The Future of Agricultural Education: The Case of the Netherlands [1] [2]

Draft

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Summary

Agricultural education has been an essential factor in the success of agricultural development in the Netherlands. At present, like in many countries throughout the world, the position of agricultural education is threatened. Does agricultural education have a future in the Netherlands, and if so, what strategies are being used to survive? This paper discusses these questions. First the agri-food complex is described briefly, to give some contextual information about agricultural education. Additionally some factual information about agricultural education itself is given. Subsequently, the trend towards green education is described, followed by describing and discussing the first Policy letter of the Ministry of Agriculture on the future of agricultural education. Then, the second Policy letter is presented, including the shift towards content innovation of agricultural education, and the implications for a general green curriculum are discussed. The paper then concludes with an overview of types of responses by institutes of agricultural education (schools and colleges) to cope with the uncertain developments. These responses are presented as metaphors: the evaporating (vanishing), dissolving (merging into much bigger regional non-sectoral educational institutions) and crystallizing (regional and supra-regional sectoral cooperation and merging) metaphor. The conclusion is that the crystallizing scenario is the most promising scenario for agricultural education, which has to support systems innovation of the agri-food complex. Next to that more attention should be given to the organization of the knowledge infrastructure to stimulate effective cooperative knowledge production and learning.

Key words: agricultural education, educational policy making, educational administration, system innovation, innovation scenario's, knowledge circulation

Introduction – the Dutch agri-food complex

The structure of the Dutch agriculture and the changes in that differ significantly from those in other countries. Only 8% of the value of Dutch agricultural production is crop production. Dutch agriculture is aimed at importing bulk products, like cereals and soya beans, and at exporting products with a high value and processed products, like flowers, vegetables and

products from the livestock industry. The percent of the value of the agricultural production is very high in the Netherlands. Knowledge is extremely important in specialized agriculture and horticulture companies. It is required to compete at the global market. Agricultural education for many years has been aimed at increasing subject knowledge of farmers. As a consequence of the restructuring of the agri-food complex, which consists of chains and networks, in which various specialists are working who are not trained in the agricultural disciplines, different kind of competencies are needed, like entrepreneurship, client orientation, sustainability, and innovation. Agricultural education institutes are not exclusively oriented towards agricultural and horticultural companies anymore, they also focus on the land use, gardening, nature conservation, environmental protection, geo-information systems, and stimulating biodiversity, to name a few.

Furthermore, the Dutch agri-food complex comprises many economic sectors and actors that are related to the primary sector: consumers, retailers, processing industry, finance, logistics, R&D, societal and sectoral organizations, etc., and last but not least: education (Ministerie van LNV, 2000c). Gross added value of the total Dutch agri-complex is 39 billion Euros. Employment in the agri-complex grew from 666,000 in 1997 to 670,000 in 2001 (out of a working force of 6.5 million), the percentage however decreased from 12 till 10% (Berkhout & Van Bruchem, 2003).

There is a remarkable shift in the development of family-related jobs. The number of these jobs decreased with 25% between 1994 and 2002, but the number of non-family-related jobs increased with more than 25%. The total number of non-family-related jobs now equals 36% of the total number of jobs in the primary sector, against 26% in 1994. Employment in the primary sector remained constant during the years 1994 to 2000, but decreased with 8% during both 2001 and 2002, and the number of full-time jobs decreased with about 10% between 1994 and 2002. (Berkhout & Van Bruchem, 2003).

In 1998 there were about 100,000 enterprises in the primary sector, but this number decreased to 89,500 in 2002. Scale enlargement is still going on. The number of larger organizations in the primary sector grows, whereas the number of small enterprises decreases. The largest enterprises in the agri-food complex are big multi-national organizations, such as Unilever, Heineken, Sara Lee/DE, and Friesland Coberco Dairy Foods.

Pressures on the agri-food complex are caused by, amongst others, international developments such as EU enlargement, changes in public support of agriculture influenced by crises in the sector (BSE, foot-and-mouth disease, swine fever, fowl pest), public protest against genetic modification, and more generally, the wide support for sustainable production. These developments necessitate a thorough innovation. Verkaik (1997) pointed at challenges and concepts for future agricultural knowledge policy. He states that much innovation was characterized by a linear approach, the classical reasoning behind the once so successful Research – Development – Dissemination strategy. In his opinion agricultural knowledge policy should be aimed at creating optimal conditions for knowledge generation, development of technologies, and innovation. Furthermore, he contends that agriculture in the 21st century in the Netherlands will have the best chances to survive, if there will be chosen for a diverse agriculture. In this respect he states, it would be insufficient that the government supports initiatives from society, it should act like an innovative entrepreneur, and build new strategic alliances with companies, societal organizations, and knowledge institutions, which he perceives as a necessary condition to implement what he calls *system innovation*. Agricultural education, in his opinion, has a specific role to play in preparing young people for this transformation.

Agricultural education

The structure of agricultural education in the Netherlands differs considerably when compared with that in other countries. At the level of secondary education for instance, in the USA and various other countries, agriculture is an optional subject (Mulder, 2006). In the Netherlands, the structure of agricultural education consists of four levels. At junior secondary level (VMBO), students can choose a track on agriculture at the end of the program. At senior secondary level, there are agricultural schools (AOCs – Agricultural Training Centers), for students of about 15-18 years of age with dual and full time school-based learning programs. There are practical training centers for the practical component of the programs of these agricultural schools for those parts of the programs that are too capital intensive for the schools individually. Furthermore, there is an institute for agricultural teacher training, and various institutes for professional higher agricultural education (HAO). These institutes for HAO are part of so-called higher vocational education, not to be confused with high schools. Institutes of HAO are comparable with colleges at the level of higher education. The Netherlands has a binary structure of higher education, of which higher vocational education (HBO) is the part that is oriented towards professional education, and the university is the academic part. Since the Bologna process institutes for HBO begin to refer to themselves as professional universities. Until now, the bulk of their programs are at undergraduate level. The masters programs they offer are not yet financed by the government, but this may chance. HBO institutes also have a task in research, but it is applied research to solve practical problems in the region, to contribute to professional development and to the innovation of educational programs. HBO, including HAO, programs are primarily aimed at students of about 17 to 21 years of age. There is Wageningen University for academic education in the agricultural disciplines with 18 Bachelor, 30 Master, one MBA, 7 PhD programs and post-academic education and training. Finally, there is so-called course education (short courses for adult education provided by private training bodies related to state-financed agricultural education institutions).

Most growth in student numbers can be observed in the green sector of preparatory vocational education (VMBO green), with an increase of 20% in four years, 1996/2000. Participation in the dual and school-based vocational learning trajectory both decreased slightly in those years. In 1975 about 90% of students were enrolled in primary production oriented courses, whereas this percentage in 2000 was about 25%. The other 75% is following programs like management, marketing, land scape planning, water management, and gardening. Enrollment in agricultural teacher education has been growing from 1995/1996 to 1999/2000 with 25% and enrollment in higher agricultural education in this period decreased with 10%. The decrease in total enrollment in Wageningen University was 16% during this period, but the students numbers are now slightly growing again, although the total enrollment is still low (for a Dutch university): total enrollment in 2005 was 4800 students; of this 1200 are PhD students. The decreasing number of students in Wageningen University is partly compensated by a growing stream of students from abroad. Wageningen University is steadily developing as the most international university in the Netherlands; Maastricht university has the most students from abroad, but Wageningen University has the largest proportion of students from outside the European Union (in 2005 there were students from 98 nationalities in Wageningen University). Enrollment in course education increased during the years 1995/1996 to 1998/1999 with 14% to 21,222 participants. The number of trainee weeks at the innovation- and practical training centers decreased with 8% to 51,323.

To give a bit of contextual information about enrollment in initial and continuing vocational education and training in the Netherlands, enrollment (in 2002) in senior secondary vocational education was about 452,000, whereas the according agricultural sector had 50,000 students. In higher education 497,810 students were registered of which 12,000

students were enrolled in higher agricultural education. In corporate training 1,559,000 enrollments were registered (in 1999) (Mulder, 2003).

From agricultural education to green education

Agricultural education has long been characterized as the third part of the so-called OVO triptych. The panels of this triptych were Research, Extension and Education, reflecting the Research-Development-Dissemination (RDD) innovation strategy of the fifties to the seventies of the previous century. Agricultural education was part of this RDD strategy (as noted by Verkaik, op cit). New knowledge, developed in research and development projects, which was relevant for new generations of farmers, entrepreneurs and workers in agriculture, was taken up by institutes for agricultural education, and integrated in the curriculum.

Due to the various crises in agriculture already mentioned, and the societal depreciation of this sector of economy, student enrollment declined significantly over the years, as has been shown. As a result severe budget cuts in agricultural education, and quite a large number of mergers of institutions of agricultural education took place.

Towards green education in 2010; the policy vision of the Ministry of Agriculture

Without high quality agricultural education the Dutch agri-food complex could not exist. A recent 'Policy Letter Green Education 2010' (Ministerie van LNV, 2000a, and 2000c) of the Agricultural Ministry asserts:

> The agri-food complex in The Netherlands is faced with the need for innovation in products, processes and partnerships. Only a knowledge-based agri-food complex can meet current challenges. The rapidly changing society needs workers in the agricultural sector who have developed a broad knowledge base and a variety of skills. Content and learning-teaching approaches need to be updated and for obvious reasons internationally oriented. Education in agriculture must meet the requirements from the labor market and students and has to express a positive attitude towards life long learning. Agricultural education needs to improve its attractiveness to students, foreign students as well. The growing inter-twining of agri and spatial land use with the rest of the economy stresses the necessity for highly qualified workers, competent to apply advanced knowledge, also from other disciplines.

As a consequence, these ambitions led to the Agenda 2010 of the Ministry, making available a budget (of 3.6 million Euros for the years 2001-2004) for:

- Innovation focusing on internationalization, societal responsibility and educational technology. Further expansion of international cooperation with educational bases in other (industrialized) countries.
- Demand driven curricula and courses. A larger role for business and societal organizations in directing course content and educational approach.
- Technological innovation, increase of IT-applications in education, concentrating on (life long) learning processes, acknowledgement of previously acquired competencies.
- Shifting balance between educational institutes (public resources) and business training (private resources).

It is interesting to note that the Minister of Agriculture also pointed at the importance of an educational innovation that has been known for long and which is adopted in vocational education policy development in various other countries in the EU (Descy & Tessaring, 2001): competence-based vocational education. Elsewhere we have extensively described the emerging use of this concept in human resource management and development in large organizations (Mulder, 2000; 2001a; 2001b), and we shall not elaborate this topic here.

Between plans and practice: policy questions that need to be answered

Looking back to the ambitious plans in the Policy Letter, and comparing this with where we are now, we contend that a lot of policy questions still need to be answered before the agenda for renewal will be realized. The Standing Committee on Agricultural Education that discussed the Policy Letter, already observed some fundamental problems that were not addressed in the letter and that it did not link the policy proposals with policy developments initiated in the years before. To name some: the change from supply to demand led education, the creation of Wageningen UR as an amalgamate of university departments and (privatized) research institutes, the creation of the technological top-institute for food sciences and the place of integrated learning trajectories in secondary vocational education.

In conclusion, the green education policy advocated by the Ministry of Agriculture, summarized in the slogans: 'green education has to become more up-to-date, innovative, international and attractive', requires a far reaching content-related and educational specification as well. The Minister recognized this and stated that for this innovation process, next to content-related knowledge there will also be a need for educational knowledge. In our opinion it is absolutely necessary to combine content-related and educational knowledge to support the further development and innovative function of agricultural education. Educational management needs to show more entrepreneurship, courage, ambition and innovation ability. Teachers in green education need to learn to cope with a new role.

Change in Policy Paradigm: towards innovation of content

It was not unexpected that after the Policy Letter in the year 2000, a renewed Policy Letter (Ministerie van LNV, 2002a) was released in which the trend towards broadening, generalization and innovation of agricultural education was continued. An important difference with the previous letter was the emphasis on content-related innovation of green education. This innovation would be aimed at the high priority policy issues of the Ministry itself, like sustainable development, multifunctional use of green space, rural development, water management, and so on. The renewed Policy Letter expressed two main challenges for education in agriculture:

- Educational innovation in close contact with non-agricultural education, according to high international standards. Curriculum development should be performed from a broad international perspective resulting in paramount quality.
- Extend focus from merely agricultural production to (a.) food production and distribution and (b.) rural areas, eco-environment, and green space; summarized as focus on 'food production and rural areas'. Enforcing knowledge circulation concerning food and green must be given special attention. The business sector 'food and green' becomes more and more connected with other economic and societal sectors and agricultural education should maintain open connections with non-agricultural education.

Compared to non-agricultural educational institutions, 'food and green' however has a number of advantages acknowledged by distinct stakeholders in the sector; the most important is the cooperation with sector-specific actors on the labor market, in combination with well established practical and individual learning.

According to the renewed Policy Letter the Ministry of Agriculture would focus predominantly on innovation of agricultural content whereas general educational development would be stimulated by the Ministry of Education. A Council for Education in Food and Green would direct, support and monitor the desired developments in the focal fields.

Because of the two main features of agricultural education, food and green, responses from two stakeholders were interesting: LTO-Nederland, the major interest organization for agriculture and horticulture, and the Council for the Rural Area. LTO-Nederland stated: 'We

support the idea that content-related innovation can be the result of cooperation between educational institutions in green education and other education. But innovation now and in the future within green education also takes place detached from this cooperation, so that sufficiently qualified persons are being educated for the rural area… We however miss the role, that educational institutions can play as network player/partner/knowledge source to support this innovation...' (LTO-Nederland, 2002). The Council for the Rural Area advised the Minister of Agriculture to think of the conditions under which a shift from one Ministry to another should take place, and stressed the role of content-related innovation of green education to be initiated by the Ministry of Agriculture (Raad voor het Landelijk Gebied, 2002).

Since the parliamentary year 2002-2003 was very turbulent, agricultural policy development slowed down, and the debate got stuck in political developments. In the years 2004-2005, the idea of content-related innovation was placed in the context of institutional cooperation. It was observed that the challenges of green education were big, that many actors were trying to invent their own wheels, that support of educational innovation was fragmented, and it was believed that all parties could benefit from cooperation. Therefore, the Ministry facilitated a process by which the Green Knowledge Cooperation was created, existing of the providers of green education (at AOC, HAO and WU level). The intention is that this Cooperation will advise and decide about programs and projects for the innovation of green education, combining various money streams that already existed.

The explorations as to the transfer of the responsibility for agricultural education to the Ministry of Education is still going on, and this will be an issue for discussion again during the next elections. Advocates of this move stress the scale advantages, the equity between the sectors of vocational education, and the facilitation effect this would have on cooperation between and mergers of institutions for agricultural education and those for vocational education. Critics maintain that transfer would lead to further scale enlargement (whereas the general feeling is that vocational schools are too large already and that they need to downsize; some have huge numbers of students, with all the consequences of this, like anonymity, lack of social cohesion, aggression, criminality and alienation), a break with the agricultural sector (which has grown over the decades, and has served as an outstanding example of linking vocational education with sectoral institutions), and loss of protection of small-scale agricultural education.

Content-related innovation beyond green education: the larger green curriculum as system of interest

What, at present, is agricultural education? As has been said, many of the educational institutions that were known as offering agricultural programs have broadened their syllabus. They now offer courses in environmental studies, regional planning, water management, food technology, geo information systems, and health studies. The typical agricultural courses are becoming less and less important.

The Ministry of Agriculture has chosen for a broadening, opening and policy-content related innovation strategy. Whereas until recently agricultural education was perceived as an important instrument of the Ministry to support the implementation of its agricultural policy, it now seems to be only one of many channels through which innovation can be implemented. The larger education system, including general education, seems to become more important for raising awareness of and distributing knowledge to the general public. If this will be sufficient for fulfilling the labor market demand for trained specialists in the green domain remains the question.

The policy themes and issues on the agenda of the Ministry of Agriculture are also present to a large extent in education programs that do not fall under the responsibility of that Ministry. So the distinction between green and other education programs gets blurred. Examples of programs that underline this are environmental studies, food technology, bio technology, geo-information systems, business administration, and landscape architecture. But next to the program and course level, at the level of subjects in general primary, secondary and higher education, there is also wide attention for green topics, for instance within biology, chemistry, social studies, economy, and geography. All the programs, courses, and subjects that relate to green education can be regarded as the *green curriculum*. This green curriculum thus crosses the boundaries of traditional agricultural education, and includes all parts of the whole educational system that is connected with agriculture, food, nature and environment. So the attention for green education suddenly gets very wide, since it might be more effective to think of elementary, general secondary, higher and even adult education, as educational subsystems that can address the policy issues that are on the agenda of the Ministry of Agriculture.

Responses of agricultural education – Evaporating, Dissolving, and Crystallizing

What is the response of institutions in agricultural education to this changing situation (which is not unique for the Netherlands)? Thinking along the lines of the green curriculum, Maguire (2002) observed the same trends in developing and more developed nations, although he states that universities and colleges in more developed nations '… appear to have had more success in getting the process of reform and reinvention underway' (Maguire, 2002, 8). For rural development, his suggestion is to cooperate with other sectors, like health, education, infrastructure, the private sector, NGOs and community groups. 'Fears concerning the disappearance of HAE (Higher Agricultural Education) are unfounded but its curriculum and content will differ greatly from those of the traditional past. In the future, HAE may be less isolated from mainstream higher education and, instead, become a vital part of co-operative approaches to solving the problems of rural development and poverty reduction. A second and largely underdeveloped role of HAE will be to expand its presence in the broader education for rural development scene. If critical sustainable agriculture and natural resources messages are to be widely disseminated in society the content of these must be researched and packaged for primary, secondary, vocational and adult education' (op cit, 8). We think this process of sectoral and inter-sectoral cooperation and networking has been fully operational during the past decade in the Netherlands. Future years will reveal which scenario will unfold, and which educational strategy has been most successful for supporting sustainable agricultural development.

What will be the future of agricultural education in the Netherlands? Will it be vanishing as a separate entity within the Dutch education system? We see that three scenarios are unfolding, and that different agricultural institutions use different scenarios. These scenarios are: (a) ceasing agricultural education, (b) inter-sectoral cooperation, and (c) intra-sectoral cooperation. We will use three metaphors to describe these scenarios: *evaporating* (closing down, vanishing), *dissolving* (in much bigger colleges that have programs in non-agricultural domains) and *crystallizing* (seeking intra-sectoral cooperation) (see box 1).

These metaphors can be described as ideal-typical; they do not exactly match the actual strategies of the institutions involved. They are meant to highlight different aspects of the strategies, and to sharpen the contrasts between them. In practice, the strategies of the institutions are much more complex, and also combined.

Evaporating	Dissolving	Crystallizing
De-institutionalizing	Lost in larger institutions	Independent institution

Disintegration	Inter-sectoral mergers	Sectoral mergers
Decreasing labor market demand	Low market demand	Sufficient labor market demand
No link with stakeholders	Weak link with stakeholders	Strong link with stakeholders
Isolation	Generalization	Specialization
Isolation	Horizontalization	Verticalization
No visibility	Lower visibility	High visibility
Independent business termination	Shelter	Independent entrepreneurship
Low cohesion	High adhesion	High cohesion
Low-no student demand	Easy transfer	Tracking

Box 1 Metaphors and associative concepts for scenarios for the future of agricultural education

The concept of '*Evaporating*' basically means, as mentioned before, closing down schools. This is a process of de-institutionalizing agricultural education, and taking this educational service from the local or regional market. Evaporating is preceded by a process of (sometimes slow and gradual) disintegration, such as vanishing energy for cooperative programs, or cooperation at all, exclusion of certain groups, and decreased services from the administrative bodies. The process of evaporating also brings about a period of isolation, which can have a detrimental effect on the motivation of the teachers and support staff in the organization. Needless to say that all this results in low social cohesion in the organization.
The concept of *'Dissolving'* means that the institution for agricultural education will be absorbed by a bigger institution for vocational education or by a broader vocational college. Ironically, this broad part of vocational education is referred to by agricultural education as the 'remaining vocational education'. Inter-sectoral mergers or just take-overs (elegantly done, so that they do not look like hostile take-overs) are the way in which this scenario is unfolding. The main cause for this is again the decreasing market demand for graduates of agricultural programs. The effect of this process is that agricultural education will have less visibility; within much larger institution it can get lost. The advantage however is that the umbrella organization serves as a shelter for agricultural education, so that there is perspective for the staff and students involved, unlike the situation in the previous scenario. The dissolving strategy is furthermore characterized by high adhesion, which means a strong interest in programs of other disciplines, to see, as said, where opportunities are for innovative programs.
The concept of '*Crystallizing*' means that institutions for agricultural education look for opportunities to work together within the agricultural sector, or to organize their institutions in such a way that they stay independent institutions for agricultural education. Agriculture in this sense should not be taken too literally however, since these institutions also used the chances in the fields of food, nature, environment, life sciences, technology and related social sciences. Sectoral mergers are the way in which this scenario is implemented. There is sufficient labor market demand for the programs in the merged institutions and there are strong links with stakeholders. Also with new stakeholders, that replaced the older ones who became more or less obsolete. Educational institutions that follow this scenario tend to specialize their programs, although there is a tension with the trend towards specialization and sectoral skills and qualifications. The institutions involved also try to seek cooperation within the agricultural education column between senior secondary, higher vocational and university level education. This also has been the policy preference of the Ministries of Education and Economic Affairs for some years, who advocated the student flow from lower

levels of vocational education to higher levers, because it appeared that the 'output' from higher vocational and university education alone was not enough to fulfill the demands on the knowledge intensive labor market in the Netherlands. Implementation of this scenario results in high intra-sectoral cohesion. The advantage for students is that there is a wide variation in tracks within the domains that are served by the educational institutions.

Apart from this, we think the trends towards generalization (Mulder, 2000; 2004), work process knowledge (Boreham, Samurçay & Fischer, 2002; Fischer & Rauner, 2002), career identity development (Meijers, 1998; Meijers & Wesseling, 1999), life long learning, informal and non-formal learning (Eraut et al, 1998; Coffield, 2000; Lans, Wesselink, Biemans & Mulder, 2004), learning in organizations (Tjepkema et al, 2002), knowledge circulation between research and education (Mulder, Lans & Schlooz, 2002), the movement towards competence development for (sustainable) performance improvement (Mulder, 2001a; 2001b, and the attention that is being paid to the learning of entrepreneurs (Kupper, Lans, Mulder & Biemans, 2003, Lans, Bergevoet, Mulder & Van Woerkum, 2005) are also very important for agricultural education and the green curriculum, and should also play a role in strategy development.

Educational institutions also have to think about competence development for sustainable performance improvement (Wals & Jickling, 2002; Corcoran & Wals, 2004; Walker, Corcoran & Wals, 2004). Competence development has no focus unless it is linked to sustainable performance improvement. Schools will also have better access to entrepreneurs and companies if they employ a performance improvement perspective, since customers of agricultural education (employers who hire graduates from agricultural education) are all focused on performance improvement. Since the labor market of graduates from agricultural educational to a large extent consists of jobs within small and medium sized companies, it is also important to look at learning of entrepreneurs.

We expect that neo-liberal politics will continue to have its influence, in spite of the critiques on privatization of public health, public transportation, and other sectors. In education, we may see more public investment, a larger individual financial effort, less dependence on collective means, and more privatization (whether we like it or not). This calls for more entrepreneurship and an entrepreneurial attitude (Mulder, 2001c). The attention for employability as a driving force behind many labor market and vocational education oriented initiatives may change therefore towards independent entrepreneurship. We expect that an entrepreneurial agricultural education innovation strategy, with active intrapreneurship within the educational institutions, will be most effective for the future of agricultural education.

Conclusions

- Agricultural education still plays an important role in the structural support of the agri-food sector. It delivers the graduates to the labor market in the agri-food complex, without whom it would be difficult to maintain this extremely knowledge intensive sector.
- Performance improvement world-wide of the agri-food complex, including the political systems, is essential given the global problems of food, nutrition and rural poverty.
- To this, governmental agricultural education policy making, needs to be effective based on a clear philosophy on the goals and intricate relationships within the agri-food complex (such as agriculture, nature, food, environment, land use, financing, insurance, and logistics). The general feeling in the field of agricultural education during the last six years is that this educational policy making has been sub-optimal. Many tensions arose between the green educational institutions and the Ministry. There was also much dissatisfaction with the contrasts between the ambitions of the Ministry regarding the

agricultural knowledge infrastructure and the way in which innovation of agricultural education was supported.

- The major shift of the Ministry to content oriented educational innovation also led to a fundamental doubt about the functionality of this approach, since it is a common place in educational sciences and practice that educational innovation always has a content-related and didactics-related element.
- Many changes, that will not be repeated here, led to heavy tensions in institutions for agricultural education. Their responses varied. The crystallizing scenario seems to be the most promising scenario for the present. It gives the opportunity for an orchestrated approach for systems innovation in the agri-food complex which is needed badly. Our idea is that stakeholders in non-agri-food complex related educational institutions have no clue of the importance, risks, and complexity of this sector, and therefore also may not be the ones who will protect sector-specific innovation processes at the cost of other prioritized sectors.
- At present, knowledge circulation (or rather cooperative knowledge construction of researchers, educationalists, consultants and entrepreneurs) is the key issue. The general feeling is that the loss of the OVO-triptych (Research – Education – Extension) is a real loss, and that there is an urgent need for a new knowledge infrastructure in which all parties involved can constructively cooperate in the best interest of the secure provision of safe food in a sustainable world. This new infrastructure will need to be managed cooperatively, respecting the integrity of all parties involved, which will not be easy since there is no consensus nor an unambiguous answer to the question as to whether this new infrastructure should be public, private of mixed (Van Vloten-Doting, 1998; Van den Berg, 2001), but which is essential given the pressure on the agri-food complex.

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