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4 Learning in the social wild

Farmers Field School and the politics of agricultural science and development in Ecuador

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Introduction

As a result of its impressive success as a knowledge-based, community-led approach for change in Integrated Pest Management (IPM) in Southeast Asia and elsewhere, Farmer Field School (FFS) methodology was introduced in the Andes, initially to help communities overcome pesticide-health concerns. Eventually, the approach was adapted to address other concerns in agriculture and natural resource (ANR) management, including the sustainable management of small and large animals, local seed systems, soil fertility, and water for food production and climate change adaptation. Beyond helping to solve technical concerns, FFS was explicitly inserted as a political device for shifting the designs of ANR management away from technology- to people-centred approaches. In this paper, we examine the arrival and rise of FFS in Ecuador, followed by encounters with the socio-technical regime organized around agricultural modernization and subsequent transformations and counter-movements. The exercise sheds light on the conflicts between present institutional designs and needed re-direction towards more adaptive agricultural science and development practice.

Following initial success, FFS become widely recognized as 'best practice' in Ecuador, leading to the proposal of new policies for agricultural development. During processes of scaling, when FFS was released into the 'social wild' of institutional collision, collusion, and coercion, the approach became systematically transformed in the hands of researchers, extensionists and farmers and their organizations and projects to the point where FFS no longer represented a serious threat to established ways of thinking, organizing, and doing in science and development practice. In the process, the original idea of FFS as a means of adaptive collaborative management was lost. The experience provides rare insight into the politics of institutional continuity and change in ANR, in particular over how actors involved in

agricultural development become organized around prestigious symbols and active in translation of meanings, truth construction, enrolment, and other processes of social networking in favour of certain agendas at the cost of competing interests.

We begin with an explanation of the theoretical approach underpinning this inquiry, followed by a description of 'FFS by design' and summary of its rise to the status of 'best practice' in Ecuador. In continuation, we examine ex-post the transformation of FFS in the social wild. The data that is presented brings together reflective practice based on the practitioner experience of Sherwood as a FFS Facilitator, Master Trainer and Project Coordinator in the Andes from 1998–2009,[1] as well as the action-research of Schut, Sherwood and Leeuwis[2] in Ecuador to explore the challenges and opportunities of implementing a methodology aimed at strategically questioning existing forms of knowledge production and institutional practice in rural development. In addition, we draw on complementary studies (Paredes, 2001 and 2010; Barrera *et al.*, 2001; Mendizabel, 2002; Barrera *et al.*, 2004; Borja, 2004; Maurceri, 2004), project documents (Jiggins *et al.*, 2001), field visits, interviews with trainers and project participants. Due to the large quantity and complexity of the material as well as our interest in grounding an analysis and examining central institutional features, we summarize our empirical data as three, highlycontrasting case studies of FFS facilitators, followed by evidence on the institutionalization of field schools in their contrasting organizational environments. After analysing and discussing the data, the chapter ends with conclusions on how methodology-based, niche-level interventions may survive the social wild, though perhaps in new forms, and grow and diversify in influence towards more fundamental institutional change.

Farmer Field School: a niche-level intervention for socio-technical change

In this section, we describe and analyse the introduction and performance of FFS as a strategic niche-level intervention for shifting a paradigm of agricultural science and development practice towards more adaptive, collaborative agriculture and natural resource management. To better understand what happened to FFS in the social wild, we draw on two theoretical concepts. First, we explore the ideas of Gibbons (1994) and Nowotny *et al.* (2003) on extreme 'modes' of scientific knowledge production to position the relevance and ambition of the introduction of FFS in the Andes. Second, in order to explain the spontaneous social processes of appropriation and transformation of FFS in the hands of different organizational actors and their networks, we analyse our experiences in the context of socio-technical regimes as described in Geels (2004).

In his book *Cognition in the Wild*, Edwin Hutchins (1996) explored the performance of cognition in its 'natural habitat' – i.e., in the realm

of spontaneous, culturally constituted human activity. Borrowing from Hutchins' metaphor, we embarked to study the performance of FFS in the context of the 'social wild' of science and development practice. Our research interest is to examine how, over time, FFS, as a niche-level intervention for broader institutional change, can become diversely translated and utilized in the hands of different actors, sometimes against the explicit purposes of the methodology.

Modes of scientific knowledge production

Although agricultural modernization has led to increases in food production and economic growth in many places, the recent International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)[3] as well as an exhaustive study by the US Academy of Sciences (NRC, 2010) concur that the benefits often have not been equally distributed and gains have come with severe social and environmental costs that place into question the sustainability of past contributions. As a result, the IAASTD concluded with a call for 'a fundamental shift in science and technology policy and practice that maintains and enhances environmental and cultural services, while increasing sustainable productivity, and safeguarding nutritional quality and the diversity of food and farming systems'.

Gibbons (1994) and Nowotny *et al.* (2003) recommend an institutional shift in science and development from abstract, specialized and externally based knowledge production ('Mode 1') to more localized, applied activity ('Mode 2'). In contrast to Mode 1 science, Mode 2 aims at knowledge production that is produced in the context of application and thus locally embedded and reflexive (Nowotny *et al.*, 2003; Maasen and Lieven, 2006). Mode 2 knowledge production emerges from peoples' processes of daily activity, problem solving and organization. This 'people-centred' approach is heterogeneous and transdisciplinary in bringing together diverse knowledge, experiences and skills. Mode 2 knowledge production operates in heterarchical structures, with interactions between mixed and dissimilar organizations – each with unique and often contradictory and competing codes and rules. Instead of blind, external review – the gold standard in Mode 1 science – the hallmark of quality assurance in Mode 2 depends on local relevance of outcomes and impacts. Thus, Mode 2 knowledge production demands scientific and development processes based on open, transparent and flexible negotiations and decision-making processes that are responsive to localities. Table 4.1 contrasts Mode 1 and Mode 2 knowledge production.

Institutions are collective sets of formal and informal rules in the form of routines, protocols, norms, values, interpretative schemes, incentive structures and regulations that ultimately shape problem definitions, inform perspectives, engineer practices, and exploit niches of development opportunity. During processes of endless formation and re-formation (i.e., institutionalization),

Table 4.1 Comparison of Mode 1 (generalized/expert) and Mode 2 (local/lay) knowledge production (after Gibbons *et al.*, 2000)

Criterion	*Mode 1: Knowledge produced in the context of abstraction*	*Mode 2: Knowledge produced in the context of application*
Focus	Technology-centred	People-centred
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 multi-disciplinary – 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
Organization structures	Centralized and hierarchical – well-established; graded and top-down	Diverse and heterarchical – loose, flexible, and fluid structures; mixed and dissimilar constituents
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	Generalizeable 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; peers selected based on compliance with norms; emphasis on individual creativity from within disciplinary bounds	Broadly based – composite and multi-dimensional; dependent on social composition of review system; emphasizes 'group think', socially extensive and accommodating
Theory of knowledge spread	Spontaneous diffusion based on merit	Repeated processes of generation

socio-technical networks or regimes spontaneously arise, fall and re-organize around symbols and bodies of knowledge as well as the generation and distribution of resources to challenge existing institutions, creating rules and implementing regulatory frameworks that affirm certain ideals ('best practices'), while marginalizing others (Rip and Kemp, 1998). A socio-technical regime, such as that which became organized around a global project of agricultural modernization project during the second half of the twentieth century, can be seen as both a factory and a storehouse of

institutional perspectives and arrangements that enable and regulate the use, development and survival of a particular value system, sets of rules and technical processes and products. Thus, over time a socio-technical regime is likely to become entrenched, focusing on the defence and reproduction of its own self-referential purposes (Schot and Geels, 2007). Ironically, over time the very success of a regime can lead to intransigence that ultimately reduces its adaptability to overcome the inevitable challenges of interests organized around competing purposes. A capacity to open up pathways of innovation with existing socio-technical networks is understood as central to overcoming the urgent socio-environmental challenges confronting modern-day society.

Geels and Raven (2006) describe social spaces as 'niches' that open up as actors experiment with and organize around particular ideals, interests, and purposes. As emerging groups of actors drive radical change, they generate tensions with the existing order, commonly leading to spirals of counter activity and ensuing responses. People and their organizations may raise doubts over whether or not established norms and rules are being followed, or they may enlist in emerging networks. As a result of endlessly creative developments from within a niche environment, over time a certain network converges around increasingly appropriated and acceptable rule sets or novelties, thereby displacing existing orders.

In the late 1990s a group of scientists based at International Potato Centre (CIP) and organized around ideals of agroecology and collaborative natural resource management, proposed the introduction of Farmer Field School methodology in the region (Sherwood *et al.*, 2000). In practice, their utilization of FFS represented a radical departure from an established socio-technical regime built upon externally based, Mode-1 knowledge and technology. In this study, we describe the introduction of FFS in Ecuador as a niche-level intervention intended to promote institutional transition towards more locally led, Mode-2 science and development practice.

FFS-by-design: transition towards more adaptive, collaborative science and development practice

There is growing concern about how science and development can more effectively contribute to exploring sustainable solutions to complex social, economic and environmental problems. Many of today's most impenetrable problems are embedded in past 'solutions', such as agricultural modernization, and require innovative restructuring of supply chains, fundamental institutional change, adaptive and collaborative management and decision-making structures towards sustainable development. At the heart of the anxiety are questions whether science and development are capable of organizing and implementing such change, or have become locked in dominant non-adaptive, non-collaborative and self-destructive paradigms. To address these questions we present empirical data on the introduction and performance of Farmer Field Schools (FFS) in Ecuador – a strategic

niche-level intervention intended to advance a transition in agricultural science and development towards more adaptive, collaborative practices.

During the 1990s, the harmful consequences of agricultural modernization in Ecuador – in particular, severe health problems associated with pesticide exposure, degrading soils and declines in productivity (Crissman *et al.*, 1998), a growing number of people became concerned over industrial era technology, leading to rising waves of protests and questioning of public policy. As a result of its impressive success of FFS methodology in Integrated Pest Management (IPM) in Southeast Asia and elsewhere, colleagues at the International Potato Centre (CIP) invited the FAO's Global IPM Facility to help it introduce FFS in the Andes (Sherwood *et al.*, 2000). As a high-order, interactive lay-expert learning approach based on well-established principles of adult education (e.g., discovery-based learning), ecological literacy (filling knowledge gaps on the existence of beneficial organisms), and social learning (adaptive, collaborative learning in heterogeneous contexts), FFS have proven to be able to address more than immediate social, human health, and environmental problems at community- level (Pontius *et al.*, 2002). It was proposed that FFS also could provide a entry point for profound institutional change: a shift from expert-led, technology-centred agricultural science and development practice towards more people-centred designs, emphasizing local knowledge and community-based innovation (Luther *et al.*, 2005). Nevertheless, providing its fundamental conflict with the agenda of a well established, influential norms of science and development practice, it remained to be seen whether FFS could indeed lead to broader institutional change.

FFS methodology explicitly emerged in response to the adverse consequences of modern, industrial era rice farming in Asia, especially the health and environmental effects of pesticides (Kenmore *et al.*, 1987). The methodology is based on the premise that farmers are motivated and capable innovators who, provided insights from biology and ecology, could devise effective solutions to their pest management problems themselves. FFS accommodates typical learning styles of lay people, such as hands-on, in-the-field learning that is closely linked with the priority crop of interest (Pontius *et al.*, 2002). Over time, however, the methodology diversified to include new crops, animals, and other aspects of rural life (e.g., market interactions, specialized soil and water management, human health, and – more recently – climate change adaptation) across different geographies and cultures (for examples and further information, see *www.farmerfieldschool.net*).

The didactics of FFS are explicitly based on Dewey's concepts of discovery-based learning (i.e., adaptive, open-ended, self-directed learning through solving problems) and learning-by-doing (practice and repetition).[4] Instead of answers, the facilitator employs lively experiments where participants collaboratively discover not just new technical content, but also how to work together in finding answers to pressing problems. Rather than providing answers to pre-determined questions, FFS brings together farmers in groups

and involves them in discussions over production concerns. The methodology strategically aims at limiting information to: what farmers do not know, but need to know to improve their agriculture. FFS seeks to shed new light on previously hidden agricultural phenomena, for example, over insect ecology and especially pest-beneficial interactions. It employs learning experiments to help farmers 'see' what was previously hidden, for example, over the life cycle of a particular insect of concern. Agroecosystem Analysis (AAE) lies at the heart of the FFS learning experience (Pontius *et al.*, 2002; Pumisacho and Sherwood, 2005). It involves teaching farmers how to 'read' the health and ecology of a crop through field observations, to sample relevant crop health indicators – plant growth, disease incidence and severity, pest-beneficial insect populations, presence of weeds, and moisture conditions – and to report and openly discuss findings with the group. Rather than rely on external, expert-based advice, the negotiated outcomes of the AAE lead to management decisions based on the experience of the FFS participants. Box 4.1 summarizes the central design features of FFS.

By design, FFS addresses adaptive management through group problem solving that is grounded in the realities of a farmer's field as well as in his or her community (Pontius *et al.*, 2002). Rather than promote specific technologies, groups of men, women and children from a particular community systematically test their ideas through comparative trials. The learning–action process is transdisciplinary in that it responds to a broad interpretation of agriculture – the agronomy of soils, plants, and pest management, marketing as well as social concerns, such as work in groups and the formation of associations. FFS actively employs both farmer and expert knowledge in open-ended discovery. It emerges from organizational processes that are socially mixed and demand extensive collaboration, negotiations and consensus building among participants. The end product is not based on a pre-determined package of solutions, for example, on how to implement IPM in potato. Instead, FFS seeks to promote critical thinking and collaborative problem-solving skills that enable participants to independently find solutions through farm-led experimentation. Successful graduates deepen their knowledge of biological principals of agriculture and specific local problems as well as possible alternatives that they themselves have devised and that have been subjected to individual and group performance criteria. As a result, spread of the FFS experience is not simply a matter of repetition, but rather each group must develop its own curriculum and learning history in light of nuanced local experiences.

Thus, FFS can be viewed as a strategic departure from the expert system and its modernization project based on the 'extension' of pre-conceived solutions (Table 4.2). Instead of depending on formally trained specialists who provide answers and solutions, FFS employs 'facilitators' – either formally trained professionals or lay volunteers – who guide participants in process design and open-ended learning. According to this model, participants take responsibility for conducting experiments and finding

Box 4.1 Learning principles of Farmer Field Schools (based on Gallagher, 1999 as referenced in Pumisacho and Sherwood, 2005)

- Non-formal adult education – Adults have substantial life experience and are largely independent, self-directed learners.
- Interactive group learning – People learn best in groups, where they can interact and exchange ideas based on their diverse life experiences.
- Content linked to crop/animal stages/life cycle – Farmers address technical content immediately, as it emerges with the development of the crop or animal and the labour and cultural activities associated with its production.
- The field is the best place for learning – Rural people prefer applied knowledge and learn best during hands-on interaction with their crops and animals in the field.
- Basic scientific concepts – Every farm and every season is different; farmers need to manage general concepts and apply them to specific local contexts.
- Continual learning and experimentation – Agriculture is a highly dynamic enterprise, and as a result, farmers never stop learning and innovating.
- Farmers become 'experts' – As a result of the above, participants become critical thinkers, highly capable of independently solving problems and taking on the challenges of their agricultural development.

answers. These features make FFS methodology an explicit application of Mode 2 knowledge production and people-centred development.

Based on its success, the FFS methodology has been proposed as a promising novelty for transforming agricultural practice (Luther *et al.*, 2005). The methodology is radically different from predominant development discourses in positioning farmers as highly capable innovators, emphasizing group learning, and utilizing real-time, iterative learning-action processes to address a multitude of social and environmental problems. Numerous studies rigorously demonstrate the contributions of FFS (summarized in van den Berg and Jiggins, 2007), leading an international call for 'scaling up' the methodology (LEISA, 2003a and b). As a result of growing popularity and its demands for radical change in development practice, however, FFS has become vulnerable to competing interests from existing institutional power interests. Taking into account the required changes to programme staffing,

Table 4.2 Comparison between conventional extension and FFS (translated from Pumisacho and Sherwood, 2005)

	Expert-led extension: technology-centred development	*Farmer Field Schools: people-centred development*
Underlying logic	Instrumental and directed	Organic and interactive
Who chooses content/ themes?	Expert/specialist	Participants themselves
Learning content	Narrow and well-defined	Broad and open to questioning
Teaching/learning methods	Formal lectures Demonstration Controlled experiments	Dialogue Discovery-based activities Open-ended experiments
Role of participants	Passive subjects: collect and memorize what is taught	Active subjects: question, learn and teach, find solutions
Role of teacher/trainer	Active subject: talk, teach, discipline, determine relevant content, provide answers	Active subject: facilitate, raise questions, learn and teach, provoke discovery
Primary source of experience	Expert/specialist	Everyone
Who is knowledgeable?	Expert/specialist	Everyone
Communication style	Uni-directional: from expert to participants, limited and controlled	Bi-directional: between facilitator and participants, open and free
How do people learn?	Collecting and memorizing what is taught	Reflection over personal experience
Desired effect on participants	Learn to adopt and manage technology	Learn to analyse and solve problems independently

resource distributions, administrative procedures and field practice, it could be expected that efforts to promote and institutionalize FFS would provoke strong reactions.

Arrival of FFS in Ecuador

By the early 1990s, the promotion of FFS became a major thrust in Southeast Asia (Kenmore, 1991). The studies of Peter Kenmore, the pioneer of FFS, revealed that by killing off beneficial organisms such as parasitic wasps, insecticide use was largely responsible for pest problems in rice. Over time, an FFS in IPM movement contributed to a broad ban on pesticides for rice in Indonesia. Kenmore leveraged this experience at the Food and Agricultural Organization (FAO), and he convinced numerous countries to develop national FFS programmes on rice IPM, including: the Philippines, Indonesia, Cambodia and Vietnam. By the end of the decade, Pontius *et al.* (2002) estimated that over two million farmers in Southeast Asia had

graduated from FFS. Subsequently, Kenmore and colleagues established the Global IPM Facility at FAO headquarters in Rome, in part as a means of exporting FFS to other parts of the world, especially Africa and Latin America. The International Potato Center and in particular Sherwood was charged with coordinating the introduction of FFS in the region (Luther *et al.*, 2005).

Establishment of a pilot programme

By the mid-1990s, word of the success of FFS in Southeast Asia and similar people-centred approaches in Latin America (e.g., Bentley, 1992) had reached people at the Ecuadorian Instituto Nacional Autónoma de Investigación Agropecuaria (INIAP) and the International Potato Center through publications, conferences, and increasingly donor demands. Meanwhile, governments throughout Latin America were well into 'structural adjustment' and 'economic modernization', which, in Ecuador, became articulated as the 1993 Law of Modernization of the State (Beckerman and Solimano, 2002; Gallardo-Zavala, 2003). For public agriculture policy, this generally involved the dismembering of public extension and research services and placing the responsibility of 'capacity building' and 'technology transfer' in the hands of private consultancy companies and the agrochemical industry. Despite major reorganizations and budget cuts in public system, a dominant logic of the expert and technology-based change continued to shape and enforce agriculture development (Sherwood, 2009).

Agriculture professionals and their organizations in the Andes commonly were resistant to ideas from other regions, but they were willing to explore common experience among successful IPM work and to adapt local methods (Thiele *et al.*, 2001; Luther *et al.*, 2005). 'Participatory approaches' became a passageway for FFS. In 1997, CIP and its partners in Bolivia and Peru started to experiment with participatory training (Torrez *et al.*, 1999a and b), incorporating some elements of the FFS approach, but not the methodology defining practice of the Agroecosystem Analysis (AAE).

In 1999 the Global IPM Facility (GIF) and CIP led a three-month Training of Trainers (ToT) course on FFS methodology in potato IPM for professional extensionists and farmer promoters from Ecuador, Bolivia and Peru, which became known after the name of the training centre in the Ecuadorian central highlands: Guáslan. The organizers subsequently charged the graduates with the task of establishing FFS in their respective countries. Between 1999 and 2004, the GIF and CIP raised funds, implemented new ToTs, and organized graduates into support networks. Moreover, they advocated and lobbied the methodology in government circles. By design, FFS in the Andes sought to conserve the central features of FFS in Asia. Nevertheless, in the Andes FFS emerged in unique contexts of agricultural modernization in the region (Box 4.2), which posed new challenges for institutional transition from Mode 1 to Mode 2 modalities.

Box 4.2 Obvious differences between FFS in Asia and the Andes

In 1999, when researchers and development practitioners began to test FFS in the Andes, the main focus was on potato and the crop's major phytosanitary concern: the disease late blight. Moreover, potato was the principal economic crop and the one that demanded the greatest use of external inputs. FFS in potato IPM centred technical content on the organisms that tended to have a comparative advantage in higher altitude production systems: plant pathogens and resulting diseases. As a result, pathologists and host resistance came to play a central role in FFS in the Andes. Additionally, in Ecuador researchers quickly found that mechanized tillage on steep hillsides was a major cause of soil loss, so FFS focused much attention on soil erosion, which was not a concern for lowland rice farmers. Also, potato farmers often over-applied synthetic fertilizers. As a result, FFS often emphasized how to increase productivity through the introduction of resistant varieties and reducing fungicide and fertilizer use.

Rural demographics were very different between the regions. In Southeast Asia, farmers commonly cultivated much less than a hectare. Meanwhile, in Carchi, they tended to farm 3 to 5 hectares. Further, rural people in Southeast Asia tend to live in concentrated communities of thousands of families. The communities of the Highlands Andes are commonly made up of fewer than 10–50 families spread out across large areas. This demographic created challenges in bringing together farmers as well as difficulties with communication between sessions. Often participants asked for fewer, more intensive meetings.

While public investment in agriculture continued in Southeast Asia, agriculture modernization in Latin America and the different project and institutional contexts placed unique demands on FFS. Andean countries underwent sharp cuts in public investment in agriculture and rural development during the 1990s. Because of a vacuum of public support for rural development, non-governmental actors in Central and South America, particularly non governmental organizations (NGOs) and community based organizations (CBOs), were called on from the beginning to play a lead role in coordination and facilitation of FFS. As a result, governments generally were not amenable to large national-level programmes such as those that championed FFS in Southeast Asia. Increasingly, short-term consultants began to dominate community development and NGOs and these operated time-bound, project-based contributions. As a result, a number of NGO partners claimed that their competitiveness depended on project-based results and that staff had to 'pay for themselves'. They were not commonly willing to send staff to intensive three-month Training of Trainer (ToT) courses. This led us to shift to less intensive trainings based on bi-weekly sessions over periods of six or more months. It also led to an emphasis on market-oriented approaches to financing FFS and farmer-led FFS.

Becoming 'best practice'

As a result of the startling research outcomes on health, environmental and productivity problems of modern potato production in Carchi (Crissman *et al.*, 1998; Yanggen *et al.*, 2003), CIP and INIAP's agenda in Ecuador became centred around the improvement of farm productivity and rural health through decreasing dependence on agrochemicals. The first goal in establishing FFS was to demonstrate the potential of the methodology, leading to a series of pilots in 1999, followed by internal evaluations and commissioned impact studies. As a growing number FFS were implemented and completed in the country, ex-post studies assessed longer-term considerations, such as technology adoption and adaptation (Borja, 2004; Barrera *et al.*, 2004; Mauceri, 2004; Schut, 2006). Results from 'ballot box' tests showed that FFS helped farmers to significantly increase knowledge of relevant ecological principals (Barrera *et al.*, 2004). Economic data from FFS comparison plots demonstrated how farmers could substantially decrease agrochemical use (including synthetic pesticides and fertilizers) without decreasing production by area. Cost-benefit analysis demonstrated that FFS graduates could nearly eliminate dependence on highly toxic pesticides while decreasing production costs for a tonne of potatoes by about 30 per cent (from $104 to $80), leading to arguments that widescale application of FFS could generate substantial gains in production efficiency that would carry on year after year.

The arrival of additional FAO project resources brought on board the Minister of Agriculture, who assigned members of the National Directorate of Investigation and Technology Transfer (DITTE) to provide government certification of FFS in Carchi and elsewhere. This involved the creation of minimum standards for FFS graduates and facilitators as well as the establishment of a database on approved field schools (Borja, 2004). As part of the FAO project, in 2001, Sherwood and colleagues organized an intensive 400-hour ToT for farmers and técnicos from the northern Ecuadorian provinces of Imbabura and Carchi. Most of the participants were from public organizations (INIAP, Ministry of Agriculture (MAG), municipal governments, and technical schools), national NGOs, and community-based organizations (communities and farmer cooperatives). A handful came from private consulting firms and agrochemical companies. The central technical theme was widened from pest management to 'integrated crop management' (ICM), which permitted attention to other crop concerns, such as soil fertility and marketing. Similar to the Asian approach to IPM, ICM potentially included: soil fertility through managing soil life, limited tillage, cover crops and green manures, multi-cropping, rotation schemes, and minimal use of synthetic fertilizers. The FFS in ICM were primarily applied to potato, but to deepen the penetration of the methodology, partners were encouraged to apply FFS to other crops and animal systems, including: field beans, tomato, Andean grains (quinoa and lupine), onion, pasture/milk production, poultry and guinea pigs.

By the end of 2001, results from longer-term evaluations arrived, showing favourable results. Studies found that a high percentage of FFS graduates adopted IPM technology, especially resistant varieties and insect traps, leading to substantially less pesticide use (Paredes, 2001, 2010; Barrera *et al.*, 2004). Farmers said they welcomed the methodology as a refreshing change to the 'theory' and 'impractical' recommendations of técnicos. A number of graduates said that they had felt abandoned by the government and were eager to work with people who were willing to spend time with them in the field and learn about the difficulties they faced, which were not always limited to production agriculture. While some farmers were impatient with the open-ended, discovery-based learning of FFS (i.e., having to find answers on their own), they favoured how the experience exposed them to 'new technologies', such as seed and varieties as well as information on pests. Participants liked that FFS facilitators treated them as equals. As a result of their enthusiasm, FFS graduates became the best salespeople of the methodology.

By 2003, hundreds of farmer groups in the country were requesting support in implementing FFS. Mayors and provincial governments in Carchi and elsewhere regularly mentioned field schools in their public addresses. The regional head of MAG cited that through FFS his office was promoting the 'cutting-edge of agriculture extension', and the Ministry formally requested assistance in commandeering international financing for field schools. Representatives from national and international pesticide companies contacted the project leaders to see how they could support FFS. Sherwood (2009) observed that by this time, the methodology had become part of the spontaneous political discourse of central players of the socio-technical regime in Ecuador. Arguably, within five years of its introduction, FFS had obtained the prestigious status of best practice.

Results: FFS in the social wild

In 2003, CIP and INIAP ended its project to introduce FFS, representing a relinquishment of control over FFS to its partners in the field – the release of FFS into the social wild. To illustrate the diverse expressions of FFS after their release in the social wild, three highly contrasting experiences of FFS facilitators are presented: Joel, an agronomist from a public research institution (INIAP), Lenin, a forester from a conservation NGO (EcoPar), and Eduardo, a leader from an organization of voluntary farmer promoters (APRODIC). The names of the facilitators have been changed to preserve anonymity.

Tales of three facilitators

Case 1: Joel at INIAP: the national agriculture research service

Joel was from a small rural town that was taken over by Quito's urban sprawl during the oil boom of the 1970s. He grew up in a rapidly urbanized

Kichwa-speaking community. His grade school teacher was proud of the agricultural roots of the town and taught the students about gardening and fruit trees. Joel applied much of his learning at home. His family raised crops and vegetables and reared chickens and pigs to feed itself, while their income came from his father's irregular employment as a factory worker or construction labourer in the city. Joel said with conviction: 'That teacher and at home is where my passion for agriculture was born.'

Joel was a good student and became the first in his family to reach university, where he studied animal science and conducted a thesis on pasture systems in the Central Highlands. Following graduation, INIAP hired him for a permanent extension-researcher position, and he was sent to support the Unit of Validation and Transfer of Technology in Carchi. As Carchi was the most intensive potato production region of the country, INIAP's activities there centred on the crop's production problems. Joel conducted applied research on varieties resistant to late blight. He researched IPM of the Andean weevil and the leafminer fly. He also conducted research on crop response to chemical fertilizers. In 1996, he was sent to CIAT in Colombia, where he was trained in a participatory research methodology known as Comites de Investigación Agrícola Local (CIAL). In 1999, Joel, who had become a leader in the EcoSalud project on pesticide health effects, was selected for the initial FFS training at Guáslan.

Joel described the ToT as an awakening. He was particularly impressed by the Master Trainer at Guáslan, a Cambodian and Head of the National IPM Programme who had studied in Cuba and spoke Spanish. Joel said that the trainer's 'commitment and passion for IPM impressed the entire group.' Joel became a champion of FFS and earned the fame of being one of the country's best facilitators.

As the provincial head of INIAP-Carchi, Joel came to coordinate many projects. Each included FFS as the lead intervention platform. In 2001, Joel organized and led the first ToT for técnicos and farmer leaders of the north. In the evaluations, the participants gave Joel a perfect five out of five star ranking in four categories: enthusiasm, teaching, example, and friendship.[5]

In a workshop leading up to the Ecuadorian methodological guide (Pumisacho and Sherwood, 2005), Joel expressed concerns over the 'erosion of FFS'. Based on his experience he had the growing feeling that participants did not possess clear knowledge of the agroecosystem analysis and that their experiments lacked creativity. He emphasized that a field school was not a field school if it did not include agroecosystem analysis, learning plot, insect collections and zoos, and experiments. He lobbied for the creation of a certification system to makes sure that facilitators and graduates met minimum standards in both the technical aspects of IPM and the process management aspects of 'participation'. Among his colleagues in the FFS movement, Joel earned a reputation as a staunch advocate of FFS-by-design.

Joel actively resisted collaboration with the pesticide industry. When he left for two years of graduate study, however, his supervisor at INIAP took

advantage of his absence to establish a new project with CropLife, an international pesticide company, which involved placing an industry representative inside the field office in Carchi. Thereafter, INIAP's approach to FFS underwent major transformations. Following his returned in 2004, Joel felt that he had been forced to implement a watered-down 'hybrid' of the FFS methodology. The new approach involved five modules that centred on getting farmers to adopt an 'IPM technology package'. One farmer FFS facilitator who collaborated with Joel argued that INIAP's re-designed field schools had little similarity with the original methodology. He explained, 'The content is pre-determined, and there is no time for learning plots, agroecosystem analysis, and experiments.' Despite Joel's early clarity and enthusiasm over 'FFS-by-design', organizational constraints eventually led him to implement technology-centred FFS.

Case 2: Lenin at EcoPar: an environmental NGO

Lenin grew up in a small city in southernmost Ecuador. His parents had rural roots, but like many youths of his era, Lenin's aim was to become a professional and move out of the rural area. The nearby Universidad Nacional de Loja had a highly demanding forestry programme, known as the best programme of its kind in Ecuador, which immediately attracted Lenin. Later, FAO's Community Forestry Program (DFC in Spanish) hired him as an agroforestry extensionist to work in the Central Highlands. He was trained in what he described as 'cutting edge participatory methodologies' and became part of the FAO's largest programme in the Andes – one of its most lauded initiatives.[6] One of his supervisors at DFC described Lenin as: 'Young, smart, and hardworking – one of our best community extensionists.' The FAO eventually ended the project in the early 2000s, and when the private consulting firm EcoPar won a grant to implement a biodiversity conservation project in Carchi, many former DFC employees were hired, including Lenin.

Midway through his career, Lenin completed an MSc in Community-based Natural Resource Management at the Catholic University in Ibarra. Of the subjects presented in the diverse curriculum, Lenin favoured economics, where he excelled as a student. His thesis on environmental services argued for forest conservation through different forms of resource privatization and administrative procedures to monetize relationships between urban- and rural-based people. He felt that, given the financial incentives, farmers would protect their land and watersheds for the people of the cities.

In 2004, the coordinator of capacity building at EcoPar – an avid proponent of people-centred development and social learning – enrolled Lenin in an FFS ToT in Otavalo, which focused on 'Integrated Potato Management'. The coordinator was concerned about Lenin's 'vertical' teaching style, and added that: 'Lenin likes to spend as little time as possible in the field, and he tells

farmers what they should do', leading to little impact. Lenin explained he attended the ToT reluctantly, clarifying: 'The DFC prepared me in participatory methodologies. The [FFS] training was very basic and not always relevant for me.' Nevertheless, he said, 'The technical training in potato IPM is new and useful, since I am working in Carchi.' Further, EcoPar's donor agency, International Development Research Centre (IDRC), was enthusiastic over FFS, so he had decided to learn the methodology.

Following the ToT, EcoPar proposed a series of FFS as a means of building a grassroots initiative around the themes of biodiversity and conservation of the forest remnants on the Eastern Andean ridge of Carchi. Lenin was placed in charge of implementation. Technical themes included ecological potato production, soil conservation and forest management.

According to FAO project reports and his colleagues at EcoPar, Lenin immediately adapted FFS to fit his own priorities. He chose to work not with groups but rather individuals, and he made decisions on the dates and times of meetings. He did not involve participants in open-ended curriculum design. Instead, he pre-determined technical content and process. His FFS did not include the central process elements of the methodology. Participants summarized the course's technical content as lectures on home gardening and controlling pests. They had not participated in the open-ended, group learning normally associated with FFS. Independent of the ultimate contributions of his activity, Lenin's utilization of the methodology involved the transformation of FFS from people- to technology-centred designs.

Case 3: Eduardo at APRODIC: a community-based organization of farmer promoters

Eduardo's parents were resource-poor immigrants from Colombia who, in the 1960s, crossed the border into Ecuador in search of work. His father became a member of the '24 of May Cooperative' that, following a violent conflict, were awarded land rights under the national land reform policies in El Angel, Carchi. His father, his younger brother, and Eduardo himself were three of 18 participants in the first pilot FFS organized by Sherwood and colleagues in Ecuador. Over time, the creativity and enthusiasm of the brothers began to set them apart. They enjoyed experimentation and immediately made their own insect collections at home. The brothers reported back to the group impressive details, for example, on the mating practices of the Andean weevil, the number of eggs laid and hatched, and the results of their studies on the insect's lifecycle. Similarly, they implemented their own detailed studies on the Andean weevil and on resistance of different local potatoes to late blight.

Since he did not own land of his own, Eduardo applied his skills to his family's farm. Within a year of the FFS his family stopped using highly toxic pesticides, and they decreased by half their use of fungicides for late blight. His learning was not limited to the potato crop. Eduardo set up a tree nursery

of native species that was used to reforest the boundaries and steep hillsides of the family farm. They set up contracts with the municipality and NGOs to sell trees for local reforestation programmes. Eduardo and Luis experimented with irrigation and pasture varieties and mixtures, leading to substantial improvements in milk production. One of his cows produced about 24 litres of milk per day, nearly three times the average of his neighbours.

Joel invited Eduardo to participate in the 2001 ToT. Joel explained that while the técnicos struggled under the applied technical content of the FFS, Eduardo's intelligence and his earlier FFS experience enabled him to stand out among the group of 26 trainees. Often, Master Trainers would draw on Eduardo to explain the process aspects of the methodology as well as technical content, for example, on insect and plant ecology or the practical aspects of managing a healthy potato crop in Carchi. Eduardo had grown confident standing up in front of a group and defending his ideas, but he was best known as an expert producer. A potato specialist at INIAP told Sherwood, 'No one knows how to grow potatoes better than Eduardo.'

Prior to the end of the ToT, Eduardo set up an FFS on IPM with primary school children in his community. Later, he organized FFS with adults on Integrated Potato Management as well as on how to manage pastures. FAO evaluators observed that Eduardo effectively applied the central elements of the methodology: the content was determined by the participants, there were comparison plots, people conducted experiments, and they regularly used agro-ecosystem analysis to inform decision-making.

Eventually, Eduardo went beyond merely implementing FFS. He became involved in the Humanist Farmers Movement and helped to set up an organization of farmer promoters and researchers in Carchi – the Asociación de Promotores de Desarrollo Integrado de la Communidad (APRODIC). Eduardo summarized that the purpose of APRODIC was: 'To make a difference.' Initially, APRODIC hoped to receive financial support from the second phase of the CIP-run EcoSalud project to run field schools, but for political reasons, the project channelled resources to the Ministry of Agriculture, municipalities, and the Provincial Government, even though those entities had little to no experience in FFS. Eventually, the government organizations did not meet their commitments, so CIP resorted to directly contracting Eduardo and APRODIC. Eduardo was charged with running an FFS based on an imposed curriculum centring on pesticide safety. When Eduardo was asked about this, he responded that when hired by CIP, 'I have to follow their curriculum, which is Safe Use of Pesticides.' He added, however, 'When I run an FFS myself, I do it the right way – according to what the people want.' Table 4.3 summarizes how Joel, Lenin, and Eduardo diversely applied FFS.

Encountering the social wild

According to established FFS practice, participants must selected the thematic platform. Then, through interactive needs assessment, the facilitator

Table 4.3 Three expressions of FFS

Characteristic	*Joel at INIAP*	*Lenin at EcoPar*	*Eduardo at APRODIC*
Professional background	Diligent técnico – locally-based agronomist with specialization in biological pest control	Development bureaucrat – urban-based forester with specialization in resource economics	Eccentric farmer – lifetime of practical experience with potato-milk farming in Carchi
Reason for learning/ applying FFS	Idealistic to pragmatic – 'improving lives' was later supplanted by supervisor's interests	Pragmatic – 'told to do so' by supervisor and donor	Idealistic – 'wanting to make a difference' and pragmatic when working with projects
Facilitation style	Open and interactive	Closed, top-down	Open and interactive
Preferred location of sessions	In the field and classroom	In the classroom	In the field
Source of funding for salaries and FFS	State and external donors (COSUDE, USAID, CropLife)	External donors (IDRC)	Self-financed by facilitator and participants; punctual contributions from municipalities and external projects (EcoSalud)
Technical platforms	Potato IPM (adoption of technologies), safe use of pesticides	Agroforestry, sustainable biodiversity, organic agriculture	Potato IPM (pesticide use reduction), pasture improvement/ animal management
Number of participants	10–15	1–5	15–30
Average number of sessions	Decreased from 15 to 6	5 informal meetings	15–20, depending on group (primary school students or adults)
Who decides technical content	Técnico, in line with project objectives, some consultation from participants on details	Técnico, in line with project objectives	Participants, with feedback from facilitator or employer
Use of Agroecosystem Analysis?	Yes and no; full discussion	No	Yes; full discussion and negotiation
Experimentation?	Yes and no; largely pre-planned and project determined	No	Yes; highly open-ended and spontaneous
Didactics	Lively and fun: dynamic but largely unidirectional	Formal: lectures, unidirectional learning	Practical: discovery-based learning, learn by doing in the field
Follow-up	Dependent on project funding	Dependent on project funding	Dependent on group enthusiasm

and the participants work together to determine technical content based on local needs, priorities, and preferences. Over time in Carchi, however, external agents commonly pre-determined the themes and technical content of FFS. In Joel and Lenin's cases, their organization's projects in IPM and conservation, respectively, conditioned the thematic platforms of the field schools. Similarly, when CIP's EcoSalud project hired Eduardo, the resulting field school shifted to the employer's priority of safe use of pesticides. Only when Eduardo ran his own, self-funded FFS did he allow participants to select their own thematic platform and curriculum. Eduardo added that: 'When I run my own FFS, I do not have snacks or lunches to offer participants. If they [the FFS participants] do not like the content, why should they show up?' In contrast, Joel and Lenin argued that free lunches and other incentives were essential to maintaining the enthusiasm of participants.

By design, FFS requires participants to identify priority research concerns and to conduct comparative, participant-led experiments. Nevertheless, several studies (e.g., Jiggins *et al.*, 2001; Schut, 2006) observed that professional biases, projects, and organizational priorities commonly influenced the content and design of experiments. In Lenin's case, no experiments were used. In Joel's case, experiments were used to 'sell' INIAP's IPM alternatives, especially resistant varieties, fungicide spray regimes, and Andean weevil traps as well as CropLife's priority: 'appropriate', 'correct' and 'safe' use of pesticides. In the EcoSalud-financed FFS, no farmer-led experiments were included. In contrast, in Eduardo's field schools the participants usually led their own experiments, for example, on themes such as potato varieties, planting distances, and organic versus inorganic fertilizers.

The extent to which the critically important component of Agroecosystem Analysis (AAE) was used differed considerably between cases. Initially, Joel applied AAE in all of his field schools, and he asked elective questions that forced participants to take good measurements and to address contradictions between their findings. Nevertheless, the hybrid FFS that he came to design and implement de-emphasized AAE. In some cases, the activity was no longer applied. According to one farmer participant, 'The goal [of Joel's FFS] is to get farmers to adopt his improved practices.' Similarly, Lenin used an AAE activity in one session and then never repeated it. His explanation was that: 'It took too much time, and that he could already predict the outcome beforehand.' In contrast, Eduardo drew heavily on AAE in all of his FFS, and he challenged participants to look for ways of decreasing outlays, especially of highly toxics pesticides and synthetic fertilizers. Joel's original utilization of AAE was more nuanced and sophisticated, with biological details, such as the name of certain insects and their habits, but Eduardo's group paid considerable attention to measurements and time for discussion and negotiation. When asked why he emphasized participant decision-making in his FFS, Eduardo responded, 'They [the participants] have invested a lot of money in the [FFS] plots. I'd be "lynched" if the experiments failed.'

In the place of theoretical, classroom lectures, FFS emphasizes in-the-field exercises where participants learn through farming practice. Joel invented numerous creative, discovery-learning activities. On multiple occasions he employed creative activities, such as 'What is this?' – an elicitive approach to helping farmers find answers to their own questions. He continued to use lively teaching in his hybrid FFS, but rather than biological and ecological principles, the content shifted towards the use of externally based technologies. Lenin's colleagues argued that, 'He [Lenin] refused to apply discovery-based activities, that he preferred to give lectures, and that he does not like to dirty his hands.' Eduardo, on the other hand was uncomfortable writing and learning in a classroom. As a result, his FFS took place almost entirely in the field. Eduardo was judicious with the use of discovery-based learning. 'When a farmer is testing me, I'll give him an answer so that he knows that I am a true potato farmer. Otherwise, he has to find it [the answer] for himself. Sometimes my answers will not be his answers. Each potato field is different. That's where the ingenieros make mistakes.'

Joel, Lenin, and Eduardo utilized FFS methodology for diverse purposes, involving consequent adaptations. Of the three, only Eduardo continued to allow participants to determine content, to use AAE, farmer-led experiments, discovery learning, and learn-by-doing, but this only occurred when he was free of project constraints. In process management and didactics, both Joel and Lenin excluded participants from determining the thematic platform, content design, decision-making, and independent learning. Be it due to project and organizational constraints or individual preferences, in the hands of these técnicos, over time FFS became transformed from a people- to a technology-centred endeavour.

Multiple appropriations of FFS by regime actors

Mendizabel (2002) explored how researchers at CIP and its national partners drew on FFS for advancing science-based contributions to agricultural development in the Andes and Southeast Asia. In so doing, FFS became hybridized to 'Farmer Field Schools-Farmer Participatory Research' (FFS-FPR). This involved shifting technical content around institutional research priorities, such as pesticide-use efficiency (Torrez *et al.*, 1999a and b) or selection of late blight resistance varieties (Nelson *et al.*, 2001; Ortiz *et al.*, 2004). Operating under the demands of scientific institutes, researchers commonly increased the complexity of single variable demonstrations to the point where FFS began to include dozens of variables and other subtleties. As a result, the outcomes of FFS experiments could only be seen through sophisticated statistical analysis. As described in Nelson *et al.* (2001), researchers commonly conserved the use of discovery learning exercises, but participants commonly were excluded from the selection of thematic platforms and curriculum content. In certain cases, researchers strategically dropped central FFS decision-making tools, such as the Agroecosystem

Analysis, and their feedback into activity. In terms of thematics, content and process, researchers systematically transformed FFS beyond its original designs.

The priorities of researchers, however, were not the only factors influencing FFS. As a técnico from a conservation-oriented NGO, Lenin never fully appreciated the time demands of FFS. He argued that participatory research offered a better balance between the 'onerous' requirements of participation and his time limitations as an urban-based professional. His field schools included smaller groups, fewer encounters, and no Agroecosystem Analysis. With regard to pedagogy, the expression of the methodology shared the features of FFS-FPR. While disciplinary demands often constrained CIP and Fundación Promoción e Investigación de Productos Andinos (PROINPA) researchers, Lenin altered FFS design for reasons associated with the 'high costs' of participation. Despite encouragement from his employer, Lenin's worldview and personal priorities kept him from implementing people-centred FFS.

Charged with both applied research and extension activities at INIAP, Joel faced very different constraints. His supervisor in the capital – an economist like Lenin – commonly evoked the work of economists at the World Bank (Feder *et al.*, 2004), which likewise criticized the 'high costs of participation'. He often referred to the primacy of INIAP and CIP, arguing that extension was secondary to research. Further, decreases in public funding as a result of government restructuring produced a subsequent need for public–private collaboration (e.g., between INIAP and CropLife), which worked against Joel's immediate interests in Carchi. On multiple occasions, central government policies intended to combat corruption interfered with FFS. For example, on one occasion, the police arrested Joel and impounded the project vehicle for working over the weekend when he travelled to support an FFS session in a nearby village. Concerned about corruption, the national government had passed a rule forbidding the use of public vehicles on weekends – exactly when most FFS groups preferred to hold meetings. Diverse constraints, such as the preferences of a supervisor, organizational mandates, private funding and public policies, combined to work against Joel's personal commitment to farmer-led FFS.

Meanwhile, Eduardo, an independently financed farmer who lived in a rural village, escaped many such constraints. This was particularly true when he was able to finance FFS through local resources. Eduardo's challenges were more localized, such as how to work together with neighbours to advance what were perceived as common interests. In the expert-led examples, particularly when Joel was coerced into running technology-centred FFS, the central objective became: 'What people did not do' (e.g., adopt certain agroforestry or IPM practices), and: 'How to get them to do something differently' (Table 4.3). This primacy often had little to do with the priorities of farmers. In Eduardo's example, the preoccupation was: 'What people did and why', and how to keep participants interested in

wanting to learn and collaborate. When Eduardo conducted the externally funded FFS on pesticide safety, he could no longer conserve this orientation. As a result, he could no longer motivate FFS participants to make financial contributions, and he had to draw on new incentives to get people to attend meetings, such as attractive lunch breaks or baseball caps. Through the freedom of self-employment, however, Eduardo owned a substantial degree of manoeuvrability allowing him to implement people-centred FFS and, to a large degree, conserve the methodology's central design feature: adapting to local realities and local relevance.

Viewed as part of an institution, the technical experts in Ecuador never seriously entertained the broader proposal of FFS as a people-centred approach and potentially part of a broader farmer-led movement for social change. During a meeting, one extensionist complained to Sherwood: 'If farmers begin to lead FFS, then what are we [the técnicos] supposed to do?' The impact studies in Ecuador de-emphasized the methodology's knowledge and social contributions, while emphasizing economic priorities, in particular cost-benefit and net return (Barrera *et al.*, 2004 and Mauceri, 2004). In such cases, the objective of FFS shifted from 'the empowerment of individuals and communities' to 'profit in the market'. In the process, participants moved from the source of innovation to imitating the experts. In practice, FFS shifted from a pathway for human and social development to a means of technology transfer and economic development.

In the hands of experts operating in their organizations, FFS became diversely packaged and sold. It appeared in proposals as a means to 'organic' or 'clean production' (e.g., by INIAP and EcoPar), 'pesticide-use reductions' (CIP), and 'increases in productivity' (IPM-CRSP: Integrated Pest Management-Collaborative Research Support Program, Ecuador). The expected outputs of FFS became part of an individual or institutional marketing strategy. Researchers, técnicos and their institutes reduced FFS from a participant-led, multi-faceted and iterative learning-action methodology to a relatively pre-determined and standardized means of technology transfer. The methodology became a simplified object: a packaged course. In the process of creating the object, FFS was re-shaped into a new form: one essentially in line with the norms of the expert system.

In the social wild, FFS was vulnerable to competing forces involved in knowledge production. This was particularly true during processes of going to scale with the methodology. Diverse institutional factors – including professional thinking and preferences, project-based constraints, organizational culture, and centralized decision-making – combined to create obstacles for FFS. Through processes of objectification and commoditization, the methodology became de-localized and de-humanized, moving away from the essential adaptive and collaborative qualities of the methodology. The institutionalization of FFS largely transformed the methodology into an approach that no longer seriously threatened established ways of thinking and doing. Nevertheless, the transformation was not complete. Certain FFS

facilitators, such as Eduardo, enjoyed conditions shaped by their geography and institutional culture that better positioned them to conserve the original people-centred designs of FFS.

Scaling-up in name, but not in meaning

After visiting the first wave of FFS throughout Central and South America, Sherwood and Thiele (2003) expressed concern over the 'methodological erosion' of FFS (Box 4.3). With the growing utilizations of FFS in Ecuador (scaling up), the methodology and many of its defining principles – interactive design, open-ended discovery-based learning, learning by doing, AAE, and farmer-led experimentation – became vulnerable to translation. As Paredes (2001), Mendizabel (2002), Borja (2004), Schut (2006) and Schut and Sherwood (2007) illustrate, FFS progressively acquired diverse and even contradictory meanings.

Between 2005 and 2006, Schut (2006) conducted research on the diverse expressions of FFS in northern and central Ecuador. Visiting the FFS in Carchi, he explored the nuances of these developments. He found that previously competent facilitators (i.e., those who were acknowledged in project documents as fully applying the methodology) no longer applied FFS in its original, people-centred form. This led him to conclude that the

Box 4.3 Early observations on the transformation of FFS in the Andes (summarized from Sherwood and Thiele, 2003)

- Group establishment – Women were systematically excluded. FFS leaders were chosen on the outset based on criteria external to the FFS experience. In most cases, FFS changed leaders over time.
- Technical content – Facilitators commonly pre-packaged technical content, as per their professional backgrounds and project priorities.
- Learning plots – Often competitive between farmers and facilitators. Sometimes there was no comparative 'traditional' plot. Often limited to demonstration of 'improved technologies'.
- Discovery-based learning – Facilitators commonly 'cut corners' on learning. Instead of facilitating open-ended learning experiments, facilitators often gave lectures in classrooms.
- Experiments – Facilitators often pre-determined content and design. Researchers often introduced complicated designs.
- Follow-up – Project priorities determined follow-up. This central feature was commonly neglected.

Box.4.4 From Farmer Field Schools to Agrarian Revolution Schools

In 2010, Ecuador's Ministry of Agriculture, Aquaculture and Fisheries (MAGAP) created a national farmer training programme, explicitly transforming Farmer Field Schools around new purposes. The Ministry of Agriculture re-named FFS 'Agrarian Revolution Schools' (in Spanish, ERAs), broadened the thematic platform around 'integrated farm management' (from soils, water, crops, pests, animals, markets), and introduced political indoctrination in President Correa's call for a 'Citizen's Revolution'. Urban-based professionals entirely pre-determined the curriculum and several hundred recent university graduates and young professionals (by policy, under 30 years of age) underwent an intensive, five-day training programme as facilitators. During the first five months of implementation, they were charged with organizing 977 ERAs involving 25,047 participants from each of Ecuador's 24 provinces. From pedagogical and political perspectives, FFS underwent a fundamental transformation to the point where the original design of the methodology was no longer recognizable.

fundamental shift of FFS in the hands of research and development practitioners was no mere oversight. Instead, he viewed it as the result of patterned behaviour. Researchers and técnicos expressed appreciation for how the methodology 'reached' into rural villages as well as the platform it provided for enabling technologies to arrive in communities. Nevertheless, other elements, particularly those associated with independent learning and decision-making, and open-ended and iterative design, proved more problematic. Over time, it was the interactive, discovery-based features of FFS (i.e., those elements that made FFS a people-centred methodology) that captured the attention of the experts, as they organized to re-work and re-design FFS for new purposes.

Within five years, CIP, INIAP, and the FAO had largely abandoned FFS in its original form. The largest and most explicit transformation of FFS, however, came in the hands of the Ministry of Agriculture. Drawing on President Correa's call for a 'Citizen Revolution' in 2009, the Ministry of Agriculture re-designed FFS methodology around pre-determined technical training of rural people in modern technologies and indoctrination in the Government's political ideology (Proaño, 2011). The end product was a national-level campaign called the Escuelas de la Revolución Agraria or Agrarian Revolución Schools. While borrowing certain attractive features from FFS, they fundamentally undermined the people-centred intentions of FFS (Box 4.4). While FFS certainly survived within certain circles, in

particular in community-based organizations and the agroecology movement, the methodology no longer influenced the activity of the larger organizations in Ecuador and thus was less threatening than previously.

Discussion

The FFS methodology became diversely appropriated. Initially, the adaptation in the Andes – in terms of the themes of interest, field conditions, and cultural practices – was generally consistent with the methodology's original proposals in Asia. Nevertheless, over time changes to process management and didactic design – i.e., the erosion of people-centred elements – revealed conflicting expressions of FFS. The experience of FFS in the social wild illustrates how competing processes of Mode 1 (expert-led/technology-centred) and Mode 2 (lay- or people-centred) knowledge production can lead to conflicts during the negotiated processes of social change. Viewed as a social construction, knowledge is not produced in a vacuum. New claims of knowledge and knowledge production are judged in reference to established forms. This is particularly true for interventions that represent entirely new ways of thinking and organizing. Those actors that do not conform may be subject to public criticism and sanction. Gibbons *et al.* (2000: 2) argue: 'It seems to be a recurrent historical pattern that intellectual innovations are first described as misguided by those whose ideas are dominant, then ignored, and, finally, taken over by original adversaries as their own invention.' FFS in Ecuador faced similar fate.

The process orientation of FFS led people from INIAP, MAG, the pesticide industry, and elsewhere to declare the methodology as expensive. After the benefits of FFS became overwhelmingly clear and the methodology became legitimized as 'best practice', many of the very same actors began to claim ownership of it. In the process of taking over, however, these actors systematically changed FFS around new purposes. The facilitation of open-ended discovery learning became specialized top-down lectures. Questions became answers. The content and processes of FFS were simplified to the point where differences between individual FFS were lost. Consistent with the design features of expert systems, FFS underwent degrees of homogenization. Rather than broaden Mode 1 production of knowledge to accommodate the necessary conditions for Mode 2, we observed that the experts and their organizations commonly sought to transform FFS in line with their competing priorities. Within that process, FFS as Mode 2 methodology was pulled into the Mode 1 paradigm; knowledge production through abstraction. Was the transformation of FFS due to a simple oversight, questions of competence, or were deeper forces at play?

Drawing on diverse literature, we continue to explore three underlying social processes that influenced whether or not FFS as a niche-level intervention could function as a catalyst for broader socio-technical change:

the reshaping of farmer perceptions and expectations, confrontations with the regime over the creation of innovation pathways, and the generation of unexpected spin-offs.

Challenging farmers' perceptions and expectations

Andean farmers do not operate alone in isolated farming domains. Rather, they are part of unique socio-technical networks in which other actors, organizations and entities collectively inform and define courses of action and development opportunities (van der Ploeg, 1993). As a result, for farmers as well as técnicos perceptions of the meaning and value of FFS respond to a certain way of defining relevant problems and solutions within a socio-technical network. Paredes (2010) explains that certain farmers operate in networks in which pesticides have come to be accepted as obligatory or unavoidable elements of good potato farming – despite the risk they represent for a family's health. For this group, agrochemicals are not seen as a problem, but rather a solution. In other farming styles, less agrochemical use is desired to avoid risks, and, in such cases, 'good farming' has come to mean safe farming, which partly explains why different actors may find different meanings and opportunities in FFS and how those influence its insertion into social life.

In retrospect we can see that the arrival of FFS in Ecuador challenged prevailing perceptions and expectations. FFS by design helped to create awareness and enabled communities to address latent pesticide concerns, particularly the health effects due to chronic exposure to highly toxic pesticides. As described in Sherwood *et al.* (2005), through the interactive learning-action process of FFS, the communities of Carchi increasingly uncovered unwanted environmental, health and economic products associated with modern farming. We found that people needed to discover for themselves the 'bads' of their agriculture before they could begin to understand the shared responsibility that farmers, communities, and broader society held in co-producing those consequences.[7] Many communities no longer blindly accepted the recommendations of the técnicos from NGOs, the government, and agrochemical stores. They began to demand non-chemical, ecologically based means for improving their agriculture. In several cases, agrochemical salespeople were chased out of town.

Nevertheless, as we experienced with Lenin and Joel's supervisor at INIAP, many experts did not share the vision of people-centred FFS and its impacts, demonstrating that changing community-level perceptions was not enough. It showed the need to also reach the institutions of professional brokers of externally based knowledge and technology, which involved unseating established seats of power and influence. Despite such constraints, the emergence of new expectations through niche-level learning (see also Geels and Raven, 2006) is a necessary entry point for further developments.

Confrontations with the regime over innovation pathways

Attempts to institutionalize FFS have centred on 'scaling-up' – i.e., increasing the methodology's geographical and institutional spread, usually meaning its organizational reach (LEISA, 2003a, 2003b). To support this, people have proposed greater investment in the ToT, better impact studies (usually through 'more rigorous' quantitative means), and better (i.e., more) communication as a means to convincing researchers and policy makers in their own language. Nevertheless, despite a wealth of extraordinarily specialized economic, environmental, and health studies and substantial investment in communicating results in Ecuador (Crissman *et al.*, 1998; Yanggen *et al.*, 2003), the institutionalization of FFS turned out to be a far less rational process. While FFS scaled in name, its fundamental principles often were lost in translation. Instead of enabling desired institutional change, scaling exposed vulnerabilities that led to the transformation of FFS (Schut and Sherwood, 2007).

Over time, FFS methodology was pulled back into the dominant institutional paradigm it was supposed to challenge (Schut, 2006; Schut and Sherwood, 2007). Supporting collaboration amongst farmers in local innovations became top-down technology-transfer, and the farmer-led, demand driven character was replaced by externally driven extension and development. Reasons can be found in the hierarchical and formal organization of national research and development institutes such as CIP and INIAP, where disciplines, procedures, protocol, mandates and responsibilities were clearly formulated, respected, and defended. Moreover, funding structures, time-constraints and donor-demands often did not provide sufficient space to adequately respond to the needs and interests of farmers.

On the surface, it appeared that organizations such as CIP, INIAP and MAG, were in favour of Mode 2 knowledge production including: growth of multi-functionality, more pluralistic science and development, increasingly fluid communication and practice, and a preoccupation with relevance (Gibbons *et al.*, 2000). Nevertheless, the experience of FFS in the social wild suggests that in practice these actors continued to enforce Mode 1 knowledge production (Table 4.4). In essence, we see that a Mode 2 methodology was scaled-up in an environment where institutional pre-conditions for Mode 2 work (e.g., conducive incentive structures and professional attitudes) were largely lacking or incapable of advancing interests against competing perspectives.

In hindsight, we found our initial proposals of regime change towards people-centred designs ambitious. It implied transformation of assumptions about the underlying causes of poverty and environmental degradation, 'best practice' and 'good agriculture', and how learning and development should be supported and facilitated. The performance of FFS in the social wild exposes the limitations of methodology-based contributions and especially

Table 4.4 Institutional conditions favourable to Mode 1 (expert-led) and Mode 2 (lay or people-led) knowledge production

Factor innovation	*Mode 1: expert-led science*	*Mode 2: lay/people-led*
Knowledge	Specialized – produced in the context of abstraction	Distributive – produced in the context of application
Role of science	Produce basic knowledge and spin-offs, set priorities – separation between science and technology	Facilitate innovation – little difference between science and technology
Preoccupation of science	Conformity to discipline and truth	Local relevance and accountability
Expected products	Solutions – answers to questions	Process management – management of interchanges
Criteria for recognition	Disciplinary knowledge, compliance to norms	Multi-functionality, adaptability and responsiveness
Communication	Formal, controlled, limited sources, and coherent	Informal, open, multiple sources, and complex
Access to information	Achieved through position	Achieved through social connections and networking
Organizational structure	Rigid, with stable boundaries	Fluid, fuzzy and porous boundaries
Role of government	Promote competition	Promote competition and collaboration

the utility of 'going to scale' with such approaches as means to changing existing, unsustainable techno-centric regimes.

At different moments of our experience, especially when we managed considerable project resources and we held tight control over FFS as a 'best practice', we succeeded in convening a growing array of actors. Nevertheless, as FFS left the protected margins of the project agenda and entered the social wild, the meaning of FFS became vulnerable to translation and cooption by the competing interests of the dominant socio-technical regime. It appears that FFS was released before its people-centred form took full social hold. Schut (2006) found that by 2005 the FFS network of actors appeared to have divided between two ideological lines: expert vs. locally led development. In Figure 4.1 we draw on the interaction of these two factors to describe competing stages of socio-technical development, useful for describing the evolution of FFS in Carchi from multiple forms of IPM as a novelty to IPM in practice.

FFS was introduced as a niche-level intervention with the intention of making it an attractive novelty that would contribute to broader institutional change towards people-centred development (from quadrant IV to III).

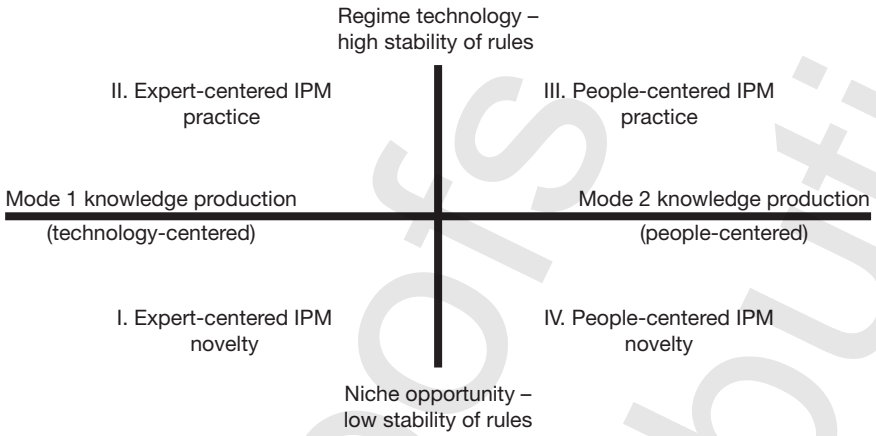

Figure 4.1 Competing stages of socio-technical change.

While FFS was successful at becoming a popular novelty and 'best practice', conserving its adaptive and people-centred qualities during processes of diffusion or 'massification' of the methodology became a struggle. At first, it seemed a question of competency (e.g., as a result of the quality of the ToT), but after observing previously competent FFS facilitators, such as Joel, loose hold of the methodology, it became obvious that more subtle social forces were at play. FFS became transformed into an expert-led IPM approach (movement from quadrant IV to I) that quickly 'scaled-up' across heterogeneous groups of actors (movement from quadrant I to II) as a result of the structural alignment of Mode 1 knowledge production that still dominated the established socio-technical system.

How could regime change towards people-centred IPM have been enabled? Spontaneous regime level movement between expert- and people-centred development is not expected, since by definition the two regimes are organized around conflicting sets of formal and informal institutions, rules, and rationalities. Change tended to happen at the moment of attempting to scale-up the methodology, when the priorities of the project leaders shifted from FFS implementation to diffusion of the methodology. At that point, the boundaries of influence became more porous, making it vulnerable to competing influences.

Institutional movement towards people-centred IPM practice requires a discontinuity with the established socio-technical regime that generally must come from 'below'. Since there is little to no alignment with the rules of the regime, change cannot happen through extending reach or scaling up but rather through expanding the depth and breadth of social embrace or scope. Influencing regime transformation requires that FFS broadly penetrate institutional spaces, transforming norms and values and organizing a new power centre around the enforcement of emergent niches and their rules.

Bypassing the regime: spin-offs and new movements

So far, this chapter largely described the diverse and often contradictory expressions of FFS that evolved when the methodology was introduced within the regime. While some space for manoeuvre was created within the regime, many institutional constraints and forms of resistance occurred. The fact that thousands of farmers gained insight into the biological and ecological processes of agriculture has had a number of spin-offs. Substantial evidence suggests that, for some, this contributed to fundamental improvements in farming, especially with regard to reducing the reliance on external inputs, whilst maintaining or increasing their productivity (Barrera *et al.*, 2004). Although FFS in Ecuador did not appear to have achieved the sort of organization described in the 'Community IPM' literature (Pontius *et al.*, 2002 and *www.communityipm.com*), it had initiated collaboration and collective action in a handful of communities, local organizations (APRODIC) and networks (MACRENA – Red de Manejo Comunitario de Recursos Naturales), with diverse and, it appears, unpredictable consequences.

By 2011, the few remaining examples of people-centred FFS continued to operate on the margins, but their strong internal organization, self-financing, and diversifying activity suggested that they had gained a social foothold in northern Ecuador and beyond. Seeds of change were planted, but it did not appear that FFS as people-centred proposal would continue to grow into an increasingly coherent body of knowledge capable of defining and enforcing rules of 'good agriculture' and 'good development practice'. Instead, a related spin-off is the emergence of Canastas Solidarias – largely self-financed consumer groups from marginal neighbourhoods of Quito – that began to meet with groups of FFS graduates from the north to negotiate new consumer-grower arrangements around 'healthy food', a concept preoccupied with not just the end product of commodities but also with the production process itself.[8] Creative social networks promised to shorten the production–consumption chain in ways that could improve efficiencies through cutting out exploitative intermediaries and improving returns to both producers and consumers. Through strengthening linkages and interactions between growers and producers, such activities also increased accountability at both ends. This appeared to generate new social benefits, such as opportunities for the children of the Canastas Solidarias to be able to escape the city and live and work on the farms of FFS graduates during breaks in the school year. In addition, many of the former FFS collaborators operating at the grassroots had become reorganized around ideals of 'food sovereignty'. Acting as part of the Colectivo de Agroecologia, these actors played an important role in provoking new public debates during the 2008 Constitutional Convention and subsequent legislation, including legislation to outlaw highly toxic pesticides[9] and proposals for food sovereignty.[10] Thus a sector of the original FFS participants had migrated to become part of diversifying networks of actors capable of producing and enforcing, at least

to a limited degree, innovative policy reform, though in a form distant from what was expected at the onset of introducing FFS a decade earlier.

Conclusions: lessons for institutional change

In this chapter, we have drawn on the extremes of Mode 1 and Mode 2 knowledge production to describe the multiple epistemological expressions of FFS. Additionally, we have drawn on theories of institutionalization and socio-technical change to assess how organizations appropriated the methodology – e.g., the evolution of FFS as a niche-level innovation to its utilisation by the dominant socio-technical regime, being pulled back in the research and development paradigm it was supposed to challenge (Schut, 2006). Although FFS scaled-up in name, it did not scale-up in meaning (Schut and Sherwood, 2007).

Key for understanding the transformation of FFS as well as similar methodology-based interventions is that such interventions are not neutral. In their public demonstrations of new desirabilities and possibilities, the FFS movement threatened established ways of thinking, doing and ordering. In the process, it became vulnerable to competing interests. Following its release into the social wild, FFS became prone to the ordering processes of the established regime. Instead of shaping new rationalities and processes of change, commonly the design of FFS was re-organized to fit existing institutional mandates and objectives, donor-demands and funding structures, and administrative procedures.

The performance of FFS in the social wild exposes limitations of methodology-based interventions, and it suggests that calls for scaling-up innovations such as FFS are overly simplistic. Just like the relevance of FFS was tailored to the expectations and objectives of its farmer-participants, we could conclude researchers, development practitioners, the private sector and policymakers did the same. FFS were adapted and modified to fit political realities, economic realities and institutional realities, harmonizing it with existing norms, values and established rules and power relations, rather than challenging them. As this chapter demonstrates, this meant the loss of key features of the methodology, in particular its people-centred character. In all, the experience indicates that one cannot realistically hope to achieve people-centred adaptive collaborative management of agriculture and natural resources through the mere development, documentation and scaling-up of a specific methodological approach like FFS.

Nevertheless, in some cases FFS as a methodological intervention arguably opened up unexpected spaces and pathways for subsequent social change. Certain FFS facilitators and graduates diversified activity further towards people-centred purposes, leading to innovative activities, such as the Canastas Solidarias and Food Sovereignty movements that were largely self-financed and self-organized and capable of producing and enforcing new 'rules of the game'. Over time, the FFS experiences contributed to the emergence of new

social networks capable of creating new relationships between producers and consumers, which led to the construction of new collaborations around the production, consumption, and circulation of food, ultimately shifting the investment of existing resources to new purposes. In essence, we see that the methodology and its underlying principles could be useful outside the sphere of influence of the regime; in a way we can speak of a self-organized 'bypassing' of the regime in support of people-centred development.

The question remains how to deal with the challenges facing methodology-based interventions in the social wild? In order to re-direct the present trajectory, beyond scale, FFS would need to influence the scope of activity. In order to respond to those expectations, niche-level interventions and counter movements must have more attention for how they influence or address established norms, values and power relations, as well as reflect on issues of desirability and feasibility seen from the perspectives of different stakeholders. Most likely, growth and institutionalization of emergent proposals would require an increasingly influential social network composed of assemblages of actors from both the old regime as well as previously marginalized sectors capable of creating and enforcing new rules on the production and re-production of methodology-based interventions among the heterogeneous set of actors involved in agricultural science and development.

In the light of present institutional challenges it should be questioned whether fundamental changes can be designed and planned by means of specific methodological devices. Our analysis suggests that it makes more sense to approach fundamental change as a pathway, in which FFS as well as other methodology based interventions can create space for innovation, new social networking and momentum for learning that could provide the foundations for exploring sustainable solutions to the complex problems facing us. As our experience shows, such a process also includes and requires forms of struggle and coalition formation towards changing dominant meanings, norms and incentive structures within organizations and establishments in order to create better conditions for people-centred development approaches.

We conclude that one cannot realistically hope to achieve people-centred adaptive management of agriculture and natural resources through the mere development, documentation and scaling-up of a specific methodological approach such as FFS. This needs to be complemented with context-specific strategies aimed at supporting the emergence of new networks and coalitions for changing dominant meanings, norms and incentives within organizations that may employ such methodological approaches. Alternatively, one could choose to bypass such establishments altogether and embed FFS within networks that have self-organizing capacity and genuine interest in people-centred development. Over time, such networks may well evolve into relevant movements for change that cannot be ignored by competing interests.

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Notes

1 In collaboration with the FAO's Global IPM Facility, the International Potato Center and others, Sherwood played a central role in introducing Farmer Field Schools in Latin America as of 1998, as summarized in Sherwood *et al.* (2000), Luther *et al.* (2005) and Pumisacho and Sherwood (2005).
2 The authors' research of FFS is summarized in Schut (2006) and Sherwood (2009), M.Sc. and Ph.D. studies respectively that were supervized by Leeuwis.
3 www.agassessment.org.
4 John Dewey's influential work on 'experiential learning' is nicely summarized at http://wilderdom.com/experiential/ (accessed 1 December 2010).
5 FAO, 2003. 'Development of Innovation Capacity for IPM and Agricultural Innovation for Greater Food Security in the Highlands.' Technical Cooperation Program/ECU/0067, 22 pp.
6 The Community Forestry Program approach in the Andes was amply described in Kenny-Jordan *et al.* (1999).
7 The 'reflexive modernization' and 'risk society' literature views the 'externalities' of modernity as an 'internality' or systemic product of societies. As such, socio-technical development in recent times is seen to lead to not just 'goods', but also 'bads' (see e.g. Giddens, 1990; Beck, 1992)
8 The Canastas Solidarias experience is summarized in Kirwan (2008). The broad concept of 'healthy food' was articulated in a national campaign document entitled 'Eat well, healthy, and in sovereignty'.
9 Official Congressional Registry of Ecuador No. 224, Tuesday, 29 June 2010.
10 The 2008 Ecuadorian Constitution calls for a shift in public policy towards 'food sovereignty', defined in the multi-dimensional context of agricultural production, emphasizing the 'social purpose' of land as a means of equitable, democratic social development and natural resource conservation and in favour of biodiversity (article 276, 282, 334 and 400), equitable food distribution and commercialisation (article 335), and ample access to culturally appropriate food and a healthy diet, in particular by means of native crops, animals, and other food sources (articles 13 and 281).

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