Agricultural knowledge chain – Examples from SLU, Alnarp, Sweden

Lena Ekelund[1]

1. Introduction

SLU Partnership Alnarp is a regional partnership between research and industry, active at the Swedish University of Agriculture (SLU) in Alnarp, in southern Sweden. The initiative was established in 2004 to meet demand for research results driven by the need for solutions to problems experienced in the agricultural and horticultural sectors.[2] The initiators identified a need for innovation and launched the partnership in collaboration with partners, or members, either from within the value chain or from supporting organisations. The initiative came from the Faculty of Landscape Architecture, Horticulture and Crop Production Science[3], and the core purpose was to create an interface where project ideas and other possibilities for co-operation could be discussed and realised so as to be fruitful for all partners.

Most of the individual partners/members are either connected to primary production, or to what Porter refers to as "the supportive industry". The Porter Diamond framework (1990) suggests that a firm does not exist in an isolated context, but is influenced by four factors: factor conditions, demand conditions, related and supporting industries, and firm strategy and structure. The framework also takes government and uncertainty into consideration. In the Partnership Alnarp (PA) context, SLU counts as a governmental force together with regional governmental bodies (Region Skåne) and local communities. This much-used framework is a way of illustrating a successful cluster, or region, which corresponds well with the aim of PA, with growth as the ultimate goal. In later years, the concept of innovation has been introduced as a driving force for growth.

2. The knowledge chain versus the knowledge innovation system

Historically, the framework of knowledge development has often been described as a linear model of intellectual tasks, often called the knowledge chain. However, in recent years a new approach has become more frequent and considers the knowledge model rather as a system, or network, rather than a chain (EU SCAR, 2012, pp.17-18).

A well-known model of collaboration is the triple helix model, which is built on interlinkages between three pillars – academia, industry and government – and co-operation between them. The concept emerged from a workshop described by Leydesdorff and Van den Besselaar (1994), and became important in the description of partnerships among university, industry and government. Leydesdorff (2005) describes the institutional differentiation of the state from civic society that began in the 19th century and led to science and technology shaping a knowledge-based industry, and, thus, how "knowledge production and control functions increasingly ceased to be the exclusive domain of academia" (Noble, 1979). Science was transformed from a public good to a useful industrial tool and matters in industrial production led to pragmatic solutions to scientific problems. American universities were quick to adopt the functions of an entrepreneur or an innovation

[1] Lena Ekelund, Swedish University of Agriculture (SLU), Sundsvägen 5, Alnarp, Sweden

[2] The earlier development of Partnership Alnarp (PA) has been described in a conference paper by Larsson, Carlsson & Ekelund (2009).

[3] Known at the time as the Faculty of Landscape, Horticulture and Agriculture.

organiser (Larsson, Carlsson and Ekelund, 2009).

These three pillars, or structures, have been included in PA as trilateral networks and hybrid organisations have long been described as the most prosperous. A recent report from the European Commission describes how these three "interact from time to time with each other, steered rather autonomously by their own development" (EU SCAR, 2012, p. 17) and how this framework stresses the dynamics of networks in the mutual creation of knowledge.

In an OECD-study from 1995, Mårten Carlsson, professor of horticultural economics at SLU, examined the agricultural knowledge system (AKS) in 18 member countries (Carlsson, 1995). The mutual relationship between research, higher education and extension (advisory services) and their relation to industry – and society as a whole – was described. Carlsson argued that the orientation of the knowledge system had traditionally been caused by the development of science and problems within the agricultural sector, where the flow of information went from basic research through basic agricultural research, applied research and development work, to advisory services and professional education of farmers and growers. During the 1990s, research topics became increasingly initiated by other researchers, and at the same time, government funding of applied research and advisory services were cut back. SLU received directives that most applied research should be financed by the agricultural sector or other non-governmental sources. Knowledge networking became a new tool.

Carlsson (1995) describes the AKS as a complicated system built on research, higher education and extension. One of the challenges was the lack of clear correspondence between function and institution:

"These functions (research, education and extension) of the AKS are carried out by different institutions (organizations) like universities, research institutes, experimental stations, advisory service organizations, agricultural schools, and […] there is no longer a clear correspondence between function and institution." (Carlsson 1995, p. 3)

Knowledge networking and collaboration has since continued and accelerated. Carlsson's theory was novel at the time of publishing, but later became an established model in the field of agricultural research and education. The focus of the model was to identify a problem in the field of agriculture and find means to solve it.

In recent years, the AKS model has been developed to also include innovation, which can be described as a new way of using knowledge. AKS has been replaced by AKIS, or agricultural knowledge and innovation system. The AKIS concept has been thoroughly presented and developed by the Standing Committee on Agricultural Research (SCAR). The word "innovation" is relatively new, and does not appear frequently in literature until the beginning of the new millennium. However, the underlying mechanisms appear to have been consistent – instead of innovation, focus was on how to make knowledge from research accessible to the target group. With AKIS, the focus has switched from solely solving a problem of farmers or other actors in the agricultural sector to considering the innovation aspect. Here, students can act as a strong driver of innovation, and consumer-driven innovation can also be part of AKIS. For example, horticultural and agricultural producers, who market their products directly to consumers, enjoy unique possibilities of developing innovative products and services (Ekelund and Tjärnemo, 2009). Stenger *et al*. (2016) also describe active and early involvement of all stakeholders as a key success factor to innovation.

Carlsson described AKS as a system for communication and creation of knowledge, for use by the sector and industry. This implicitly indicates what would today have been defined as innovation. In comparison, the EU SCAR report (2012) describes innovation:

"Innovation starts with mobilising existing knowledge. Innovation is a social process, more bottom-up or interactive than top-down from science to implementation. Even pure technical innovations are socially embedded in a process with clients, advisors etc. Very often partners are needed to implement an innovation." (EU SCAR, 2012, p. 9)

Further, the EU SCAR report describes that little is known about the performance of AKIS in the EU, as the systems are built differently in different countries, regions and sectors. There are also different difficulties within the same AKIS system; for example, education and research face different challenges. The report states initially:

"Different parts of AKIS, such as education, extension and research face different challenges. […] Education is often weakly connected to research, extension and business. Applied research is often reviewed on scientific output, much less on practical relevance. Networking and cooperation between research and extension or farmers groups is crucial and to be promoted. Agenda setting by farmers and food business is more important than just more research dissemination. We therefore advocate a distinction between science driven research and innovation-driven research in the motivation of research." (EU SCAR, 2012, p. 7)

Thus, two problems are identified; lack of involvement by education, and lack of reward for applied science.

3. Organisation of collaboration

Policies on academic partnerships look different in different counties. In horticultural research and in discussions about competitiveness between countries, the Netherlands is often cited as an example of success and progress. It could be noted that one of the first scientists in horticultural economics was W. Sangers, who in 1968 described the success of Dutch horticulture in terms of a "centre-function", including business actors as well as research and schools, which would today be called a cluster and put in an innovation context (Sangers, 1969, pp. 18-21).

The EU SCAR report (2012), which presents findings from Finland, the UK, France, Denmark, Germany, the Netherlands, Belgium, Turkey, Estonia, Switzerland, Italy, Latvia and Ireland, but not Sweden, describes the situation as follows:

"Some countries (like the Netherlands and Switzerland) see research and innovation programmes as a policy instrument to reach certain public goals (e.g. regarding the environment) and combine them with other types of regulation. The interaction with innovation in the private sector (like the food industry) is often weak, and not very clearly taken into account in designing policies." (EU SCAR, 2012, p. 77)

Pannekoek *et al.* (2005) describe how the Dutch greenhouse industry organises its entrepreneurial innovation with a strong focus on co-operation between different stakeholders, such as "chain partners, knowledge institutions and colleague firms". The clustering of greenhouse companies has been proven to lead to successful innovation and the authors suggest that the more actors along the horticultural production chain are actively involved, the bigger the chances of success. Collaboration between firms and knowledge institutions is described as rapidly increasing and is "becoming the rule, rather than the exception". (Pannekoek *et al*., 2005)

The tradition from the days of Sangers (1969) is still strong. In one aspect, the Dutch industry seems to have changed, as the authors conclude: "Only the contribution of knowledge institutions is rather limited both in incremental as well as in radical innovation." (Pannekoek *et al*., 2005, p. 47)

If we turn to Sweden, a regulation (Högskolelagen, 1992) stipulates that universities (and other

institutions for higher education) are set up by the state with aims for education, research and development. In 1996, an addition was made, stating that universities shall also "collaborate with the surrounding society and communicate its activities", which in practice forces the universities and their academic staff to collaborate. Several evaluations have been conducted and have concluded that collaboration has become strongly integrated in research and education.

The responsibility of the agricultural sector has long been at the centre of SLU's societal focus. One difference compared to many other countries is that Sweden has no special independent institutes for agricultural and horticultural research. The government has demanded that SLU produce knowledge applicable to agriculture, forestry and horticulture to fulfil the policy goals of efficiency, productivity and, later, sustainability. In 2008 SLU's Board decided that the university should carry out a comprehensive evaluation of its research. This evaluation, Quality and Impact (KoN 09), covered two main aspects: assessment of scientific quality by peer review, and assessment of the utility for society and the sectors as perceived by the stakeholders (industry, public authorities, organisations). SLU was considered to have great potential with public interest and research needs growing in the fields in which the university works. However, SLU was criticised for "conducting research focusing more on problems than on solutions". The evaluators concluded that "Stakeholders call for greater emphasis on the 'big picture', a systemic and more proactive approach, as well as communication adapted to meet the needs of the user and the context." (SLU, 2016)

In the work that followed at SLU, Partnership Alnarp and other collaborative bodies are often held up as examples of how responses to this criticism have been found. As for "research focusing more on problems than on solutions", the EU SCAR report (2012) suggests that research can be science driven or innovation driven. The diffusion of science-driven research is linear and is focused on individual organisation, with an economic line of thinking developed with a macro-economic approach. The quality criteria for science-driven research is to obtain high scientific quality. Innovation-driven research instead takes a systems approach where networks are the key focus. Here, the economic line of thinking involves systems of innovations. The quality criteria in innovation-driven research are measured in relation to the sector or the region (EU SCAR, 2012, p. 101). Viewed in this perspective, SLU has taken these aspects into consideration.

4. How Partnership Alnarp works

The PA project was launched in 2004 with the purpose of creating an interface where project ideas and other possibilities for co-operation can be discussed and realised in a way that is fruitful for all partners. The key stakeholders are actors of the faculty (researchers, teachers, students), agricultural and horticultural firms and organisations, and authorities and sector associations in the region. Among the around 80 partners/members are producer organisations, financial institutions and advisory service organisations, the county government and the Federation of Swedish Farmers (LRF).

PA is organised into six different subject groups: Fruit and Vegetables, Food Crop Production, Bioindustry Production, Animal Husbandry, Marketing and Management, and – more recently – Forestry. In the ten-year period since it began, there have been over 900 activities, including research projects, meetings on-demand (seminars, workshops), annual conferences, student projects (support, thesis projects) and a student mentoring program.

A typical PA project starts with a company/organisation or a researcher having an idea or a problem. The company/organisation or the researcher contacts PA to discuss who should be involved. Once the concept of the project is clear, a formal application can be filed, including a

summary, a funding plan and a communication plan. More than 50% of funding must come from the company/organisation. When the application has been processed by a subject group, the Steering Committee takes a decision and the project is ready for implementation. The realisation involves a contract between the partners, as well as a final report, usually discussed with the partners.

Henrik Stridh, former adviser, now director of the biggest fruit grower co-operative Äppelriket:

"Five years ago, scientists in Alnarp were involved with what they thought was fun, usually something that was of little benefit to us. With Partnership Alnarp we are seeing big differences. Now researchers are solving problems we face in the horticultural industry and are keeping in regular contact with us."

Partnership Alnarp is unique in its field, as it combines research with teaching and education. In the EU SCAR report, education is often described as being weakly connected to research, extension and business (EU SCAR, 2012). In Partnership Alnarp, however, students are involved in business cases from the early years of their university education. At the end of their studies, students are invited to conduct their theses or graduation projects at some of the partner companies.

The EU SCAR report also describes online platforms as important tools in the innovation network, to enable the exchange of information and training, as well as communication and networking (EU SCAR, 2012, p. 39). Additionally, the PA platforms for information were found to be important, but onsite meetings of different sizes and face-to-face gatherings are the crucial means of communication. In an evaluation of PA, conducted in 2008, the partners stated that PA's key strength was its role as a meeting point for actors in the sector and within the region. Seminars and conferences were also described as valuable occasions for the partners involved to meet and discuss current issues. Furthermore, the heads of departments at SLU described PA as the most important tool used to communicate research findings to industry, as well as to develop professional networks. Students also described the project as keeping them up-to-date with recent industrial activities and helping them develop their networks (Schroeder, 2008, p. 2).

5. Other forms of collaboration

Apart from PA, two other forms of collaboration are currently active within SLU in Alnarp.

The first is Partnership Horticulture (Tillväxt Trädgård, TT), a national collaboration between academia and the horticultural industry. The project, set up in 2008, aims to foster growth and sustainable development through such actions as increasing the value of products and increasing competitiveness through innovation. Creating new ways of thinking and collaborating is another objective to TT. The partnership conducts research and development projects and organises other activities, such as newsletters and seminars. TT is funding projects related to horticulture, often including external collaboration with meetings in different regions in the country (Partnership Horticulture 2016).

The second is the Swedish Centre for Agricultural Business Management (Kompetenscentrum Företagsledning, KCF, htpp://kcf.slu.se), a national collaboration that started 2015 which brings together farmers and rural companies with researchers. The aim is to find new ways of improving knowledge and implementing knowledge in business management. The importance of business and marketing was stressed by a government report on the agricultural sector's competitiveness (Konkurrenskraftsutredningen 2015). The initiative involves a project leader as a bridge to advisory and education (e.g., PhD students). In comparison, PA aims to improve the agricultural industry's competitiveness as well as research and education at SLU Alnarp.

6. Conclusion

Partnership Alnarp has been an important tool in the development of the agricultural and horticultural industry in southern Sweden over the past decade. Several benefits from the cross-disciplinary collaboration have been achieved and the project is expected to continue contribute to development. However, some recommendations to future improvements of PA can be made. The PA models are expected to be developed further within the near future and project applications are expected to become even more strategic. PA could also be taken from a regional to a national level and applied to other sectors outside the agricultural industry. Improved communication, e.g., through social media, as well as new, business-focused research are also expected to be used to aid development. As previously explained, PA was an initiative from SLU's Faculty of Landscape Architecture, Horticulture and Crop Production Science. There have been discussions about taking the model to the university level to include other faculties as well. As of spring 2016, a part of forestry research (located in Alnarp) has been incorporated, but attempts have not been further developed by SLU.

One problem with science-driven research is that researchers engaged in PA are subject to the same reward system as researchers in general, where scientific publications are counted and judged as quality. Hence, it is not as rewarding for scientists to work on applied science and innovation. This type of work also involves rather small but relatively time-consuming projects, making researchers reluctant to engage in them.

PA solves one of the problems identified by the EU SCAR report (2012) – the involvement of students in the process – while the second – a lack of reward for researchers – remains.

The more applied side of research has become more important, as has the policy goal of increasing the number of students in higher education. The broader goal is to increase democracy. EU policy promotes science in society and the Bologna declaration stresses student employability. The role of the university has thus changed from an institution of "culture and refinement"[4], of the blending of knowledge and education, or research and studies, in the Humboldt tradition, to a motor of innovation for the competitiveness of a region or sector. One might add that there may be a risk in becoming "too applied" in research and education.

To sum up, the challenges for universities are producing both quality and impact as well as providing research-based education; prioritising specialisation and systems thinking and combining different kinds of knowledge from research and from practice; and solving the problem of financing and creating incentives for academics.

7. References

Carlsson M., 1995. On Agricultural Knowledge Systems: Some reflections based on country notes and case studies. OECD: AGR/REE, (95), 4.

Ekelund L., Tjärnemo H., 2009. The Competitiveness of Local Food Clusters – Supermarket Strategies Versus Consumer Preferences for Vegetables in Sweden. *Acta Hort.* (ISHS), 831:193-200.

EU SCAR, 2012. Agricultural knowledge and innovation systems in transition – a reflection paper, Brussels. Available at: http://ec.europa.eu/research/bioeconomy/pdf/ki3211999enc_002.pdf

Högskolelagen, 1992. 1992:1434, SFS, Svensk Författningssamling.

[4] Swedish: *Bildning.* German: *Bildung.*

Konkurrenskraftsutredningen, 2015. Attraktiv, innovativ och hållbar – strategi för en konkurrenskraftig jordbruks- och trädgårdsnäring, SOU 2015:15. Elanders Sverige AB, Stockholm 2015. Available at: http://www.sou.gov.se/wp-content/uploads/2014/11/SOU-2015_15_Webb.pdf

Larsson J., Carlsson M., Ekelund L., 2009. Trends in the Development of Collaboration between Horticultural Research and Education and the Industry. *Acta Hort.* (ISHS), 831, 55-64 http://www.actahort.org/books/831/831_6.htm

Leydesdorff L., Van den Besselaar P., 1994. Evolutionary Economics and Chaos Theory: New Directions in Technology Studies. London, Pinter Publishers.

Leydesdorff L., 2005. The Triple Helix Model and the study of knowledge-based innovation systems. *International Journal of Contemporary Sociology*, 42, 1.

Noble D., 1979. America by Design: Science, Technology, and the Rise of Corporate Capitalism. New York: Knopf, cited in Leydesdorff 2005, p. 5.

Pannekoek L., van Kooten O., Kemp R., Omta S.W.F., 2005. Entrepreneurial innovation in chains and networks in Dutch greenhouse horticulture. *Journal on Chain and Network Science*, 5. Wageningen University, the Netherlands. Available at: http://www.wageningenacademic.com/doi/pdf/10.3920/JCNS2005.x053

Partnership Horticulture, 2016. Swedish University of Agriculture. Homepage. Available at: http://www.slu.se/en/faculties/ltv/collaboration/1/tillvaxt-tradgard/

Porter M.E., 1990. The Competitive Advantage of Nations. Harvard Business Review. March-April 1990, 73-93.

Sangers W.J., 1969. External economies of localisation in horticulture. *Acta Horticulturae*, 13, 18-21.

Schroeder H., 2008. Partnerskap Alnarp (PA) nuläge, utvärdering och framtida utveckling. Available at: http://partnerskapalnarp.slu.se/uploads/protstyrgrp/utvardering.pdf

SLU, 2016. Quality and Impact – KoN. About SLU. Homepage. Available at: http://www.slu.se/en/about-slu/mission-vision-and-strategic-goals/strategies-and-evaluations/quality-and-impact-kon/

Stenger M., Altmann M., Schreiner M., 2016. New strategic approaches for promoting the diffusion of innovations within the horticultural sector. EURAGRI e-