

## EDITORIAL

### Technology, rural dynamics and pro-poor development

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#### 1. Introduction

This special section of the *European Journal of Development Research* focuses on the relationship between science, technology and development. The papers published in this section edition were first presented at the 2007 Development Studies Association Conference,<sup>1</sup> co-hosted by the Institute of Development Studies (IDS) and the Economic and Social Research Council STEPS (Social, Technological and Environmental Pathways to Sustainability) Centre at the University of Sussex, Brighton.

The DSA conference proposed that emerging patterns of scientific and technological change can offer an exciting lens through which to address major development and policy issues. Papers presented at the Conference addressed the developmental possibilities – and threats – arising out of rapid advances in science and technology, whether in relation to agriculture, health, environment and climate change, information or industrial and urban challenges. They sought to explore how development studies can contribute to understanding these processes, while influencing trends and outcomes to ensure that development aims are met and poor people's perspectives and priorities included in the resultant agendas. Rethinking development and development studies from a science and society perspective, the conference suggested, provides opportunities for development specialists to engage in new debates and to reposition themselves within existing debates. In addition, emerging patterns of scientific and technological change produce new dynamics in the processes that shape and might mitigate poverty, requiring new modes of understanding. This special section draws together a collection of papers from the conference that focus on the unfolding interrelationships between science, technology and socio-economic change in rural settings. Not only do they offer a fruitful contribution to the academic literature on topical subjects on the international agenda but by providing a richly-textured set of cases and illustrations, they also offer both a set of insights into these multiple dynamics and their relationships with poverty, and some key concepts that might help us understand them.

The 2007 DSA conference presenters – across a set of five plenary and more than 30 parallel sessions – offered widely diverging views on the relationships between science, technology and development, from a diversity of disciplinary and cross-disciplinary perspectives. In broad terms their contributions can be grouped according to what Leach and Scoones (2006) call three 'races' – or three approaches – to the use of science and technology in development contexts. Albeit described here in highly stylised terms, the first race, the 'race to the top in a global economy', emphasises scientific and technological contributions to economic growth.

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The models here are the Asian Green Revolution and the rapid technology-led growth of Asian economies such as China and India. Modernist assumptions presuppose that science and technology will enhance economic growth, enabling countries to progress through developmental stages to achieve industrial and post-industrial modernity. Poverty, in this view, is expected to reduce through the ‘trickle down’ effects of overall economic growth rather than through reducing inequality. In contrast, a second ‘race to the universal fix’ highlights technological innovations which address poverty directly. New drugs, vaccines, seeds and information technologies are, in this view, often portrayed as ‘silver bullets’ to address poverty-related problems of health, hunger and isolation. In recent years, scientific, policy and investment focus has been on those technologies which promise big impact, emphasising their rolling out and scaling up over large areas. In contrast again, what Leach and Scoones (2006) call a ‘slow race to citizen’s solutions’ recognises that both causes of and pathways out of poverty involve a complex interplay of social, economic, political and cultural processes. Technologies have roles to play, but these will always be shaped by their interactions with these processes. And rather than rely on globalised technological knowledge and expertise, this approach recognises key roles for the knowledge and perspectives of poorer women and men themselves in creating, selecting, adapting and transforming technologies, and attuning them to local needs. In this view, technology development thus becomes part of a more democratic, deliberative and inclusive process to evaluating potential responses to poverty and exclusion.

All these approaches – which in practice occur in parallel, with boundaries more blurred than these stereotyped views portray – are significant as they suggest very different development trajectories. Nonetheless, there are tensions between these different approaches which have major implications for how science and technology are perceived and potentially incorporated within policy-making and governance processes.

This special section of the *European Journal of Development Research* assembles a number of case studies which illustrate a development studies attentive to society–technology interrelationships in action, and provide us with a new set of empirical insights into how technologies are being negotiated, and transformed in today’s rural worlds. It focuses on technologies which have very often been presented as ‘ready-made’, global solutions to rural poverty, namely genetically modified (GM) crops, biofuels and information communication technology (ICT). In keeping with the second ‘race to the universal fix’, advocates of these technologies often define development in terms of global public goods and global responsibility. These second ‘race’ solutions are often lauded as effective, inexpensive, easy to distribute and simple to use, yet with high impact. Genetically modified crops, biofuels and ICT have all been characterised in this way as ‘big hit’ technologies which promise fantastic results in terms of poverty reduction. Seen thus, ‘The nature of the health, food or agricultural problem is assumed to be broadly similar across vast areas, so that technological solutions are unproblematically transferred, and can be applied “at scale”’ (Leach and Scoones 2006, p. 22).

Despite the particular technologies that they focus on, the papers published here pose a range of challenges to this ‘race to the universal fix’ approach. All the authors use empirical research to demonstrate how technologies – with ‘big hit’ potential – enter dynamic rural contexts (of class, gender, education, governance and politics) and how negotiations between differently-positioned actors leads to unexpected and diverse outcomes which may – or may not – work for the poor. They reveal strongly the significance of local and historical context. Using the examples of GM crops in India and Bolivia, of biofuels in Brazil, of ICTs in India and of resource portfolios in Ethiopia, the authors demonstrate how technological impact is absorbed into and negotiated within complex rural worlds. Thus they show that to the extent that technologies are fixes, these are neither simple nor universal, and what they are fixing – and for whom – is often deeply contested. The messages they convey are more akin to the

arguments of the third, 'slow race to citizens' solutions' – that development processes involving technology need to be understood and enacted as part of more complex and deliberated pathways.

## **2. Science, technology and development: empirical studies**

Historically, questions about technology and processes of innovation and use have concerned both science and technology studies and development research. Somewhat more recently and in parallel, development studies have shown an interest in understanding the dynamics of rural change, of vulnerabilities and of livelihoods in relation to technological processes and choices. Bringing these debates together by combining the lenses of science and technology with development makes conventional debates on culture, gender, social difference, power relations, governance and pro-poor development look radically different. In addition, the fact that some of the poorest parts of the world experience cutting-edge technology – despite being labelled 'backwards' or 'undeveloped' – highlights the need to think about the ways in which science and technology are 'working for' development. As these advanced technologies are often relatively untested, the poor interact on the basis of asymmetrical and imperfect knowledge. They are, as such, uninformed users exposed to unpredictable technologies in highly diverse contexts where there is generally no or little room for debates on precautionary principles or consideration of the processes' irreversibility. Yet as we see in the cases here, local users also often come to experiment with, transform and adapt technologies in highly creative ways.

Furthermore, the changing dynamics of certain technologies, such as ICTs, have the power to reconfigure social, economic and political relationships – whether between social groups, between rural and urban spaces or between localised and globalised 'spaces'. This resonates with ongoing debates on 'new rurality' which, over the last ten years, have proposed that technologies can reduce remoteness in terms of both communications and economic relationships.

The papers in this collection show how deeply socio-economic change, cultural and political dynamics affect the manner in which technology innovation, application and specialization occur. In so doing, the papers all demonstrate that the idea of a 'race for a universal fix' with simple and universal solutions might not always work as expected. Processes of technological change can magnify existing differences between people, and exacerbate power differentials. Whether or not technology contributes to pro-poor development – and which people gain or lose – thus depends on much more than choices about types and directions of technological change. Crucially at stake is the interplay between technological change and ongoing cultural, socio-economic and political dynamics.

Studies of technological change within agriculture and cropping systems have a long history within development studies, with biotechnology assuming recent prominence. Yet new forms of biotechnology and innovative understandings which link biotechnology with a developmental focus have introduced new challenges in the areas of regulation, policy and implementation. Several papers in this section examine different aspects of the interplay between crop technology and society. Daniel Puente-Rodríguez (EJDR prize-winner in 2007 with Wietse Vroom whose paper is discussed below) explores breeding innovations among potato farmers in the Bolivian Andes, seeking ways in which small scale farmers can benefit from the deployment of molecular markers and participative plant breeding networks. He shows how, as things stand, the farmers have little to gain from international crop development policies, precisely because these policies focus on industrialized forms of agriculture. Farmers and their varieties of potato are not generally included in technology development and plant breeding, and their breeding preferences are not taken into consideration, despite clear attempts by local farmers to self-identify in ways that establish their breeding credentials and tie them into the development

process. Wietse Vroom's paper addresses a public–private consortium, this time based in India and developing transgenic cabbages for resource-poor farmers. Using the case of the Collaboration on Insect Management for Brassicas in Asia and Africa (CIMBAA) consortium, he shows how constraints to poorer farmers' participation (such as high seed prices which usually result from the way R&D product development is conceptualised) can be overcome by following a strategy more in keeping with the practices of seed breeding companies than conventional biotechnology models of business. The importance of this example lies less in the low seed costs than in the fact that the company has adopted a model of commercialisation that challenges biotechnological principles of development: instead of seeking a return on high investments in technology development through a monopoly, CIMBAA is relying on developing a package of services which include superior germplasm, seed coating technologies and ongoing sales through effective distribution and buyers' networks.

Both Vroom and Puente-Rodríguez explore ways in which the design of technology can be de-linked from its hegemonic origins – which reflect dominant values, beliefs and norms – in order to serve more democratic purposes. While Puente-Rodríguez focuses on the spaces of interaction and the importance of participation, Vroom further points out that the redesign of technology can take place at different levels. It is thus necessary to consider both the practical level of the concrete technological object, as well as the wider historical trends which the technology plays into and supports. Ultimately, even if a project is able to challenge some conventional trends in the social organisation of agricultural production, this does not necessarily translate into good models of agricultural development.

Staying with the subject of crop technology, Clancy's paper moves the discussion from biotechnology to biofuels and examines evidence for the pro-poor value of this technology drawing from a range of examples in the developing world. In keeping with Vroom's and Puente-Rodríguez's approach, Clancy's review shows that it is the institutional structure, rather than the technology itself which ultimately determines the value of biofuel agriculture. She argues that governance and ownership are 'major determining factors' in pro-poor biofuel benefits and that these have to occur in different parts of the value chain in order to challenge the conventional tendency of assuming biofuels to be part of a pro-growth strategy. Included in this are state financial support of small scale farmers, insurance and technical assistance schemes and stakeholders' commitment to equitable distribution of revenue.

The significance of historical processes, institutional contexts, social networks and power relations is a theme continued in Esha Shah's paper as she examines the role of biotechnology in India. She argues that the quest to develop and produce biotech cotton is peculiar to India's middle class farmers who wield considerable social and economic power. In developing an approach which examines questions about agency, risk, perceptions and practice, Shah shows that cotton cultivation is a risky and precarious enterprise, the costs of which can only be met by people who 'have the cultural capacity to aspire, socially and materially'. These are land-rich farmers – and it is their particular positions and capabilities that explain their seemingly unlimited faith in science and biotechnology. In contrast to Vroom, Puente-Rodríguez and Clancy, who seek the emancipatory power of technology through participation, her work shows how 'technological culture' has an inscribed rationality which enables powerful social actors to use technology, often quite subtly, to structure processes and fields of action to their advantage.

This theme of democratising technology – and the challenges to such democratisation in particular rural contexts – is continued in Tiwari's analysis of the development and emancipatory potential of rural ICTs which draws attention to the socio-cultural, political and economic contexts in which technologies are inserted. Focusing particularly on the Gyandoot kiosks which provide government-owned computer network services in Madhya Pradesh, Tiwari shows that the user group tends to be literate, land-holding male farmers and that most of the

e-governance, e-commerce and e-education services are being ignored. Instead of operating as a 'unique technological intervention capable of challenging traditional barriers', ICTs are proving unable to address social and economic barriers to the participation of women and other marginalised people. Tiwari thus argues that the kiosks buttress – rather than bridge – the digital divide in rural India.

### **3. Unpacking 'pro-poor technology development'**

The agriculture and crop technology papers provide an explicit critique of the manner in which binary understandings of technology – such as that biofuels are either pro-growth or pro-poor – come to assume prominence in much development studies and policy discourse. Thus both Puente-Rodríguez and Shah seek to go beyond the radicalised pro/anti debate around biotechnologies. Puente-Rodríguez does this by focusing on 'places of encounter' from which plant breeding might be reconstructed to work for local development of poor Brazilian farmers and populations. Shah shows that such binaries are produced by a focus on 'outcomes' (such as impact on farmers, on health, on the environment and on economic performance) and that asking different questions about biotechnology and crop production, approaching it from the social and political context of technological choice, enables one to move out of the inertia generated in the pro/anti debate.

Moving beyond technology-specific debates and concentrating instead on resource portfolios, Torkelsson and Tassew show how complex and interrelated questions of poverty, access and technology are. Focusing on rural Ethiopia they demonstrate how a resource portfolio – comprising a combination of natural, physical, financial, social and human assets – enables or inhibits people's ability to pursue viable livelihood strategies. Instead of effective 'universal fixes', access to various kinds of agricultural and other technologies are predefined by local cultural and gendered norms. These limitations are then further shaped by the fact that resource capitalisation is linked to access to particular resources and technologies – so that, in a ratchet effect, having resources increases one's ability to accumulate more. This insight reveals the significance of a range of what might be seen as 'hidden' technologies. Metal roofs, for example, are not generally considered as a significant part of big technological solutions for development or for poverty alleviation. Yet as these authors show, lack of access to a simple roof may act to inhibit other forms of resource mobilisation and indicates a significant lack of social capital. Thus unexpected technological factors interact with social, cultural and political ones to shape who will, and who will not, be able to move out of poverty. These factors also shape how universal solutions will operate in reality.

Across the papers emerges the importance of addressing the specificities of rural livelihoods in dynamic settings, and institutional, social and political contexts, including issues of social difference, if scientific and technological solutions are to contribute to pro-poor development. Ignoring these runs the risk of technologies simply not being taken up, or failing to be applied. The 'race to the universal fix' is unlikely to succeed if it emphasises quick solutions which are effective, inexpensive, easy to distribute, and simple to use at the expense of understanding local complexity influenced by gender, political, socio-economic and cultural factors. More seriously, in stressing only the emancipatory power of technologies, ignoring the gap between such rhetoric and reality, technological incapacities and lack of access may well emerge as further sources of marginalisation for the diverse kinds of rural people described in this special collection of papers.

All the papers included in this EJDR special section point towards the need to develop ways of integrating science and technology with local contexts and to make technologies appropriate and available for poor and marginalised people if we are to achieve development's aims of

poverty reduction and social justice. In other words, an approach more akin to a 'slow race to citizen's solutions' provides a means to link science and technology with bottom-up, participatory processes of deliberation, policy development and governance. Engaging the recipients of development and of science and technology in 'both the "upstream" choice and design of technologies, and their "downstream" delivery and regulation' (Leach and Scoones 2006, p. 14) provides a means of doing this. Nonetheless, a word of caution is necessary. Such an approach should not turn participation into a 'quick fix, universal' solution. As is now well recognised in the development field, participation can be both empowering and disempowering as it involves power dynamics, inclusions and exclusions, instrumentalism, framings and has to be integrated into wider political processes. Adding a science and technology perspective requires careful consideration of its 'participatory potential'. To what extent do the complex arrangements between science, technology and society require a different understanding of how participatory processes and issues of governance might work towards poverty reduction and social justice? Under what conditions is science and technology able to become a key factor in participatory programmes, facilitating effective participation and citizen deliberation? These questions have recently been raised and the issues are currently being discussed in both development studies and science and technology arenas, but far more remains to be done. We invite EJDR's contributors and readers to engage in this ongoing debate.

#### Note

1. A parallel set of papers published in a special issue of the Journal of International Development details the conference proceedings, addresses conceptual challenges raised during the DSA conference and explores ways in which development research may need to reinvent itself to comprehend and respond effectively to a fast-changing arena of scientific, technological, social and economic change.

#### Reference

- Leach, M., and Scoones, I. (2006), *The Slow Race: Making Technology Work for the Poor* (Demos Pamphlet), London: Demos.