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Anticipating the Future: Scenarios for Resilient Institutions in Agricultural Research and Innovation

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ABSTRACT

Over the last 20 years several countries have made changes in their Agricultural Knowledge and Innovation Systems (AKIS): institutes for applied research have been put on output-finance with reduced budgets or have been merged into larger structures (Finland, Italy), sometimes into universities (NL, Dk). Incentives to publish have been strengthened in universities. Private advise is now available all over Europe and competes with public extension. How will or should this develop in the future? The SCAR strategic working group AKIS did a foresight study and identified three scenario's for AKIS: High Tech, Self-Organisation and Collapse. Recommendations are made to make AKIS more robust.

Introduction[1]

To cope with the wide range of complex and interlinked challenges facing agriculture, the Standing Committee on Agricultural Research (SCAR) regularly carries out foresight exercises. The latest Foresight addresses a critical issue with broad implications entitled: "Sustainable Agriculture, Forestry and Fisheries in the Bio-economy – a Challenge for Europe".

The SCAR strategic working group on Agricultural Knowledge and Innovation Systems (AKIS) carried out a foresight on how AKIS might develop towards 2030. The aim is to provide insight into how policy makers can anticipate on future needs regarding the agricultural sector, food demand and supply. In particular, it is about how knowledge and innovation can contribute to cope with challenges in agriculture.

Through its long term focus, foresight is and has been a tool for public research planning and public policy building. Scenarios represent possible future circumstances that are not (easily) influenced by decision makers, like climate change, immigration, ICT, food technology and patterns and the future of the EU.

Scenarios for agriculture and food

In the study about 60 drivers of change in different areas (environment, geo-politics, technology etc.) have been classified on relevance and potential impact by about 120 experts in the SCAR-AKIS community. These scorings have been used in an interactive 2-day setting with about 25 experts to derive 3 scenarios: High Tech, Self-Organisation and Collapse:

[1] A large part of this text has been taken from the SCAR-AKIS report (2015) to which the authors contributed a chapter. We thank the SCAR strategic working AKIS for their involvement and collaboration in this foresight exercise.

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- **HighTech:** strong influence new technology owned by multinationals. Driverless tractors, contract farming and a rural exodus. US of Europe. Rich society with inequality. Sustainability issues solved. Bio-boom scenario.

- **Self-organisation:** Europe of regions where new ICT technologies with disruptive business models lead to self-organisation, bottom-up democracy, short-supply chains, multi-functional agriculture. European institutions are weak, regions and cities rule. Inequalities between regions, depending on endowments.

- **Collapse:** Big climate change effects, mass-migration and political turbulence leads to a collapse of institutions and European integration. Regional and local communities look for self-sufficiency. Bio-scarcity and labour intensive agriculture. Technology development becomes dependent on science in China, India, Brazil.

AKIS in the different scenarios

Scenarios are not created to choose from, but to prepare for the situation that they might come true. Of course the scenarios will never become history in exactly the way they have been described above. But important elements of them (also in other combinations) might become reality faster than some of us would wish or dare to think. Scenarios should be evaluated on the question if they contribute to a strategic conversation: what do we to do now, to make AKIS more robust for these futures, how can we make them future-proof? To support this discussion, Table 1 summarises the way AKIS is organised and governed in the three scenarios.

Table 1: Organisation of AKIS in the three scenarios

Characterisations	**HighTech**	**Self-organisation**	**Collapse**
Economic			
Geographical economic scale	Stronger internationalisation and more specialised orientation.	Stronger regionalism and more general orientation. Community oriented.	Stronger individualism and holistic orientation. Clan oriented.
Financial	Large scale private R&D. Private industry does not compensate reduced public R&D. IPR (intellectual property rights) provides funding.	Mix public-private. Farmers pay for advice and new actors in AKIS. Linked to regional governance. Stress by rapid change "everybody is challenged".	Small scale private R&D, some local awareness building. Increasing urban farming. Individual but increasing community thinking. Often tribal (family/area).
Role of consumer (feedback)	Consumer: indifferent in product choice; "it is all far away anyway" but issue management via NGOs.	Consumer: co-creation and incident oriented "problem-by-problem".	Consumer: food first, no big quality issues. Essentials first (like animal disease research).
Language used	English	Multi-linguistic actors and projects as connectors	Local
Political			
Governance	AKIS centralised and privatised. No independent public funding.	AKIS decentralised and diverse (public-private collaboration).	AKIS fragmented and local (farm/food driven). Very specific and localised AKIS.
Government role and policy	Minor role of government, private multi-national business models dominate. Guerrilla type of resistance ('non-corporate AKIS').	Government active on community level, mixed public-private orientation and regional public finance. Grass-root research and innovation.	More local groups and individuals: fragmentation and "many internets". Rising status and importance of the agricultural sector in policy making.

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Agenda setting	Agenda set by business.	Agenda set by communities.	Agenda set by individuals and donors.
Organisation of food safety	Trust: monitored by large companies. Certifications and global institutions important.	Trust in civil society is high via transparency: "arguments count, not positions".	Trust: about rebuilding institutions. Short distances Government fragments are important and influential.
Technology, knowledge and innovation			
Driver for innovation	International competition.	Regions in both competition and collaboration.	Individuals and small groups searching for new entries and ideas to farming.
Risks in innovation	Risk: Danger of exclusion (closeness) and controlled access. "Access for the few".	Risk: much "muddling through" and sense of "nothing is gonna change". Reduced capacity AKIS.	Risk: outside control of ICT (China). "Local survival of the strongest".
AKIS skills / type of competences	"Up-skilling" through the need for specialised knowledge and skills in international networks and consulting: "network research".	"Multi-skills", efficiency, territorial and value competition. Community representation, "peer consultation".	"Basic-skills", problem oriented towards the basics as food, soil and water.
Basic educational orientation / profession of farmer	Technologists, not land managers.	Land managers, not technologists.	Technology and land management.
Domain of AKIS	AKIS go for non-food (bio-boom).	AKIS go diverse – increasing in numbers.	AKIS go for more community thinking: access to variety. Food only: bio-scarcity.
Internationalisation	Connecting the globe: centralised research; dominance by a few large companies.	Connecting regions, decentralised research.	Connecting people through applied solutions.
Focus of AKIS	Global food chains and flows. Strongly product oriented.	Adaptations in the regional setting (cooperatives). Strongly farm system oriented.	Food composition (nutrition) and usage.
Tools in AKIS	Global tools and benchmarks, economic efficiency and labelling; thematic cross-overs. IPR is important.	Demonstrations and regional network tools, institutional efficiency (best practices).	"Must reach all" interaction; small group learning processes; trial and error.
European research programmes	Large PPP between EC and multinationals dominate (such as in Future Internet PPP and Bio-based PPP). JPI and KIC survive, ERAnets disappear (no national funding).	Very differentiated landscape of AKIS across Europe. Need to link them, but difficult to find good instruments. Role of EU becomes less important. Probably most influential in basic science and in research infrastructures.	Not relevant, as EU is hardly relevant. Concentration on negotiating global deals on acquiring basic knowledge. Recruitment of the best students for the student exchange programme quota for China.
Cross-overs with other industries	Important (see ICT and Bio-based PPP). More beta science than social science. Strong specialisation in disciplines. Technology	Multidisciplinary. Need for (traditional) agricultural research in combination with other disciplines. Technology / beta science is important, in	Urban farming, attention for farming and city development. Health science / research becomes important (new plants / food as medicines).

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	becomes more important than (traditional) agricultural research.	combination with social science.	
Knowledge organisations and actors			
University	Direct contact on research and education programmes with companies. Silicon Valley model. Innovation is part of the mission and business model (patents etc.): third-generation university (teaching, research and innovation). Students from all over the world through MOOCs and TEDx's. Only a few, big Life Science universities in Europe. Campus with research stations.	Many regional universities that collaborate and specialise second-generation universities (both teaching and research).	Struggle to exist and stay relevant due to reduced public funding. Focus on the societal challenges of food security and climate change. Less money for research, focus on teaching. Back to first-generation university (teaching).
Applied research	Moves into (applied) *universities*. Companies find it more attractive to deal with universities. Public support declines.	Moves into applied (higher) *education*. Life-long learning hubs. More intertwined with experimental farms and advisory service.	Relatively important over fundamental research. Gets part of its basic know-how from fundamental research in China and India.
Farm research stations	Public funding ends. Collective funding via levy / commodity boards ends; some are saved by big farms.	Networked in a research infrastructure and on campus with education. Farmer field schools and on farm research.	Cater for the needs of local farmers.
Advisory service	Advice stays but becomes a service provided by multi-national food companies and input industry, and their computer-generated advice. Public extension disappears. Some consultancies with certified independent consultants and coaches (facilitators).	Mix of public extension service and commercial advisory organisations. Linked with applied research and higher education.	Para-professionals act as the traditional extension-worker that gives instruction on low-risk practices. Could be part-time farmers or local problem-solvers like teachers. Extreme big role of donors.
Operational groups / interactive innovation	Less relevant as innovation is more top down driven.	The challenge is to organise multi-knowledge networks that integrate education and training.	Innovative farmers contribute to local innovation.
Education	More scientific. Gap between lower education and academic level. Higher education under threat. Emphasis on in-company training on the John Deere University.	International exchange programs and minor programs are important. Both initial and post-initial training. Focus on lifelong learning.	Higher education for advisors. Focus is on skills and crafts.

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Recommendations

To make the AKIS more robust for the three scenarios, the SCAR strategic working group AKIS identified the following actions that could contribute to more resilience of AKIS at European, national and regional levels:

Research on ICT, and especially its governance is needed as it has a huge influence on which scenarios can be expected**. Cross-overs** between agriculture and themes such as ICT but also other sectors in the bio-economy. **Big Data** is a development that not only will influence agriculture but also science, research and development and innovation processes in AKIS. **Social sciences**, including economics, are an important discipline, not to be neglected in programming research. **Interactive, transdisciplinary innovation** as well as transdisciplinary research and development processes should be strengthened in the AKIS. **Public-private partnerships** in research and innovation for agriculture should be tried out. **Involvement of regional authorities and cities** in research and innovation in agriculture and the food system should also be tried out. **Excellent Research Infrastructures** are relevant in all three scenarios. **International collaboration** with partners from other continents is attractive in several scenarios. A real **European Research Area** is a prerequisite for many of the actions suggested above.

References

EU SCAR (2015), *Agricultural knowledge and innovation systems towards the future – a foresight paper*, Brussels.

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