More reading

Agri-food System Dynamics: Pathways to sustainability in an era of uncertainty, STEPS Working Paper 4 (2007), by John Thompson, Erik Millstone, Ian Scoones, Adrian Ely, Fiona Marshall, Esha Shah, and Sigrid Stagl (ISBN – 13: 978 185864 653 7)

Contested Agronomy: The Politics of Agricultural Research in a Changing World (2012) edited by James Sumberg and John Thompson. London: Earthscan Publications (forthcoming).

Environmental Change and Maize Innovation in Kenya: Exploring pathways in and out of maize, STEPS Working Paper 36 (2009), by Sally Brooks, John Thompson, Hannington Odame, Betty Kibaara, Serah Nderitu, Francis Karin and Erik Millstone (ISBN: 978 1 85864 903 X)

Reforming the Global Food and Agriculture System: Towards a Questioning Agenda for the New Manifesto, STEPS Working Paper 26 (2009), by Erik Millstone, John Thompson and Sally Brooks (ISBN: 978 1 85864 783 5)

STEPS Briefings on Environmental Change and Maize Innovation Pathways (No. 1-7, 2010) by John Thompson, Sally Brooks, Molly Morgan, Erik Millstone, Hannington Odame, Francis Karin and Andrew Adwera.

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Credits

This briefing was written by John Thompson and Erik Millstone and edited by Nathan Oxley and Julia Day.

About the STEPS Centre

The STEPS Centre (Social, Technological and Environmental Pathways to Sustainability) is an interdisciplinary global research and policy engagement hub uniting development studies with science and technology studies. We aim to develop a new approach to understanding, action and communication on sustainability and development in an era of unprecedented dynamic change. The STEPS Centre is based at the Institute of Development Studies and SPRU Science and Technology Policy Research at the University of Sussex with a network of partners in Asia, Africa and Latin America and is funded by the Economic and Social Research Council. Find out more: www.steps-centre.org

Contact us

STEPS Centre, Institute of Development Studies, University of Sussex, Brighton
BN1 9RE, UK
+44 (0)1273 915673
Email: steps-centre@ids.ac.uk
Web: www.steps-centre.org
Twitter: @stepscentre

Institute of Development Studies

University of Sussex
SPRU – Science & Technology Policy Research

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Pathways to Sustainable Food Futures in a Dynamic World

The STEPS Centre Agriculture domain, 2007-2011

STEPS domain briefing

From food prices and hunger to GM crops and biosafety, debates about agricultural innovation involve many competing narratives about key science and technology problems and their potential solutions. With each narrative suggesting different pathways to a more sustainable and productive food future, why do certain narratives and pathways come to dominate science policy debates while others remain marginal or even hidden from view? The ESRC STEPS Centre is analysing the causes and consequences of this process in order to identify alternative pathways for agricultural policy that address sustainability and social justice.

Food market, Nigeria. Photo: Curt Carnemark / World Bank from worldbank's Flickr gallery (Creative Commons)

Pathways to food futures

Which agricultural innovation pathways are pursued and which are not is often a question of governance, with power relations and institutional interests shaping policy. To understand the governance of agri-food systems and reveal how they might proceed along more sustainable pathways, it is helpful to recognise three key dimensions of innovation: direction, distribution and diversity, or the '3Ds'. Innovations in agricultural science and technology often develop along path-dependent trajectories, characterised not just by scale, but by **direction**. Thus arguments about the direction of technological change in these systems are at least as important as those concerning the pace of change.

"It is helpful to recognise three key dimensions of innovation: direction, distribution and diversity"

Direction shapes the **distribution** of risks and rewards from innovation. In many developing countries, industrial agriculture can work well for those who can afford the inputs, such as land, fertiliser and machinery. However, it often marginalises small farmers in more complex, diverse, risk-prone settings. If we are to challenge the directions of dominant pathways and recognise and support alternatives, we need to encourage different questions to be asked about direction and distributional consequences of innovation. Alongside the 'how much?' and 'how fast' questions about the pace and efficiency of a particular technological trajectory, we must also consider who benefits, who loses, and what other options there are - the 'which way?', 'what else?', 'who says?' and 'why?' questions.

It is also crucial to focus on whether forms and levels of **diversity** (whether in crop gene pools or other technologies or practices) are increasing or diminishing and what this means for the resilience, robustness and security of agri-food systems.

In a world of increasing globalisation, harmonisation and standardisation, diversity could preserve crucial context-dependent sensitivities, whether ecological, social or technological (e.g. in crop gene pools, agronomic practices and the resulting landscapes). Since the interests of the least powerful are most marginalised, the opening of wider ranges of possible pathways may, on balance, help those who are otherwise poorly resourced. When dealing with uncertainties that are difficult to resolve (e.g. the benefits and risks of crop biofortification, drought tolerant maize, GM crops, etc.), diversity can provide a vital means to ensure that 'not all eggs are in one basket'. Supporting diverse 'niches' – pockets of innovation temporarily sheltered from wider market forces – is another way to support transitions away from unsustainable socio-technical 'regimes' and towards more sustainable food futures.

The STEPS approach to understanding agri-food system dynamics

Examining directionality, distribution and diversity brings important social, technological and ecological factors and political actors and interests into sharp relief and highlights the contested nature of agricultural change. Rethinking agri-food systems along these lines requires several challenging questions to be addressed:

1. Re-framing the sustainability challenge
How do different interest groups – from agricultural scientists to policy makers to small farmers – think and talk about agricultural innovation and technological change in different ways? How are the terms 'sustainability' and 'sustainable intensification' used and interpreted by these actors?

2. Exploring multiple pathways
As agri-food systems become more uncertain and complex, how can we identify and assess the diversity of alternative innovation pathways that may lead towards more sustainable and socially just food futures?

3. Responding to shocks and change
How do alternative agricultural innovation pathways respond to both internal and external shocks and stresses? What frameworks and methods can we use to examine how resilient, robust, durable and stable they may be under different conditions?

4. Mainstreaming new practices and technologies
What are the critical factors that support the emergence of small-scale 'niches' of innovation in agri-food systems and accelerate the transition towards more sustainable, large-scale regimes?

5. Analysing governance
How inclusive and deliberative are the policy processes that define what – and who – agriculture is for? Which pathways are constrained by current governance processes and which could be opened up if alternative governance arrangements were envisaged?

6. From analysis to practice
How can we help transform agri-food systems to meet the challenge of poverty reduction, food security and socio-ecological sustainability? What innovative approaches can be employed for analysing, appraising and reforming policy regimes that affect what happens on the ground?

"Rethinking agri-food systems requires several challenging questions to be addressed"

Case study

Maize Innovation Pathways in Kenya

Maize is a highly significant staple crop in Kenya, socially and economically. This three-year study took maize as a window through which to explore different responses to food insecurity in the face of climate change in Kenya. It examined different types of innovation pathways 'in and out of maize' proposed by various actors - public agricultural research institutions, donors and private companies, as well as those practiced within, or sought by, farming communities and broader social networks. At issue were the ways in which people in different social, institutional and geographic locations understand and frame resilience, for example as a property of seeds, of farming systems or of broader livelihoods; and how those framing assumptions have shaped research and policy agendas and influenced the allocation of resources in some directions rather than others.

Maize seeds. Photo: Speak-It Films/STEPS Centre