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CHALLENGES FOR THE FLEMISH AGRICULTURAL RESEARCH INSTITUTES TO SUPPORT AN INNOVATIVE AND COMPETITIVE AGRICULTURAL SECTOR

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Abstract

Agriculture is faced by permanent evolution and it is expected that this trend will continue in the next decennium. The question is what challenges lie ahead and which types of agricultural research can support the sector in order to retain its competitive power by the year 2020. To address this issue, a multi-stakeholder and multi-disciplinary process was initiated in Flanders. The process outcomes learn that two types of action are needed. Firstly, there is need for a focused knowledge production in 5 thematic fields. Central issues hereby are an efficient agriculture, the broadening of the value creation model of agriculture and the increasing sustainability of production. Secondly, efforts should be made to improve the organisation of research with emphasis on participation, anticipation, meta-coordination and validation of research outcomes.

Key words: Research organisation, knowledge networks, innovation

Introduction

Agriculture nowadays faces a rapidly growing demand for biomass in many different forms. This not only concerns food and feed, but the demand for bio-fuels, diverse materials, health-promoting substances and recreations is also increasing. At the same time, the sector is confronted with a shrinking natural resource base and the existence of numerous interactions between human and natural processes into account (EFFP, 2005; OECD-FAO, 2008; SCAR, 2007; UK Government Cabinet Office, 2008; Van Braun, 2007).

Although this context is extremely challenging for farmers, both in Flanders and abroad, it also provides immense opportunities. The agricultural sector must guarantee and increase both the natural and the social capital which are entrusted to her and search for synergies with e.g. the chemical and pharmaceutical industries, the retail sector and environmental actors. It should not only focus on Flanders, but strive for embeddedness within an international framework.

Agricultural research can support the sector in meeting these objectives through the optimization of the existing production processes and by supporting the search for new and innovative applications for agricultural products and processes. A vigorous and focused knowledge production will thereby have to anticipate to the future demand for new technologies, policy instruments, and forms of cooperation. The

Platform for Agriculture Research acknowledged these challenges and started in 2007 a process to identify the long-term priorities for Flemish agricultural research.

This paper focuses on the outcomes of this process and describes the challenges for research institutes to develop knowledge and techniques that support the agricultural sector to maintain its competitive position in the next decade. The second section starts with a short discussion of the process of priority-setting. Section 3 gives an overview of the main fields in which additional knowledge is necessary. But only putting forward priorities will not create dynamics, efforts should also be made to guarantee that the required knowledge is produced and that the research is efficiently organised. Starting from the present situation, section 4 explores which actions can or should be taken in order to come to a solid research organisation that is capable of supporting a competitive and innovative agricultural sector. The concluding remarks of the paper are formulated in the fifth and final section.

Setting long-term priorities to support an innovative and competitive agricultural sector

Foresight and priority setting are hot topics and several dedicated processes have been initiated. The German FUTUR project (Cuhls & Georghiou, 2004; Smits & Kuhlmann, 2004), the SCAR exercises (SCAR, 2007; 2009), the Rural Futures Project of DEFRA (Future Foundation, 2005) and the efforts by IAASTD (2008) are only a few examples. In Flanders, a consultative approach was adopted to set the priorities for agricultural research.

The process (see Figure 1) consisted of five consecutive phases and started with the consultation of ca. 40 national and foreign experts on their long term expectations for the global agricultural sector. Central element in the outcomes is that agriculture is an activity at a crossroad of natural processes and human systems, and the sector is, as a consequence, liable to a very broad and complex network of influencing factors. Firstly, there is a rising demand for food products, which is (for several reasons) not followed by the supply of agricultural products. A second element is the depletion of fossil fuels, which leads to the need to rethink the energy infrastructure and to reflect on the possibilities and restrictions of agriculture as a supplier of bio-energy crops. The need to improve the balance between human activities and the ecological needs, the climate and the restricted natural resources is a third factor that will influence the future developments of agriculture. Next, there is the restricted availability of arable land and the rising pressure from other functions in the countryside. Fifth factor is the globalisation of commercial flows, which connects prices with the world market, but also leads to higher price volatility and finally, there are the possibilities of new technologies (provided that a social consensus can be found).

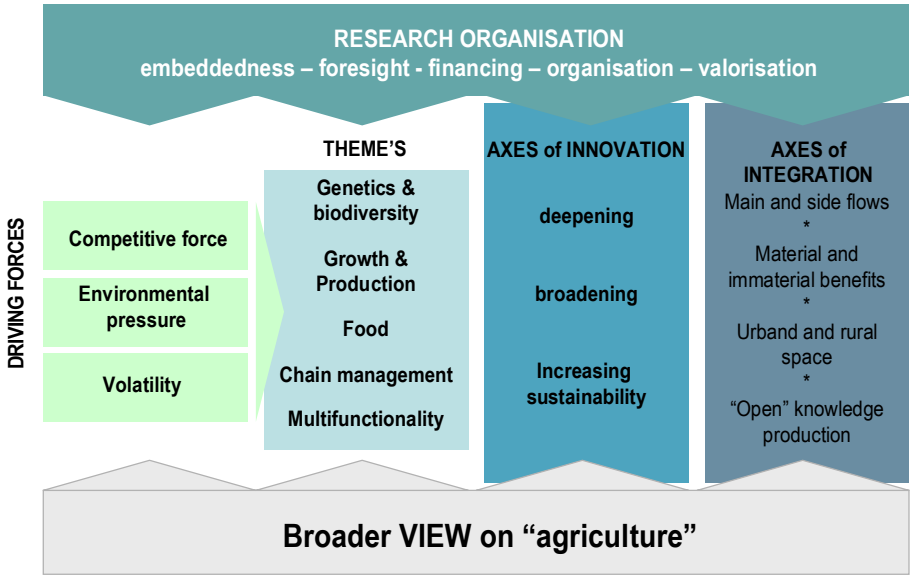

Figure 1 - Overview of the process outcomes

Based on these priorities, three future needs, from which society expects that they are addressed by agriculture, could be identified: (i) the need for a knowledge production which enables the raise of productivity and cost-effectiveness of agricultural production, (ii) the need for a knowledge production which helps agriculture to raise the social appreciation and to reduce the impact of negative externalities which are linked to its activities, and (iii) the need for an anticipative (foresight) capacity that allows to align research activities with unexpected developments in the matrix of external factors.

In the next phase, a group discussion with the members of the Platform of Agricultural Research learned that advancements are needed in five research fields to address these societal needs: (i) genetics and biodiversity, (ii) optimization of growth and production factors, (iii) enforcing supply chains, (iv) improving quality and the societal role of agricultural food products and finally, (v) multifunctional agriculture. The discussion furthermore revealed that it is also necessary to question the research organisation. Each of these topics was further developed by a working group consisting of wide array of scientists and other stakeholders. Based upon the researchers' expertise and taking into account the information gathered during the first phase of the process, these working groups identified research questions that need to be addressed in the future. These research questions were then prioritized according to their sense of urgency, the relevance for the Flemish situation, the existence of a sufficient knowledge base and the possibilities for validation. Only those questions that received sufficiently high scores were sustained and these were consequently grouped into a "White Paper on Agricultural Research".

Focused knowledge production

As was mentioned in the previous section, the process learned that there is a need to focus the Flemish knowledge production in five fields and around selected research questions. Each of these fields is shortly addressed in the next paragraphs.

Genetics and biodiversity

Research that aims to increase the sustainability of production and products not only requires an improved understanding of the development of plants and animals, but also from the role of genetic factors and environmental conditions. Research should therefore develop the correct techniques, methods and strategies. Given the importance of genetic heritage, it will also be crucial to maintain and use the existing biodiversity.

Additionally, new techniques are necessary to cope, in a sustainable way, with threats that may influence the quality and the quantity of the production. This concerns not only new substances to protect the plant and animal production, but scientist should simultaneously develop new strategies.

It is furthermore necessary to continuously strive for added value and broadening of the market. This can for example be realised through the improvement of local niche species or races and the development of new crops.

Optimisation of growth and production factors

Research should help to improve the productivity and output of the plant and animal production. Knowledge of the intrinsic potential of the different processes is of vital importance and can contribute to the development of new technologies that optimally exploit the potential.

Given the evolving consumer demand, there are also possibilities for new products, diversified production and the processing of primary raw materials into energy. Sustainability of new and existing production processes, described by clear criteria, must be the guiding principle. Important issues in this field are more eco-efficient production processes and waste reduction in supply chains.

Finally, the efficiency of individual farms must be raised through the optimal use of production factors and support for company-specific management decisions.

Chain management

To valorise products maximally, demand-driven supply chains, which innovate in response to social, technological and environmental developments, must be developed. Research must also contribute to the (safe) valorisation of secondary and waste streams and support farmers' value creation efforts through a performing chain organisation.

To reinforce the chain position of the primary producers, new mechanisms should be developed to distribute value and risk over all chain actors and to improve both horizontal and vertical cooperation. To support Flemish farmers that opt for an export strategy, it is important to have a good knowledge on their relative strengths and weaknesses and on the impact on the entire chain to do so successfully.

Quality of agricultural products and the societal role of food

Product quality, food safety and consumer perception are central issues in the optimisation of food production. The development of quality standards, performing quality and control systems, criteria to monitor the sustainability of production and consumer research are essential.

There are also possibilities to extend the market through the exploitation of the intrinsic heterogeneity of agricultural products and the creation of added value for region-own products. Agriculture can furthermore provide raw materials for the agro-food industry and other sectors.

Sustainability criteria must be used to communicate with consumers and other stakeholders on food, diet, sustainable food production and the social importance of the agro-food production chain. By doing so, consumers receive arguments for a more justified food choice and a safer use of food.

Multifunctional agriculture

Next to the traditional products, multifunctional farmers also produce outputs which are requested but often not remunerated by society. At present, the farmer's efforts are almost exclusively valorised by the government. New instruments must be developed that help to recognize the non-commodity outputs of agriculture and to measure their value.

It is however not enough to validate these non-commodity outputs, but efforts must also be made to increase this output through the convergence of functions. This not only concerns the optimization of existing function combinations, but new combinations should also be established. Other important topics are the enhancement of the synergy between urban and rural areas and the optimal use of the available area by means of integrated production models.

Although these five research fields differ largely, there are also important similarities. Agricultural research should namely realize developments in three main innovation areas: (i) the deepening of the existing processes and competences in order realize an efficient production system, (ii) the broadening of the value creation model of agriculture and (iii) an amelioration of the sustainability of production.

Implications for the organisation of the research activities

Throughout the discussions, it became clear that the outlines of a new, integrative agriculture paradigm are emerging (Figure 2). Traditional contrasts – like the opposition between main and secondary flows, urban and rural space and commodity and non-commodity goods – will be transcended into a new holistic concept that considers agriculture as the integral value creation on the basis of natural resources. The rise of concepts such as bio-based economy, multifunctional agriculture and metropolitan agriculture already announce this transformation.

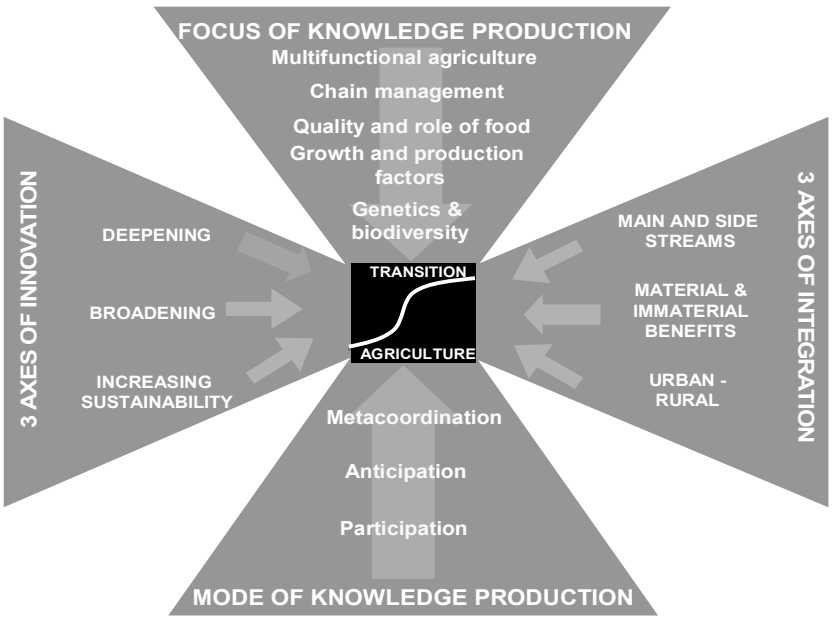

Figure 2 - Elements influencing the transition towards a new agricultural paradigm

The transformation can however not be realised through substantive work only, but should also be impregnated in the organisation of research and knowledge production. Four challenges should thereby be addressed: (i) to realize a higher degree of participation through cooperation with institutions, companies and related fields, (ii) to make research more anticipative so that it proactively searches for new opportunities or the prevention of possible risks, (iii) the creation of a body that provides meta-coordination on financing, cooperation and competences and (iv) the development of new strategies to valorise research results. Each of these challenges is now shortly discussed in the next paragraphs.

Participative research as a starting point for innovation

A first challenge for research is to embed itself in the user community by establishing cooperation with other institutions, fields and businesses. Research can in this way evolve towards a more open process of knowledge production, including a demand-driven component and active involvement of beneficiaries.

The new paradigm will moreover lead to unprecedented, fundamental questions concerning the use of technologies (such as genetic modification or nanotechnology), the role of agriculture in climate change and adaptation and the ways in which commodity and non-commodity outputs can be validated. Interaction between researchers, sector and society in general will be essential to address these issues.

Finally, research must also anticipate to the emergence of opportunities or threats and start a proactive process of knowledge production. The evolution towards knowledge networks, with special attention for agricultural and food companies will be a basic condition. The dividend that results from an improved embeddedness is plural: gains in efficiency and effectiveness of the research, better validation of the results and creation of a basis for co-financing by the sector. Permanent efforts should thus be made to support the positive return in research dynamics.

Putting forward priorities and development of a foresight capacity

Flemish research traditionally had a bottom-up approach: individual scientists set the topic, the objectives and the methods of their research. Although this approach has lead to an excellent knowledge basis, it is commonly adopted that evolution towards a knowledge economy requires focus so that the involved researchers can distinguish themselves and become (or remain) world players (Debackere, 2008; Goorden, 2005). Specific for agricultural research, the fields discussed earlier can serve as a starting point. Within each of these topics, research must aim to deepen the existing competencies in intensive and efficient agriculture, to broaden the value creation model and to make production more sustainable.

At the same time, a foresight body should be started to proactively coordinate research in function of emerging opportunisms and threats. Not only researchers should be involved in this foresight process, but all relevant actors and organisations and in extension the entire society.

Towards a meta-coordination of financing, competences and organisation

A third challenge to realize the transformation of the agricultural sector concerns the organization of research. There is need to improve the collaboration between researchers and the sector, to maintain competences and to improve funding. Each of these issues is addressed in the next paragraphs.

Financing

Although Flanders scores relatively well on the Lisbon targets for the funding of agricultural research, there is still room for improvement. A large part of the funding is namely provided by the government, there is a fragmentation of research resources and it is hard to find funding for new approaches.

The fragmentation of research resources leads to important efficiency losses and a defective valorisation of the results. The development of an overarching research strategy that includes all financing canals and the entire research chain could be a valuable strategy. This strategy should simultaneously aim for a better harmonisation with the European and international research frameworks.

Another issue is the fact that it is nowadays very difficult to find funding for innovative research trajectories. This is in contrast with the need for new research strategies (such as long term, trans- and multidisciplinary, explorative, risky and conceptual research) required in a context of evolving paradigms and high demand for creative solutions.

Competences

A dynamic agricultural research sector largely relies on the competences and skills of the involved researchers. Most of the research institutions however work with a small permanent staff because of the restricted basic financing. This lack of critical mass makes it difficult to preserve and deepen the competences that have been built. The creation of competence pools that offer the necessary flexibility for experts to commute between research institutes can provide new opportunities to build a strong network of experts.

Organisation of research

In the past, there were already some actions to promote cooperation between research institutions, but additional efforts are needed. Collaboration should be encouraged through the creation of the correct conditions and by means of policy and financing. Research groups that go beyond the competitive, thematic logic of research can then for example be rewarded. This could also open possibilities to pool costly infrastructure and to stimulate multidisciplinary cooperation between Flemish complementary research teams and for the creation of consortia with Walloon and foreign research teams. The interaction and knowledge exchange between different research types (fundamental, applied, etc.) and application at practice level can moreover be promoted by the research in research chains and networks.

To realise these challenges and provide meta-coordination for the entire agricultural research sector, a new body should be created. It should search for synergies over the financing canals and research topics in order to achieve a maximum effectiveness of the deployed resources and expertise. This should preferable be realised through the installation of a forum in which both research institutions and financing institutions are represented.

Valorisation of research results

In recent years, a dichotomy has grown between knowledge production in open and closed knowledge bases. An increasing amount of private funding is often accompanied by a rising pressure to establish closed knowledge bases. This evolution however hampers the broader distribution of the obtained knowledge. As a consequence, the question arises to keep - especially - basic research as much as possible in open, rather accessible knowledge bases. Research characterized by an open knowledge base is on the other hand vulnerable to the leaking of intellectual capital. As a consequence, the researchers are often not appreciated for their work. Efforts should thus be made to design of a fair regime of intellectual property rights, with attention for both the interests of the knowledge users and producers.

Conclusions

Agriculture is faced by continuous evolution, leading to an increasing competitive pressure, an increasing pressure to take the environment and climate into account and an increasing volatility of the market environment (which causes higher uncertainty for the farmers). Within this framework, this paper discussed the outcomes of a consultative process and investigated how agricultural research can contribute to the enforcement of the competitive power of the Flemish agricultural sector in 2020. The outcomes learn that action is needed on two fronts: the focus of knowledge production and the organisation of research.

There is a need for a focused knowledge production and five priority fields were identified for Flemish agricultural research: (i) genetics and biodiversity, aimed at an optimal exploitation of the genetic potential of plants, animals and micro-organisms and of biodiversity, (ii) optimisation of growth factors (plant, animals and soil processes) and production factors (such as capital, labour, knowledge and land), (iii) increasing performance and robustness of agro-food chains, (iv) raising the quality of agricultural products and valuation of the social role of food, and (v) broadening the value creation model of agriculture by developing a multifunctional agriculture. Within each of these fields, research should aim (i) to deepen the existing processes and competences in order realize an efficient production system, (ii) to broaden the model of value creation of agriculture and (iii) to contribute towards a more sustainable production.

As a second element, the organisation of research should be reconsidered so that four challenges can be addressed. A first element is an increased participation of relevant actors and organisations so that research networks can be established. Secondly, the research must be able to anticipate and to proactively address the occurring challenges and opportunities. A third element is the creation of a new body that provides meta-coordination on issues like financing, cooperation and

competences and finally, new strategies should be developed to valorise research results and to transcend the duality between open and closed knowledge bases.

These findings were summarized in a White Paper on Agricultural Research, but this doesn't guarantee that the (theoretical) findings are implemented in the field. Continuous efforts should be made, by the researchers, the government and the agricultural sector, to tackle the issues. The first efforts have now been made. The Platform for Agricultural Research has agreed to take the White Paper as a lead in the design of its future activities and the largest Flemish farmers' organisation agreed to invest an additional 3 million Euro in applied research activities (VILT, 2009).

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