Innovation and social sciences and humanities in agricultural research

Chapter 8

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In the following chapter, we reflect on relevant and decisive but sometimes neglected aspects concerning the development of agriculture and its societal embedding. Our considerations are connected to many current concerns about modern agriculture and its challenges. They have been directly addressed as such or indirectly covered in many EURAGRI events within a broad field of agrifood and bioeconomy research.

1. Agriculture – challenges for the future?

During the last decade, governments, national and international organisations and institutions have increasingly produced a vast number of surveys, foresight reports and strategies (see reference list for further examples). They have analysed the challenges in order to provide visions of the role agriculture could play in the future – what, how and how much should be produced and where, as well as the conditional requirements of doing so in terms of social and environmental conditions. Continued global population growth, the consequences of climate change, increasing obesity and other food- and health-related lifestyle diseases and the concerns around fossil fuel dependence have added urgency to these questions and voiced demands for change with regard to the way we are managing things.

Governments and organisations funding agricultural sciences have developed programmes to handle the negative externalities of agricultural production systems, including the connected food processing, distribution and marketing systems. National and international legislation (not least in the case of Europe) has gradually been revised to assign greater value to ecosystem services to better balance the widened set of considerations against more conventional agricultural productivity goals.

However, real system changes seem to be too slow compared to the needed tempo of transition. How can this be explained?

Global food demand will continue to rise due to population growth, an expanding middle class in emerging markets and increasing urbanisation. It is generally assumed that ongoing continuing advances in science, technology and innovation will pave the way for new types of profitable but also more sustainable agrifood and bioeconomy industries in the future. Accordingly, considerable public and private investments have long been made in science, technology and innovation. But there is also the lingering question about the direction of the support to handle the broadened set of concerns:, i.e., what should be addressed, how to go about it and what it means for relative priority setting. The use of new technologies (such as satellite imaging, digital sensors, advances in plant genomics and advanced ICT and data analysis), will most certainly pave the way for distinctly more sophisticated farming practices (e.g., water-efficient agriculture). This will result in advances in increased precision in the use of support resources, leading to new processes that are more efficient and more sustainable. Similarly, the food processing systems are already improving. Limit food waste from production to consumption has already been identified as area for development. Marketing systems must handle a range of health and environmental factors that had previously been underestimated. Transparency and better assessments about these factors must be improved

and the legal and administrative systems need to be better adapted to these requirements.

As throughout agricultural history, applying these technologies and other innovations will impact the livelihoods of farmers, their families and their communities. It will have impacts on the connected businesses and industries, as well as on the people working within these agriculturally dominated areas. It will also change the relationships between all sector actors in addition to the connections to their supporting communities. Furthermore, it will affect the use of landscape and rural life, food and food availability, forms of marketing and distribution etc. and will likely change the power relations between the actors. In short, it will influence everybody in some way or another because we all depend on food and its availability, and live in and depend on some kind of landscape.

Implementing new and emerging technologies will produce yet unknown benefits and risks, losers and beneficiaries. Farmers operating larger farms are more likely to have the human and economic resources to adopt these technologies more rapidly, while as small-scale farmers may lack the human and economic capacities to adapt to the new circumstances. Even small semi-local or regional food processing actors can now reach larger markets through smart ICT distribution applications. However, due to new conditions, rural economies could experience 'brain drain' and rural activities could be increasingly run by larger farming units. New types of businesses could emerge creating new interlinkages and jobs. Fertile landscapes could either be used in a more unified way, or new types of management and business ideas that increase diversity could emerge. Less fertile areas might be taken entirely out of agricultural production and being used deliberately in other ways. Some crops will become more resistant against pathogens and/or be made more resilient under varying and changed weather conditions. Some food produce might become more 'technical' and 'heavily' processed. Livestock and dairy production could become more adapted to human physiological and health needs, even better adapted to different phases of customers' lives. The use of animal-based products could widen and become more specialised and focused on transformed product segments. This may mean changes of management styles and operative designs of new types of production units and links to other types of operational units. In this type of situation, sectors other than agriculture might provide the basic material needed for the use within other sectors, thus freeing up land for other uses (this happened with the partial replacement of wool with recycled plastic fibre from plastic bottles; Poore, 2017*).* Many of these potential – or already emerging – changes not only have strong societal consequences in terms of a changed distribution pattern of work, but in terms of societal conditions in general as well, including shifting the balances of gender-related tasks, distribution of economic gains and losses, and changing intergenerational relationships.

Agriculture and culture

Despite the risks and changes that new technologies and innovations are bound to bring to the sector and its connected networks, existing (often long-time) sector stakeholders will have to take on an increased load – which could also be seen as an opportunity – to find creative solutions in the sector and related interfaces. The solutions will need to address large systemic issues of a societal nature in addition to improving production, which always requires innovation. In striving to develop and implement new solutions, i.e., within daily business processes (including efforts to reduce negative externalities), it is often too easy to forget the profoundly culturally oriented aspects – or deeply societal and human side – of agriculture and food production (Barthel *et al.*, 2013).

Farmers are not a homogenous group, neither concerning their ideas on how to run their farms, nor concerning their attitudes towards the general policy frameworks that impact their opportunities in their region and sector. There are small- and large-scale farms, and this decision often depends on

farm location: in a fertile or more marginalised area, in mountainous or plains areas that generally do not have as rich soils as those benefitting from river sediment. The societal history of the region may have an impact. For example, farms could be situated in regions with a long history of 'free, independent farmers' or be in an area where farming has long been linked to earlier periods of rule by landlords. Farms established in Eastern bloc countries after the fall of the Berlin Wall have yet another social and organisational history. A farm's location influences the produce and therefore the economic drivers it is subjected to. There are farmers that regard their farms as merely a business and there are farms that have been in the family for generations. There are highly specialised farms and more diverse ones with a higher distribution of risk in case of failure. There are dynamic farmers who respond to market opportunities and adopt new technologies and others who are more conservative and risk averse. There are farmers who have easier access to capital for investment and others that mainly survive thanks to various forms of subsidies, etc. Last but not least, the beliefs and norms of farmers' social networks, families, neighbours, advisors and other business relations, as well as the local, regional, national and EU political climate as a whole are also factors. All of these actor spheres have influence on farmers' decisions in general, and to varying degrees in issues like choices about sustainable intensification and technology adoption (ADAS Report, 2014; Noe *et al*. 2015).

Until the 1970s, most families in Europe had ties to their own families or friends and acquaintances living in the 'country'. Even if they were living in urban areas they returned for holidays and annual festivities, indulging in the local cuisine and customs, helping them remain a part of the community. People still understood production practices and the underlying economics and dependencies, despite increasing mechanisation and intensification. That has changed. The majority of people living in urban areas have become increasingly alienated from agriculture and food production. This holds also true for the ever more complex, specialised and often multinational food industry and also the policy bodies administering primary production and its social embedding. Neither people living in urban areas nor many in the countryside have a clear, solid understanding of the sector's complexities and dependencies. Visitors see larger and larger fields. They see the machinery operating in these areas and they see the equipment getting bigger and bigger year after year. The same is also true for livestock units managed at a single farm. Consumers hear about plant protection and fertilisation measures threatening water quality and biodiversity. They hear about food scandals in the production chains and the resulting health risks and they are shaken up by the occasional need to destroy huge numbers of livestock or produce quantities when there is a risk of infectious disease or contamination.

However, many people still draw a substantial part of their identity from regional and national cuisine. They have strong emotional connections to taste of the season's first local strawberries or the occasional Sunday roast prepared from a certain breed of beef. Overwhelmingly, people have very different perceptions, knowledge and interests about food and food production (including background understanding about the landscapes where food is produced). These associations and preferences differ greatly and depend on personal connections to local traditions, education level, income levels, age, tradition and where the person is from. Their values concern nature, animals, consumption and the way we should do things and why. These values vary greatly within communities, locally as well as nationally. They may change over time but they have a strong basis and exert substantial influence on the willingness to accept (and even promote) change.

Agriculture – integrated research methods for SSH and science and technology

Research and development in the new and emerging technologies will not be enough on their own. On the contrary, it could backfire if the development process neglects to take those who are directly

or indirectly impacted into consideration. Modern societies, which are highly specialised, complex and often characterised by lack of transparency, demand a substantial degree of trust between their actors to function smoothly. Trust, however, is easily destroyed and can be difficult to restore, as earlier examples of prematurely enforced, non-consolidated actions throughout history have shown.

The social sciences and humanities (SSH) are essential to improve understanding the root causes of our challenges and problems. This means research projects need better integration of SSH approaches with a basis in science and technology at an early stage of the research process. Testing hypotheses and developments, and optimising and fine-tuning specific questions, ideas and techniques must be done for curiosity's sake as well as to test opportunities, potential and options .

Not every research project in science and technology will need to integrate SSH approaches. Each new technology or new application of a known technology will not cause disruption, substantial change and dilemmas. But many of them do, like big data, biotechnology and nanotechnology. Quite often, the combination of new technologies such as 'digitisation of everything' does as well. These dilemmas have many different SSH facets, such as legal, socioeconomic, ethic, structural and political, to name but a few. All of those facets represent different disciplines with different scientific communities with their respective histories, jargons, ways of approaching questions and working with them and publishing their results. These difficulties must also be tackled by finding ways to match the respective contributions to the bigger picture of the challenges. Integration within research programmes is not only an issue for the researchers involved but a concern for research managers, policymakers and stakeholder community representatives as well.

How can these divides be overcome? The answer is neither obvious nor clear-cut and will always depend on the relevant research complex. However, some procedural changes are indispensable:

First, all stakeholders must be willing to get involved despite the differences in approach and research philosophy and traditions, with a clear focus on the aim. This will require all participants to be innovative with regard to their research methods and their willingness to learn and try different approaches. Second, concepts must be revised according to the task at hand. Third, the discipline with the leading role will depend on the task as well. Sometimes the natural science stakeholder will take the leading role; sometimes the problems will require the SSH stakeholder take the lead, such as when certain problems causes can be clearly identified. In other cases, both natural science and SSH stakeholders will need to cooperate from the start to incorporate SSH in the development of technologies from the earliest stages.

Fourth, research funders and administrators must acknowledge the need to integrate SSH in the type of research and development we discussed earlier. It must be acknowledged not only as a general need but with all the implicit consequences: time and money allocated to build up necessary skills, including the development of new methodologies. Publication track records must be reconsidered and funding may have to be rewarded according to new criteria. Funders and administrators also need to be more precise in their research calls. SSH questions are often only implicitly integrated into research programmes, which create an indirect dominance for natural science aspects. If societal adaption and change is the aim, it needs to be explicitly mentioned and programmes have to be drawn up accordingly, with representatives from both research domains included in the process.

Finally, the process will take considerable time. Changing attitudes, approaches, reward systems and structural frameworks will not happen overnight but evolve only over time when social norms, values and traditions of the people involved have had the time to adapt (see Palsson *et al*. 2013 as one suggested approach).

Conclusion

Concerns about the human, cultural, value and custom-based sides of agriculture and food production must be taken into consideration, with efforts made by other knowledge production system stakeholders, including natural science and technology research and case studies. Indeed the social sciences and humanities domains of knowledge creation are the carriers of a considerable part of the knowledge base – and perhaps even a prerequisite – to understand the causes of the new challenges and problems. We must explore the way we tackle and operate things and processes, be it individually, institutionally or structurally. SSH are also vital in the way we can learn how to deal with change, its risks and uncertainties.

However, we need to take this aspect even further. We cannot yet accurately predict the outcome of the joint development of society and the interlinked natural conditions when implementing various promising different technologies. Problems are solved with and without the help of technology. New problems will likely arise, with new implications and new causes. SSH must be regarded – and accepted – as an integral part of the knowledge creation we need to address the challenges we face, for which we have traditionally relied heavily on science and technology research. SSH contributions must not merely be seen as a complementary attachment to, for example, the communication process of disseminating various technical results to a more or less diversified stakeholder community and the decision-making community. SSH have long been a vital and fundamental part of knowledge generation activities. But its relative role should be strengthened, which also highlights the need to take in account SSH considerations at an early stage and with an integrative ambition on equal par with the other components of the knowledge production system and linked to various processes of implementation.

Acknowledgement

Throughout the years of EURAGRI activities (and especially over the last ten years), a considerable number of contributions based on themes as such these have been made to annual conferences, supportive workshops and through informal networking. We are deeply indebted to all of our colleagues, without whose contributions and skills our understanding would have been much more limited. This includes our contacts over years with key decision-makers at many levels who have shed light on policies and how they have addressed the challenges involved.

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