

In pursuit of knowledge-based Slovenia: Is knowledge transfer to agriculture stuck in faculties?

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Abstract

The pursuit of a competitive “knowledge-based society” in Slovenia has shaped a new mission of academic institutions in their transfer of knowledge to practice. These institutions are expected to link basic and applied research to the rapid transfer of their academic results to knowledge users and consumers in order to contribute to economic development. Such reasoning is also implicitly involved in the imagining of knowledge transfer to agricultural practice. The Slovenian strategy of agricultural development highlights knowledge and its transmission to practice as a key driver of increased labour productivity and competitiveness of farm holdings. However, the academic institutions of a relatively well-established network of formal and informal agricultural education have substantially reduced their transfer of knowledge to practice. What determines such a curtailed transmission of knowledge was the basic research question of the targeted-research project entitled Challenges and Needs of Agricultural Knowledge Transfer in Slovenia. This article is limited to the understandings of the functioning of knowledge transfer among the knowledge providers from the faculties and secondary schools. The results show that irrespective of the primary mission of educational institutions, i.e. the transfer of knowledge into practice, the institutions reveal two cases at either end of the spectrum: a self-contained faculty educational system and the open consortium of agricultural secondary schools. While the faculties have adopted the working strategy ‘The more efficient you are as a researcher, the less concerned you are with the transfer of knowledge to practice,’ the secondary schools for agriculture have cooperated on joint projects that have accelerated and improved knowledge transfer to the “real environment”.

KEYWORDS: knowledge-based society, knowledge transfer, academic institutions, agriculture, Slovenia

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Introduction: In pursuit of a knowledge-based society

If a discussion on the dramatically changed position of higher education in “post-industrial” contexts of the USA and the UK in the 1990s (Becher & Trowler 2001) seemed detached from the realities in the EU, it became tangible only a decade later. Since then, terms like “knowledge-based society”, “globalisation”, “science-industry relation”, “Mode 1”, “Mode 2”, the “Triple-helix model”, “marketising knowledge” to mention just a few, have become constituent terms of the EU vocabulary about the knowledge society. The term knowledge society was first coined by Peter Drucker in 1969 in his book entitled *The Age of Discontinuity: Guidelines to Our Changing Society*. According to Sharma et al. (2008: 2), the term is often used interchangeably with knowledge-based economy, defined by the OECD (1996) as being ‘directly based on the production, distribution and use of knowledge and information’ and later expanded by the APEC (2000) to also cover the ‘production, distribution, and use of knowledge as the main driver of growth, wealth creation and employment across all industries.’

Building a knowledge-based economy and society in the EU is embedded in the vision of the Lisbon Strategy (2000) to make the EU ‘the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion’ (Lisbon 2014). Among several sound goals, the EU heads of states and governments agreed to achieve this vision with better policies for the information society and research and development (R&D) activities. In this transition to a knowledge society, universities are granted an essential role but on the condition that they adapt to the demands of a global, knowledge-based economy. The expectation is more than clearly elaborated: ‘It is not the stock of knowledge that will trigger the knowledge-based economy, but its availability and its efficient use for economic processes’ (World Bank in Diaconescu 2009: 52). Universities are expected to link basic and applied research and to convert the results to new products or services, and to rapidly bring these innovations to the market. Finally, in this process, the prime importance is attributed to the transmission of academic results to knowledge users and consumers.

The pursuit of a competitive knowledge-based society, however, has correspondingly determined particular standards of quality of science production. The careful monitoring of academic staff through the criteria of science excellence has, indeed, contributed to a more competitive academic world, particularly through the proliferation of numerous scientific journals. However, the imposed quality standards have significantly determined the relationship between academics and the users of their knowledge.

This reasoning is well-manifested in the knowledge transfer to agricultural practice; the increasingly fragile bond between academics and the extension services is illustrative here. Many authors (Tatchell 2005; Anderson et al. 2004; Mahon et al. 2010) diagnose the separation between these traditionally cooperative actors as being a result of the introduction of quality evaluation of academic institutions according to strictly scientific criteria. Disharmonised priorities and needs between academics and farm advisers frequently lead to the closing of some university departments or junior colleges

that train and educate specialised workers for research transfer to practice, e.g. to farm advisers.

Based on the Lisbon Agenda (EP 2000), the Slovenian strategy of agricultural development (DZ RS 2013)¹ defines knowledge and its transmission to farmers as a key development driver of increased labour productivity and competitiveness of farm holdings. Agricultural education is performed through several types and phases of formal and informal education. Formal education is performed through the system of secondary schools, junior colleges and the two faculties for agriculture, while informal education is run mainly through the extension services and to a lesser degree with the other providers of agricultural knowledge (e.g. development agencies, NGOs, private firms). Nevertheless, the institutions of a relatively well-established network of formal and informal education have substantially reduced the transfer of knowledge to farmers (Kovačič et al. 2008).

What determines such a curtailed transmission of knowledge was the basic research question of the targeted-research project entitled Challenges and Needs of Agricultural Knowledge Transfer in Slovenia (2010–2012).² The project aimed at revealing assessments, experiences, needs, preferences and mutual communication among several academic and non-academic actors in the knowledge transfer system. The project combined several quantitative and qualitative approaches. In turn, two surveys were carried out with farmers (513) and agricultural advisers (310); semi-structured interviews were conducted with knowledge providers from various academic institutions (16), farmers (10) and agricultural advisers (12); and finally, a focus group discussion included participants of the three observed groups.

This article is, however, limited to the understandings of barriers in knowledge transfer to practice among the knowledge providers from the academic institutions. Selected interviewees (16) from various academic institutions (the Biotechnical Faculty at the University of Ljubljana, the Faculty of Agriculture and Life Sciences at the University of Maribor, and three secondary schools with programmes related to agriculture) debated the wide repertoire of topics related to knowledge transfer to agricultural practice. Themes encompass the collocutors' understanding of their position in the academic institutions, the science excellence criteria, the science-industry relationship, the science-extension-farmer relationship, and their understanding of various forms of knowledge transfer to diverse users. Finally, the collocutors discussed the role of their institutions in knowledge transfer and offered some proposals for the improvement of the existing system of transmission of knowledge to agricultural practice. Whether there are any examples of prospective collaboration between the academic and the non-academic actors in the knowledge transfer system is discussed later in the article.

This article starts with a short review of recent discussions on the noticeable changes in the knowledge production and transfer in imagining and building a knowledge-

¹ The full title of the strategy is the Resolution on the Strategic Direction of the Development of Slovenian Agriculture and Food Industry in 2020 – “Ensuring the Food for Tomorrow”

² The project was funded by the Slovenian Ministry of Agriculture, Forestry and Food and the Slovenian Research Agency.

based economy and society in the previous two decades in the EU. These changes are seen in favour of more applied, target-oriented knowledge in order to more efficiently contribute to industry, economy and other sectors of society. This issue is further elaborated through the current discussions on the reform of agricultural knowledge and innovation system (AKIS) in the EU to situate the expectations attributed to academic knowledge providers (universities and research institutes) in imagined networking with the non-academic participants of the system (field extensionists, farmers, knowledge brokers). The next section provides the reader with the Slovenian context of envisioning and practicing the knowledge-based economy and society through the example of a recent case study on science-industry cooperation between a biotechnical faculty and the food processing industry, a short historical overview of developments in funding R&D in Slovenia, and a short description of evaluation of science excellence by the national research agency. Such a context provides the framework for the analysis of the functioning of knowledge transfer to agricultural practice, as understood by the knowledge providers from the faculties and secondary schools. Whether academics believe that they successfully transfer their knowledge to the final beneficiaries, i.e. the farmers, is presented in the last two sections of the article.

The new mission of universities in a knowledge society

Following the vision of a knowledge society, it seems that the views on the production of scientific knowledge and its transfer to various end users have changed significantly in the previous two decades, particularly in the sociology of science (Gibbons et al. 1994; Nowotny et al. 2001; Hessels & Lente 2008; Jarzabkowski et al. 2010; Hewitt-Dundas 2012; Hicks 2012; Fromhold & Werker 2013). In their well-known book, *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* (1994), Gibbons and his co-authors argue that a new form of knowledge production began emerging in the mid-20th century, which increasingly involved multidisciplinary teams that worked together for short periods of time on specific problems in the “real world”. The authors labelled this knowledge production as Mode 2 in contrast to Mode 1. The latter was seen as an autonomous endeavour of the academic institutions, investigator-initiated and discipline-based knowledge production, and was believed to have been increasingly supplemented but not replaced by Mode 2. If Mode 1 focuses on academic basic research, the agency of individuals, scientific peers and a hierarchical university-centred regime system, Mode 2 emphasises the trans-disciplinary, problem-oriented knowledge production, encompassing a wider range of both academic (universities and research organisations) and non-academic actors (e.g. government agencies, NGOs, public R&D laboratories, private firms) (Fromhold & Werker 2013). Mode 2 is viewed as oriented towards a vision of a knowledge society emphasising R&D, which questions rigorous scientific production strictly bounded within individual scientific disciplines and “academic tribes”, and prioritises their openness and sensitivity to social issues (Gibbons et al. 1994; Nowotny et al. 2001; Nowotny et al. 2003). In this view, basic research is now ascribed ‘a minority position’ even within universities (Nowotny et al. 2003: 184).

Another example that questions Mode 1's understanding of science production is the Triple-Helix model, introduced by Etzkowitz in the mid-1990s. This model considers the university to be an emerging entrepreneurial entity including the establishment of technology transfer offices, science parks and business incubators, as well as various kinds of administrative offices that contribute to more intensive three-way university-industry-government relations. As already established by Mode 2, this model strongly indicates the commercial exploitation of research as the prime mission of contemporary universities (Tuunainen & Kantasalmi 2013).

However, contrary to the extensive discussions on these emerging modes of knowledge production,³ the empirical evidence shows that only a minority of academics and universities are highly-oriented towards commercial activities (Tuunainen & Kantasalmi 2013). The problematic nature of the entrepreneurial university thesis can be well summarised by Tuunainen's observation (2013: 62): 'While the auxiliary parts of the university may, indeed, reach out to the corporate world, the academic core may still dissociate itself from entrepreneurship.' A similar observation can be extracted from the longitudinal survey among academic staff at four Norwegian universities conducted by Kyvik (2013). Commercially-oriented or applied research appears to be rare among the academic staff and only a small decline in basic research is evidenced. Moreover, Perkmann and co-authors (2013)⁴ found that academic engagement among academics needs to be distinguished from the commercialisation of science. The authors understand academic engagement to be mostly inter-organisational collaboration involving person-to-person interactions that aim to generate some kind of utility for the non-academic partners. Academic engagement is believed to be closely aligned to traditional academic research activities whereby academics obtain access to resources to support their research agendas and academic values, norms and conventions, and to a lesser extent with financial rewards (Perkmann et al. 2013).

Regardless of a much closer relationship with industry and other sectors of society, academics' identities as researchers are still defined in terms of academic affiliation with disciplinary communities where research and academic publishing continue to be highly valued (Henkel 2000). As Kyvik (2013) observes, the university researchers today publish much more than they did in the past, which is related both to academic norms and the increased research capacity of academic staff that has been enlarged by the entry of new generations of researchers who are better trained to undertake scientific work. Career opportunities based on research achievements have increased considerably over time; nowadays, the admission to full professor promotion depends significantly on research competence irrespective of vacant professorships. Moreover, fixed salaries for professors have been replaced with a negotiation system rewarding "productivity" and "quality" in research. Published output is now included as a parameter in the research funding model

³ The SciVerse Scopus database on articles discussing both models of knowledge production shows 2,471 citations for Mode 2 and 1,292 for the Triple-Helix model (Tuunainen 2013).

⁴ The group reviewed 413 peer-reviewed articles published worldwide that discussed university-industry knowledge transfer in the forms of collaborative research, contract research, consulting and informal relationships in the period from 1980 to 2011.

of universities (Kyvik 2013). Similarly, Ylijoki and co-authors (2011) show that in Finland the share of scientific and scholarly publishing prevails over popular science publishing, indicating that the mission of academics as science publishers is still emphasised to a greater extent than their mission as popularisers of science.

Recent evidence questions the argument of universities as increasingly commercialised entities. Quite on the contrary, it seems that academics respond differently to intentions of linking together universities with industry and economy. Indeed, universities are cooperating with various actors in society, but not in the way anticipated by the abovementioned models. As Bresnen and Burrell put it (2012: 35), the long tradition in the construction of scientific endeavours grounded in relations of power and patronage that measure investments in scientific production ‘not in terms of any benefits for the population but on the good standing – the “name” of the benefactor – ... of gentlemen’s clubs’ is not automatically replaced by new modes of knowledge production.

A new mission of universities in agriculture knowledge production and transfer

A new understanding of the position of universities in the system of knowledge production is mirrored in the current discussions on the reform of the agricultural knowledge and innovation system (AKIS). As the Standing Committee on Agricultural Research (SCAR)⁵ claims, the ‘old linear model of technology transfer (from scientists to users) is ... outdated and should be replaced by an interactive model of networking systems, which integrate knowledge production, adaptation, advice and education’ (EU SCAR 2012: 12) as anticipated by Mode 2. However, the SCAR workshop (SCAR 2008) has already pointed out several negative aspects in the way academics influence the AKIS. The criticism pertains particularly to research agendas, priorities and evaluation criteria that are set within the academic domain, and places great emphasis on peer-reviewed publications. The SCAR believes that diverse users of knowledge and innovation need more “adapted knowledge” that is better translated to their understanding and needs. According to the SCAR, the concept of a broadened AKIS requires various forms of knowledge brokerage, e.g. the dissemination of applied research results in grey literature, farmers’ magazines, specialised websites, posters, and seminars. This could be achieved with ‘more emphasis on networking, transdisciplinary research and cooperation between the worlds of academia (universities and research institutes) and practice (farmers, field extensionists, knowledge brokers, etc.)’ (EU SCAR 2012: 29).

The idea of the multi-stakeholder platform of networks in the AKIS encompassed by heterogeneous groups of actors from academia and non-academia has been examined by researchers from various social scientific backgrounds, working in the domain of rural and agricultural issues. Scholars have already collected a wide range of material that

⁵ The Standing Committee on Agricultural Research (SCAR) was established in 1974 by a Regulation of the Council of the EU. The SCAR advises the commission and the member states in the field of the coordination of research in agriculture.

corroborates the existence of “bottom-up initiatives” related to networks of heterogeneous groups of actors in agriculture, including those outside or at the margins of official research and extension bodies (Moschitz et al. 2104; Cristóvão et al. 2012; Klerkx et al. 2013). However, such investigations have also identified several difficulties in the knowledge transition from the conceptual design to the successful practice of networks, referring particularly to the organisational, cultural and contextual factors that hinder the level of trust and consequently undermine the effectiveness of cooperation within the network groups (Brunori et al. 2013; Klerkx et al. 2012; Koutsouris 2012; Murphy 2012; Owen & Williams 2012).

Illustrative is one of the rare in-depth studies on farmer-university networks in one of the regions of eastern Germany (Von Münchhausen & Häring 2012). In this case study, cooperation between farmers and the university took place in the forms of student projects and graduation theses, business internships, on-farm research projects and farmers’ seminars. However, the creation of a partnership among equal parties remained merely notional. On the side of farmers, as a heterogeneous group, the carrying out of the partnership was hindered by their lack of interest in substantial changes in their already successful farm operations, their lack of time, and their low levels of education and media competence. On the side of academics, weak motivation to collaborate with farmers as equal partners was hindered by their limited recognition of farmers’ contributions to agricultural knowledge production.

Academic-non-academic networks seem to be vague and controversial terrain in which actors, who “should” interact, still encounter their uncoordinated expectations, interests, settings and initiatives (Hessels & Lente 2008; Knights & Scarbrough 2010).

On the way to a knowledge society in Slovenia

Inspired by the EU Lisbon Strategy (2000), the Slovenian government situated the vision of the transition to a knowledge economy and society at the centre of its development strategy. Several national documents immediately and almost simultaneously adopted the trinity of research-education-innovation as the background formula for establishing a knowledge-based society (Bučar 2011). A shifting balance of public research funds from basic, non-targeted research in favour of targeted (and applied) research, and a changing system of financing public research organisations, so that it rewards their cooperation with the private sector, are only two among the numerous policy priorities of the National R&D Programme (NRDP) launched in 2005. The ambitious goals of such a vision called at a minimum for the coordination of education, economic and fiscal policies, but according to some estimations the NRDP was too optimistic in setting goals, while its implementation remains weak (Bučar 2011).

A recent study on several cases of science-industry cooperation in the Slovenian food and chemical industries proves a considerable discrepancy between the policy documents and practice (Bučar & Rojec 2009). Illustrative is the case of research and consultancy activities of the Chair for Agricultural Economics, Policy and Law (CAEPL)⁶

⁶ This Chair is located at the Biotechnical Faculty, University of Ljubljana.

for the Slovenian food processing industry (SFPI). At first glance, this science-industry collaboration seems to be a case of “good practice”. In turn, the Chair provided the industry with the analysis of current developments in the SFPI, free-of-charge consulting for their firms, and with the applicable B.A. and M.A. theses of students on topics relevant for particular firms. It seemed that all actors involved benefited: the Chair obtained better insight into practice, i.e. the development of a particular firm of the SFPI; a firm gained solutions for its current problems; and a student had an opportunity for employment in the SFPI. However, some shortcomings were salient. Since the SFPI had been treated as a primary producer of food and not as a manufacturing activity, its firms were not eligible for the instruments focusing on the promotion of science-industry cooperation. Moreover, a large number of small firms of the SFPI did not have capacities for R&D, or else their needs for science-industry collaboration were rarely expressed. As a result, the Biotechnical Faculty and the CAEPL established cooperation with the largest firms only, which as a rule defined the general R&D ambitions of the SFPI. In contrast, the role of the Chair in science-industry collaboration was limited since it had been defined as a public institution and its activities as being free-of-charge. The authors of the study suggest the creation of university spin-offs as a possible solution since the present framework under the umbrella of the University of Ljubljana cannot offer proper support for science-industry collaboration (Bučar & Rojcek 2009).

The historical overview of developments in funding R&D in Slovenia shows that the science-industry relationship is not a novelty. The precursor institutions of the present Slovenian Research Agency (SRA)⁷ have sought to interweave science and industry since the 1960s. The first R&D Fund institution (1954) aimed at promoting ‘theoretical and practical research work in economics, and social and natural sciences as well as in all other fields directly assisting the development of the socialist economy’ (Novak and Demšar 2012: 50). Moreover, in 1962, the fund made an effort to fully include science in the insufficiently modernised economy in Slovenia, which was considered to be ‘lagging behind in the global division of labour with regard to techniques, technology and organisation of production’ (ibid.: 50).

Despite the highly sound policy targets, however, the practice proved that science only slowly penetrated the economy, supposedly due to the poorly defined role of the consumers of scientific products or services. Similarly, recent evidence from the European Survey on innovative activities for the period of 2002–2004 showed that only 5.7% of Slovenian firms believed that the information obtained from universities was very important for their innovative activities, while only 2.4% of firms considered the input from the public research organisations to be very important (Sorčan et al. 2008).

It seemed that the attitude towards knowledge as a “tradable good” remained weak in Slovenia. While the firms mostly believed that science was overly engaged in some high science topics with a lack of practical, business relevance, the view of science remained that firms are mostly preoccupied with some trivial, everyday problems.

⁷ The Agency was established by the government in 2003.

Being aware of these difficulties, the SRA in the previous decade has continually reformulated the methodology for evaluating research applications. On the one hand, the Agency sought to follow the provisions of the R&D Act to promote the science-industry relationship; but, on the other, its methodology for evaluating applications was based on the rules of procedure for co-financing research activities, which prioritised an applicant's science excellence, as determined by the SRA. The agency coined a formula for the quantitative evaluation of research excellence that applies to the applicants of basic, targeted and applied research projects. The formula is comprised of four elements: $A = A_1 + A_2 + A_3 + A_4$. Three of them (A_1 , A_2 and A_4 scores) measure the number of published research papers with an emphasis on their quality proved by well-established and indexed scientific journals and publishers, and the number of pure citations, while A_3 quantitatively measures knowledge transfer to practice in the form of a researcher's obtaining project funding outside the agency (SRA 2014).

Paradoxically, highly evaluated scientific excellence seems in disharmony with poorly evaluated research activities related to science-industry cooperation or other forms of knowledge transfer to practice. The only element of the existing formula that implicitly refers to the cooperation between science and industry, A_3 , actually measures the researcher's capability of obtaining project funding outside the Agency as a proof of the unquestioned transfer of knowledge to practice. However, this measure does not clarify whether and how science is transmitted to practice, to a final knowledge consumer, or the beneficiary.

This concern is implicitly involved in the governmental efforts to strengthen human potential in Slovenian agriculture. Following the priorities of the renewed Lisbon Strategy for growing job opportunities, the Rural Development Programme 2007–2013 (MAFF 2007) ingrained this objective in Axis 1 and Axis 3 measures aimed at enhancing the productivity of agriculture through the raising of qualifications of farmers and improving the diversification of their economic activities (MAFF 2007). The economic productivity of mainly self-sufficient, relatively small (6.5 ha), and dispersed farms in several locations is low. The education and age structure of farmers also contributes to the low economic productivity. Recent figures show that more than half of the operators are over 55 years old, while only seventeen per cent of them are under 45 years old. Less than half of farm operators have a vocational or secondary education but not necessarily from an agronomic background, and only 1.3 per cent of them have completed studies of agronomy at the university level (Erhart 2014). Whether the science providers successfully transfer their knowledge to the final beneficiaries, i.e. the farmers, is discussed below.

Education for producing scientific articles

The oldest Slovenian Biotechnical Faculty (BF), when introducing itself, gives the impression that the highly envisioned mutual collaboration of education, research and industry in a knowledge society is the inherent duty of the education institution *per se*:

The fundamental mission ... is to perform university, higher education, professional and postgraduate education, scientific-research and expert and consulting work in the field of science about living nature ... as well as agriculture, forestry and fishery ... and the related production technologies (UL 2013).

Discussing this relation in their everyday working career, faculty staff explain that they are ‘mostly bogged down in teaching,’ even though they are simultaneously expected to conduct research and to be engaged in several activities related to knowledge transfer, in the forms of consulting and teaching various consumers of their expertise. Truthfully, the ideal formula should read: ‘In each case, a concerned educator integrates the research (scientific) findings of their work in the teaching process and transfers them through their applied activities (consulting and teaching) to agricultural practice.’ Or to illustrate with the words of I6⁸ from the BF:

As a full professor, I do believe that teaching is of prime importance. But as university teachers, we cannot be good pedagogues if we don’t do research, if we don’t work very hard on knowledge transfer, on expertise. I always make an effort to balance all three fields, even at the expense of my personal and leisure time.

The promotion of a university teacher’s academic career, however, is not in harmony with this formula. Especially in the previous decade, the faculty staff has learnt that their endeavours related to the knowledge transfer to agricultural practice is becoming undervalued in newly defined science excellence in the national rules for financing research. Moreover, their efforts to turn their research results over to farm advisers are severely curtailed. Therefore, the farmers in general are deprived of valuable professional advice in their everyday practices.

Discussing the desired triangle of intertwined pedagogical, scientific, and practical-applied work (expertise) in biotechnical sciences to determine the most important field of activity for one’s career promotion at the faculty, the educators commonly agree that the engagement in scientific-research projects is of prime importance. Their musings can be summarised by the observation of I1 from the BF:

Basic research is a precondition for any kind of promotion. What counts the most are original scientific articles published in prominent international scientific journals with high impact factors. The rest is of secondary importance without any serious consideration or value. Unfortunately, the same goes for teaching. As a professor, you are successful only if you are a relentless producer of scientific articles.

The fact that scientific work ‘decisively opens a door for any kind of promotion’ at the faculty is ascribed by a majority of collocutors to the criteria for appointment to the positions of university teachers and researchers, which in their opinion favour research as a prime activity and not teaching. Moreover, there is a special loop: the criteria for teachers’ promotion are intertwined with the criteria for scientific excellence, which are defined and continuously upgraded by the national Research Agency in its pursuit of a knowledge society. Teachers employed at the faculty believe that their work is subject to a triple burden: the same person has to meet the expectations for an industrious pedagogue,

⁸ Interviewees’ names are replaced by I1, I2, I3, etc.

a transferor of knowledge to practice and an excellent scientist. Or in the words of I6 from the BF:

When the faculty opened itself to the international scientific community, and international publishing became important, direct knowledge transfer to practice began to lose its significance. Before, up to the 1980s, professors literally introduced knowledge in agriculture, designing entire systems of production and technology. Huge and almost revolutionary shifts in farming followed. Now, the faculty should strive for a combination of various profiles from excellent professors, scientists and carriers of knowledge to practice. The same person cannot be simultaneously a top-level scientist and a carrier of knowledge to practice.

Now, even the calls for targeted and applied research projects are valued by the same criteria of science excellence as the basic research projects. Previously, the applicants' expertise sufficed. In the teachers' view, research priorities are gradually being defined by 'excellent producers of high science' and not by 'demands identified on the ground' as they used to be. Therefore, the faculties and research institutes do not respond to the difficulties "on the ground" in time.

The knowledge transfer to agricultural practice or the science-practice relationship is becoming a matter of rare individuals who still insist on transmission of know-how to wider publics. They organise public events (seminars, workshops, demonstrations of experiments), public lectures and courses, and disseminate their research findings in "less academic forms"⁹ to numerous and heterogeneous consumers of their knowledge. An all-inclusive list of their targeted groups primarily includes farmers and extension services. They believe that their knowledge is directly applicable to agricultural practice, particularly through the still performed personal consultations to interested farmers. Illustrative is I13 from the Faculty of Agriculture and Life Sciences:

This year I am occupied with establishing a new quality scheme for labelling food products fed without genetically modified fodder. For an interested diary from Celje, we have organised lectures in twelve locations all over the country. In two weeks, 1,200 farmers attended the lectures and some 100 employees from the diary arrived as well. Farmers are expected to change their fodder to increase the quality of milk and purchasing price. But this direct transfer of our knowledge is not evidenced, let alone evaluated, in the SICRIS.¹⁰ We used to work a lot with industry, advisers and farmers. Now, we are fighting just for citations.

⁹ 'Less academic forms' include various popularised outputs like 'professional papers', media presentations on agricultural issues in Slovenia (radio broadcasting, TV series, several newspapers and journals for farmers), round tables for wider publics, etc.

¹⁰ SICRIS is an acronym for the Slovenian Current Research Information System, i.e. the basis for quantitative evaluation of research excellence.

There are very few interested farmers who get in contact directly with the faculty seeking to obtain the relevant knowledge or information. They represent a bond between the faculty and the extension service, which together organise demonstrations or experiments in their fields, inviting other interested farmers to participate.

However, in the previous decade, faculty-extension service collaboration became increasing fragile. It seems that only the mandatory quota of hours spent for permanent education is keeping this formal collaboration alive, albeit conditionally, depending on whether the advisers estimate that the suggested research topics are pertinent to their fields of interests. Faculty staff attributes the reason for such weak collaboration to undefined priorities for research in agriculture at the state level. Therefore, the scientific interests of excellent researchers prevail irrespective of the ‘needs from the ground’ identified by the extension service. However, educators from the faculty see the advisers as becoming overloaded by filling in demanding application forms for farmers on account of their consultancy on the field. They all agree that this relation should be strengthened in the future in order to perform ‘more efficient know-how’ in agriculture.

The same applies for the science-industry relationship. Rare are those who, like I3 from the BF, maintain collaborative partnerships with gastroenterologists and pharmacists to research and develop nutritional supplements and similar products. The majority believe that industry in Slovenia has no need for genuine research or development, but only that which is necessary to resolve its current difficulties. In the context of economic recession, research and development are to be “insecure” and cannot promise success or profit overnight.

Insisting upon the interwoven trinity of teaching-research-knowledge transfer to practice, faculty educators offer some responses to the existing situation. To avoid simplistic thinking that science excellence automatically reflects creative knowledge transfer, the majority suggest reevaluation of various forms of knowledge transfer as an inevitable dimension of science and research. Some of them advocate inter-institutional networks of knowledge providers and their consumers to jointly coordinate knowledge transfer. Other teachers favour extension services independent from the political influence of the Chamber of Agriculture and Forestry¹¹ in order to ease collaboration with research institutes, faculties and other actors in the knowledge transfer system. The last group of educators believe that well-organised knowledge transfer should link all the actors in the system, including those from the food-processing industry and the farmers themselves.

Thus far, however, the majority of university teachers and researchers are increasingly adopting the current working strategy which reads: The more efficient you are as a scientist, the less concerned you are with the knowledge transfer to practice.

¹¹ In 1992, a year after Slovenia proclaimed its independence (1991), the farm advisory service was organised as a public administration within the then Ministry for Agriculture. Some years earlier, the advisers gradually moved from the cooperatives to regional agriculture institutes to be available to all farmers, not just to members of cooperatives (Erhart 2014). The national Chamber of Agriculture and Forestry (CAF) was established in 2000 as an NGO and the formal representative of all farmers’ interests; their membership was mandatory. In the same year, regional institutes, together with the advisers, became part of the CAF (Frelj Larsen 2005).

Education in a real environment

An entirely opposite story may be extracted from the interviews with the principals of the secondary schools for agriculture. In 2004, eleven Slovenian biotechnical schools with programmes for agriculture, forestry, veterinary medicine, food science and horticulture associated within the Consortium of Biotechnology Schools to cooperate over a long-term period in educational, professional and developmental fields of farming and food. Thus far, the results of this cooperation are evident in three joint projects that significantly reorganised the teaching process towards more community embedded education of biotechnology.

With the first project, Biotechnical Areas, the Most Effective Learning Environment (2004–2008), schools significantly renewed their obsolete teaching methods with clear-cut and fixed boundaries between theory and practice. A new profile of a teacher, the “teacher-inventor” was designed to synthesise theoretical teaching with its implementation in practice. This fusion required widespread connections between schools and local actors, from regional agricultural advisory services and local tourist and cultural organisations, to local companies, which gradually evolved into the idea of multifunctional centres. The principal from the first selected secondary school for agriculture explained his motives for such an effort:

Such a centre would revive this rural space, which is becoming more and more emptied. The youth is still leaving this area. In this centre, education is meant to interweave the needs of the environment, farming services, tourist industry and cultural organisations to bond and revitalise the rural space, to create new opportunities for various activities, and to encourage the youth to stay at home (Principal 1).

The union of theory and practice to integrate a community was not a novelty for the second selected school. The idea has been introduced in teaching programmes in the 1990s, but it was realised only within the same project on the learning environment:

Farming does not include only knowledge of growing, producing and breeding, but also processing, trading, tourism and recreation. In 2007, our school joined the School for Catering and Tourism and the centre with five units¹² was founded. Practical training for our students is provided in the modern Culinary House, where rooms for the students’ shop are located. Now, teachers easily demonstrate how theory and practice are intertwined (Principal 2).

For the evaluation of education in a real environment, teachers use a particular methodology that was created during the second project, entitled Identifying and Providing Biotech Network Quality Schools in Slovenia (2006–2007). Since then, all participants of education have regularly analysed the accomplished aims, obstacles for their achievement and offer proposals for their improvement to advance the teaching process or to find new teaching environments.

¹² Those five units include the School of Agricultural Biotechnology and Plant High School, the College of Hospitality and Tourism, the Vocational College, the Student Dormitory and the Business Educational Centre.

If the first project of the Consortium consolidated a new profile of a teacher, the ensuing project Biotechnology, the School of Life and Development (2008–2012) has established circumstances for networking of various actors towards sustainable education in a community. This was achieved by the introduction of an “open curriculum”, “personal learning paths” and a “record of learning outcomes”. In collaboration with the local partners, the schools have autonomously defined the content of the open curriculum to enable students to acquire additional vocational qualifications for easier employment in a local setting; local partners regularly participate in the teaching process.

The introduction of an open curriculum also enables easier planning of personal learning paths to empower young people to stay on their farms. At first, students are asked to fill out a questionnaire about their farm’s characteristics. Then they are invited, together with their parents, to discuss with the teaching staff at school the opportunities for their farm’s development. Finally, they all together determine a plan of mandatory and elective courses in line with the envisioned farm improvement. This approach is further upgraded by the establishment and management of a record of learning outcomes of each student during their education. This record is evidence of a student’s obtained formal and informal knowledge and their professional competences, necessary information about a student’s further educational career or in the process of certification of their vocational qualifications.

“Learning in a real environment” is also meant for other people in the community. The principal of the third selected secondary school explains that the school provides education also for adults interested in biotechnological issues either formally, in the framework of the department for adult education, or informally, through the changing repertoire of current issues related to agriculture. In this work, the school cooperates with other units from the Biotechnical Centre and the local enterprises. Such was a joint project with the local power station about the installation of a solar power plant on stables. The project results were transferred through formal and informal courses to the students and interested adults:

Specific courses for interested adults, such as the safe operation of tractors and tractor attachments for taking the tractor exam, are traditionally offered. Evidence shows 2,000 participants per year. Recently, the number of participants has increased mostly due to new traffic legislation. More than 1,000 participants regularly visit testing of sprayers in the field. Adults show a lot of interest also for the application of plant protection products, gardening, wine-growing, livestock, landscaping and horticulture. There is also some interest in shorter courses, such as a course for pruning fruit trees, a demonstration of a milking robot and a robot pricking-out. Well, there is always a community interest for particular and new informal learning (Principal 3).

Finally, such efforts for higher quality in agricultural education, particularly in collaboration with community actors, contribute to an enhanced reputation of the farming profession. Searching for self-employment and business opportunities through individual career paths and plans, the open curriculum, and practical and informal education for adults in a community in collaboration with the local actors surpasses the usual practice of lip-service on maintaining the important farming profession and its reputation. The

principals do believe that joint projects with partners on the local and state level contribute to mutual learning about the importance of nature and rural space preservation, protecting the environment and healthy food. Innovative education for the youth, adults, and even the elderly of a community is the best promotion and example for motivating young farmers to stay on their farms and continue with farming. Beyond mere rhetoric, this is proved by the increased number of enrolled students from rural areas in secondary schools of agriculture.

Concluding remarks

The importance of higher education is clearly recognised in the notion of the knowledge-based society. In this vision, “modernised” universities and research institutes should find easier paths towards the users and consumers of their knowledge, and respond quickly to societal problems. It seems that the envisioned routes of science-society penetration are hindered by unanticipated “hitches” in imagining such a society. Ambitious goals notwithstanding, evidence implies that academics still remain bound in their “ivory towers” despite their efforts to collaborate with non-academics in building networks in a system of knowledge transfer to practice.

Academics in Slovenia experience similar difficulties practicing knowledge transfer as foreseen in a knowledge-based society. Paradoxically, their daily efforts to establish mutual and permanent engagement with various actors outside academia, set as an ideal of science-economy collaboration, are not sustained by existing standards of science excellence that, puzzlingly enough, are to contribute to a more qualitative academic-non-academic relationship. Knowledge transfer to agriculture is a salient case. Knowledge providers from academic institutions experience this dilemma daily seeking to fulfil the imposed expectations of being excellent educators, researchers and transferors of their knowledge to agricultural practice. Doing so, they find themselves caught in a vice of disharmonised mechanisms aiming at both making them well-aware of the issues on the ground to adapt their teaching and researching, and rendering them trustworthy scientists, well-equipped to face societal challenges. Narratives of the educators employed at the faculty offer some answers to such an entangled position, pointing primarily to remaking the extant criteria for science excellence. They believe that academics may enter into efficient networking with non-academic actors in the knowledge-transfer system only if such activities are recognised as valuable in science excellence assessments. To date, predominantly scientific production in the form of publishing in prominent academic publications has prevailed over other forms of knowledge production. It seems that such standards contribute rather to self-contained faculties than to open faculties, subject to and responsive to the real environment.

Secondary education shows a contrasting picture. Their educators are not expected to produce outputs under the scrutiny of demanding standards of science excellence. A recent curriculum reform, designed to fuse theory with practice to consolidate a teacher-inventor, seems an appropriate step towards the desired networking with various actors in the wider community. Local industry, farm advisers, students and others interested in consuming biotechnical knowledge, long-learning, and obtaining necessary certificates, are offered ways and infrastructure for prospective collaboration. Retaining young people in a community and stimulating farming continuity seems like a less illusionary endeavour if mechanisms for its implementation are reflected within a real environment.

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Povzetek

Prizadevanje za tekmovalno ‘družbo znanja’ v Sloveniji uveljavlja novo poslanstvo akademskih institucij v prenosu znanja v prakso. Od teh institucij se pričakuje, da povežejo temeljno in aplikativno raziskovanje v hiter prenos akademskih rezultatov do uporabnikov njihovega znanja, kar bi prispevalo k ekonomskemu razvoju. Taka vizija je implicitno vpeta tudi v zamišljanje prenosa znanja v kmetijsko prakso. Slovenska strategija kmetijskega razvoja prepoznava znanje in njegov prenos v prakso celo kot temeljno gibalno za povečanje produktivnosti dela in tekmovalnosti kmečkih gospodarstev. Vendar so akademske institucije, sorazmerno dobro oblikovane mreže formalnega in neformalnega izobraževanja, bistveno zmanjšale prenos svojega znanja v kmetijsko prakso. Kaj pogojuje tako okrnjen prenos znanja, je temeljno raziskovalno vprašanje ciljno-raziskovalnega projekta z naslovom Izzivi in potrebe v prenosu znanja v kmetijsko prakso v Sloveniji. Pričujoči prispevek se omejuje na delovanje prenosa znanja v prakso, kot ga razumejo snovalci znanja na fakultetah in srednjih šolah. Rezultati kažejo, da izobraževalne institucije, kljub svoji temeljni nalogi – prenosu znanja v prakso – kažejo podobo dveh izrazitih praks: vase-zaprtega sistema fakultetnega izobraževanja in konzorcij odprtega izobraževanja srednjih kmetijskih šol. Medtem ko fakultete vedno bolj privzemajo delovno strategijo, “bolj ko si učinkovit kot raziskovalec, manj se ukvarjaš s prenosom znanja v prakso,” srednje kmetijske šole sodelujejo v skupnih projektih, ki pospešujejo in izboljšujejo prenos znanja v ‘resnično okolje’.

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