

Recent policy developments in green education in The Netherlands

After editing this paper was published as:

Kupper, H., R. Laurentzen & M. Mulder (2012). Analysis of recent policy developments in green education in The Netherlands. *The Journal of Agricultural Education and Extension*, 18, 2, pp. 121-139.

ABSTRACT

Education for the Dutch green sector (agriculture, nature and food) is permanently redefining its position within the national green knowledge system. In this contribution we describe the implementation of a new public policy to stimulate green education to be more involved in innovative developments of the green sector. Innovation of learning and teaching approaches, broadening institutional collaboration and deepening the co-operation with green research and business partners are the basic elements of that policy. We further elaborate on three scenarios for green education in The Netherlands that have been described in a previous contribution to the JAEE in the year 2006. Based on governmental policy analysis, literature study and monitoring research, the current contribution focuses on what has occurred in education for agriculture, nature and food during the last years, and how it is directed towards the concerns of that sector. More particularly, we describe the newly founded educational platform, the Green Knowledge Co-operative, where green education and green research have found ways to intensify their collaboration. This co-operative can be an example for other countries to organize innovation in green education. We show how public policy makers changed their vision of governing developments in education by supporting that co-operative. The impact on school administrators, teachers and students is described. We conclude that educational institutes have found new ways to innovate and to become more attractive to business and society.

KEYWORDS: green education, knowledge co-operative, educational policy.

In this article we provide an assessment of the Dutch green educational system: that part of education in The Netherlands affiliated with the Ministry of Economic Affairs, Agriculture and Innovation (EL&I, in Dutch) and particularly oriented towards the green sector (agriculture, nature and food). The societal mission of green education is to contribute to the development of qualified human resources for the green sector as well as to the adequate dissemination of new knowledge within that sector and the society at large (Ministry of Economic Affairs, Agriculture and Innovation, 2010ⁱ). Next to that, as holds for all education, green education has to support participants in their personal development and their citizenship.

In a previous article in this journal (Mulder & Kupper, 2006) we described how green education in The Netherlands was preparing itself for coping with expected developments. In that article the possible outcome of that process was presented as (a combination of) three scenarios for green educational institutes: evaporating

(vanishing of separate sectoral green education), dissolving (merging into much bigger regional non-sectoral -non-green - educational institutes) or crystallizing (regional and supra-regional sectoral co-operation and merging). The crystallizing scenario, which was considered to be the most promising scenario for green education, actually occurred in the past years. The developments we expected in 2006 emerged on the level of the distinct institutes. Courses with limited enrollment ceased (evaporated) or their continuation is threatened. Institutes, not affiliated with green education, now offer courses in food marketing, food chain management or food design (dissolving, a shift from green to non-green education). The tendency however is that green educational institutes organize themselves in larger and regionally dispersed organizations. Their size, compared to non-green educational institutes, however, is still relatively small. The financial relationship with the Ministry of EL&I is predominantly on a one-to-one basis. Collective operations are part of a recently founded Green Knowledge Co-operative (GKC). Since our previous article, where we mentioned the intention to start a knowledge co-operative, the GKC has moved from the preparatory to the operational stage.

In this contribution we provide an update of the changing situation since 2006. Articles in this journal show interest in developments in green education and extension in different countries (e.g. Mulder & Pachau, 2011; Rivera, 2011). We assume that this article with its strong focus on Dutch green education will give insights that can be useful in various regions of world.

As it is a main goal of green education to serve the green sector, we start with describing that sector. We continue with a description of the present situation in education from basic vocational to academic level, including changing societal perspectives on education. Next we discuss new views that are emerging about the function and role of the green educational system. Subsequently we deal with co-operation within that system, the foundation of the Green Knowledge Co-operative. Finally, we present conclusions showing how green educational institutes adapt to challenges of the current knowledge economy.

Changes in the Dutch green sector

The Dutch green sector comprises primary production (including fisheries), food processing, rural affairs and natural environment. The primary sector consists of specialized domains that maintain close relationships with trade, processing industry and service organizations. Nearly 55 per cent of the Dutch surface is destined for agricultural activities for the primary sector. Dutch agriculture is strongly international oriented and is second exporter in the world, after U.S.; 17% of Dutch export is agriculture. Horticultural produce, meat and dairy are the three largest export product groups. Although most intensive livestock farming companies focus on (dairy) cattle and sheep, the majority of the livestock population consists of poultry and pigs. Cereal, beetroot and potato account for the majority of crop production (Ministerie van Landbouw, Natuur en Voedselkwaliteit, 2008). Present-day, the production of the agro-sector still accounts for 10 per cent of the Dutch GNP and 10 per cent of the total working population is employed in the green sector in 2009. Although the majority of enterprises concentrate on breeding and rearing of animals, the majority of employment is related to horticultural and landscaping companies (Ministerie van Landbouw, Natuur en Voedselkwaliteit, 2009).

The number of farms for primary production is declining for many years now (81,750 in 2005 and 73,008 in 2009; Statistics Netherlands, 2010a); the total yield however is not decreasing due to scale-enlargement of the remaining farms and technological progress. There also is a shift in business models. Bulk products are being replaced by value-added produce for niche markets. A continuing competition for land-use between agriculture, construction, nature, infrastructure and leisure is visible everywhere in the country. The green sector can be characterized more and more as metropolitan agriculture going along with a manifold of conflicts resulting from multifunctional land use. Furthermore, the 'license to produce' is being disputed more openly by environmental and animal welfare advocacy groups. Citizens, expecting high quality, safe and healthy food, are very critical regarding human health aspects of fresh produce and processed products.

Next to the change in business models, new markets are also explored within the green sector. Therefore, the green sector becomes even more diversified. An example of this diversification is clearly present in the agricultural sector, where especially smaller enterprises generate secondary income with sideline activities. Activities can be closely related to the primary production, for example the production of alternative crops (nettle, hemp fibre or bio-fuels), but enterprises also opt for activities that can be described as services. Examples are agro tourism, care farms, farm education and farm shops. Although farm shops and agro tourism started off as the most popular sideline activity, recently care farms are gaining ground fast. Other activities that are fairly new to the agricultural sector are education and childcare. Farm education focuses primarily on primary school pupils, although also secondary school students are targeted by various enterprises. Childcare on agricultural family holdings anticipates on the facts that the available time and motivation for/of children to play outside are decreasing and that children become less connected with nature. There are diverse variations, such as day nurseries, school care and host care, which are available to children and youth between the age of 0 and 12 (Ecorys, 2009). To scaffold these developments in the agri-food sector more attention is being paid by government and various farmer organizations to strengthen entrepreneurial capacities. Young farmers together with green schools develop entrepreneurial courses. In vocational and higher education entrepreneurship obtained a more dominant position in the curricula.

Green education

Outline of the green educational system

The diversity present in the green sector is also visible in the green educational system, as green education serves a wide variety and different levels of workers in the labour market (Mulder, 2010). It ranges from low educated farmer to PhD-graduates in bio-nanotechnology or geo-information systems. The multitude of occupations that exists within these sectors is visible in the International Standard Classification of Occupations (ISCO-08), which lists over 100 occupations that exist in the agri-food sector. Green education institutes are not the only ones that educate students who prepare for these occupations. Non-green education, which does not fall under the jurisdiction of the Ministry of EL&I but under that of the Ministry of Education, also provides courses in life sciences, although for a relatively small number of students (e.g. environmental studies, food and business; OCW, 2009).

Education for the green sector is structured according to the general outline of the Dutch educational system. This consists of primary education, secondary education, vocational and higher education. The level of primary education is the same for all pupils, but at secondary education there are three levels available: VMBO (junior secondary education), HAVO (senior secondary education) or VWO (pre-university education). The VMBO consists of four different levels, of which the assistant level (BB) is the lowest and the theoretical level (TL or MAVO) is the highest one. After completing VMBO, students are entitled to enter at a subsequent MBO level (vocational education) or, after MAVO to continue at HAVO (senior secondary). MBO is offered at four levels and students choose between practical orientation (BBL) or theoretical orientation (BOL). Most students of MBO level 1 choose the practical one, while at level 4 most students opt for theoretical (Aequor, 2010). Students who have completed HAVO or MBO level 4 are entitled to enter higher professional education, HBO. Students either start a study program for Associate or for Bachelor Degree. The Associate Degree consists of the first two years of a regular 4 year Bachelor program and is included in the educational system from 2006 onwards as a means to encourage MBO level 4 students to continue education at a higher level and to provide a level of education the labour market is interested in for both new and experienced employees (IB-groep, 2010). HBO institutions started offering Master programmes as a response to the difficulties HBO Bachelor students experience to enroll in an academic Master program at a university. However, only a few professional Master programs are acknowledged and funded by the Ministry of Education. Nevertheless, HBO institutes are allowed to educate students for a Master Degree as the government acknowledges the diplomas and titles (HBO-Raad, 2011). At academic, WO level, VWO (HBO students that have completed their first year are sometimes also allowed to start at a university) students enter at Bachelor Degree level with a duration of three years and continue at Master Degree with a time span of one or two years. In contrast to the HBO Bachelor – Master trajectory, the majority of the WO Bachelor students continue their education at a Master program. The PhD level is available once a Master has been completed.

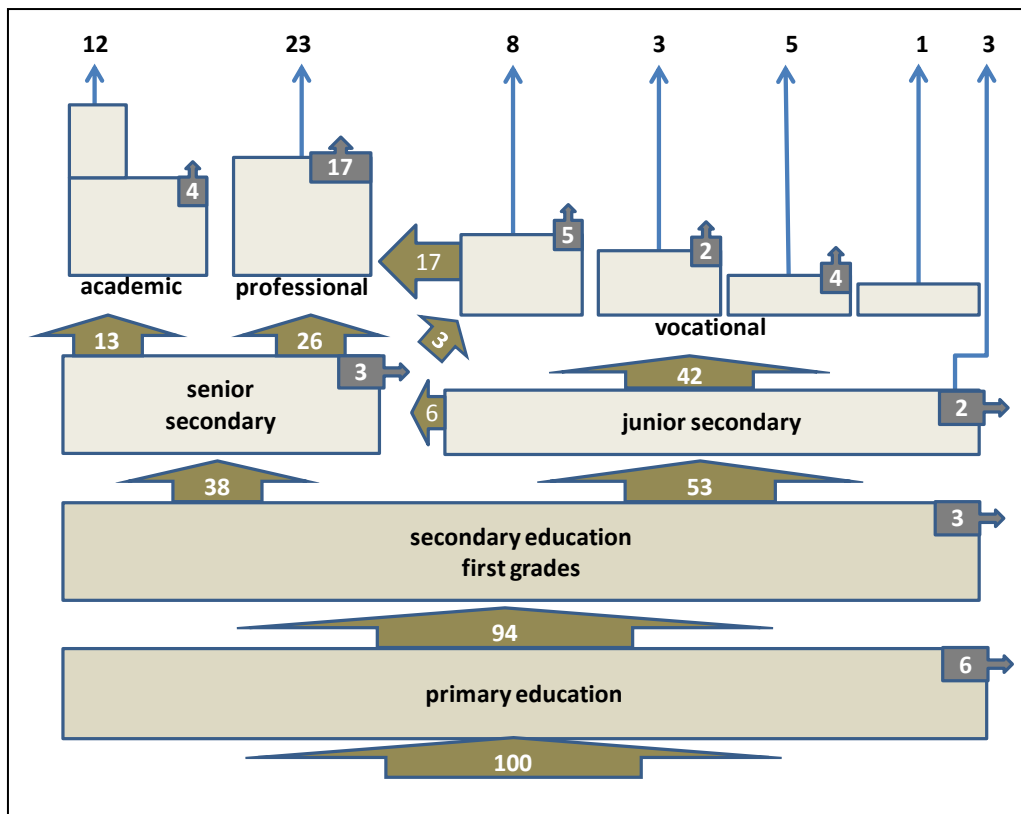


Figure 1, Dutch educational system, flow chart with flow-in/flow-out.

Figure 1 depicts the outline of the general educational system (VO-Raad, 2010). Numbers are reflecting flow-in and flow-out, starting with a cohort of 100 at primary level. At secondary education, first grades e.g., 94 out of 100 pupils that have started at primary level enter secondary education, 38 continue at senior secondary, 53 at junior secondary while 3 are early school leavers (Statistics Netherlands, 2010b). The upper row represents numbers of students that have finished the respective curriculum successfully, e.g. 12 (out of the 100-cohort started at primary level) finish academic level with a master’s degree.

Green education is only available at the secondary, vocational and higher educational level. At junior secondary there are various trajectories students can choose as a type of specialization and the green stream is one of these. In the green vocational education, provided by regionally oriented agricultural training institutions (AOC in Dutch, MBO level), courses are clustered into so-called “worlds of experience” e.g. Animal Friends, Mighty Machines or Surprising Nature. Most of the AOC institutes offer both green junior and vocational level education. At higher level in green education a wide variety of study programs are available, such as more traditionally oriented programs like Arable and Dairy Farming or new programs like Applied Biology or Leisure, Tourism and Environment. At academic level, green education is offered by Wageningen University only.

Teacher education for green schools is provided at Bachelor and Master Degree level. Teachers who complete a Bachelor program are allowed to teach at all levels of junior and vocational education. Teachers with a Master Degree are entitled also to teach at higher professional education. For specific green content (e.g. dairy, animal

husbandry, equine or horticulture) there is one teacher-training institute in The Netherlands at Bachelor Degree.

Green student population and employment

There are relatively few students that choose green education. According to the Council for Agricultural Vocational Education, there is a market potential of 15%, whereas actual enrollment is about 5%. Table 1 shows the total student population at the various educational levels and the green student population. Enrollment at all educational levels increased in 2008 – 2009 after a slight decrease the past years (Aequor, 2009; Inspectie van het Onderwijs, 2010; Inspectie van het Onderwijs, 2011). Since our previous 2006-article, enrollments at green academic raised with 25% (12 % all universities), at green higher professional level with 3% (10% all higher professional level), green vocational with 15% (5% all vocational) and pre-vocational dropped with 9% (all pre-vocational a decrease of 7%)

Table 1, non-green and green student population

Enrollment 2008-2009	VMBO	MBO				HBO	WO
		Level 1	Level 2	Level 3	Level 4		
Non-green	212,229	21,600	134,100	136,600	216,500	383,883	213,900
Green	31,488	2,142	6,479	7,114	11,399	7,909	6,146
Ratio	14.8%	9.9%	4.8%	5.2%	5.3%	2.1%	2.9%

As the ratios in table 1 indicate, the attractiveness declines from low- to high-level green education. Students that start at a green VMBO (junior secondary) can continue their study at a green MBO (vocational), sometimes even proceed at HBO (higher professional) and WO (academic) level. However, of green junior vocational students that graduated in 2005 – 2006, only 36 per cent continued education at green senior vocational education. The students that changed sector chose for health and welfare (38 per cent) and economics (34 per cent). Only six per cent of the junior secondary students of the other three sectors (economy, technique, health and welfare) that changed sector chose to continue education in a green theme. Especially girls and non-western immigrants continue education in another field at senior vocational level: girls prefer to continue in health and welfare and non-western immigrants prefer the economic sector (Statistics Netherlands, 2009; Inspectie van het Onderwijs, 2010). Of the senior vocational students that continue education at higher professional level, 80 per cent choose an educational program with comparable green courses, a number that is in line with other professional sectors, such as economics and health and welfare (Inspectie van het Onderwijs, 2010). The green sector recognizes this issue and aims to further improve and strengthen the learning trajectory from VMBO up to at least HBO (AOC-Raad, 2010). To make the trajectory from junior to senior vocational and to higher green education more attractive for students and to retain them for the green sector a new offer from green educational institutes has become available recently: the “Green Lyceum” (AOC-Oost, 2011). This makes it easier for students to climb the ladder from junior via senior vocational to higher education.

Apart from retaining students as participants in green education once they have selected a green school, early school leavers is a problem as well. The EU target is to reduce the share of early school leavers to less than 10 per cent of all 18 to 25-year-olds in 2010 (CBS, 2010). In 2008, more than 11 per cent of pupils in the Netherlands left school prematurely. Although the number of early school leavers is dropping in both green and non-green schools, leaving school without a start qualification is still considered a great problem by the Dutch Educational Inspection (Onderwijsinspectie, 2010b).

Compared to vocational level the ratios in table 1 for higher professional and academic are low. While the level of education of the general working population increased between 2001 and 2009 (Statistics Netherlands, 2010b) this might not be the case in some green sectors where the majority of the vacancies is still open to employees with no basic qualifications: 32 per cent in the husbandry sector, 48 per cent in the agricultural sector, 38 per cent in the horticultural sector and 47 per cent in the food sector. The only sector with a majority (nearly 60 per cent) of vacancies for employees with MBO level 4 or higher was forestry and nature conservation (Aequor, 2009). One explanation might be that a considerable number of east European immigrants work in various sectors of the green sector, for example in horticulture. It is expected that, because of the current economic recession and low labour demand, students that graduate at vocational level tend to continue education at higher professional level, instead of starting a job at MBO level. Another characteristic of the green sector also differs from the general working population: gender. In the agricultural sector 73 per cent is men vs. 57 per cent in the general working population (UWV, 2010), this could be related to the physically demanding activities in this sector.

Migration and its impact on the green sector and green education

The Netherlands has a long history as a multi-cultural society. With the first major immigrant populations originating from the Dutch East Indies, Turkey, Morocco and Surinam, present-day, newcomers from Poland and the Netherlands Antilles contribute to the ethnic diversity. The increasing multi-cultural aspect of Dutch society is clearly visible in its changing population: whereas between 1996 and 2010 the total number of inhabitants of the Netherlands increased by seven per cent to 16.577.612 (May 2010), within the same time span the total immigrant population grew with 34 per cent to 3.362.154 (May 2010). The origins of the immigrant population changed around the millennium; 46 per cent of the immigrants originate from non-western societies in 1996, while 55 per cent of the immigrants in 2010 is of non-western origin. (Statistics Netherlands, 2010c). A slight majority of immigrants is female, e.g. 53 per cent of European immigrants and 52 per cent of Asian immigrant, however, a minority of the immigrants originating from Africa is female (46 per cent) (Statistics Netherlands, 2010d). About 150.000 workers in The Netherlands come from East European countries, mainly from Poland. More than half of them have jobs in horticulture.

Currently, immigrants account for 20 per cent of the Dutch society. The student population consists for 25 per cent of immigrants: 24 per cent at VMBO level, 26 per cent at MBO level, 23 per cent at HBO level and 24 per cent at WO level, however, only 18 per cent and 17 per cent of the student population of HAVO and VWO are of non-Dutch origin mainly originating from non-western societies (Statistics Netherlands, 2010e; Statistics Netherlands, 2010g; Shewbridge et al, 2010).

Students with an immigrant background prefer educational programs oriented at economics and are almost completely absent in green education (Aequor, 2009b; Centraal Bureau voor de Statistiek, 2009; Inspectie van het Onderwijs, 2010). For example, of the 134.000 senior vocational (MBO) students with an immigrant background only 0.5 per cent attends a program that deals with agriculture and/or animals. Two aspects of the agricultural/green sector make it unattractive for these students: 1) agriculture can be viewed as a sector of low social prestige, which results in students choosing an educational program that prepares them for a job with high social reputation and 2) the difficulties to start an agricultural/green businesses without own capital or the opportunity to take over a business will discourage students to even attempt this and thus choose education in another field (Inspectie van het Onderwijs, 2010). To stimulate cultural diversity in green education the Council of Green Vocational Schools (AOC-Raad) has started an action program “choose colour in green”. The program is the outcome of a covenant in 2008 between all institutes for green vocational education.

Migration not only affects the labor market as it increases supply but it also reduces supply. It is estimated that the last couple of years 115 farmers emigrate yearly and start a new farm abroad, mainly dairy. The number has decreased; some years ago the estimated number was 350 each year. Favorite countries are Canada, Germany and Denmark.

Green education and public governance

Green educational institutes in The Netherlands are under the responsibility of the Ministry of Economic Affairs, Agriculture and Innovation (Dutch: EL&I). The green sector is considered as any other economic sector, although with great impact on living environment and with strong connection to the Common Agricultural Policy of the European Commission. Emphasis on competitive innovation is expressed in the Ministry’s name. Since 2011 nine top sectors have been selected that receive special attention from national government for innovative stimuli, horticulture and agri-food being two out of these nine. Green educational institutes are positioning themselves as partners in the co-innovation processes that are considered essential in achieving sustainable innovation (GKC, 2011, LTO, 2011).

From 2005 onwards, the approach of the public administration in governing green education has shifted from a control-based to a more subsidiarity-based approach, in which the government is trying to achieve shared agreement with the stakeholders in green education on main issues, and to make schools accountable for their results. Together with that, the government intends to decrease bureaucracy. ‘Decentralize what is possible, centralize what is absolute necessary and reduce administrative burden’ is the quote that is being used. Regarding financing of education, schools receive a lump sum and are free, within legal frameworks, to decide on matters like facilities, partnerships and working conditions. Educational organizations act as more or less independent market parties, at a certain distance from government. The ministry has various instruments available for trying to achieve what is considered to be of societal interest. Deploying policy instruments is checked against their potential to make the green sector more innovative. Innovation in green education therefore not only aims at educational quality but also at supporting the green sector to become more competitive, both at national and global level.

According to current political opinions, the green knowledge system, now consisting of independent – at a certain distance from government – bodies for research,

consultancy and education, has to work more and more in compliance with market rules. The once public extension service, not only became independent of direct governmental influence but is now fully privatized. Public research in centers for life sciences also has become more dependent on market demand, and co-financing from private parties is often a requirement for public funding. Generally speaking, green education and green research are becoming more inter-related.

The crystallizing scenario

Green education is faced with the challenge to maintain and secure its position within the Dutch educational system. It consists of strongly interconnected institutes, has strong ties with green research and is well-known and appreciated by the green sector. In our previous 2006-article we have described three possible development scenarios for green educational institutions: evaporating, dissolving and crystallizing. Crystallizing has emerged as dominant strategic approach. At present we can determine strategic collaboration to be the selected strategy by most institutions. We distinguish two types of collaboration strategies deployed within the crystallizing scenario: corporate restructuring (mergers, acquisitions, parent-subsidiary) and alliances (strategic partnerships). The collaboration can be horizontal, with institutes on the same educational level, or vertical with different levels (vocational, professional, academic). Joint activities can be deployed with institutes in the green domain or with non-green schools. An example of corporate restructuring is the merging of various organizations in the Aeres Group. In 2004 one MBO (vocational) and one HBO (higher professional) institution merged, followed in 2006 by a HBO for green teacher education and finally in 2009 a practical training institute joined the organization (Aeres, 2010). This merge resulted in an extended learning trajectory from VMBO up to HBO level that caters for over 8.500 students (excluded practical training for externals). Another example of corporate restructuring is the acquisition of an HBO institution by Wageningen University and Researchcenter that resulted in facilitating a learning trajectory from HBO up to WO level. Over 10.000 students (including 1400 PhD students) attend education at these two institutes (HBO-raad, 2010; Wageningen University, 2010). The past years, Wageningen University and Research center has proliferated itself as a university for life and social sciences, abandoning its strict agricultural roots. Vertical strategic collaboration like mergers or acquisitions of different educational levels is an institutional means to ensure that students starting at VMBO level continue education at a higher level in the similar green domain, which could prevent green students from changing to non-green. Besides the above-mentioned crystallizing strategies, almost all institutes co-operate in different networks and platforms, regional, national or international, with green and non-green education. Both at the MBO and HBO level there are examples of alliances without corporate restructuring, mostly initiated by the desire to remain small-scaled and maintain autonomy. Figure 2 displays a pie diagram of green institutes with student enrollments in 2009 as percentage of total enrollment in green education. The diagram depicts the crystallized characteristics of green education in recent previous years. For instance 66% of all students are attending courses in institutes for vocational education that were merged in the past years. Eight percent of all students are enrolled in schools for professional education that are now subsidiaries of organizations with higher or lower levels of green education, etc.

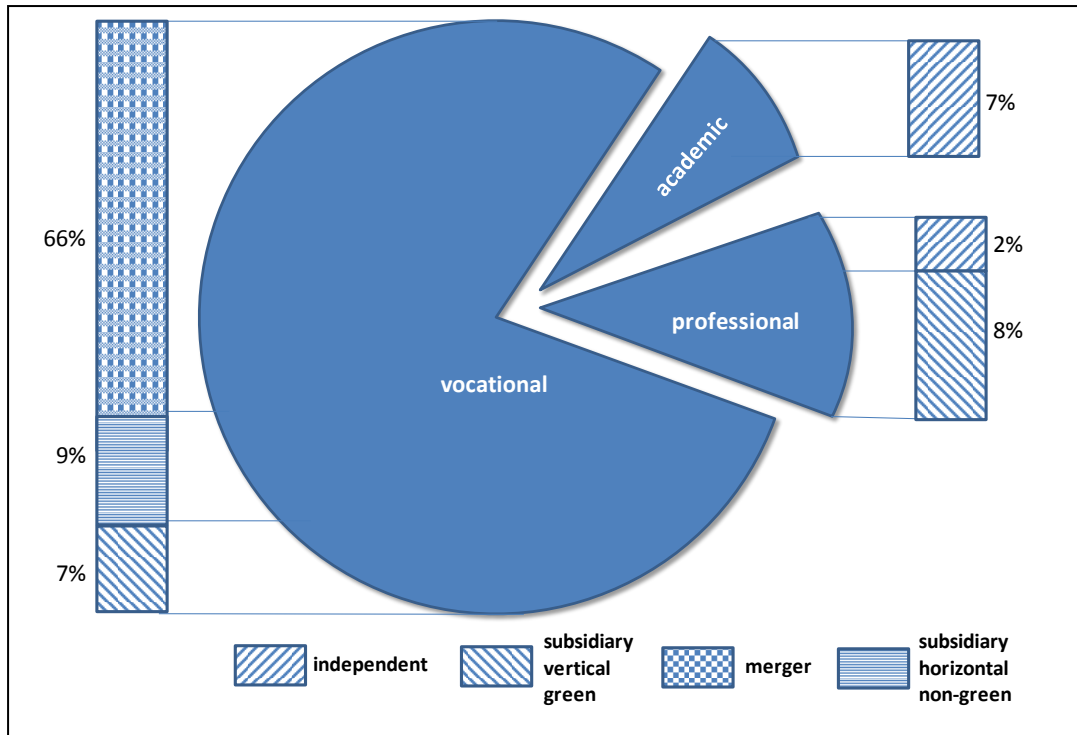


Figure 2, Crystallizing characteristics of green education, percentage of total student enrollment in green education.

Various views on achieving high quality education

Currently, Dutch society is, alike other European and western countries, faced with economic recession. Present Administration has commissioned several studies to analyze possibilities for reduction of public expenditures. The educational sector was also studied and suggestions were made to implement five related measures that focus on improving productivity of the educational system (Ministerie van Financiën, 2010). These measures aim to improve basic curricula, to reduce complexity, to shorten and intensify educational programs, to balance costs for student care and to better utilize the direct benefit principle. This package of measures is estimated to save the Dutch government up to €4.1 billion (Commissie Toekomstbestendig Hoger Onderwijs Stelsel, 2010). Simultaneously, various organizations emphasize that education is not a cost but an investment regarding Dutch economy and society. For example, Commission Veerman (2010) states that both government and educational institutions should improve the quality and diversity of higher education. The government should enable student selection by educational institutions, to stimulate educational institutions to proliferate knowledge, to invest in research and to support the various educational levels, such as associate degree, bachelor and master. Educational institutions could do this by disseminating new knowledge, emphasize education as most important theme and invest in qualities of staff (Commissie Toekomstbestendig Hoger Onderwijs Stelsel, 2010). Furthermore, various business organizations point out that high quality education, either by proliferation of educational programs or collaboration between educational institutions and entrepreneurs, is essential for companies to attract high potentials and for The Netherlands as a means to maintain its strong international position (VNO-NCW, LTO & MKB, 2010). During the 2010

elections, several political parties addressed education as a means to ensure a society that thrives on solidarity, respect, ownership and that ensures its competitiveness.

According to the most recent OECD-PISA study (Programme for International Student Assessment, 2006) the 32 included countries invested on average 6.3% of their GNP, whereas for The Netherlands this percentage is 5.6%, equal to the figure of 1995. In 2007 the OECD countries have spent 13.3% on average of their public budget on education; The Netherlands has spent 1% less in that year. In the PISA study arithmetic and language in primary education underrates top country Finland, but overrates the economically most important neighbor Germany.

Green education, research and extension in a knowledge economy

The call for an innovative green knowledge system

For decades, the green sector in The Netherlands is a knowledge-driven domain. Research, business, and education are strongly interwoven and supported by the former department of Agriculture, Nature and Food Quality (now part of the Ministry of Economic Affairs, Agriculture and Innovation). The sector is often considered as exemplary for a knowledge and innovation economy '*avant la lettre*'. However the once successful linear approach from research outcomes via extension and education to agribusiness has drastically changed. Societal questions concerning production methods are being positioned more and more in a broader systemic context of sustainable development. Systemic interdependencies between agricultural production, nature and environment are investigated in the new research area of systems innovation. Green business is not merely concerned with international competition but more and more prominently with the societal acceptance at national, regional and local level. Integration of concerns about nature, environment and animal welfare with production systems are crucial for a sustainable green sector in The Netherlands. Traditional linear diffusion of knowledge is no longer considered appropriate for dealing with these systemic questions. Consequently, green education as part of the knowledge system also reconsiders its position.

The developments in green education can also be considered from a broader perspective. The Dutch economy has in the past years slid down from the fifth to the tenth position on ranking list of knowledge economies (OECD, 2010a, Steeg 2011). The government of the Netherlands is ambitious to put the economy back on track to the top-5 of knowledge and innovation countries. This is in accordance with the European Commission's ambition for the years 2010-2020. Representatives of Dutch business, education and research are proposing a knowledge agenda until 2015. Innovative business and high level research aside, there are three priorities formulated for Dutch education in general: top teachers for every participant in education, tailor-made teaching and an eager learning culture (KIA, 2010). The knowledge and innovation agenda formulated for Dutch education in general is *a fortiori* applicable for green education. After all, dealing with severe international competition and the critique of a national 'license to produce' is an enormous challenge for green education.

In the same period it became more obvious that the green domain was faced with a lot of troublesome developments that put quite some agricultural entrepreneurs on a junction of difficult and complex decisions. A growing number of claims arose from

infrastructure, building and recreation on land where agriculture was the main activity. Apart from soil-bound agriculture (dairy farming, arable farming, organic farming and open horticulture), non-soil-bound (intensive livestock farming and greenhouses) is limited to certain agriculture-development areas. Intensive livestock keeping evokes criticism from citizens because intensive farming may not comply with minimal standards of animal welfare and is expected to corrode the image of the countryside. On the other hand, however, soil bound farming, with free-range flocks or cattle, causes high environmental pressure. There is a strong belief that agriculture in The Netherlands can only maintain its leading position in the world's competition with knowledge intensive production methods. At the same time sophisticated production for the world market must deserve its societal acceptance by being transparent to citizens. Or as the Ministry of Economic Affairs, Agriculture and Innovation puts it "use land to make a living, but care for nature".

At the beginning of this century a changed view on the knowledge dissemination model became in favor of the once popular linear model. That model of research, development and dissemination (RDD) was based on independent and publicly financed research and extension, small farms and moderately educated workers. Knowledge could be considered as a commodity to be applied anywhere. As the majority of Dutch agriculture left producing bulk products behind and became directed towards value-added niche markets, knowledge needed to be more specialized. Farmers were better educated and had access to new media like the Internet. Large merged dairy companies, flower and vegetable auctions and trading organizations, stimulated mutual knowledge exchange between farmers. Farmers and growers became entrepreneurial actors, also towards the provision of knowledge. On national and European level politicians and policy makers became interested in the knowledge and innovation economy. The main argument for the rising interest in knowledge and innovation was that Europe could stay on the competitive edge only by investing substantially in research and education and by financially supporting business innovations. It was emphasized by policy makers that agricultural holdings needed more of an entrepreneurial attitude (Pyysiäinen, 2006; Wolf, 2007) with new knowledge playing an important role.

In a knowledge and innovation economy education and research are crucial elements in the socio-economic system, as is innovative business and a governmental policy directed to creation, development and utilization of knowledge (World Economic Forum, 2010). Changing circumstances and new views on knowledge dissemination, as described above, challenge green education. Views are being expressed that green education can only fulfill its societal assignment if (Veerman, 2005):

- The green educational system consists of a strong collection of institutes which offer high quality education attractive to students;
- Schools co-operate in the pre-competitive development of innovations for education and business;
- Schools maintain a robust link with research institutes;
- Educational institutes are recognized by business and societal organizations as reliable partners for innovation and for educating and training (future) entrepreneurs and employees to develop adequate vocational competence.

For the EL&I-ministry, green education is also regarded as a means to achieve its policy ambitions. Traditionally education is responsible for providing the labor market

with sufficient and adequate supply. Initial and post-initial courses are therefore offered in varying ways of co-operation with the demand side of the labour market. However, another additional societal function has to be fulfilled according to present views on green education. That is to support circulation of knowledge, in close collaboration with research (fundamental, applied and practice-oriented), for the development and utilization of knowledge on the practical level of farms or other organizations. Besides, the ministry considers green education as important for increasing respect for and acceptance of agricultural production, interest for nature and environment and awareness of healthy food. These new assignments cannot be carried out successfully, according to the ministry, by distinct schools alone. Therefore in 2006 a midterm arrangement (2006-2010) has been agreed with all green institutes for education and research to jointly conduct the new tasks. It resulted in the foundation of the so-called Green Knowledge Co-operative (GKC).

The founding of the Green Knowledge Co-operative

The GKC reflects the changing view on knowledge management in the green sector. Holding owners and employees nowadays are well educated and deploy an entrepreneurial attitude towards knowledge. They are very well able to use their own contextual experience in combination with more de-contextualized knowledge from research. Education should become a mediator in the circulatory knowledge exchange with business, research and other partners, see figure 3. The Ministry of EL&I not only stimulates education to fulfill its new role in knowledge exchange, it also broadens the possibilities of cooperation between scientific research and vocational education. Furthermore, the government is in a process of deregulation to the advantage of business that is encouraged to articulate research questions.

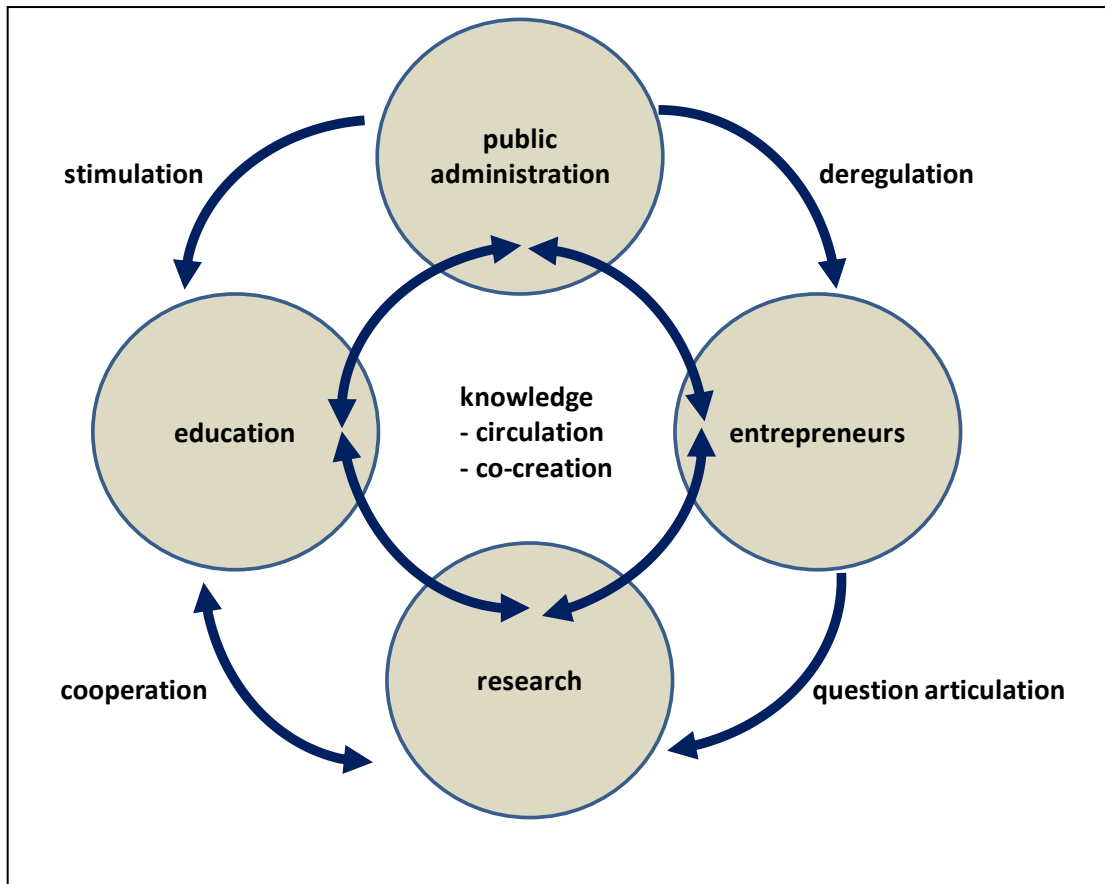


Figure 3, diagram representing the circular relationship between actors in the green knowledge system.

The GKC, as a platform of all green educational institutes, governs its activities in distinct programs, with a duration of 4 years on average. Programs can address issues in certain sectors like livestock, arable farming, logistics, horticulture, nature, food etc. Or on themes like entrepreneurships, animal welfare, regional transition, civic green education, etc. A program consists of a program team with members of different schools and research institutes, complemented with representatives from business, societal organizations or governmental bodies. A program states a vision, mission and strategy. It maintains contacts with representative bodies from sectors or with thematic platforms. Each program has sub-programs, projects with a duration of about two years, where teachers, students, researchers, entrepreneurs and employees jointly realize the project's objectives, in compliance with the program's strategy. Schools that tender for participation can apply for additional funding only if they co-finance their own contribution. Programs or projects with public-private funding are in favor for the Ministry to subsidize.

The EL&I ministry considers many GKC-programs in essence quite successful, albeit bothered by start-up problems. Taking this into account, a new agreement has been signed recently for the period 2011-2015 which is essentially a continuation of the previous agreement. It states that green educational institutes:

- Position themselves as regional knowledge centers so as to make a countrywide network able to cater for the demand for education, research and support for innovation processes. GKC-programs offer possibilities for schools to disclose the (inter)national knowledge pool.

- Further develop their activities for green civic education.
- Develop a supply of courses for future need of workers and students and put additional effort in growing enrollment and efficient educational processes. Use GKC network for an effective approach for post-initial education.
- Embed GKC experiences in their organizational and educational strategy.

To achieve results that fit in this view and so in the ambitions of the agreement between the ministry and green education, the GKC has set itself five critical success factors (CSF's):

- business involvement,
- valuable knowledge,
- regional embedding,
- motivated participants and
- attractive learning.

These CSF's, formulated in 2006, do resemble the top priorities for education put forward in 2010 by the Knowledge and Innovation Agenda KIA, mentioned in a previous section of this paper. For monitoring the CSF's as pre-conditions for success, a method has been developed that assigned aggregated scores to each of the 5 CSF's (Kupper & Kleijn, 2011a and 2011b). The monitor showed that CSF's concerning the more traditional tasks of education had scores from sufficient to excellent. However, the new educational functions, mirrored in the first three CSF's, are still underdeveloped. It can be made plausible that the efforts (€50 million yearly from the government's budget for additional funds concerning innovative impulses) put in by GKC to emphasize the new position of education in the Dutch green knowledge system pay off. Progress has been made in regionally embedding vocational education into the knowledge infrastructure, but relations with business and research grow at a slower rate than expected. Vocational education as instigator for innovation could not yet be observed. There are indications that teachers are not used yet to conduct practical innovative research. Currently, additional funds are made available for teachers' capacity building in the context of green lectorates (a lectorate is a unit in a school for professional education around a specific subject and is headed by a lector, who is an expert in that subject; he/she conducts applied research in a specific area of expertise together with teachers and students and maintains contacts within relevant branches of business or other organizations).

Concluding characteristics of Dutch green education

In our 2006 article we outlined the possible developments in Dutch green education using a metaphor from the physical behavior of liquids: evaporating, dissolving or crystallizing. The crystallizing scenario, which was considered to be the most promising scenario for green education, actually occurred in the past years. This outcome of the process of the last years is visible in certain characteristics of green education anno 2011. Institutes have gained a solid structure in terms of finance, expertise, enrollments and regional spreading. Their focus now is more externally oriented. In this concluding section we will group the current characteristics under four headings: (1) de-sectoralization: (2) externalization, (3) co-operation and (4) internationalization.

De-sectoralization:

- As described, agricultural education institutes have broadened their scope significantly. Wageningen University promotes itself as university for life and social sciences, and its mission is to explore the potential of nature to improve the quality of life. Healthy lifestyles and sustainable livelihoods are key issues now.
- At a lower level, pet care, gardening, landscaping, flower and plant retail, environmental management and food quality are attractive fields of study.
- On the other hand, the non-green educational institutions offer programs in comparable fields.
- De-sectoralization is also visible in rural and agri-metropolitan areas. Primary production in agriculture goes hand in hand with setting up services for environmental education, mental care in farms, agri-tourism, country-side living in refurbished farms and producing regional products (in that respect the merger of the ministries of Economic Affairs, with its economic structure policy, and Agriculture, Nature and Food Quality is well chosen).

Externalisation:

- The institutes for green education have become larger in scale with stronger positions in the distinct regions. They are able to act as robust nodes in the Dutch knowledge infrastructure. For a knowledge intensive sector like agri- and horticulture such an infrastructure is necessary for innovation in the green sector. After all innovation, apart from the entrepreneurial ability to recombine new developments, is favored by adequate research and education.
- Schools become more alert for quickly developing new interests in society. As vocational and higher education are joining the same structure in the green educational domain, developments can start simultaneously on different school levels. That can produce fruitful collaboration in the educational chain.
- The additional financial resources made available by the national government urge schools to each year critically consider their capabilities for tendering for the GKC programmes. The Ministry, by adjusting the tender conditions, can stimulate education to react on societal developments. This will reinforce the institutions' agility to respond to external changes.
- Teachers no longer act merely inside their classrooms. More extramural activities are asked from them, joining research projects, acquire business assignments and coach students for delivering proper results with practical usability. This changing role requires a new professional attitude. Capacity building of teachers has to accompany this changing professionalism.

Co-operation:

- Green education can gain advantage from collaborating with green research from the perspective of curriculum content. In education there is an influx of up-to-date knowledge developed and used in the research area. In the absence of structured co-operation between education, research and business it would take quite some time before changing business needs and parallel knowledge is introduced in the curriculum. Working closely together with schools that are committed to the collaborative idea will accelerate the implementation of new content and learning approaches.
- Close relationship between business, research and education in the green domain makes schools more independent of the Ministry of EL&I. It is not just a bunch of individual green schools one is dealing with, but a coherent knowledge sub-

system for the benefit of a strong economic sector. That makes green education less vulnerable for changes in political ambitions.

Internationalization:

- Next to the internationally accepted Master/Bachelor (and associated degree) structure, green education is working on qualifications according to the European Qualifications Framework (EQF), promoting workers' and learners' mobility between countries and facilitating their lifelong learning (European Commission, 2008; Ministry of Education, Culture and Science, 2010). Dutch green (higher) education is attractive for foreign students and the qualification framework makes it more easy to acknowledge education abroad, to offer joint degrees and to organize distance learning for other countries (Hobbes, 2009). The international character of the food market acts as an attractor for many students to spend their apprenticeship abroad.
- Most educational institutes are involved in international projects for capacity development in developing countries. In many cases there is a connection with the Millennium Development Goals.

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ⁱ State Budget, Proposal 2011 Agriculture, Nature and Food Quality, article 26, policy objective:

- Knowledge in the agri-food complex and the green area contributes to innovative, competitive and sustainable entrepreneurship, safe food, living nature and a vital rural area;
- Sufficient qualified labour force for the agri-food complex and the green area;
- Internationally acknowledged centre of expertise for the agri-food complex and the green area (Wageningen University and Research centre).