive), a series of educational, pedagogical, and instructional approaches in Dutch higher agricultural education are described as examples that can help develop the new competencies required.

These approaches are:

- Project education, which is employed for instance to a large extent by the college of Larenstein in Velp (now part of Wageningen University), which addresses social learning in self-directed student teams to a large degree;
- Problem-oriented education (a model which started in the Netherlands within the School of Medicine of the University of Maastricht, and which was adopted in a modified way by Wageningen University), which addresses integrated problem analysis, information finding and processing, team learning, and problem solving;
- Multi-disciplinary design and problem solving (a model developed at various technological universities, but also implemented in a specific way in the Academic Master Cluster of Wageningen University), in which communication of students from various disciplines is developed;
- Computer-based collaborative learning (a model of a-synchronous network-based communication about learning content, knowledge construction and development of collective representations, widely used world-wide, but still in its infancy in Wageningen University; see Veldhuis-Diermanse, Biemans, Mulder & Mahdizadeh, 2006), which is typically used for content areas in which diverse perspectives are existing, and students can have differences of opinion;
- Video-based case study and problem solving techniques (a way of working with new and sometimes emotional situations with which students may not have much experience, such as HIV-Aids or conflicts); this addresses for instance handling emotions, negotiation, and conflict resolution;
- Competence development, based on competence assessment, personal development plans, coaching, feedback and reflection (widely use, not only in education but also in companies in Europe);
- Entrepreneurial learning, in models of small business education or simulations (such as being practiced in an agricultural college in Goes); inspiring learning environments of entrepreneurs can serve as examples for course activities in higher agricultural education (as studied in the greenhouse sector by Lans et al).

Further studies regarding innovative educational approaches for competence development in the Netherlands are the program on knowledge circulation, beta-gamma interaction in education, competence-based higher education, learning with future, learning of entrepreneurs, and inspiring learning arrangements. These studies will be described in short.

### **Knowledge co-creation**

The first innovations that are described here are part of a program on knowledge circulation (Potters, Van der Hoeven & Gielen, 2006; Lans, Kupper, Wals, De Beuze & Geerling-Eiff, 2006) managed by Arjen Wals et al (in fact based on ideas of knowledge co-creation). In this program it is emphasized that effective arrangements between research institutes, industry, and educational institutions should be created, to inform education about the developments so that they can be integrated in their programs and to implement new interactive and participative initiatives in which students can develop competencies and expertise the need.

In the project called 'Learning with future' (Potters et al, op cit), three pilots of innovative arrangements between education and research were tested in cooperation with the Clusius College Hoorn, CAH Dronten and INholland Delft.

First of all causes and consequences of suboptimal cooperation between research and education were analyzed and a model for future oriented learning was developed. The key causes of limited cooperation between education and research institutes were related to lacking overlap between the networks, little vision on cooperation and low priority, and restricted concepts for cooperation. All this resulted in limited vitality and sustainability in agriculture. Practical networks were not used as learning environment, new knowledge does not flow into educational innovation, chances for preparing students for professional practice were under-used, capacity for research of education was not used, which leads to less innovation power.

After these observations, two meetings were organized in which perspectives were shared and opportunities for cooperation were identified. The concept of learning with future revolves around the idea that structural cooperation only starts and continues as long as the various stakeholders have mutual benefits of it. Because of this participative methods were used to develop cooperation, and the project team played a facilitating role.

Based on the meetings three draft proposals were developed and the proposal which had the strongest support was elaborated and tested by three pilot core teams. The project gave room for exchanging experiences and go beyond traditional boundaries between entrepreneurs, research and education. The partners in the projects thus learned about new opportunities for cooperation and developed ideas for institutional integration of the ideas.

The core of the pilot projects consisted of student teams who were working on questions of entrepreneurs who participating in a practice network of a research institute. During the projects students could develop the following future oriented competencies: 1. strategic entrepreneurship in networks; 2. translating research findings into practice; 3. working in a teams and project management; 4. communication: deliberation, making agreements, informing, interviewing, human relations, report writing and presenting.

The student teams worked independently, but they were supported by researchers, teachers and consultants. Teachers were coaching the learning processes and created a safe learning environment, researchers and consultants gave advice regarding the content of the projects and the research process. The entrepreneurs served as project commissioners, but also acted as practical experts and information sources about the company.

As said, three pilot projects were implemented, one on biological agriculture, one on open integrated cultivation, and one on greenhouse horticulture. Reactions of all stakeholders about this interactive entrepreneurship-research-education model were very positive. Participants said: 'This is REAL education', 'This is much better than doing an internship in a company. One makes the link between theory and practice. In other internships one in fact just works along in practice. Now one wants to also see what an entrepreneurs has on paper inside', and 'One learns things one normally does not learn in the program, for instance how one can get as much out of an interview as possible'.

Lessons learned were about the cooperation and knowledge circulation between the actors, and structural embedding of the model.

Regarding the cooperation and knowledge circulation it was found that the choice of the theme for projects influences the perceived value of the project for the partners. It is important to choose a specific question of entrepreneurs, to relate to project theme to current research which fits it the running research program, and to link it to existing educational programs and themes of educational innovation. Furthermore, the right persons who have the right competencies should be linked together. Also, the learning project should be well defined, and

a start-up meeting is essential. Clear communication, quality management and the flow of knowledge are also important.

As for the institutional embedding vision development, agreements, flexibility in added value, a joint year calendar, organizational support from all actors, keep watching overregulation, financing, training and coaching of teachers, researchers and entrepreneurs, linkages with innovation processes, and appointing a coordinator within the participating organizations are important.

### **Knowledge arrangements**

The second project mentioned (Lans et al, op cit) was about knowledge arrangements as powerful learning oriented combinations of groups of actors. Ten of these knowledge arrangements were monitored, about cow and chances, poultry knowledge, declaration-obligatory animal diseases, duration cultivation, crop protection, new style tree nursery, learning with future (described above), pre-university campus (a service of the university for students of pre-university education for instance for the support of students who have to make assignments in field that are covered by the university), knowledge circle food safety (a knowledge circle is a group of experts around the relatively new position of reader in higher professional education, who has the task of innovating educational programs, creating new programs, and to do practice oriented research), and the rural house of a specific region in the Netherlands. All knowledge arrangements were analyzed, and again lessons were distilled that are important for setting up and maintaining good and innovative practices.

Competencies were identified which are essential for these arrangements, and guidelines were given for 'directors' of them, based on 1. the four factors identified in this study that are important for success: vision, support, competence and culture, and 2. the three levels of the actors: individuals, organizations and the networks. Directors can assess the situation of a knowledge arrangement on these factors and levels and decide on a deliberate strategy to orchestrate (and develop and manage) the arrangements.

### **Beta-gamma interaction within Environmental Sciences in Wageningen University**

In a project of the Environmental Sciences Group (Mulder, Van Loon-Steensma & Broekman, 2004) a whole series of educational innovations regarding problem-based learning, ICT and beta-gamma interaction in education were evaluated in an interactive study with project managers, teaching staff and students, with the aim to collectively share the experiences within the whole Group, which covers a series of Bachelor and Master programs. The project was commissioned by the Environmental Sciences Group of Wageningen UR to study the experiences with educational innovation financed by its Board of Directors. The educational innovation was aimed at stimulating problem-based education (PBE), information and communication technology in education (ICT) and, what is so characteristic of Wageningen University, integration /interaction of natural, technological and social sciences (Beta-Gamma Interaction - BGI) in education.

The aim of this project was also to share experiences regarding educational innovation. Over thirty innovation projects were conducted, all aimed at content-related courses.

Educational innovation is often carried out by project teams, but communication of results between these teams is not always optimal. The exchange of experiences was facilitated through group discussions, interviews and a workshop. It was readily apparent that the participants very much appreciated this opportunity to exchange experiences. They believed

that the content and design of renewal in education should be discussed more frequently among colleagues. In their experience, discussions focused too often on preconditions for change (regarding budget and time allocation and other facilities).

This project provided a number of important insights for educational innovation in problem-based education, ICT and BGI. Various general conclusions can also be drawn. In addition to conclusions regarding the organization of and conditions for renewal (such as the mandatory character of the innovation, the tasks of the various actors, the evaluation of proposals and the financial aspects of projects), the most important general conclusions that can be drawn from this project are the following:

- Implementation of beta-gamma integration in education should receive greater attention, especially with respect to testing, didactics and competencies of teachers. It would be good to initiate a research program aimed at the didactics of the integration of beta-gamma disciplines in education.
- Educational innovation pursued only within specific subjects is too narrow in scope. BGI and PBE are innovations that clearly have to be viewed from the perspective of life-long learning trajectories. It is impossible to acquire all of the desired BGI competencies within one subject. BGI is a learning process that has to be stimulated in various subjects over the entire width of BSc and MSc programs. This requires smart planning and intensive collaboration.
- Competence development can only be partially programmed, because over the course of their education students will diversify and design their own learning trajectories according to their own needs. Due to the various entrance possibilities for students, it is now more important than ever to consider differences in pre-entry competencies.
- Educational innovation requires coordination of educational philosophy, objectives, content, organization and testing. Change in one of the components has implications for all of the others.

The specific conclusions regarding the introduction of BGI education were the following.

- Didactics - Problem-based learning and case-based learning are good didactical approaches to realize BGI.
- Needed beta and gamma knowledge – Important is to determine with which core problems in the subject domain graduates will have to deal and which beta- and social science knowledge is needed for solving those problems. BGI-education needs to be programmed based on these problems.
- Necessity of BGI – Students should get clear examples as to in which way they will be confronted with inter-, multi- or trans-disciplinary work after they have graduated, and that it is the task of the university to give attention to the integration between core subjects next to further (super) specializations. To make BGI understandable the way in which different disciplines are connected should be clearly indicated: there should be alignment. This can be achieved by presenting a conceptual framework of to make the read thread visible.
- Mutual interest - BGI has to scaffold the stimulation of mutual interest and understanding in one another's content area and the differences in design and problem solving approaches. BGI education should be linked to the zone of proximal development of beta and gamma students.
- Language and way of thinking - Beta and gamma students have to learn to know their mutual language and way of thinking. They also have to be curious to the background of that thinking not only because of getting a better understanding of that, but also to be able to cooperate were necessary.

- Mixed teacher teams – Employing mixed teams with bèta and gamma teachers works especially good when good ex ante agreements are made between the teachers involved and there is a clear framework of actions.
- Knowledge of teachers – Both bèta and gamma teachers who are being chosen to implement BGI education have to have insight in their mutual domains.
- Continuous learning lines – Multi- or trans-disciplinary problem solving cannot be learned in one subject. That calls for continuous learning lines spread across the program. It is important to program BGI oriented competence development in such learning lines.
- Exams – It is also important to give attention to assessment of BGI competence. Teachers have to be very well aware of different assessment frameworks and accompanying standards. Different disciplines have their own grading practices. Bèta teachers may have lower marks in mind when assessing work of BGI groups regarding the social sciences component and vice versa.

### **Inspiring learning arrangements for entrepreneurs**

In this project an attempt is made to design various learning arrangements for entrepreneurs which are inspiring for them to engage in (Gielen, Biemans & Mulder, 2006). It is well-known that entrepreneurs are not very interested in participating in formal education and training courses. Their learning preferences are different (Lans, Wesselink, Biemans & Mulder, 2004), and in an innovative context they tend to rely on reflection, observation and imitation (Mulder, Lans, Versteegen, Biemans & Meijer, 2006). Supporting entrepreneurs in their learning effort is a challenging effort, and the idea was that if learning support would be inspiring entrepreneurs would be more benefit from it. Therefore, various pilot studies were conducted in which inspiring learning arrangements were found, which were labelled with metaphors. The metaphors are listed below, and the pertaining competencies are indicated behind the metaphors. Various specific didactic varieties are listed below the metaphors.

- Master class - Insight and experiential knowledge
  - Workshops, cases, court game
- Clinic - Skill
  - Demonstrations, audits, benchmarks
- Workshop - New perspective
  - Brainstorms, mindmapping, creative sessions, scenario-development
- Laboratory - Viability of solutions
  - Model development, practice simulation, research, concept development
- Academy - Multidisciplinary knowledge
  - Classes, lectures, seminars, symposia
- General rehearsal - Collective routine
  - Training, conducting, development of cooperation and routines, presentation
- Entrepreneurs café - New networks
  - Lectures, discussion, teamquiz, socio drama
- Boxing ring - Improved performance
  - Debate, panel discussion, game, training and coaching, competition
- Kitchen table - Deepening network
  - Dialogue, group conversation, coaching conversation, reflection conversation, consultancy session

- Utopia - Innovation
  - Discussion, negotiation, presentation to the public
- Study club - Mirroring company results
  - Story-telling, company visit, company audit, systems analysis, presentation
- Expedition - Self-knowledge and new values
  - Excursion, blind date, study tour, survival, journey report

These inspiring learning arrangements are being advised to institutes of HAE. The general idea is that taking authentic learning of entrepreneurs as an example, students of HAE will also be motivated to engage in these activities, in which they then acquire the competencies that are being conceived of as very important.

### **Towards competence-based education**

The overarching innovation at this moment is competence-based education. The implementation of this innovation is further in colleges for professional education than in universities, since the colleges are more oriented towards professional practices, whereas the universities are more focused on academic skills and research. Various principles of and experiences with competence-based education are elaborated, based on studies of Wesselink, Biemans & Mulder (2007). A matrix was developed with these principles and levels of implementation. This matrix is primarily meant for competence-based agricultural vocational education, including higher professional education. The principles are:

1. The competencies, that are the basis for the study program, are defined.
2. Vocational core problems are the organising unit for (re)designing the curriculum (learning and assessment).
3. Competence-development of students is assessed frequently (before, during and after the learning process).
4. Learning activities take place in several authentic situations.
5. In learning and assessment processes, knowledge, skills and attitudes are integrated.
6. Self-responsibility and (self)-reflection of students are stimulated.
7. Teachers both in school and practice fulfil their role as coach and expert in balance.
8. A basis is realised for a lifelong learning attitude for students.

The matrix for competence-based agricultural-vocational education is depicted as an attachment to this paper.

First research into the application of competence-based agricultural-vocational education showed the following.

1. The relationship between competencies in the job profiles and the education programmes is not always clear.
2. Sufficient collaboration is needed in formulating objectives and making agreements.
3. It is difficult to establish core assignments because tension is inherent between content-matter thinking and practice-oriented thinking.
4. The important thing is to bridge this difference in a productive way.
5. Intake of students has to be clearly explained and should return later in the programme.

6. The strong linkage in competence-based education programmes between education and practice is viewed as very positive.
7. Teachers find the facilitating and coaching role needed to support competence development new and difficult. They fear that the learning process will become fragmented and that the students' potential will not be optimally utilised.
8. Methodologies are needed to give the teachers a clear idea of the students' experiences in practice.
9. Recognition of the competencies by students is limited.
10. The students' response to independent study varies. Some enjoy it, while others would prefer more support from the teacher.
11. Students find that they are too often confronted with the concept of competence, the added value of which is not clear to them.
12. Too much bureaucracy presents a constant threat. If students are asked too often to fill in forms and write evaluation reports, they will eventually balk.
13. Opinions vary with respect to the functionality of assessments. Teachers doubt whether enough is asked of the students in assessments, whereas students find this to be a pleasant way to be tested.
14. Assessment is a more intensive way to test student achievement, and the additional workload for teachers must be taken into consideration.

Various faculties and universities are now in the process of working with the concept of competence in their programs, also based on the Bologna process, the European Qualification Framework, the Dublin-descriptors, and accreditation requirements regarding the societal relevance of educational programs. Wageningen University takes this very seriously, and has implemented a program of identifying competencies in all programs, and now places this in a wider perspective of the preparation of students for the labour market and society, in which the expectations of the public also play their part.

## **Conclusions**

The public had various expectations about a multitude of issues in the fields of agri-food production, environment, landscape and the management of natural resources. New competencies are needed for graduates to meet the challenges of the diverse demands of the public and the strengths and weaknesses of many practices. Educational institutes which traditionally were aimed at providing agricultural education have responded widely to new qualification needs (Mulder, 2006). There are also various ways in programs, courses and in practical educational settings, to develop the new competencies needed, such as beta-gamma interaction, facilitating multiple stakeholder processes, participatory methods, interactive strategies, conflict resolution, responsiveness regarding community needs, and social responsibility. Examples have been given of ways in which competence development can be brought about, some at the systemic level, others at institutional level, and still others at organizational, team and individual level. We can conclude that HAE does not fall short of strategies, methods and tools to support the competence development of students in the directions described. In various cases faculty development may be needed to share experience about new ways of supporting learning. Traditional educational innovation trajectories of needs assessment, curriculum design, instructional design, implementation and evaluation are not sufficient to reorient HAE towards the direction needed. These trajectories take too long because of their immanent time lag of many years. Clear values regarding the content-related issues together with an appropriate educational philosophy are imperative. Based on that, new

ideas about knowledge circulation (or knowledge co-creation), interactive knowledge arrangements, inspiring learning environments, entrepreneurial learning and competence based education can be used. Further research is necessary to look at the implementation and longer term impact of these interventions.

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Framework for competence-based learning (Source: Wesselink et al, 2006).

Principle	Not competence-based	Starting to be competence-based	Partial competence-based	Completely competence-based
1  The competencies, that are the basis for the study program, are defined.	There is no job competence profile put together.	There is put together a job competence profile without participation of the vocational practice. This (vocational) competence profile has been used during the (re)design of the curriculum.	There is put together a job competence profile with participation of the vocational practice and this profile is fixed for a longer period of time. This job competence profile has been used during the (re)design of the curriculum.	There is put together a job competence profile with participation of the vocational practice and this profile is tuned frequently with the regional and local vocational practice including the major trends. This job competence profile has been used during the (re)design of the curriculum.
2  Vocational core problems are the organising unit for (re)designing the curriculum (learning and assessment).	There are no vocational core problems specified.	There are vocational core problems specified, which are used as examples in the (re)design of the curriculum	There are vocational core problems specified. These core problems are the basis for the (re)design of the some parts of the curriculum.	There are vocational core problems specified and these are leading for the (re)design of the whole curriculum.
3  Competence-development of students is assessed frequently (before, during and after the learning process).	Assessment is the final stage of a learning process and takes place at a fixed moment.	Assessment takes place at several moments. Assessment is used for formal assessment and does not play a role in the learning process of students.	Assessment takes place before, during and after the learning process. Assessment is used for both formal assessment and competence development of students.	Assessment takes place before, during and after the learning process. Assessment is used both for formal assessment and competence development of students. Students determine moment and format of assessment themselves.
4  Learning activities take place in several authentic situations.	Learning in practice is of subordinate importance and there is no relation with learning in school.	Learning in school is leading. Sometimes, in the form of cases a relation is set up with learning in practice or experiences from practice.	Learning activities take to a large extent place in authentic settings, but the relation with learning in school is insufficiently.	Learning activities take to a large extent place in a diversity of authentic settings and the learning activities are clearly related with the learning activities in practice.
5  In learning and assessment processes, knowledge, skills and attitudes are integrated.	Knowledge, skills and attitudes are separately developed and acknowledged.	Knowledge, skills and attitudes are sometimes integrated in the learning process. Knowledge, skills and attitudes are assessed separately.	Knowledge, skills and attitudes are integrated in the learning process or in the assessment procedure, not in both processes in the same time.	Integration of knowledge, skills and attitudes is for both learning and assessment processes starting point and therefore operationalised.
6  Self-responsibility and (self)-reflection of students are stimulated.	Learning activities are characterised by external steering: students carry out assignments by means of elaborated instructions. There is no (self)reflection.	In a limited part of the learning activities, students determined the way of learning themselves. There is hardly any reflection on the learning process and functioning in vocational settings.	Students determined themselves the way of learning, and time and place of learning, based on the reflection on the learning process and functioning in vocational settings.	The student is after all responsible for its own learning process on the base of its own learning needs.
7  Teachers both in school and practice fulfil their role as coach and	There is no question of support. Knowledge transfer is central issue in the learning process.	To a limited extent the responsibility for the learning processes is handed to the students. The teacher	The students enjoy to a certain level to determine their own way of learning. the teacher observes when	The teachers stimulates the student to formulate learning needs and on the base of self reflection to determine his or her own

expert in balance.		is directive in his or her way of supporting.	the students needs support and offers his or her support.	learning process
8 A basis is realised for a lifelong learning attitude for students.	There is no attention for competencies that are related to learning or (labor) identity development.	In the curriculum there is attention for competencies that are related to learning and (labor)identity , but these competencies are not integrated in the learning process.	During learning trajectories competencies related to learning and (labor)identity development are clearly related to vocational core problems and attention is paid to those competencies to a large extent.	During learning trajectories competencies related to learning and (labor)identity development are integrated and reflection on the future career of the students has taken place.