Moving from Communication as Profession to Communication as Being in Northern Ecuador

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Research communication in transition

In this chapter we take a reflective look at the practices of communication in science and development. We deal with public policy in favour of highly harmful pesticide technology (World Health Organization Class 1 products) in northern Ecuador, a region once described as a 'model for agricultural modernization' (Barsky 1988) among smallholder farmers. Drawing on multidisciplinary research dating back to the late 1980s,[1] we examine the evolving roles that competing actors – operating in both formal and informal institutions – have played in different phases of development in pesticide policy. The case evolves from the arrival, growth, and normalisation of mass pesticide poisoning as a consequence of publically supported agricultural modernisation, to the enabling of alternatives as a result of the growth in influence of agroecology and other counter-movements. While, in practice, poisoning by highly toxic chemicals continues to be a major concern in northern Ecuador and elsewhere, in 2008, public policy shifted at the constitutional level to focus on 'food sovereignty', leading to legislation for the elimination of Class 1 pesticides from the market in 2010. Here, our objective is to summarise the institutional dynamics involved in the different phases of communication around these pesticides and their alternatives and call attention to what we see as a promising, emergent pathway of communication in research and development practice: 'Development 3.0'.

The pesticide experience in Ecuador exemplifies a broader reality: the effect of harmful, unwanted products of past public policy on environment and society. Notable examples abound – from soil and water degradation, loss of genetic

1 The multidisciplinary research in Carchi is summarised in Crissman et al. (1998), Yanggen et al. (2003) and Sherwood (2009).

resources, rising rates of obesity to global warming and climate change. These unwanted outcomes, however ubiquitous, are not the deliberate result of policymakers (though it could be argued that the perpetuation of harmful policy, for example, concerning highly toxic chemicals, can become deliberate (Sherwood and Paredes 2014)); they are largely the product of self-organisation. While people are aware of such concerns (or at least these concerns can become knowable, such as in the lingering questioning in certain sectors over the existence of global warming and climate change), at the same time, communities have proven impotent at enabling timely change, even when guided by the insights and resources of science and government. In fact, a growing body of literature points at science and development for both establishing and perpetuating much of the harmful organisation responsible for socio-environmental decline (see for example Ulrich Beck's (1992) work on 'risk societies'). This context invites a critical look at the role that researchers can come to play as communicators and social actors in processes designed to tackle such institutionally complex and problematic issues.

To analyse this case we bring into play our diverse experiences with research communication for social change: both in using research to shift practices at personal and community levels and in using research to influence and change organisational priorities and government legislation. We believe this case sheds light on the limitations of both approaches, while providing a number of lessons for necessary redirection and institutional transition.

Here, we view communication as more than words, language, symbols and exchange. For us, it is a largely self-organised, co-constituting process underlying development. Through communication people derive meanings, significance and sense of self and community. Thus, communication is understood as not merely a process of *inter*action. It also involves *trans*action, in the sense that, through communication, those involved undergo fundamental cognitive, behavioural, cultural and social *transformations* (Simpson 2009). As such, communication is ultimately about organisation: social ordering and networking to shape worldviews, agendas, priorities, and purposes.

Thus, communication can be seen a vehicle for opening up a particular course of action – in other words, policy. As experienced in Ecuador, the process of communication changes the organisation of individuals in communities and government, including, we found, those involved in science and development. This means that, through endless interactions with others, a development actor comes to make sense of her or his role in the systems of which s/he is a part, thereby shaping and reshaping her or his identity, beliefs, and activity.

This perspective places into question the common assumption underlying development research and policy: that social change is primarily the function of externally based intellectual ideas (i.e., exogenous designs) and of informing the public of the same. In fact, change is most commonly the product of far less deliberate, localised activity: peoples' everyday practice (Schatzki et al. 2001). As

argued in the research in public health (Marsh et al. 2004) and agriculture (Van der Ploeg 2009), enabling promising ongoing activity (i.e., 'endogenous potential') can be seen as a promising, largely underutilised resource for development policy.

Nevertheless, shifting attention from exogenous design to endogenous potential raises serious challenges for present-day research and development practice, in particular with regard to how professionals view themselves, define problems, allocate resources and engage the development process (Gibbons et al. 2000). Ultimately, a shift to Development 3.0 demands that researchers and development practitioners publically accept a role as a non-specialised, non-paid member of a family, community or social network – i.e., as a social actor. In the process, the abstract professional, once protected by title, salary and status, becomes accountable to the sort of standards commonly asked of her or his project-based 'beneficiary' and, in the process, becomes subject to public performances and displays of 'being', as expressed in one's own practice.

Research communication in sociotechnical change

From Latin *communicare*, meaning to impart, share or make common, communication is most about sense-making and meaning-making as well as organisation. Through communication, people act and are acted upon; they establish and break relationships; they mobilise and paralyse; they place into motion all kinds of intentional and unintentional events. Knowingly, deliberately or not, through communication people open up and close courses of action and, in the process, they make, break and set in motion policy.

In our research on development communication, as social scientists we are inclined to ask, what is being socially accomplished through communication? Researchers communicate for many purposes: to define problems, set priorities and influence the distribution of resources. Whenever researchers interact with policymakers, industry representatives or farmers, their communication is not only carried out using words, but also by the practices involved in the research process itself, which includes continual interactions with other stakeholders.

Through their use of symbols and language in everyday life, not unlike other actors, researchers forge identities and belief systems; they create and sustain communities, systems of prestige and authority; and they generate storylines and explanations. The communicative processes involved in setting agendas in and around emergent issues both brings together and divides people, who act as individuals and in groups in civil society, private enterprise and government. Thus, the outcomes of research communication have important implications for particular sets of actors and their communities. In summary, through their agency, practices and attitudes, researchers convey research results at the same time as promoting certain values and beliefs, and in the process, they become embroiled in the social politics of continuity and change.

In the creation of policy around technology, groups of researchers creatively organise around common interests and open up new pathways, moving networks along particular 'trajectories' of interaction with members, third parties and artefacts. Therefore the changes that their activities promote (and demote) are not understood as merely the product of rational, evidence-based decision-making. Instead, researchers strategically utilise communication as a means of both self-expression and social organisation. Viewed this way, research communication becomes one of the messy, often 'irrational' processes of enactment, which is central to social networking and change.

In their examination of knowledge production in universities and research centres, Gibbons et al. (2000) describe how researchers belong to particular communities organised around competing beliefs on the social meanings, purposes and utilisations of public resources for social change. In Table 1, we summarise two extreme modes of knowledge production: Mode 1 (expert-led) and Mode 2 (people-led). Mode 1 is founded on the positivist notion of largely context independent knowledge production that prioritises adherence to universal rules and standards of rigour. Meanwhile, Mode 2 is based on the tenets of socially constructed knowledge, thus emphasising the importance of situation and context. We utilise this taxonomy of knowledge production to describe the ways in which competing groups of researchers, development workers and countermovement activists form and reform communicative interventions in their efforts to promote particular presents and futures at the cost of other possibilities.

Table 1. Mode 1 (expert-led) and Mode 2 (lay or people-led) knowledge production

Criterion	Mode 1: Knowledge produced in the context of abstraction	Mode 2: Knowledge produced in the context of application
Nature of knowledge production	Theoretical: produced from within a disciplinary community	Practical: produced from within a problem context
Bias: rules that govern conduct	Disciplinary and multidisciplinary: single or multiple system of rules governing conduct	Transdisciplinary: dynamic, multiple systems of rules collide and collude
Problem solving: experience and skills employed	Homogeneous: focused, well-defined experience and skill set	Heterogeneous: diverse experiences and skills involved
Organisation structures	Centralised and hierarchical: well established; graded and top down	Diverse and heterarchical: loose, flexible and fluid structures; mixed and dissimilar constituents

Criterion	Mode 1: Knowledge produced in the context of abstraction	Mode 2: Knowledge produced in the context of application
Negotiation and consensus: resolution of differences	Closed and static: conditioned by pre-established norms and rules	Open and transient: conditioned by context of application and evolves with it
Nature of knowledge	Generalisable and cumulative	Context specific and dependent on locality
Social accountability and reflexivity	Low: offer oriented, exclusive and low sensitivity to impact of outcomes; preoccupied with internal criteria and priorities	High: demand oriented, inclusive and high sensitivity to impact of outcomes; preoccupied with relevance
Quality control: enforcement of 'good science'	Self-referential: peer review judgements; peer selection based on compliance with norms; emphasis on individual creativity from within disciplinary bounds	Broadly based: composite and multidimensional; dependent on social composition of review; emphasises group thinking; socially extensive and accommodating
Theory of knowledge spread	Spontaneous diffusion based on merit	Repeated processes of generation

Source: based on Gibbons et al. (2000).

Evolving communication in development practice

In this section we call on nearly two decades of collaborative action research led by scientists from the International Potato Centre (CIP) and Ecuador's National Institute for Agricultural Research (INIAP) in the highland Carchi Province. As a model for agricultural modernisation (Barsky 1988), Carchi experienced substantial changes as the result of a government-endorsed potato–dairy system. Despite the immediate success of the agricultural modernisation initiated in the late 1960s, studies summarised in Crissman et al. (1998) found that, over time, this progress came at great costs. By the early 1990s, a very fragile monoculture of a few potato varieties came to dominate the highland landscape. Cole et al. (2000) identified that two thirds of the rural population – men, women and children – suffered measurable neurological damage due to exposure to highly toxic pesticides, and economic studies identified a relationship between pesticide exposure and low productivity (Antle et al. 1998). Sherwood (2009) concluded that market oriented production and reliance on externally based knowledge and technology had generated second order problems with worrisome environmental, productivity, and human health consequences. Twenty-five years after the onset of agricultural modernisation, it had become increasingly difficult to grow a crop and to survive financially as a farmer, and the model of modernisation was on the verge of collapsing.

We summarise the history of research communication in Carchi in three general phases tied into the evolution of Ecuador's dominant sociotechnical regime:[2]

- technology transfer (or Development 1.0);
- participatory development (Development 2.0);
- an emerging approach emphasising self-organised 'coherent practice' (Development 3.0).

Based on different problem orientations, norms and standards of practice, we believe that this evolution has important implications for researchers and communication professionals.

To illustrate each phase, we draw on three corresponding development interventions that responded to growing public awareness and concern over the harmful consequences of pesticide technology and evolving notions of 'best practice' in agricultural research and development. The initial approach was based on technology transfer, as exemplified by the agrichemical industry's global 'Safe Use of Pesticides' (SUP) programmes, focused on promotion and management of pesticide technology. This was followed by participatory development, with a prominent example being the Farmer Field Schools, which emphasised pesticide-use reduction. Most recently, Ecuador's lively agroecology movement has inspired a period of reimagining the food system through reflective family-level practice (as exemplified through its national awareness raising campaign '*Que Rico Es!*' or 'How Sweet It Is!').

Development 1.0: technology transfer for the safe use of pesticides

The success of agricultural modernisation in Carchi was built on a uniquely successful process of land reform tied to ambitious public policy to promote industrial era technologies (i.e., mechanised tillage, improved crop varieties, synthetic fertilisers and pesticides) and to efforts linking farmers with urban-based commercial markets. Following the introduction of currency in rural areas and strapped with the need to pay off government-sponsored loans, beginning in the 1960s rural families quickly abandoned their traditional crops and cropping systems for higher valued potatoes. Agricultural modernisation brought substantial increases in food production and productivity for nearly 20 years, enabling many smallholders to settle debts and to recoup other investments, and for some to achieve ownership of larger areas of land, cattle, a house and a vehicle – constituting previously unimaginable accumulation.

Over the last 50 years, rural development initiatives in Ecuador have centred on intensifying production through externally sourced inputs. Regarding pesticides, in the 1990s a consortium of international agrichemical companies (in particular,

2 A regime refers to relatively stable sociotechnical network organised around a single or limited pathways of acting. Since agriculture is based on the coordination of social and technical elements (e.g. people, nature and artefacts), in this context a regime refers to a relatively stable network in favour of a certain pattern of farming (Van der Ploeg, 2003).

Bayer CropScience, Novartis/Sygenta, BASF and FMC) and their national partners (Agripac, Ecuaquímica, Farmagro and India), supported by the Ministry of Agriculture, designed and implemented Safe Use of Pesticides training programmes, emphasising product selection as well as information on dosage calculation, application and storage. The SUP training programme in Carchi was a local expression of broader agrichemical industry-sponsored initiatives across the globe to promote food production based on pesticide technology (Atkin and Leisinger 2000).

An important assumption of the SUP training in Ecuador was that exposure occurred because of 'a lack of awareness concerning the safe use and handling of [pesticide] products' (letter from the Ecuadorian Association for the Protection of Crops and Animal Health). Based on the tenets of technology transfer, the programme focused on transferring knowledge from technical experts to lay farmers as a means of changing practices. An innovative industry-sponsored programme promoted Safe Use of Pesticides in schools as a means of reaching parents through their children (Box 1).

Box 1. Scarecrow: the Safe Use of Pesticides Programme

In 2001 the agrichemical industry consortium initiated the 'Scarecrow comes out in defence of nature' programme in the rice-growing region of Guayas province, as part of a project called 'Plan America'. That year, a team of communication professionals presented the programme to 1,148 schoolchildren between the ages of 10 and 15 from 28 rural schools, declaring, 'Rural grade school education is central to the future of agriculture'. The stated goal of the campaign was:

> to change the mentality of adults through their children and to form tomorrow's farmers with information on the Correct Use of Products for Crop Protection and Integrated Pest Management, in such a way that children were trained to recognise the most important local pests and insects, diseases and weeds in the area, as well as the risks associated with the poor uses and abuse of products.

The training programme was based on a pre-developed slide show and a graphic manual. It included drawing contests and written tests where awards were given to the best performers. As a result of the perceived success of the project, CropLife Ecuador launched a second Scarecrow campaign, which reached an additional 2,000 children.

EcoSalud, an action research project led by CIP and INIAP, worked to strengthen SUP by strengthening communication, such as through community-run theatre. Efforts were made to inform people of the latest research findings and for the farmers to experience, in a safe environment, the toxicity and propagation of the pesticides and to consider the health issues caused by careless management of dangerous chemicals. Researchers introduced fluorescent tracers into backpack sprayers and then returned to homes at night with ultraviolet lights as a means of helping families to see the contamination pathways into the home (Box 2). When farmers complained about the unavailability and high costs of protective gear, for example, the programme obtained equipment and subsidised its costs. In addition, EcoSalud introduced emotionally impactful activities, such as public presentations of child education campaigns, including wall paintings and photographs of parents abusing pesticides. One activity involved feeding a dosage of carbofuran, the most popular local insecticide, which is also a highly toxic neurotoxin, to baby chicks and having an audience observe them until they became intoxicated and ultimately collapsed and passed away (later, this activity was videotaped to avoid further maltreatment to animals). Nevertheless, despite much creativity, provocation and diligence, such interventions ultimately had little lasting impact on farmers' practices.

Box 2. Exposure pathways

To illustrate pesticide exposure pathways, we used a non-toxic fluorescent powder that glowed under ultraviolet light as a tracer. Working with volunteers in each community, we added the tracer powder to the liquid in backpack sprayers and asked farmers to apply normally. At night we returned with ultraviolet lights and video cameras to identify the exposure pathways. During video presentations, community members were astonished to see the tracer not only on the hands and face of applicators, but also on young children who played in fields after pesticide applications. We also found traces on clothing and throughout the house, such as around wash areas, on beds and even on the kitchen table. The tracer study helped people discover how pesticides entered the home and how those who did not apply pesticides, women and children in particular, became exposed.

While the improved SUP programme captured the attention of participants, research showed that it did not address underlying social roots behind a growing public health crisis of pesticide-induced intoxications (Mera 2001). The exercises made it clear that there was something wrong with the use of pesticides, but farmers did not explicitly experience the harm or witness the most abstract, chronic effects of pesticides that can take years to surface. Additionally, without culturally

acceptable substitutes to maintain the high productivity and family income, farmers continued to use the pesticides, even when explicitly aware of their negative effects. **The researchers concluded that information, even conveyed in very convincing and practical ways, was not sufficient to overcome individual and collective social barriers to change.** Further attention was needed to the underlying limitations of agricultural modernisation, in particular with regard to the situated nuances of culture and knowledge systems.

Development 2.0: participatory research and Farmer Field Schools

Studies concluded that Safe Use of Pesticides programmes overemphasised scientific understanding, technology transfer, and market linkages as the means to better futures (Atkin and Leisinger 2000). Consequently, activity focused on crops, bugs, and pesticides, rather than the people who designed, chose and managed practices. Of course, technologies can play an important role in change, but when the technologies themselves lie at the root of the problem, greater attention needs to be paid to addressing problems caused by humans. Frustrated by the limited success of their attempts to address pesticide concerns through SUP, in 1998 a group of researchers at CIP and INIAP began to test the Farmer Field School (FFS) action-learning approach.

Originally developed by the FAO in Southeast Asia, the Farmer Field School approach was developed as a means of building knowledge and improving decisionmaking by farmers. Each FFS group is composed of about 25 farmers who come together to test ideas on a small learning plot. Groups meet weekly to manage the plot according the results of their ongoing agro-ecological analyses and to run a series of selected field experiments. The general goal of a FFS is to identify practical ways to increase crop production and decrease costs.

Beginning in 1998, CIP and INIAP ran 25 Farmer Field Schools in Carchi. Studies found that through combining their own experience with the biological and ecological insights of science, FFS graduates effectively found new cost effective ways for improving pest management, such as traps for the previously unknown adult Andean weevil (Box 3) (Barrera et al. 2001). Furthermore, farmers identified precocious potato varieties resistant to late blight. As a result, Farmer Field School participants were able to grow potatoes with half as many fungicide applications as previously, thereby saving money, time and avoiding needless harm to their families and the environment. Following harvest and graduation from the season-long Farmer Field Schools, some groups progressed to form local research committees that concentrated their efforts on seed production or tackling particular, difficult, field-level problems.

Box 3. Weevil traps: eliminating highly toxic pesticides through ecological literacy

The problem with highly toxic pesticides has never been a lack of alternatives. Where we work in northern Ecuador, farmers have cultivated potato for millennia without highly toxic pesticides. Nevertheless, when pesticides arrived in the 1960s and 70s, farmers found them miraculous.

Despite very positive experiences at first, decades later soil fertility declined and certain Andean weevil populations survived the chemicals and reproduced, leading to more resistant populations. Farmers had to spray more and more pesticides to achieve the same control as before.

Studies in many cultures show that rural people are commonly unaware of insect life cycles, leading the anthropologist Jeffrey Bentley to conclude in 1989, 'What farmers do not know cannot help them.' Similarly, the Andean weevil grub lives underground, where it is very hard for farmers to see. Through rearing Andean weevils, FFS participants learned about the existence of the adult weevils that live above the ground, and they became interested in learning how to capture them, before the females laid their eggs. Researchers worked with them to develop traps: potato leaves set under carton boxes for shade, with dozens placed around the margins of a freshly ploughed field. Knowledge of the Andean weevil lifecycle is just one example of how ecological literacy can enable farmers to decrease the use of highly toxic pesticides without adversely affecting production.

In the Farmer Field Schools, life cycle studies are communicative exercises that enable farmers to 'read' what's going on in their fields. Helping farmers to fill knowledge gaps can help them manage the agroecology in their favour. Such knowledge-based approaches can help rural people to assess more deeply the dynamics of their field, thereby enabling more informed decisions and freeing themselves from a dependence on solutions offered by external proponents of agricultural extension and salespeople.

This communication strategy went beyond the approach of filling knowledge gaps with externally validated evidence and pre-packaged solutions. In the FFS, communication became a joint meaning-making venture between researchers and farmers to find context-specific solutions. Researchers facilitated the process by bringing new information, raising discussion questions and systematising experiences.

Unfortunately, despite the initial success of the Farmer Field School programme in changing the way pesticides were used and a good reception by policymakers, its context specific nature posed serious institutional challenges, making FFS hard to scale up (Sherwood et al. 2012). The Ministry of Agriculture created an ambitious national extension programme that was not capable of accommodating the nuanced demands of FFS and, in the process of creating standardised curriculum, it effectively converted FFS from an example of a relatively open-ended, participatory action-learning approach (Dev 2.0) to a uni-linear technology transfer approach (Dev.1.0). FFS graduates and researchers lobbied for continued investments in participatory processes in addition to substantial efforts to increase the controls over the most harmful, highly toxic pesticides. Such efforts, however, were not successful in a context where the rural sector carried little political clout compared with an agrichemical industry that had effectively established the assumption that pesticides were not dangerous if properly applied.

Development 3.0: the rise of the consumer citizen and 'Eat well!'

The research in Carchi came to find that a matrix of cultural practices, power, business interests and ideology led major stakeholders, including farmers, researchers, government and industry, to become locked dangerously into a lethal system of food production. The effects of pesticide poisoning had become so far reaching and generalised that it was no longer possible to place the blame on a single actor, be it a farmer or pesticide salesperson. Chronic poisoning had become naturalised as part of the sociotechnical agrifood backdrop. Meanwhile, it became increasingly evident that urban consumers, used to relatively cheap basic foods, but also anonymity, were important actors in both sustaining the current state of affairs and enabling future redirections. The challenge for ameliorating the situation is in linking growers and consumers into a powerful force of change. But who should be targeted, how, and with what resources?

This scenario, of generalised chronic poisoning, is giving way to increasingly influential counter-movements, in particular the 'consumer-citizen' (Sherwood et al. 2013). In Ecuador, public contempt has turned towards those technologies once legitimised by the logic of economic rationality, but now undergoing severe questioning. At the same time, a growing number and diversity of farmers, distributers and citizens are turning to alternative food production, circulation and consumption. We understand this to have happened mainly due to their personal experiences with what have become conventional agrifood processes, connected to the information available on the adverse effects of pesticide technology.

The limitations of research communication as technology transfer or through knowledge-based approaches have led some researchers to join food counter-movements, leading to new political possibilities. While criticism of agrichemicals has continued to be the rallying point for agroecological movements, over time, food movements in Ecuador have evolved to address more holistic issues of farm

management: in particular, soil conservation, as well as integrated plant and animal management. Most recently, these have come to include even broader producer–consumer relationships pivoting around 'healthier food systems', which address such priorities as agro-biodiversity and exchange equity, as well as making investments in direct exchange markets, barter economies and the emergence of local currencies.

One particularly influential movement in Ecuador, the *Canastas Comunitarias* (literally 'Community Food Baskets'), has become inspiration for greater consumer activism. These groups promote direct grower–consumer exchange as a new form of community 'responsibility'. Over the last 20 years, the *Canastas Comunitarias* have emerged in over 50 neighbourhoods, involving more than 1,500 families and spanning six cities (Kirwan 2008). Initially, individual groups were motivated by the financial advantages of purchasing commodities in large quantities, which usually results in savings to the order of 30 to 50%. Over time, however, groups such as the Ecuadorian NGO Utopia and the community of Tzimbuto, Chimborazo diversified their agendas to include matters such as food quality, environmental sustainability and social equity (Borja et al. 2013). The municipalities of Quito, Cuenca, Guayaquil, Ibarra and Riobamba have promoted Community Food Baskets to advance their political agendas (Dillon-Yepez 2006) and, recently, Congress selected a Canasta representative for its eight-member Food Security and Sovereignty Board, which is charged with setting national priorities.

The *Canastas* are composed primarily of families in poor neighbourhoods. Since its founding 18 years ago in the city of Riobamba, the *Canastas* movement has grown largely without external financing, which demonstrates its intrinsic value for the participants. *Canastas* are not simply based on the principle of solidarity; they are founded on the idea of reciprocity (i.e., complementary relationships and mutual gain among all participants). This later principle encourages members to organise collectively around positive-sum opportunities, enabling them to avoid paternalistic gift giving and dependency, which often plague externally led community development projects.

Enabling groups, such as the *Canastas*, to confront contradictions between the beliefs of individual members and collective practices represents an opportunity for addressing a number of public health concerns – from pesticide poisoning and unfair pricing to overweight and obesity (Sherwood et al. 2012). These spaces, as a focus of attention on emerging networks of actors, have generated expectations and political possibilities, leading to new claims on food production, provision and consumption. In the process, food movements have grown into a national force, known as the National Agroecology Collective (*Colectivo*). Most recently, the members of the *Colectivo* have united around a holistic national campaign, '*Que Rico Es!*' that aims to provide equal attention to 'sustainable, regenerative and equitable' food (Box 4).

Box 4. 'Que Rico Es!'

The members of the National Agroecology Collective created a week-long, twice-yearly campaign to 'wake up' 'those who eat' (i.e., consumers) to the power that they inherently wield in food systems. In Ecuador, studies estimate that consumers spend about US$ 8 billion per annum in food and drink – in effect, financing the production, consumption and circulation of food and food products (Prado 2004).

The central objective of the campaign is to sensitise consumers to the food crisis, and to inspire them to get involved in existing examples of healthy alternatives, such as alternative food fairs and the Canastas Comunitarias. Ultimately, it aims to enable ordinary people to exercise a sense of citizenship through their individual and collective daily food practices, as per an explicit policy shift from 'agriculture as production' to 'agriculture as food' in the 2008 National Constitution and 2010 Food Sovereignty Law.

Entering its second year, the Colectivo has set up a Responsible Consumption Committee, charged with leading the campaign. One of its most important activities is to consolidate research results on 'healthy' food production, consumption and circulation and to disseminate information to members, government and the media. For example, the committee engages with proposals to introduce genetically engineered seeds and crops in Ecuador (which are presently prohibited at the constitutional level).

The members of different movements and organisations involved in the campaign use diverse research, including the pesticide studies summarised in Yanggen et al. (2004), to engage urban consumers in food issues, yet the campaign still appeals to the everyday experiences of families and their networks. Researchers in these movements primarily participate as activists; the research agenda depends upon the needs of the movement rather than on predefined intervention objectives.

New dynamics of communication in development

Looking back on our experience of research communication in the context of Ecuador's public health issues, our thinking has evolved from treating research as a primarily abstract, externally led activity to something entirely more active and intrinsic to communities. Similarly, our idea of communication has evolved from informing the public to questioning the role researchers themselves should play in the course of social change. One conclusion is familiar: that is, an understanding of context is very important for policy change – but this does not just apply to farmers,

producers and consumers. This experience shows the necessity of understanding the context of researchers themselves, particularly with regard to their cultures and organisations, and to how their mindsets, attitudes and performances – during negotiations and other deliberative processes – shape desired outcomes.

Reinterpreting the communication process

Faced with public concerns over pesticide technology, research communication in Ecuador has evolved from being primarily expert driven towards being more community led and open to participation. The contradictions within the Safe Use of Pesticides approach and the institutional confrontations between the Farmer Field Schools and the dominant socio-technical regime of the time led alternative food movements to open up new opportunities for social change within the food system itself. Given the centrality of food in people's lives, we have learnt that there is no point sitting at the back, observing. The emerging approach demands that all stakeholders, including researchers, accept that their (in)actions have social impacts and that they find ways of embedding their activities within the social campaign or movement they support.

In the 'modernisation' development paradigm, as characterised by both Development 1.0 (technology transfer) and 2.0 (participatory development), research communication is very much viewed as a means of addressing what are understood as information deficits, through the dissemination of scientific knowledge. Researchers are viewed as playing an external role in compensating for such deficits, often aided by intermediaries or brokers. Over time, however, the pressures of social movements demanded that researchers' pro pesticide intensification agenda shift to an agroecological approach. In certain organisations researchers were able to open up space for new forms of capacity-building and technology generation, such as the discovery-based approaches of Farmer Field Schools as well as farmer-led research. Nevertheless, studies show that, in many cases, the required shift in modality violated institutional standards of 'good practice', and went against established administrative procedures, such as the ability to predetermine outcomes, and the utility of project-based designs (Sherwood et al. 2012). Despite awareness and interest in the shift in communication and capacity-building approaches, many sympathetic researchers faced serious challenges in their organisations and, ultimately, their participatory designs. For example, when they tried to scale up, the Farmer Field Schools, became less about community empowerment and leadership and more about sustaining externally led development.

Our experience has led us to view communication of research as not merely an element of rational decisionmaking but a central part of social organisation itself: what we describe as a process of self-organisation. Just as paradigms of development practice have changed over time, so too have the processes and expectations of communication. Slowly, researchers are coming to recognise that information alone is not sufficient to address the diversely rooted causes of a growing pesticide health epidemic. In fact, a preoccupation with conveying information that already existed made them blind to

the complicity of science and business in perpetuating a certain harmful sociotechnical trajectory. New direction was called for, what we call 'Development 3.0'.
The shift to Development 3.0 evolved from elements of earlier paradigms (i.e., technology transfer and participatory development), but also opened up a fundamentally new pathway, where communication is not an ex-post activity, but rather a central means of internalising the externalities of agricultural modernisation. In this context, communication needs to be seen not so much as the set of activities carried out by a communications team, but what researchers themselves do from the onset of their investigation as means of assuring their accountability to stakeholders and the relevance of their contributions.

The process of communicating research among the different stakeholders therefore changes the social organisation among the different stakeholders, including the researchers themselves. This third method of engagement poses challenges to the traditional way of conducting research and communication.

Implications for practitioners and researchers

The arrival and perpetuation of harmful pesticide technology demonstrate a number of lessons for researchers. The research that was carried out was aimed at stopping the health epidemic caused by the use of pesticides. At different points in time researchers targeted farmers, industry representatives and policymakers to inform them of the alarming findings, such as the fact that a majority of the rural population, including women and children, suffered chronic exposure and serious health problems. The hope was to eliminate the most highly toxic products and work together in promoting alternatives. Nevertheless, eventually it became apparent that a large number of scientists, business people and government officials put their personal interests ahead of those of the broader public – a blatant demonstration that the activity of science, technology and government was not always about advancing the public good. This raises serious questions of ethics and morality in how researchers use communication for competing purposes.

Researchers and development workers are trained to assume that sustainable development is a function of good quality information. Nevertheless, this case exemplifies that information is not enough. While it is easy to point the finger at the agrochemical industry, the fact is that the vast majority of products sold in Carchi were compliant with labels that met international standards, complete with the industry's colour labelling system to reveal toxicity and warning about safe use. Unlike many areas of the developing world, farmers in Carchi were literate and capable of reading and understanding labels. Presenting information in such a way that only delineates the issue at hand does not guarantee that the stakeholders will opt for a given solution. This actually opens a contested space where stakeholders interpret and act on information and experiences differently, leading to outcomes that are impossible to predict and control. In the case of Carchi, during the Development 1.0 period, pesticides became a social marker of gender: public exposure to neurotoxins was a public presentation of masculinity (Mera 2001). In this

sense, pesticide poisoning for social reasons is not unlike how some people in urban settings drink large quantities of alcohol during public encounters, smoke cigarettes or drive motorised vehicles recklessly beyond speed limits when it is knowable that such activity can have serious consequences on their health and wellbeing.

Similarly, diverging policies may arise that challenge each other no longer on the technical but instead on social and political grounds. Challenging assumptions and taking responsibility for unintended consequences or irresponsible behaviour requires researchers to understand the sociopolitical context, where the technology they create and promote may take on a life of its own. In other instances, researchers must be held socially accountable for their activity by farmers as well as by the broader public, which ultimately must pay the costs of both the 'goods' and 'bads' of their technology.

Underlying these matters is also the assumption that change is linear and predictable and that development can be controlled, fixed or engineered. To be effective, researchers perform within the norms of their discipline and profession, but they also need to become more intimately involved in the socioenvironmental contexts where their activity unfolds. When serious contradictions arise, even if unwanted, they must be held accountable and come to share responsibilities, working with stakeholders to mobilise resources for ameliorative measures. For example, a number of researchers in INIAP organised themselves to promote a new agenda for decreasing pesticide use and promoting ecologically based alternatives, leading to proposals for shifting 'best practice' from SUP to the Farmer Field Schools.

Communication, from a practice perspective, challenges the defined split between the observer and the observed. The point of departure for a practice perspective is that the world is not just full of observations and facts, but also agency: the strategic activity of people as social actors, taking positions and strategically pursuing their interests. Even when not intending to do so, researchers communicate their own belief systems and values along with their research results: for instance, when participating in expert-led training programmes or taking a backstage position within social counter-movements. In an environment of institutional change (especially involving contested policies, such as agricultural modernisation policy), it is not simply a matter of knowledge being communicated; rather, it is about the attitudes and competences of researchers as social actors, willing and capable to act reflexively and step outside the bounds of their professional norms to enable corrective change in their organisations. In such cases, performance standards are not just limited to a self-referential group of colleagues organised around relatively narrow institutional interests, but researchers also must be held accountable to broader public scrutiny.

Ultimately this means that, when researchers communicate they must take into account the roles they play in communities organised around certain standards of practice. Researchers can no longer just provide specialised advice based on abstract knowledge and assume that their institutional role as a knowledge broker is accepted and provides them the legitimacy to intervene. The Ecuadorian experience with

pesticide technology highlights the need to recognise that researchers are not external players. By communicating, they participate and perform in social networks and are active actors of change. Hence they are sustaining certain belief systems and regimes of practice over those of others. To be effective, researchers must view themselves as both communicators and the target of communication efforts. Otherwise, they risk becoming entrenched in their own perspectives and blind to the very realities they aim to affect.

Researchers eat: the 'practice-turn' in communication and the social sciences

'Practice' is a familiar term that is commonly misunderstood and under-appreciated. Typically, practice in development is limited to the mundane routines of daily life. Nevertheless, the body of works of social thinkers over the last century – Heidegger, Vygotsky, Wittgenstein, Bourdieu, Foucault, and Schatzki – invites reflection on its underlying philosophical meanings and implications. People's daily practices, for example, around the use of pesticides in food production, can be seen as a public display of what is possible and what is desirable: simultaneously an expression of who we are as individuals and as a community. Dependent on continually changing local contexts, perceptions, creativity and flair, practice represents an infinitely complex and dynamic space of communication and social organisation.

Our study on how the practice of pesticide poisoning inserts itself into families and communities sharply contrasts with notions of peoples' activity as being related to a single rationality or calculus or informed by research. Communicative practice, such as in farming, brings into view activities that are situated, corporeal and shaped by habit and inspiration with little to no immediate reflection. For example, farmers communicate their beliefs on pesticides verbally as well as through use in their daily lives. In the same sense, researchers may promote pesticide safety in a rural community, and then go home to the city and purchase potatoes for dinner: an action that ultimately finances the very practices they criticise. Therefore, a full understanding of self-poisoning by pesticide requires moving from the comfortable tendency to place blame on the victim, to providing attention to peoples' agency in spaces that are today simultaneously individual and collective, private and public, and social and technical.

This case, however, has taken us to consider practice not only as something we study from a distance, but also as a co-construction of which researchers, as members of a society, are intimately part. In the transition of the phases of this case, it became clear that the way in which researchers carried out their activity and how they interacted with others changed their behaviours as researchers and as communicators, from an external position to an embedded one. Initially, researchers behaved as external actors that brought pre-packaged knowledge to

the rural sector. In the second phase, certain groups of researchers responded to

public criticisms and opened up space for change, coming up with process-based innovations capable of shifting regimes of practice towards knowledge-based approaches: commonly involving no pesticides. Since that time, a growing number of researchers have become involved in creating alternatives to input-intensive agriculture, ones which are increasingly responsible to the situated realities of localities, rather that the predefined, universal notions of conventional agricultural science and development practice. In the process, researchers have become part of a new movement – which was emergent and thus not fully understood or researchable – essentially a new operational modality that involved researchers as actors from within.

In this new context, in order to communicate, the researchers must now gain legitimacy among the other actors. Legitimacy cannot be based solely on the researcher's work, findings and evidence. It becomes more relevant who the researcher is as an individual, and how he or she communicates through his or her practices and, in this particular case, eating habits.

It is clearly exemplified in this case that researchers are stakeholders because they certainly are 'people who eat', as described by the members of the Colectivo, meaning that they are not just abstract actors but also an intrinsic part of the system to be affected. This is something we see happening more frequently, as researchers and policymakers start to recognise that they are part of the context that they investigate. We are seeing more researchers being an explicit part of the process of change, which in turn is changing professional identities, the nature of work and the researchers' sense of agency.

This raises interesting questions regarding researchers' legitimacy as communicators in the policymaking process. For example, in the case of researchers who study public health services but use private services for their own health needs, or promote changes in public education but send their children to private schools. Do they have legitimacy beyond that provided by their social status and privileges to participate in policymaking advice? But if, on the other hand, they were embedded in the system, how could they maintain their claim of objectivity?

Researcher–citizens: from communication in abstraction to communication in practice

Through their growing activity in social movements, we see that a growing number of researchers in Ecuador have become active in communicating their concerns at a personal level and taking on responsibilities as parents, neighbours and citizens. In this chapter we examined experiences with pesticide technology in search of new insights into the challenges involved in communicating complex ideas. We found an evolution, from technology transfer to participatory development rooted in the tradition of agricultural modernisation to an emerging third pathway focused on a qualitative shift towards greater embedding of research and the researcher in the social space. Our findings beget three concerns for policy researchers and research

centres more generally:

1. *conflict between the expectation of objectivity and neutrality and the increasingly apparent agency of the researcher;*
2. *need for greater accountability and responsibility of researchers in processes of social, economic and political change; and*
3. *institutional challenges in shifting from development in abstraction to development in practice.*

Not unlike the effects of other modern technology, the risks associated with pesticides were largely abstract and essentially invisible, and thus they were subject to interpretation. As a result, there was not a linear process from research communication to action, but it was the successful entrepreneurship of different arrays of actors – e.g. people operating in farming communities, research agencies and universities, NGOs, agrichemical industry, and government – that informed public perception and determined endogenous pathways of action. In this dynamic a more engaging role of researchers as communicators was important in triggering results.

Initially, research communication was about messaging and diffusion, for example, through largely unidirectional courses and reading material on pesticide safety. Studies showed that such approaches were influential, but often in ways that favoured product sales and the image of industry, rather than addressing public concerns over pesticides (Atkin and Lesinger 2000). Later, communication became more about self-directed learning through filling 'knowledge gaps' and deepening insights, in this case via discovering learning practices for greater 'ecological literacy' and 'Integrated Pest Management' (Cole et al. 2007). In this case, researchers played the role of educators and capacity-builders, for example, in creating the Farmer Field Schools. In practice, however, this kind of research communication continued to reproduce the underlying problems of agricultural modernisation, namely conformity to markets and dependence on expert knowledge and technology, which – in turn – undermined the social and environmental embeddedness of rural development (Sherwood et al. 2012).

Nevertheless, we find researchers who have opened up a third pathway that appears to be addressing this matter. Most recently, efforts to address pesticide poisoning and other concerns associated with agricultural modernisation have been aimed at new consumer–producer relationships and forms of interaction. Actors involved in earlier efforts to tackle pesticide problems have shifted their attention to communication strategies that emphasise more 'responsible' forms of organisation through such new relationships.

In many ways, counter-movements have pioneered these activities, operating outside the boundaries of formal science and development institutions. In some instances, these pioneers included researchers and development practitioners

who chose to step outside the usual institutional boundaries at universities, NGOs and the government. This shift in responsibility demanded that researchers, practitioners and bureaucrats in part leave the abstract professional position and pay attention to her or his individual and collective roles as 'one who eats': i.e., a potentially influential agent of food practices in the family, community and social networks. In other words, they must recognise their unshakable roles as citizen.

The transition required demands 'coherent practice': understood broadly as thinking, feeling and doing in the same direction. This is most immediately and practically expressed in one's daily consumption of food and other products, as a means of seeking social equity and environmental sustainability – not in abstract terms but through daily practices of living and being. As such, 'work' extends beyond one's professional activity to other domains of life.

While an interesting concept, this shift poses serious institutional challenges, such as those highlighted in the 2009 International Assessment of Agricultural Science, Knowledge and Technology for Development (IAASTD). In Table 2 we summarise our understanding of that transition and its meaning for research and development practitioners. We do not pretend that institutional support presently exists for this new pathway. Nevertheless, there is a growing urgency for 'organised responsibility' in research and development practice, creating a demand for the emergence of a new professional and supportive institutional frameworks and environments. According to the IAASTD, such institutional change merits further reflection and strategic attention from the think tanks, universities and agencies of development policy.

For those of us involved in research in developing countries, today, our professional and personal lives are becoming far more interconnected. In practice, we as researchers are experimenting with the tensions between our ideas and our daily activity. As actors belonging to social networks, our sense of allegiance may shift to the point where institutional rules must be broken in order to get things done. In our example, despite claims of the political neutrality of the science, progress eventually depended on the willingness of researchers to take a position on the need to outlaw highly toxic pesticides or to keep genetically modified seeds and crops off the market. The boundaries between the personal and professional space break down in our version of communication. We are endlessly forced to deal with our own inconsistencies and incoherencies. In this case in particular, we can no longer purchase food in just any store, but must make efforts to eat organically and buy directly from farmers in local markets. We see hope in such tendencies: in reorganising our responsibilities and in reconnecting our ideas with our actions, our living and doing, our families and our communities.

Table 2. Institutional movement in development practice: from information provision to process facilitation to 'being'.

	Dev. 1.0 Professional: producer of knowledge, technologies and services	**Dev. 2.0 Professional: facilitator of process management**	**Dev. 3.0 Professional: practitioner and social actor**
Dilemma	Uninformed practice and organisation – a need to inform and educate.	Exclusive, undemocratic organisation – a need to deliberately involve hidden voices and manage externalities.	Organised irresponsibility – a need to internalise social and environmental externalities.
Assumptions on reality	Single, tangible reality.	Multiple realities that are socially constructed.	Multiple realities that are individually and socially constructed.
Interaction with bodies of knowledge	Discipline-based, limited interaction with other perspectives.	Multidisciplinary, ongoing interaction and transformation of perspectives.	Transdisciplinary, need to overcome arbitrary dichotomies of modernisation (abstraction and practice; expert and practitioner; internality and externality; local and global; personal and professional)
Scientific method	Reductionist and positivist. Complexity can be best described through independent variables and cause – effect relationships. The perception of the researcher is central.	Holistic and post-positivist. Local and global categories and perceptions are mutually acknowledged. Differences between subject and object; methodology and data are little defined.	Reflexive. Objectivity is denied; a need to be explicit about influences and manage them.

	Dev. 1.0 Professional: producer of knowledge, technologies and services	**Dev. 2.0 Professional: facilitator of process management**	**Dev. 3.0 Professional: practitioner and social actor**
Strategy and context of research	Professional knows what he or she wants. Designs are pre-established. Information is the product of universal knowledge. Context is controlled and independent.	Professional does not know where processes will go. Themes emerge as a result of learning – action. Focus and understanding emerge from interaction.	Professional seeks coherent daily practices in family, neighbourhood, communities and office. Performance and public accountability in context is fundamental.
Who sets priorities?	Researchers and practitioners give priority to problems and activities.	Communities, practitioners and researchers prioritise together.	People, through their daily living and being.
Relationship with intended beneficiaries	Researchers and practitioners control and motivate clients from a distance. Tendency to distrust local people, who are principally research objects.	Researchers and practitioners maintain close dialogue with constituents. Construct trust through joint analysis negotiations.	Direct and immediate, as a member of communities, the researcher lives the consequences of his and her activity.
Intervention modality	Unidirectional and project driven: time and theme bound.	Interactive and deliberative: unbound, working in teams based on long-term commitment.	Socially embedded and contextualised: working within defined social change contexts.
Political position	Inappropriate: threatens objectivity.	Appropriate and necessary: managing social role of science and development.	Central: professional understood as a person first, intricately involved in intentional and unintentional communicative products.

References

Antle, J.M., S.M. Capalbo, and C.C. Crissman (1994) 'Econometric production models with endogenous input timing: an application to Ecuadorian potato production.' *Journal of Agricultural and Resource Economics* 19 (July): 1–18.

Antle, J.M., D.C. Cole, and C.C. Crissman. (1998) 'The role of pesticides in farm productivity and farmer health' in: C.C. Crissman, J.M. Antle, and S.M. Capalbo (eds) *Economic, Environmental and Health Tradeoffs in Agriculture: Pesticides and the Sustainability of Andean Potato Production*. Dordrecht, The Netherlands: Kluwer Academic Publishers, 231–242.

Atkin, J. and K.M. Leisinger (eds) (2000) *Safe and Effective Use of Crop Protection Products in Developing Countries*. Oxon, UK: CABI Publishing.

Barrera, V.; L. Escudero; G. Norton; and S. Sherwood (2001) 'Validación y difusión de modelos de manejo integrado de plagas y enfermedades en el cultivo de papa: una experiencia de capacitación participativa en la provincia de Carchi, Ecuador.' *Revista INIAP* 16: 26–28.

Barsky, O. (1984) *Acumulación Campesina en el Ecuador: Los Productores de Papa en Carchi*. Quito, Ecuador: Facultad Latinoamericana de Ciencias Sociales (FLACSO).

Barsky, O. (1988) *La Reforma Agraria en Ecuador*. Quito, Ecuador: Corporación Editora Nacional.

Beck, U. (1992) *Risk Society: Towards a New Modernity*. London, UK: Sage Publications.

Borja, R.; P. Oyarzun; S. Zambrano; and F. Lema (2013) 'Local Food Systems: Tzimbuto and Canasta Utopia.' *Farming Matters* 29(2): 38–40.

Cole, D.C., F. Carpio, N. Leon (2000) 'Economic burden of illness from pesticide poisonings in highland Ecuador'. *Pan-American Review of Public Health* 8(3): 196–201.

Cole, D.; S. Sherwood; C. Crissman; V. Barrera; and E. Espinosa (2002) 'Pesticides and health in highland Ecuadorian potato production: assessing impacts and developing responses.' *International Journal for Occupational and Environmental Health: Special Series on Integrated Pest Management* 8(3): 182–190.

Cole, D.C.; S. Sherwood; M. Paredes; L.H. Sanin; C. Crissman; P. Espinosa; and F. Munoz (2007) 'Reducing pesticide exposure and associated neurotoxic burden in an Ecuadorian small farm population.' *International Journal for Occupational and Environmental Health* 13: 281–289.

Crissman, C.C., J.M. Antle, and S.M. Capalbo (eds) (1998) *Economic, environmental, and health tradeoffs in agriculture: pesticides and the sustainability of Andean potato production*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Gibbons, M.; C. Limoges; H. Nowotny; S. Schwartzman; P. Scott; and M. Trow. (2000) *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London, UK: Sage Publications.

Marsh, D.R.; D. G. Schroeder; K.A. Dearden; J. Sternin; and M. Sternin (2004) 'The power of positive deviance.' *British Medical Journal* 329 (7475): 1177–1179.

Mera, V. (2001) 'Paying for survival with health: potato production practices, pesticide use and gender concerns in the Ecuadorian highlands.' J*ournal of Agricultural Education and Extension* December 8(1): 31–40.

Miettinen, R., D. Samra-Fredericks and D. Yanow (2009) 'Re-Turn to Practice: An Introductory Essay.' *Organization Studies* 30: 1309–1327.

Molenaar, H. (n.d.) 'Towards a new understanding of research for development' in: H. Molennar, L. Box, and R. Englehard (eds) *Knowledge on the Move*. Leiden, The Netherlands: International Development Publications, 1–32.

Paredes M. (2010) *Peasant, Potatoes and Pesticidas. Heterogeneity in the Context of Agricultural Modernization in the Highland Andes of Ecuador*. Wageningen, The Netherlands: Wageningen University, 308.

Prado, J.J. (2004) 'El consumo en Ecuador: indices exclusivos.' *Perspectiva* Año 10(8): 2–5.

Röling, N. (2005) 'The human and social dimensions of pest management for agricultural sustainability' in: J. Pretty (ed) *The Pesticide Detox: Towards a More Sustainable Agriculture*. London, UK: Earthscan Publications, 97–115.

Schatzki, T.R., K. Knorr-Cetina, and E. von Savigny (eds) (2001) *The Practice Turn in Contemporary Theory*. London, UK: Routledge.

Sherwood, S. (2009) 'Learning from Carchi: Agricultural Modernization and the Production of Decline.' PhD dissertation. Wageningen University, The Netherlands.

Sherwood, S., M. Schut, C. Leeuwis (2012) 'Learning in the Social Wild: Farmer Field Schools and the politics of Agricultural Science and Development in Ecuador' in: H.R., Ojha, A. Hall, R. Sulaiman (eds) *Adaptive Collaborative Approaches in Natural Resources Governance: Rethinking Participation, Learning and Innovation*. London, UK: Routledge, 102–137.

Sherwood, S.; A. Arce; P. Berti; R. Borja; P. Oyarzun; and E. Bekkering (2013) 'Tackling the new modernities: Modern food and counter-movements in Ecuador.' *Food Policy* 41: 1–10.

Sherwood, S. and M. Paredes (2014) 'The Dynamics of Perpetuation: The Politics of Keeping Harmful Pesticide Technology on the Market in Ecuador.' *Nature and Culture* 14(1).

Simpson, B. (2009) 'Pragmatism, Mead and the Practice Turn.' *Organization Studies* 30(12): 1329–1347.

Van der Ploeg, J.D. (2003) *The Virtual Farmer: Past, Present, and Future of the Dutch Peasantry*. Assen, The Netherlands: Royal van Gorcum.

Van der Ploeg, J.D. (2009) *The new peasantries: new struggles for autonomy and sustainability in an era of empire and globalization*. London: Earthscan.

Yanggen, D., C. Crissman, and P. Espinosa (eds) (2003) *Los Plaguicidas: Impactos en Producción, Salud y Medio Ambiente en Carchi, Ecuador*. Quito, Ecuador: CIP, INIAP and Abya-Yala.

Yanggen, D.; D.C. Cole; C. Crissman; and S. Sherwood (2004) 'Pesticide use in commercial potato production: reflections on research and intervention efforts towards greater ecosystem health in Northern Ecuador.' *EcoHealth: Ecosystem Approaches to Human Health* 1(2): 72–84.