Bio-economy and green growth: Integrating farmers' knowledge for a public goods-oriented approach

Otto Schmid[1], Susanne Padel[2], Les Levidow[3] and Nic Lampkin[2]

[1] FiBL Research Institute of Organic Agriculture, Switzerland. otto.schmid@fibl.org, www.fibl.org
[2] The Organic Research Centre, Newbury, UK. susanne.p@organicresearchcentre.com, www.organicresearchcentre.com
[3] Development Policy and Practice, Open University, Milton Keynes, UK
L.Levidow@open.ac.uk, http://dpp.open.ac.uk

Keywords: bio-economy, green growth public goods, European Union, agroecology, farmers' knowledge, rural development

Introduction

The bio-economy and green growth have been on the international policy agenda for several years. Two main views prevail concerning the 'bio-economy' – an industrial perspective, and the other a public goods perspective – each promoting different futures for agricultural systems and farmers' roles; some address both perspectives.

The OECD (Organisation for Economic Co-operation and Development, www.oecd.org) and multinational companies, promote further industrialisation of agriculture for the new bio-based economy. This means: "transforming life science knowledge into new, sustainable, eco-efficient and competitive products" (OECD, 2008). From this viewpoint "Green growth can be seen as a way to pursue economic growth and development, while preventing environmental degradation, biodiversity loss and unsustainable natural resource use" (OECD, 2010, p. 13). In the European Commission "Improving the knowledge base and fostering innovation for producing quality biomass (e.g. industrial crops) at a competitive price" is a key priority as part of its Bioeconomy Strategy and Action Plan (European Commission, 2012: 4, 6), where 'quality' denotes biophysical characteristics useful for industrial processing.

However, the dominant industrial definitions have been criticised as too narrow, especially by downgrading agricultural outputs to biomass or emphasising novel food (Levidow et al., 2013). They neglect the contribution that agriculture makes to quality-food production (including speciality and traditional foods). They also neglect the strong scientific advance of traditional agronomic and food science, the contribution of farmers to rural development through social and organisational innovations, as well as public goods such as the multiple ecosystem and social services that agriculture delivers (e.g. Cooper et al., 2009). It is therefore worth reflecting further on the public goods nature of green growth and the bio-economy within the context of the growing push toward further industrial expansion of agriculture and food systems.

Concepts of public goods: linkages with bioeconomy

Industries that rely on biological processes and resources, strongly interact with the environment throughout the production cycle. Such processes are therefore fundamentally intertwined with public goods, which can be either enhanced or undermined. For the bio-economy, the most significant public goods are:

- Environmental: soil functionality, agricultural and forested landscape; farmland and forest biodiversity; water quality and availability; climate stability (greenhouse gas emissions, carbon storage), air quality, and resilience to flooding as well as drought and fire.
- Social: food security and food culture; rural vitality; animal welfare and health (adapted from Cooper et al., 2009).

Agroecology, for instance, is an approach to agriculture that attempts to reconcile environmental, sustainability and production goals by applying ecological concepts and principles to the design and management of agricultural systems. Drawing upon local natural resources, agroecological methods intensify ecological processes and the farmers' knowledge of them. Agroecological, low-input and organic farming methods are important for maintaining and linking on-farm resources – e.g. soil fertility, plant genetic diversity, pollination and bio-control methods. Furthermore, by re-linking production and consumption patterns, such methods reduce dependence upon external inputs, thus moving towards greater self-sufficiency (Niggli et al., 2008: 29; Schmid et al., 2009).

Agroecological methods have received growing attention from policy-makers, as reflected by numerous high-level reports[1] (Lampkin et al., 2015). According to a study for the EU's Standing Committee on Agricultural Research:

> "Approaches that promise building blocks towards low-input high-output systems, integrate historical knowledge and agroecological principles that use nature's capacity and models nature's system flows, should receive the highest priority for funding" (SCAR FEG, 2011: 8).

In 2014, the French government announced an agroecology action plan, as described by the then French Minister of Agriculture, Stéphane Le Foll:

> "I want our agriculture to go down the road of high performance in terms of both economics and ecology, making the environment a key factor in our competitiveness. This is a dynamic founded on the strength of collective effort and the rich diversity of our regions, on innovation and on the spread of new know-how. We shall make France a leader in agroecology" (Ministry of Agriculture, Agrifood and Forestry, 2014).

The UN-FAO (2014) has been promoting agroecology, partly through linking agronomists and practitioners. Discussions continue on how agroecological methods can help to transform the overall agricultural system (Levidow et al., 2014).

All of the above contrasts with the industrial perspective on the bio-economy. According to its land-sparing approach, some land is set aside for conservation, whilst other land is used through agricultural intensification with more external inputs to produce agricultural commodities. On highly productive farmland, however, biodiversity is also needed to maintain productivity through pollination, pest control and nutrient cycling among other practices.

> "These crucial ecosystem services are provided by 'planned' and 'associated' biodiversity), whereas the land-sparing concept implies that biodiversity in agro-ecosystems is functionally negligible (Tscharntke *et al.* 2012: 53).

"Planned" biodiversity refers to crops and varieties grown, whereas associated biodiversity is the sum of non-crop living organisms found in agroecosystems.

Knowledge base and social innovation

Sustainable development of the bio-based economy requires a wide understanding of the necessary knowledge base, building on models of joint knowledge-production (EU SCAR, 2012: 32, 42). New methods may be needed to assess and improve the performance of farming systems in relation to agriculture's multiple functions (McIntyre et al., 2009). The joint production of knowledge model underlines the need to move from one-way "knowledge transfer" to "knowledge exchange" (EU SCAR, 2012: 75). The term 'agroecology' implies that knowledge about the ecology of agriculture is an essential component of the agricultural knowledge system (Lampkin et al., 2015: 46).

Such a participatory model for knowledge production should overcome the boundaries between knowledge generators and users. The joint knowledge-creation model recognises the importance of local knowledge and leads to the enhancement of local capabilities, while also accommodating diversity and complexity (Padel et al. 2010; 2011). This model has a participatory approach emphasising social innovation (Freibauer et al., 2011: 90). In poor neighbourhoods of big cities with high rates of unemployment and obesity, social innovation with urban farming and food projects can contribute to a better quality of life (EU SCAR, 2012: 101).

Similarly, in the food sector there is a need to balance innovation (new knowledge) with tradition (old existing knowledge). The EU-funded SOLID (Sustainable Organic Low-Input Dairying) project has shown that farmer-led research can be a good way to stimulate this dialogue between the farmers and scientists as equal partners in trying to find solutions to problems experienced by farmers and to develop sustainability. Problems explored included the reliance on imported protein, the need to reduce antibiotic use and improve animal health or a link between further intensification and biodiversity (Padel et al., 2015).

Farmers have played a central role in expanding the knowledge base, generally through forms of social innovation and this can be harnessed to support initiatives that support green growth and the bio-based economy. Examples include the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-Agri, 2012), the European Rural Networks' Assembly (ERNA, 2015), and BASE in France and the UK[1]. In the UK Duchy Future Farming Programme, farmers join with researchers in developing practical solutions to improve their farming systems on topics like feeding silage to pigs, building soil organic matter, controlling problem weeds like creeping thistle or establishing multi-species mixtures of leys.[2] The SOLINSA project provides Learning and Innovation Networks for Sustainable Agriculture (LINSA) on many topics including specific production systems, plant and animal health and local food network[3].

Conclusions

Currently the policy framework for a bio-economy and green growth is dominated by an industrial perspective. This neglects the sustainable use of scarce natural resources – such as soil, water and biodiversity –which are public goods. An environmentally sustainable approach must recognise the need for the co-production of food, biomass and ecosystem services, even in the most productive agricultural areas. A public goods-oriented perspective on the bio-economy emphasises agroecological methods, the

[1] BASE (Biodiversity, Agriculture, Soil and Environment) is the leading network for conservation agriculture in France.

[2] http://www.soilassociation.org/innovativefarming/duchyfuturefarmingprogramme/abouttheprogramme

[3] http://www.solinsa.org/the-results/the-concept-of-linsa/map-of-linsa/

organic and low-external input agro-food sector, ecosystem services and social innovation (for more details, see Schmid et al., 2012).

To succeed, farmers must be central to knowledge production for such land-use systems (e.g. MacMillan and Benton, 2014), and be not seen only as commodity producers but also as providers of quality food, as managers of the agricultural eco-system and landscape and as contributors to rural development. Such agricultural knowledge innovation systems build on farmers' tacit knowledge and active producer participation. Joint research programmes allow to valorise 'the diversity of knowledge (local/traditional know-how and practices, common knowledge and expert knowledge) in the definition of research problems, the definition of people concerned, and in finding solutions.' (EIP-Agri, 2013: 9).

Therefore the bio-economy and green growth concepts should be broader in scope than the dominant industrialised interpretations. Integrated, comprehensive, innovative and sustainable approaches to land use should draw on agroecological methods of natural resource use, both within and beyond agriculture and involve a broad range of civil society groups, including farmers, scientists, SMEs and consumers. Such approaches are essential for enhancing the public goods on which all agriculture depends.

References

Cooper, T., Hart, K. and Baldock, D. 2009. Provision of Public Goods Through Agriculture in the European Union. Report Prepared for DG Agriculture and Rural Development. Contract No 30-CE-0233091/00-28, Institute for European Environmental Policy: London, UK.
http://www.ieep.eu/assets/457/final_pg_report.pdf [accessed 24 July, 2015]

EIP-Agri. 2012. European Innovation Partnership Agricultural Productivity and Sustainability (EIP AGRI). (COM(2012) 79). European Commisssion, Brussels, Belgium. http://ec.europa.eu/eip/agriculture/ [accessed 24 July, 2015]

EIP-Agri. 2013. *Strategic Implementation Plan*: European Innovation Partnership, Agricultural Productivity and Sustainability (EIP-A), Directorate-General for Agriculture and Rural Development. European Commisssion, Brussels, Belgium. http://ec.europa.eu/agriculture/eip/pdf/strategic-implementation-plan_en.pdf [accessed 24 July, 2015]

ERNA. 2015. European Rural Networks' Assembly, Subgroup on Innovation for agricultural productivity and sustainability, Report on 1st Meeting, 10 March. European Commisssion, Brussels, Belgium.
http://ec.europa.eu/eip/agriculture/sites/agri-eip/files/field_event_attachments/report_subgroup_innovation_10_march_2015_final_version.pdf. [accessed 24 July, 2015]

EU SCAR. 2012. Agricultural Knowledge and Innovation Systems in Transition: a Reflection Paper. European Commisssion, Brussels, Belgium.
http://ec.europa.eu/research/agriculture/scar/pdf/akis_web.pdf [accessed 24 July, 2015]

European Commission. 2012. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Innovating for Sustainable Growth: A Bioeconomy for Europe. SWD (2012) 11 final. Brussels, Belgium 13.2.2012. COM(2012) 60 final.

FAO. 2014. Final Report for the International Symposium on Agroecology for Food Security and Nutrition, Food and Agriculture Organisation, Rome, Italy. http://www.fao.org/3/a-i4327e.pdf [accessed 24 July, 2015]

Freibauer, A., Mathijs, E., Brunori, G., Damianova, Z., Faroult, E., Girona i Gomis, J. et al. 2011. The 3rd SCAR Foresight Exercise. Sustainable Food Consumption and Production in a Resource-Constrained World. EU Standing Committee on Agricultural Research (SCAR), Brussels, Belgium.

Lampkin, N.H., Pearce, B.D., Leake, A.R., Creissen, H., Gerrard, C.L., Girling, R. et al. 2015. The role of agroecology in sustainable intensification. Report for the Land Use Policy Group: Organic Research Centre, Elm Farm, Newbury and Game & Wildlife Conservation Trust, Fordingbridge, UK.
http://www.snh.gov.uk/docs/A1652615.pdf [accessed 24 July, 2015]

Levidow, L., Birch, K. and Papaioannou, T. 2013. Divergent paradigms of European agro-food innovation: The Knowledge-Based Bio-Economy (KBBE) as an R&D agenda. Science, Technology and Human Values, 38(1): 94-125.

Levidow, L., Pimbert, M. and Vanloqueren, G. 2014. Agroecological research: Conforming – or transforming the dominant agro-food regime? Agroecology and Sustainable Food Systems, 38(10): 1127–1155.

McIntyre, B.D., Herren, H.R., Wakhungu, J. and Watson, R.T. eds 2009. Synthesis report with executive summary: a synthesis of the global and sub-global IAASTD reports. IAASTD Secretariat Millennium Institute African Centre for University of East Anglia, Island Press: Washington, D.C., USA.

Ministry of Agriculture, 2014. *10 Keys to Understanding Agroecology*. Paris, France: Ministry of Agriculture, Agrifood and Forestry, http://agriculture.gouv.fr/IMG/pdf/plaqPA-anglais_vf_cle01abac.pdf [accessed 24 July, 2015]

Niggli, U., Slabe, A., Schmid, O., Halberg, N. and Schlüter, M. 2008. Vision for an Organic Food and Farming Research Agenda 2025: Food, Fairness and Ecology. TP Organics, Brussels, Belgium, UK.
http://www.tporganics.eu [accessed 24 July, 2015]

OECD. 2009. The Bio-economy to 2030 – Designing a Policy Agenda. Report. Organisation for Economic Co-operation and Development, Paris, France.
http://www.europabio.org/%20CriticalI2006/Critical2006.pdf[accessed 24 July, 2015]

OECD. 2010. Interim Report on the Green Growth Strategy: Implementing our Commitment for a Sustainable Future, Organisation for Economic Co-operation and Development, Paris, France.
http://www.oecd.org/greengrowth/45312720.pdf [accessed 24 July, 2015]

Padel S., Niggli, U., Pearce B., Schlüter, M., Schmid, O., Cuoco, E. et al. 2010. Implementation Action Plan for Organic Food and Farming Research. Technology Platform Organics. IFOAM EU Group. Brussels, Belgium.
http://www.tporganics.eu [accessed 24 July, 2015]

Padel, S. Pearce, B. Cuoco, E. Schlüter, M. Niggli, U. Schmid, O. et al. 2011.Technology Platform Organics: Knowledge Generation and Exchange in Organic Food And Farming Research, in D. Neuhoff et al., eds, *Organic is Life: Knowledge for Tomorrow 2*, ISOFAR, Bonn, Germany. pp. 330-333. http://orgprints.org/19307/ [accessed 24 July, 2015]

Padel, S., Vaarst, M. and Zaralis, K. 2015. Supporting Innovation in Organic Agriculture: A European Perspective Using Experience from the SOLID Project. Sustainable Agriculture Research, 4 (3), 28-37.

SCAR FEG. 2011. *Sustainable Food Consumption and Production in a Resource-Constrained World*.: Standing Committee on Agricultural Research, Foresight Expert Group, Brussels, Belgium. http://ec.europa.eu/research/agriculture/scar/pdf/scar_feg3_final_report_01_02_2011.pdf [accessed 24 July, 2015]

Schmid, O., Padel, S., Halberg, N., Huber, M., Darnhofer, I., Micheloni, C. et al. 2009. Strategic Research Agenda for Organic Food and Farming. Technology Platform Organics. IFOAM EU Group. Brussels, Belgium. www.tporganics.eu .

Schmid, O., Padel, S. and Levidow, L. 2012. The bio-economy concept and knowledge base in a public goods and farmer perspective, *Bio-based and Applied Economics (BAE)* 1(1): 47-63, http://orgprints.org/20942/, http://www.fupress.net/index.php/bae/article/view/10770 [accessed 24 July, 2015]

Tscharntke, T., Clough, Y., Wanger, T.C., Jackson, L., Motzke, I., Perfecto, I. et al. 2012. Global food security, biodiversity conservation and the future of agricultural intensification. *Biological Conservation* 151, 53–59.

Commissioned by: Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA)
Published by: CTA, http://knowledge.cta.int/
Edited by: J.A. Francis, CTA
Citation: CTA 2016. http://knowledge.cta.int/, "author" accessed on "date."