"Papas, Plaguicidas y Personas (Potatoes, Pesticides and People): The Farmer Field School Methodology and Human Health in Ecuador"

By

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Abstract

In potato-producing regions of Ecuador, the potato is an important crop and the foundation of the Andean diet. Modernization of potato production is strongly linked to intensive use of pesticides. Environmental and human health problems are common consequences.

The Ecosalud research-intervention project intends to use the Farmer Field School (FFS) methodology as an intervention strategy to improve the sustainability of agricultural systems by reducing health risks and promoting health benefits. This research set out to determine whether the FFS is an appropriate methodology for achieving the human health goals of the Ecosalud project in the context of Ecuador.

Field studies of three FFS in the province of Chimborazo demonstrated that effectiveness is dependent on both the context and the way in which Field Schools are used. The issues and tensions highlighted in these cases might be extended to contexts beyond Ecuador – where development agendas are torn between objectives to achieve *sustainability for the environment and for humans*, and objectives directed at ensuring that small-scale farmers are able to *enter markets and compete* in an ever-globalizing world.

The thesis concludes that in order to fulfill its goals to end the reliance on pesticides and improve human health through use of the Farmer Field School methodology, Ecosalud will need to be strategic in partner alliances and intentional in cultivating a culture of cooperation between institutional actors with diverging interests and philosophies. Above all, stakeholders must work to ensure that project goals are not undermined by competing objectives which place economic *profit* before the health of *people*.

April 26, 2007

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And, to Andrew, who has been with me since the very beginning –your ability to calm and inspire me is nothing short of a miracle and a blessing in my life.

¡Viva Ecuador!

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Abbreviations and Acronyms

AEA - agroecosystem analysis

CEA - Coordinatora Ecuatoriana de Agroecologia
(Ecuadorian Coordinators of Agroecology)

CIP - Centro Internacional de la Papa (International Potato Center)

CGIAR - Consultative Group on International Agricultural Research

FAO - Food and Agriculture Organization of the United Nations

FFS - Farmer Field School(s)

FLS - Farmer Life School

FTAA - Free Trade Area of the Americas

GIF - Global IPM Facility

IDRC - International Development Research Centre

IMF - International Monetary Fund

INIAP - Instituto Nacional Autonomo de Investigaciones Agropecuarias
(National Agricultural Research Institute)

IPM - Integrated Pest Management

LEISA - Low External Input and Sustainable Agriculture

masl - metres above sea level

MDG - Millennium Development Goals

NAADS - Uganda National Agricultural Advisory Services

NGO - Non-Governmental Organization

PPE - personal protective equipment

R&D - Research and Development

SAP - Structural Adjustment Program

SUP - Safe Use of Pesticides

T&V - Training and Visit

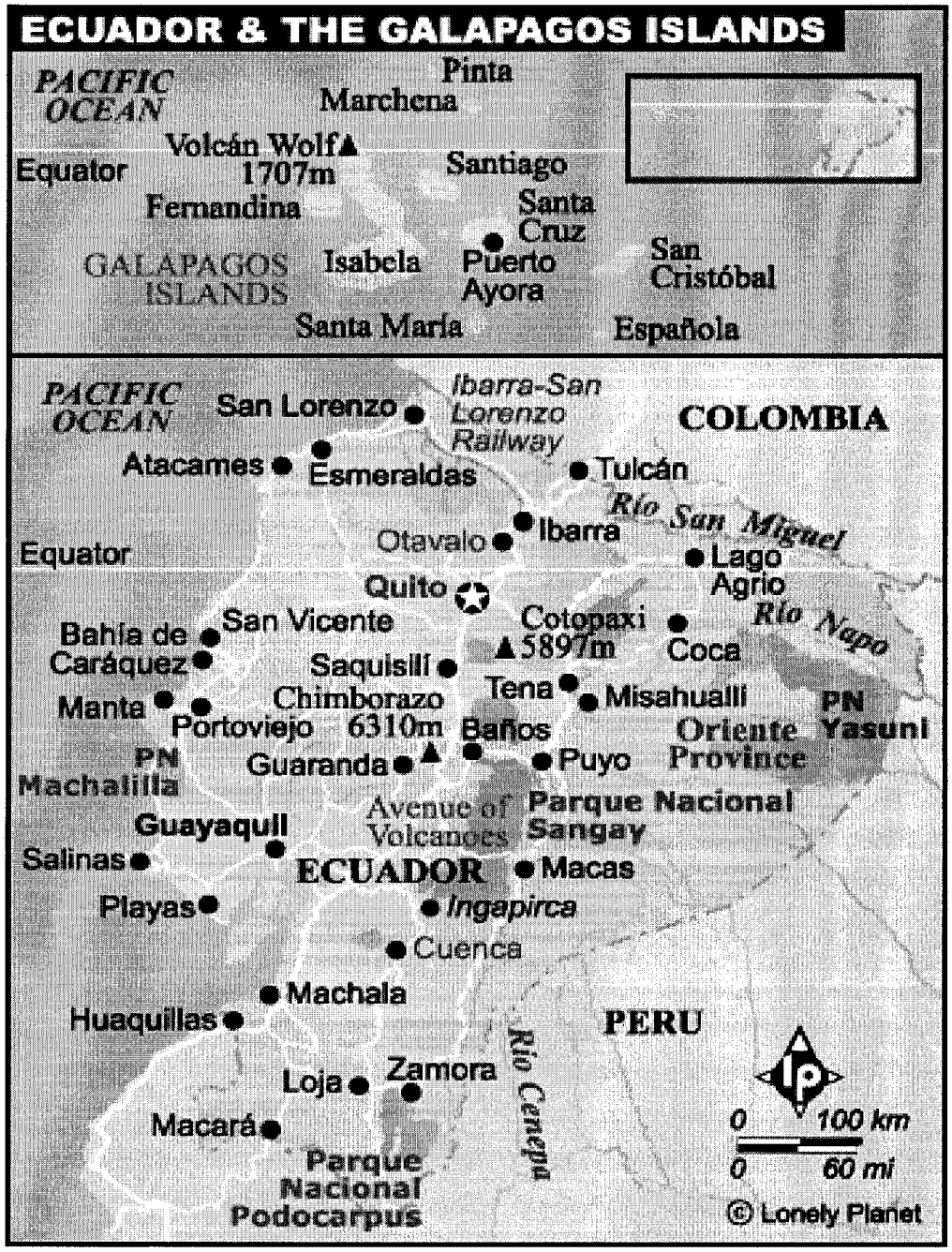
TOT - Training of Trainers

UDUCACH - Unión de Oganización Campesinas de Chimborazo

UN - United Nations

UNDP - United Nations Development Program

Map of Ecuador



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CHAPTER 1: INTRODUCTION

In the year 2000, under the leadership of the United Nations, world leaders from 189 nations agreed to a set of well-defined, time-bound development goals which measure progress in the fight against poverty. These came to be known as the Millennium Development Goals (MDGs).

Agriculture is outlined as one of the most important sectors in the achievement of the MDGs. It is fundamental to the eradication of poverty. Agriculture is central to raising food security; improving human health; maintaining environmental stability and fostering broad-based economic development. Over 60 percent of people living on less than one dollar a day live in rural areas. At least 70 percent of the labour force in low-income countries works in agriculture and small farmers and herders continue to dominate the rural sector in most of these countries. For these smallholders the chances of rising out of poverty depend directly on their ability to increase the productivity of their crop and livestock husbandry activities (CGIAR, 2005). Yet "nearly 1.4 billion resource-poor farmers in risk-prone marginal environments remain untouched by modern agricultural technology" (Altieri, as cited in Gonsalves et al., 2005, para.1).

1.1 Potatoes, Pesticides, and People: Justification for this Study

> What we need here is simple ...we need to learn how to produce more potatoes and we need to learn how to use pesticides in a safe way ...and we must be involved more in the process ...we want to do this. (Small-scale Ecuadorian farmer, personal communication, February 13, 2006)

In Ecuador, the potato is an important crop and the foundation of the Andean diet. Potatoes originated in the Andes and have been cultivated there for more than 8000 years (Hellin & Higman, 2003). Modernization of potato production, rooted in efforts to increase crop productivity and fend off crop contamination, is strongly linked to intensive

use of pesticides. As a result, the region is confronted with environmental and human health problems.

Recent studies show that at least six percent of small-scale potato farmers in Ecuador have suffered a pesticide intoxication at some time in their lives (Orozco, 2005b). In the most extreme case of the northern province of Carchi, up to two-thirds of potato-growing households show "significant neurological impairment" attributed to intoxications (Yanggen, Cole, Crissman, & Sherwood, 2003, p.2). [1] In Ecuador, deaths due to pesticide intoxication are second only to deaths due to traffic accidents (Ministry of Public Health, Ecuador, as cited by Sherwood in CEA, 2005).[2]

Ecosalud, or "Ecohealth," is a participatory research-intervention project focused on reducing toxic pesticide impacts in Ecuador (Cole, Lochhead, & Orozco, 2006).[3] For the past ten years the project has focused on the health dangers of pesticide use for farmers and their communities. More recently the focus has transferred to healthy crop production alternatives in potato-production areas throughout the Andean region, including the provinces of Carchi, Tungurahua, and Chimborazo.

The Ecosalud project uses the "ecosystem approach to human health" which is an approach to resource management that integrates social aspirations, human activities, economic environments, and the biophysical characteristics of a given natural ecosystem (Forget & Lebel, 2001, p. S4; see also De Plaen and Kilelu, 2004). Under the ecosystem approach, "health" is defined as a "state of complete physical, mental and social well-

[1] "Intoxication" is the term used to indicate an acute poisoning due to the inhalation or ingestion of pesticides or pesticide contaminated foods (Mera-Orcés, 2000).
[2] CEA is the acronym for Coordinatora Ecuatoriana de Agroecologia (Ecuadorian Coordinators of Agroecology). CEA coordinated a conference in Quito, Ecuador October 27-29, 2006 entitled, *Primer Encuentro nacional de Agroecologia y Feria de Semillas* (First Nacional Agricultural Conference on Agroecology and Seed Fair).
[3] Ecosalud is a project of the International Potato Center (CIP), in Quito, Ecuador, funded by the EcoHealth initiative of the International Development Research Center (IDRC), in Ottawa, Canada.

being and not merely the absence of disease" (World Health Organization, as cited by IDRC, 2005).

Ecosalud is a small project with insufficient funding or human resources to work alone. Accordingly, the project works to promote the involvement of stakeholders from the local, municipal, and provincial levels in order to strengthen institutional and community capacities for improving human health. In order to advance its own goals, the Ecosalud project also seeks to work with established organizations. In Chimborazo province, the Farmer Field School (FFS) methodology is the principle extension approach being used in the project area. Therefore, a key element of the project involves the implementation of the FFS methodology – as an intervention strategy "to improve the welfare of rural residents by improving the sustainability of agricultural production systems in terms of the reduction of health risks and the promotion of health benefits" (Orozco, 2005a, p. 1; CIP, 2005).

The Farmer Field School methodology is grounded in the theory of participatory non-formal adult education. The most fundamental elements of FFS include learning that is people centered; knowledge intensive; and location specific. In Asia, FFS for Integrated Pest Management (IPM) has experienced immense success – operating through a state-run extension system. Over two million farmers experienced increases to yields and incomes, and reduced pesticide use (LEISA, 2003).[4] Today, large-scale Farmer Field School programs also operate in several countries in Africa and Latin America. Yet outside of Asia the methodology has proven to be less effective. Difficulties

[4] Integrated Pest Management (IPM) is a broad ecological approach to plant protection that relies on several techniques to keep pests at acceptable population levels without excessive use of chemical controls. IPM applies only those controls that are needed, when they are needed, to control pests that will cause more than a tolerable level of damage to the plant (United States Department of Agriculture, n.d.).

implementing the methodology in alternate political climates and cultural contexts have hindered success; as has the tendency for FFS facilitators to revert back to more formal teaching methods.

FFS in Latin America have a short history that has not been particularly well-documented. In Ecuador, FFS have been implemented in the most important potato-producing provinces for the past decade, with national-level agricultural institutions promoting the methodology through a range of local institutions and non-governmental organizations (NGOs). The momentum in the country is toward further institutionalizing the FFS movement (Luther et al., in Norton, Heinrichs, Luther, & Irwin, 2005).

The goal of human health has not been given adequate coverage in FFS programs. FFS has been promoted as an educational methodology to improve decisions about crop and pest management at the field level, and initial reports indicate gains in crop output and earned incomes resulting from implementation of the methodology. Yet, it is unclear how FFS training can factor into the situation surrounding pesticide exposures and intoxications in the farming communities involved in the Ecosalud project in Ecuador.

The Ecosalud intervention strategy anticipates the implementation of IPM FFS in potato producing communities in three provinces. This purpose of this thesis is to ask what challenges the Ecosalud Project can expect to face in using the Farmer Field School methodology. It is important to identify the conditions that cultivate success and failure for the methodology; and to assess the specific context of Ecuador, including the current condition of FFS implementation, before determining what, or if, any adjustments will be needed to achieve success for Ecosalud.

To evaluate the FFS methodology in the context of the Andean region of Ecuador, the research focuses on three FFS potato projects in the province of Chimborazo (see Map of Ecuador). The key research questions are:

1) Has the FFS methodology been successfully implemented?

2) What have been the factors contributing to its success or failure?

Personal Justification for Study

This study has also been driven by my personal interests in education and the environment. My experience in resource management has led me to question the current state of agriculture. We all rely on the sustainable functioning of agricultural food chains but most of us living in more developed countries are unaware of the environmental and human health costs paid by farmers in many of the poorer countries.

I think that "development" must be a sustained attempt to create meaningful changes in the everyday quality of life of all people – but I fear that environmental and human health issues are threatening the potential for this to happen. I also firmly believe that education will continue to play a huge role in development. Not only will science and technological innovation have to advance, but so will viable methodologies for including people in the meaningful and lasting development solutions that will affect their lives. More than anything, my experiences living and working with indigenous communities – both in Ecuador and in Canada – have shown me that people can work together to solve the everyday issues that affect them. Knowledge is power.

I am keen to explore the potential that lies at the intersection of participatory education and agriculture and to contribute to the literature on the use of the Farmer Field

School methodology for achieving sustainable agriculture that benefits farmers and their communities.

1.2 Thesis Outline

This chapter has introduced the thesis by outlining the link to development and the reasons which motivated research of this topic. The research goal and the research questions have also been presented. Chapter 2 provides a review of the literature on the theory underlying agricultural extension and the Farmer Field School methodology. This chapter also presents experiences in the application of FFS, including evidence of successes and failures and the explanatory reasoning for these outcomes. The methodology for the case studies in Ecuador is outlined in Chapter 3. This chapter describes the research locations in the province of Chimborazo as well as the methods of data collection used to conduct field research. Chapter 4 presents the case studies. This chapter includes background information on the country, potato farming and experiences with FFS and pesticide use. Field data is then presented, organized according to successes and problems/failures in FFS. Data on the theme of pesticide use and human/environmental health in FFS is also included. In Chapter 5 the implications of findings on FFS are discussed within the context of implications for the Ecosalud project in Ecuador. This chapter also presents concluding statements on both FFS and Ecosalud as well as recommendations for further research.

CHAPTER 2: REVIEW OF THE LITERATURE ON FFS

This chapter provides a description of the Farmer Field School (FFS) methodology. The first section covers the history of FFS, its theoretical basis, the key concepts and the implementation process, and also the goals and the current scope of the methodology. The remainder of the chapter presents evidence of the successes and failures of FFS including the explanations for these outcomes offered in the literature. The chapter ends with a summary on FFS and a re-statement of the thesis question and the evidence requirements.

2.1 The History of Farmer Field Schools

2.1.1 Origins of the Farmer Field School in Agricultural Development

In the 1960s, the Green Revolution was launched in Asia with the aim of improving the productivity of small farmers. This new agricultural paradigm was characterized by agricultural modernization and the introduction of improved high-yielding crop seed varieties and high external input farming. This trend toward "modernization" emerged from the ideals of market dependency and the orientation of agriculture to market-valued crops and reliance on high-input technologies like synthetic fertilizers and pesticides. Traditional farming systems were supplanted and small-scale rural farming systems were integrated into the existing marketing system. According to the Food and Agriculture Organization of the UN (FAO), the Green Revolution was "highly successful at meeting its primary objective of increasing crop yields and augmenting aggregate food supplies" (2006b, para.1).

Through the 1970s and 1980s it became increasingly apparent that pest resistance and resurgence, caused by the indiscriminant use of pesticides, posed an immediate threat

to the gains of the Green Revolution.[5] At the same time, "together with ecosystem disruption came new threats to farmer health and the introduction of millions of tons of poisonous substances to the fields, waterways, food, and homes of rural people" (The Field Alliance, 2002, para. 5; IFPRI, 2002).[6]

Not only were the new technology packages inherently flawed – failing to account for environmental impact and address local needs and field conditions – but the process of transferring these centrally-determined recommendations arguably contributed to a "de-skilling" of rural communities. "Farmers were expected to be passive recipients of new technologies rather than active innovators" (The Field Alliance, 2002, para. 7).

While some research explored the viability of biological control of major crop pests (i.e. by other insects), gaps still existed between the science generated in research institutions and common farmer practices conditioned by years of aggressive promotion of pesticide use. Attempts to bring Integrated Pest Management (IPM) to small farmers, particularly rice farmers in Asia, saw mixed results. Some experts made claims that the principles of IPM were too complex for small farmers to master, and centrally-designed messages remained the key to altering farmer practices (The Field Alliance, 2002).

Asiabaka argues that by the late 1980s farmers had developed a dependency on external sources of expertise known as "top-down" agriculture extension services. Many programs were proving to be unsustainable, unresponsive, inflexible and costly (2002). Generally speaking, research was beginning to highlight correlations between the effect and sustainability of development project outcomes, and the extent to which project beneficiaries had contributed to the project (Morss, et al., 1976, as cited in Roling, 2002).

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[5] For a summary of the impacts of the Green Revolution from 1960-2000, see Evenson and Golin, 2003.
[6] IFPRI is the acronym for the International Food Policy Research Institute.

Some agricultural development theorists began to condemn the transmission of knowledge in a top-down manner in support of the idea that "sustainable agricultural development" would require more than the acquisition of ecological knowledge by individual farmers (Axxin, as cited in Feder, Murgai, & Quizon, 2004; Braun, Thiele, & Fernandez, 2000). The Farmer Field School approach emerged from this shift toward agricultural extension that was more participatory, integrative, and practical – educating and enabling farmers to define and solve their own problems.

The first FFS were designed and managed in Indonesia in 1989 by the FAO. At this time the methodology was used with rice farmers as a means to address a lack of farmer knowledge related to agro-ecology and to facilitate learning of Integrated Pest Management as an alternative to pesticide application (FAO, 2006a, para. 2; Gallagher et al., as cited in Pretty, 2005).[7]

2.1.2 The Theory behind the Farmer Field School Methodology

Traditional "transfer of technology" models of agricultural extension were known as "top-down" techniques because they were based largely on a "vertical one-way communication model with information flowing from research to extension to the farmers" (Asiabaka, 2002).[8] Farmers, extensionists and researchers were viewed as three separate strata with weak or non-existent linkages between them (Asiabaka, 2002).

The Farmer Field School represents a radical departure from earlier extension programs. The FFS approach utilizes participatory methods "to help farmers develop

[7] Agro-ecology is the science of applying ecological concepts and principles to the design, development and management of sustainable agricultural systems, or the science of sustainable agriculture. Agro-ecology methods have as their goal the achieving of agricultural systems balanced in all spheres: culturally sensitive, socially just, economically viable and environmentally sound (Altieri, 1995).

[8] The development of the technology transfer models of the 1950s and 60s was followed by the promotion of the Training and Visit System (T&V) in the 70s and 80s. T&V was promoted by the World Bank whereby government extension agents would interact in the field with selected "contact" farmers, in order to disseminate set packages of information (Benor & Harrison, 1977).

their analytical skills, critical thinking, and creativity, and help them learn to make better decisions" (Kenmore, 1997, *Section 2*). Roling and van de Fliert (as cited in Feder et al., 2004) explain that such an approach – where the trainer is more of a facilitator than a trainer, and farmers are viewed more as active participants than as passive beneficiaries – represents a paradigm shift in agricultural extension.

Table 1 outlines how FFS compares to traditional agricultural "transfer of technology" extension methods.

Table 1 Classical Extension Models Compared to Farmer Field Schools

	Classical Agricultural Extension	Farmer Field School Methodology
Field-level extension officer's job	Top-down transfer of technology/ delivery of pre-packaged "messages," (not technical expertise, which is reserved for specialists not involved at the field level).	Technical Facilitation. FFS trainers should have basic technical skills (ability to grow crops/ rear animals etc.). Facilitators should have group oriented training and management skills, (typically learned in a season-long Training of Trainers (TOT) programme) where they learn what they will teach.
Experience of trainers	Variable. Farming skills and experience not essential. Field level staff given communication skills training.	Master training with farming experience via Training of Trainer programmes. (Requirement to grow crops/ carry out field studies to test for use in future Farmer Field Schools.
Content/ Information	Primarily top-down messages from distant research stations about situations presumed to be representative of farms.	Recommendations are tested against conventional practices and new information about the site emerges.
Desirable practices	Use of component technologies to control target variable.	Management of the farm as an agro-ecosystem so as to enhance self-organization.
Contact point/ Scaling-up mechanism	Via farmers meant to train other farmers by passing on external information. Scaling-up: diffusion of innovations among users.	Via groups of interested and active farmers through generation of local study circles. Scaling up: spontaneous local dynamics started up by empowered alumni (including FFS).
Time frame	Continuously, without end, on a two-week regular cycle. Devoid of basis on any natural phenology.	A pre-defined period. Usually on a weekly basis over a season – can be longer, but never less than one season integrated with the crop phenology.
Pedagogy	Training: transfer of knowledge via use of static pre-determined demonstrations, lectures, and in-field examples to "show and tell".	Adult Education: focus on non-directive methods that allow farmers to derive and adopt recommendations. Meant to energize and foster discovery-learning.

Evaluation	At best indirect: based on measuring delivery and funds spent.	Pre- and post-testing. Community self-surveying. Identifiable indicators defined in terms of system-critical factors.
Training site	Demonstration field, training centers, home of "contact farmer". Static, not revisited/ observed as an on-going process.	Shared field which the FFS uses to test and validate new management methods over entire season.
Short/ Long term objectives	Learning: individual adoption of innovations. Objectives: increased food production/ profitability etc.	Learning: group learning based on field observations and inference, and on experimentation. (As long as the decision making process is right, the decision is right). Objectives: farmer groups that will continue to address agricultural and community problems on their own, with technical backstopping.
Institutional Support (and Research)	Uninterrupted flow of technology from science to farmer. Research: primary source of information is research stations assumed to develop representative models that are widely applicable.	De-centralized organization to foster local dynamics and farmer-driven FFS. Research: a process and consequence of local testing and within-community/ecosystem learning.
Conducive Policies	Support for research and development (R&D) and extension services. Subsidies on input use.	Abolish subsidies on input use. Support and finance for local dynamics and networking. Encourage farmer support and local R&D.

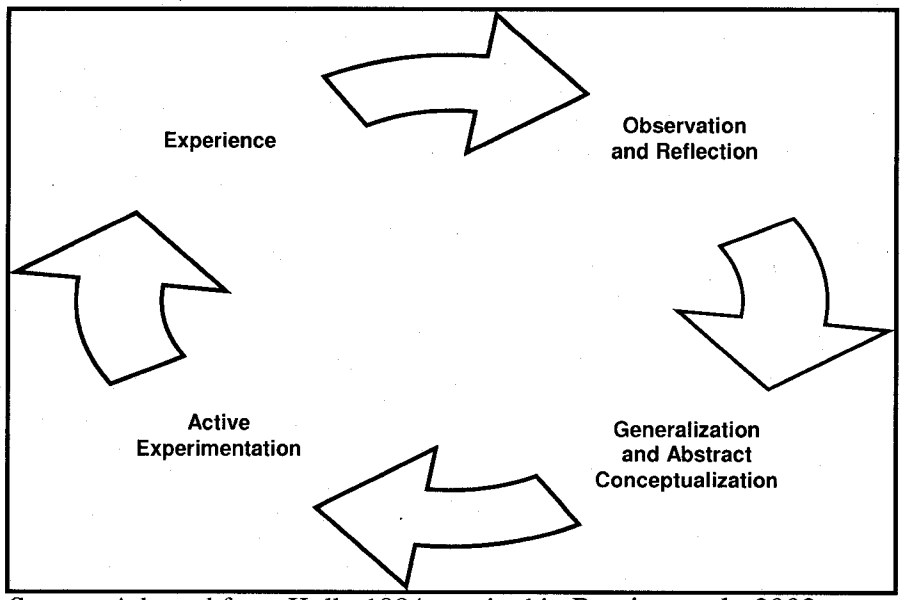
Source: Adapted from Gallagher, 1999; Roling and Wagemakers, 1998, as cited in Roling, 2002.

Gallagher explains that the original name of the field schools, *Sekolah Lapangan*, was created to reflect educational goals (Gallagher, 1999, p. 1). The educational theories underpinning the FFS are drawn from adult non-formal education, and in particular the schools of participatory and experiential education (Gallagher, Braun, & Duveskog, 2006; Pontius, Dilts, & Bartlett, 2002; van de Fliert et al., 2002). The "bottom-up" approaches are so-called because they are centered on the experiences and transformation of the learner.

In *Beyond Transfer of Technology*, van de Fliert (2002) has explained how Farmer Field Schools are theoretically designed to *capacitate* farmers, not just inform them. This is said to transpire through participation in a cyclical process of "observation, analysis, decision-making, experimentation" (Gallagher, 2003, p.6). This process is described by

Kolb as the "Learning Cycle" (1984). The theory expands on Freire's notion of praxis: action followed by reflection, followed by further action (1972). According to Kolb, education must begin with the experience of the learner and not from abstraction or pure theory. The four central elements of the learning cycle are depicted in Figure 1.

Figure 1 The Learning Cycle



Source: Adapted from Kolb, 1984, as cited in Pontius et al., 2002.

In an FFS for IPM, agroecosystem analysis incorporates phases of observation and data collection in the field ("experience"); followed by data analysis ("reflection"); then presentations and action proposals, such as *apply fertilizer*, or *don't apply insecticides*, ("generalization & abstract conceptualization" leading to a hypothesis); this decision is then implemented ("active experimentation"); and the cycle begins again (Pontius et al., 2002). Many experts argue that this practical orientation of FFS – under realistic conditions in the field – is the basis for building farmer skills and capacities in decision-making (Braun, Jiggins, Roling, van den Berg, & Snijders, 2006, p. 8; Nathaniels, 2005, p. 1; Pumisacho & Sherwood, 2005, p.145).

FFS is also described as a learner-centered educational approach, based on self-directed learning. The theory is that adult learning is optimized when the teacher or trainer is removed from the central role and the learner instead, takes control of his/her own learning. According to Rogers, adults require learning that is not only relevant to learning needs but encourages self-direction and fosters independence, creativity, self-reliance, self-criticism and self-evaluation. Rogers argues that learner-centered approaches require that facilitators take the place of teachers. Further, there are specific facilitation needs which apply to participatory strategies like the FFS (Rogers, 1969, as cited in Pontius et al., 2002). Pontius et al. (2002) suggest that the facilitator:

- is vital in setting the initial mood or climate of the group or class experience
- helps to elicit/clarify the purpose of the individuals and the group
- relies upon the desire of each student to implement these purposes that have meaning
- endeavours to organize and offer the widest possible range of resources for learning
- regards self as a flexible resource to be utilized by the group
- is able to become a learner, expressing personal views as those of one individual only
- remains alert to the expressions indicative of strong feelings
- endeavours to recognize and accept his/her own limitations

Finally, FFS are intended to achieve development goals based on theories of farmer "empowerment." The FAO has termed such experiential adult education models, "the human capital route to empowerment" whereby experiential learning leads to critical thinking, which leads to self-reliant decision making, which leads to empowered farmers (Bartlett, 2002).

Drawing on theories from Habermas, Pontius et al., (2002) suggest that self-reflection, or critical thinking which examines both the internal factors and the

environmental limits that together inhibit people's control over their own lives, produces a knowledge that leads to empowerment. In a similar vein, Paulo Freire (1972) argued that when people are allowed to participate actively in their own education through the sharing and joint construction of knowledge and ideas, they are empowered locally to gain greater control over their circumstances.

Commonly cited manifestations of farmer empowerment in FFS include heightened confidence levels, continued learning, improved capacities in social and political skills, and enhanced local relationships and organization (Khisa and Heinemann, as cited in Penning de Vries, 2005; Pontius et al., 2002; Matteson, 1996, as cited in Nathaniels, 2005, p. 1). Empowerment through FFS has also been linked to the "accumulation of financial, human and social capital" (Bartlett, 2002).

2.1.3 The Fundamental Elements of a Farmer Field School

It has been said that Farmer Field Schools succeed because "they provide basic scientific conceptual frameworks and knowledge in very democratically run field groups" (Gallagher, 1999, *Basic Concepts*). While modification to FFS may be required in order to fit different cultural contexts, and the content, schedules and costs may vary (depending on learner goals and local circumstances), it is argued that the methodology can work globally so long as the regular meetings are maintained – in-line with the crop/livestock management schedule – along with hands-on field-based learning (Gallagher et al., 2006).

The following is an overview of the basic concepts and fundamental elements common to FFS across differing contexts and countries (adapted from Gallagher, 1999; Gallagher, 2003):

Participatory group study

FFS are organized for groups of about 25 persons with common interests. The group can include men or women, or both. FFS is not intended to create a long-term group-based organization, although this often occurs.

Curriculum basis and time limitations

Active member participation determines the FFS crop/topic and the curriculum. Specific hands-on management and study take place in the field (or topic context). FFS (and Training of Trainers [TOT] for FFS) for IPM utilize the crop as a teacher, and the field as the classroom. Meetings commonly occur on a weekly/bi-weekly basis in order to follow the natural cycle of the subject (crop, animal, soil etc.). Courses are delimited by this cycle – with a definite beginning and end. Field schools may extend beyond one season, but rarely can be effective for less than the cycle of the crop.

Adult non-formal education

Field Schools assume that farmers already have a wealth of experience and knowledge, and may also have misconceptions and bad habits. FFS are oriented to provide basic agroecological knowledge and skills in a participatory manner – integrating farmer experience into the programme. All activities are based on experiential, participatory, hands-on work. Each activity involves a cyclical procedure for action, observation, analysis, and decision-making.

Strong facilitation

The facilitator must have certain skills and competencies in order to lead members through experiential learning and hands-on exercises. There is no lecturing involved. The facilitator can be an extension officer or FFS graduate but a key objective is to move

towards farmer facilitators. All facilitators need (season-long) training to (re)learn facilitation skills in group-building methods, experiential techniques, the specifics of the crop (or topic) and management skills.

Field School site

FFS are always held in the community where farmers live so that they can easily attend sessions and maintain the Field School studies.

Basic science

FFS focus on basic processes through field observations, season-long research studies, and hands-on activities. In IPM, two learning plots are utilized: the conventional plot, representing traditional farming practices, and the experimental IPM-plot, based on agroecosystem analysis (AEA) and corresponding field-level management decisions. There are also plots for specific studies and crop experimentation (different crop varieties, organic techniques, etc).

Process versus goal-oriented

FFS provide farmers with a learning environment in which they can achieve predetermined personal and collective development goals (which vary from reducing inputs and increasing yields and profits, to improving negotiation and decision-making skills). FFS should incorporate strategies to facilitate the dissemination and replication of impact post-graduation.

Evaluation and certification

FFS include field-based pre- and post-testing of participants. Farmers with high attendance rates who master the field skill tests are awarded graduation certificates.

Funding

There is an explicit goal for FFS groups to become independent and seek local support separate from external funding.

Programme support

Most FFS exist within a larger programme, run by government or non-governmental organizations. A programme leader must support the training of facilitators, organize materials for the field, solve problems in participatory ways and nurture the field staff. This person closely monitors FFS for potential technical or human relations problems. All stakeholders must commit to having faith in farmers' and facilitators' abilities to learn locally and to apply this learning.

The comprehensive report, *A Global Survey and Review of Farmer Field School Experiences* (Braun et al., 2006), reiterates that the "comparative advantage" of FFS relies on the "skillful incorporation" of the following:

"(i) learner-centered, field based, experiential learning; (ii) observation, analysis, assessment, and experimentation over a time period sufficient to understand the dynamics of key (agro-ecological/socio-ecological) relationships; (iii) individual and joint decision-making based on learning outcomes; and (iv) individual and group capacity building" (Braun et al., 2006).

2.1.4 The Methodological Process of a Farmer Field School

Many of the aforementioned "defining elements" of a successful Farmer Field School focus on educational elements and the inherent need for learning that is experiential and people centered, knowledge-intensive, and location-specific. The stages of the "ideal" FFS process flow from these principles. This section (adapted from

Sherwood and Thiele, 2003, as cited in Norton et al., 2005) will review the start-to-finish process of a Farmer Field School.[9]

While the methodological process of FFS is normally adapted to fit the specific context, topic, culture and region of application, this section serves to outline the general stages of implementation for any FFS, including the intended purposes of each stage. The example of FFS for Integrated Pest Management is relevant since each of the case studies were IPM FFS, and future FFS for the Ecosalud project will also be IPM FFS.

Establishment of the group

A Farmer Field School is initiated with introductory meetings with the community in order to determine whether an FFS is desired. The initiative is commonly taken on by the government, or a non-governmental organization. The group/community need should be self-identified. Participants are often drawn from a group facing a shared issue. Where possible, the FFS should reflect the socio-cultural heterogeneity of the interest group; including men, women and youngsters. A group of approximately 25 farmers is ideal. Prior to enlisting, participants should be made aware of expectations for the FFS and expectations for members. Participants who are not comfortable can disengage at this time.

After formation of the participant list, organizational matters need to be established – including the schedule (date, time and frequency) for sessions; a space for the sessions (i.e. a plot of land); and a list of tasks and responsibilities for the entire

[9] For a comprehensive overview of FFS for Integrated Pest Management see Luther, et al., "The Key Role of Farmer Field Schools," *Chapter 9*, as cited in Norton et al., *Globalizing IPM, 2005*; Pumisacho and Sherwood, "Metholodical Process" (Proceso Metodológico), *Chapter 2*, as cited in *Methodological Guide on Farmer Field Schools* (Guia Metodológica sobre ECAs), 2005; LEISA, *Facilitating and Leaving Facilitating: Helping Participants to Direct FFS* (Facilitar y Dejar Facilitar: Ayidemos a los Participantes a Dirigir las ECAs), 2003, p. 80.

season concerning attendance, materials, resource management, investment of the harvest, and other key issues. Financial planning, including expectations concerning contributions from the group, from each farmer and from the organization is determined at this time. Election of a president, secretary, spokesperson and financial planner may also take place at this stage. These decisions are all drawn up in a contract.

Further, a "moral contract" entails that participants are accepting of the idea that the learning process will require a certain attitude. This means:

- maintaining interest and motivation for participation in the FFS
- willingness and ability to share experiences with others
- willingness to invest in the FFS with labour and resources
- respecting the FFS principles of equity, discovery-based learning, group decision-making, agroecosystem analysis, and alternative management methods

Determination of technical content

A baseline study increases awareness of specific issues and potential opportunities that may exist within the group. This study might include a review of the geographical context; a list of participant information including name, gender, age, family composition, profession, costs, gains etc.; and an inventory of socio-cultural activities.

A participatory diagnostic is utilized to determine the most salient issues and the crop or animal that will be the topic of the FFS. Participants and the facilitator must agree on this. Through the diagnostic, the group also decides the specific topical theme and the specific studies or "real life" experiments to be conducted. The diagnostic exercise must allow the participants to self-identify the topic and themes for the FFS and these selections must be representative of the most pressing issues of the group. Course curriculum can be determined once the topic and theme are decided. The topic and

curriculum should never be pre-determined by the executing organization or the facilitator.

In Latin America, the practical exam (termed, "prueba de caja", or "proof box") is an activity which attempts to determine each participant's knowledge on certain key topical elements, before and after the FFS. The practical exam has three main objectives:

- provide the facilitator with the a baseline knowledge summary of the group
- demonstrate individual/group gains in terms of knowledge and skills
- act as a monitoring and evaluation tool

Establishment of learning plot

After site selection, the traditional and learning plots can be prepared. The plots should be of similar size and exposed to similar natural conditions and they should be sown together, with both the facilitator and participants present. The conventional plot is managed according to the (traditional) farming norms of the community, while the IPM plot is managed according to the results of careful agroecosystem analysis in order to achieve common objectives. The learning plots form the "live" laboratories of the FFS. Plots should be marked with posts or signs to prevent confusion among participants. All labour and activities should be group oriented.

Development of sessions and learning activities

Learning sessions take place at a determined date, place and time. The basic format of an FFS for IPM consists of three elements: agroecosystem observation, analysis, and presentation of results; a "special topic," such as marketing, or credit; and a "group dynamic" teambuilding activity, such as a sport or game (Gallagher, 2003, p. 6). Figure 2, outlines a typical FFS session.

Figure 2 A Typical Farmer Field School Session (for IPM)

8:00	Opening (often with prayer) Attendance call Day's briefing of activities Stretching exercises, or quick dynamic group activity
8:30	Go to the field in small teams Make observations (noted by the facilitator and one other group member) Facilitator points out interesting new developments
9:30	Return to shade (meeting area). Begin agroecosystem analysis drawing and discuss management options
10:15	Teams presents results and the group arrives at a consensus on management needs for the coming week
11:00	Short tea/ coffee/ water break
11:15	Energizer or group building exercise
11:30	Special study topic or second crop/livestock study Optional review of day's session Planning for next session
12:30	Closing (often with prayer) Sharing of group meal or drinks etc.

Source: Adapted from Gallagher, 2003, p. 5.

Learning activities take place in the field where the facilitator works to challenge and support participant learning. Apart from delivery of a "special topic" (representational of farmers' interests, when a facilitator might fill a role more reminiscent of a traditional teacher) the facilitator and participants work together throughout the FFS process to achieve learning objectives (Luther et al., as cited in Norton et al., 2005). Every effort should be made to build an environment where questions can be asked and mistakes made. Depending on crop demands and learning needs, an FFS will involve 15-20 regularly scheduled sessions mirroring the crop cycle.

"Agroecosystem analysis," often described as "the heart" of the FFS, consists of the following phases:

- Farmers break into small learning groups to complete field observations of the crop and the field environment in both the conventional (non-IPM) plot, and the

alternative (IPM) plot. This includes random sampling and analysis of crop and related pests and insects, weeds, diseases, weather effects etc. Notes are taken.

- The group reassembles to report on observations. Data are diagramed and tabled to facilitate group understanding and analysis.
- Group presents findings with opportunity for questions. The facilitator confirms data, asks challenging questions, and ensures input from all.
- Optimally, group consensus is reached regarding the immediate crop management action that is needed to maintain crop health.
- Implementation of the crop management activity is conducted through a group-based action plan.

A field day can also be implemented as an important activity during the FFS cycle. Participants demonstrate the methodology to other local actors. This takes place near the end of the cycle and is organized by participants with the support of facilitator(s). This experience can help to promote the evolution of farmers from FFS participants to facilitators since the field day gives participants an opportunity to act as facilitator and carry-out/analyze field activities for non-members (Luther et al., as cited in Norton et al., 2005; Pumisacho and Sherwood, 2005).

A repeat of the practical exam takes place near the end of the FFS cycle. Questions derive from both the initial exam and from activities done during the field school. Results are compared with pre-test results to demonstrate knowledge changes to both the participants and the facilitator. If participants do not pass, the facilitator develops complementary capacity-building activities.

The practical fieldwork of an FFS culminates in the harvest of the plots. This includes harvest and weighing of the crop and an economic analysis. This demonstrates the feasibility of using alternative management strategies. The yield is sold or divided

amongst participants. In auto-financed FFS, the gains from sales are used to finance follow-up events or FFS.

Graduation and follow-up

A graduation event is organized at the end of the Field School. The participants who have successfully completed the FFS receive an official certificate or diploma. Since most farmers have never received formal recognition for their learning, this is an important event for participants, and a moment of great pride. The formal event is normally facilitated by the organizing institute.

Conditions for graduating are:

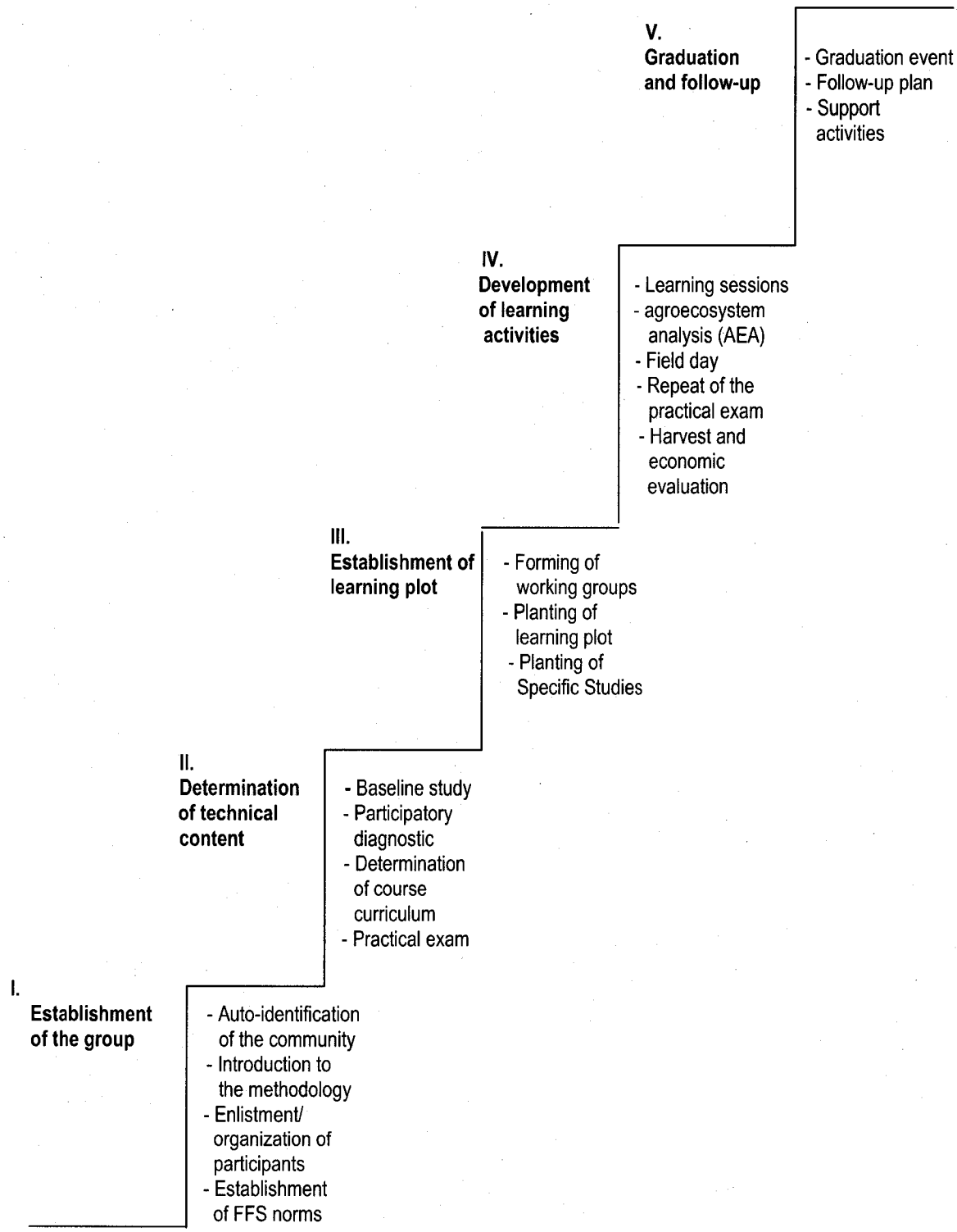
- Participants have attended at least 80% of sessions
- Participants have successfully completed the second practical exam
- Participants have satisfactorily contributed to the individual/group learning process

Evaluation results and a summary of learning are shared, and the participants are given the chance to share highlights from the experience. This serves as a second opportunity to promote and diffuse the methodology to local communities, authorities, institutional representatives etc. The ceremony is often accompanied by traditional cultural elements.

Follow-up activities, after graduation can vary. The expectation is that farmers continue to study to broaden their understanding of the ecological basis of agriculture, and also maintain a community IPM program (Thiele et al., as cited in Gonsalves et al., 2005, p.3). It is also expected that some farmers will conduct a second round of FFS to include more farmers and address other (crop-related) problems. Individual diffusion of FFS experiences amongst family or neighbours is also considered a form of follow-up. The most important factor is the construction of a plan for follow-up.

Ex-FFS participants must take initiative and ownership of these follow-up activities – with limited influence of the facilitators, organization, or institution. Although the FFS is not meant to be sustained, the intention is that the impact of FFS will be sustained acting as a "stepping stone" to the development of self-sustained groups (Braun, et al., 2006, p. viii; Gallagher et al., 2006, p. 2).

Figure 3 Summary of the FFS Process



Source: Adapted from Sherwood and Thiele, 2003, as cited in Norton et al., 2005.

2.1.5 Goals of the IPM Farmer Field School

First and foremost, FFS goals are *agricultural* goals. The objective is to improve farmers' abilities to farm through the improvement of farmer capacities for problem-solving and decision-making. Thiele et al. position FFS as a platform for "integrated decision-making and innovation for sustainable agriculture" (as cited in Gonsalves et al., 2005, p.1). Pumisacho and Sherwood (2005, p. 145) specify the goal for farmers to become better managers of their agroecosystems, grow healthier crops, and improve their welfare. Gallager et al., (2006) contend that FFS "should always improve productivity or profitability" (p.2).

Pontius et al. (2002) contend that, in the short term, "IPM FFS strive to enable farmers to respond to practical needs, usually pest control, crop production and productivity" but over the longer term, "FFS aspire to farther reaching individual and collective matters that are commonly behind social marginalization and poverty.

"People development or human resource development is an often-stated goal" (CIP-UPWARD, 2003, as cited in Norton et al., 2005). This has been defined as the development of "sustainable human and social capital needed for next-step actions among farmers, such as collective marketing of produce and lobbying through farmer networks, savings groups and other associations..." (Braun et al., 2006, p.viii). Gallagher et al. (2006, p.2) depict this as the formation of networks, federations and associations and improved technical, social, and life skills. Norton et al. (2005) describe such goals as social empowerment goals, and the improved capacity to protect economic and cultural interests. Simpson and Owens (2002) suggest that additional "hope" for FFS is the

development of improved exchanges and more constructive relationships between farmers, extension agents, researchers, and other stakeholders.

2.1.6 Trends and the Global Scope of Farmer Field Schools

According to Dilts (2001, p. 18), "from the first Farmer Field Schools consisting of 25 farmers each," the people centered IPM movement has grown to include "several millions of farmers ...in rural areas of developing countries throughout Asia, Africa, and Latin America" (FAO, 2007, para. 2). Luther et al., (as cited in Norton et al., 2005) state that FFS are also active in Eastern Europe and Australia. Variants of FFS are now being promoted by many international agencies, governments and non-governmental organizations (Braun et al., 2006), as well as a wide range of institutions and independent research programs (Luther et al., as cited in Norton et al., 2005).[10]

The geographical spread of the methodology has been accompanied by local cultural and socio-economic adaptations by local facilitators (Luther et al., as cited in Norton et al., 2005). Many innovations have occurred and changes to the basic theme have been developed. While FFS for IPM remains very common, the methodology has been adapted for other crops such as legumes, fruits, vegetables and tuber crops, as well as other technical and social themes such as integrated crop management (ICM), community forestry, livestock, water conservation, HIV and AIDS, literacy, advocacy and democracy. FFS adaptations have also been extended to a new audience, including school children (Braun et al, 2006, p. vii; see also LEISA, 2003; CIP-UPWARD, 2003; van den Berg, 2004).

[10] For a summary of *The Global Status of Farmer Field Schools* , see Braun et al., 2006, p. Appendix II.

2.2 The Impact of Farmer Field Schools

"No agreement exists as to what to measure, how to measure, or how to assess the results of measured impacts" of FFS (Braun, et al., 2006, p. viii). There is contention surrounding what constitutes a "failed" field school, and whether impact can be measured through qualitative study, including participant testimonials, versus quantitative and objective measures (Braun et al., 2006, p. viii). The following two sections review the successes and the failures of FFS and of explanatory factors, beginning with an overview of the debate on the measurement of FFS impact.

2.2.1 The Debate on FFS Impact

The Food and Agriculture Organization of the United Nations (FAO) identifies several challenges facing efforts to assess FFS impact:

> Impact evaluation of the IPM Farmer Field School has proven to be complex because of methodological obstacles, because of the range of immediate and developmental impacts, and because of different perspectives of stakeholders. Consequently, there is no agreed framework for measuring impact. (as cited in van den Berg, 2004, p. 5ii)

Two issues make it difficult to generalize the benefits and costs of Field Schools. First, there is a lack of agreement about the factors that should be considered on each side of the equation. On the benefit-side, variables can include: crop yield, levels of pesticide inputs and income, public health measures, and farmer levels of knowledge, empowerment and organization. On the cost-side, variables include: time, cost and labour expenditures. Malarin insists that the quality of FFS will always be expressed in terms of compliance to farmers expectations in training results (2002).

Secondly, the degree of value placed on individual factors varies widely. Costs of a Field School range between $150 and $1,000 depending on the country and the

organization. And high variation across implementation contexts complicates comparative analysis. Farmers who eliminate/reduce pesticide use (with no loss in yield), may experience *cost savings*; however, farmers who were not previous users of pesticides cannot increase savings from this source. Instead, yield increases, garnered through alternative crop maintenance practices, may bring increased *profits* (Feder et al., 2004).

Generally speaking, it is disputed whether FFS is "an educational investment" or an "extension activity." It is argued whether emphasis should be on changes in farmer practices, knowledge, or technology used; or changes in productivity and profitability; or changes in human and social capacities and impacts on human health and the environment. There is also varying weight given to "participants' own appreciation of the difference an FFS might have made to their lives," compared to "objective measures" (Braun et al., 2006, p. viii).

In short, high-level stakeholders including the World Bank and the FAO have differences in motivation, scope of analysis, and methodology – and so disagree on the advantages and disadvantages of FFS as an intervention strategy. While an FAO-commissioned meta-analysis of 25 impact studies outlines substantial reductions in pesticide use, increases in crop yield, and broader development impacts attributable to FFS training, a widely circulated paper by World Bank economists questions the benefit of *Sending Farmers Back to School* (Feder et al., 2004).

Some experts contend that Farmer Field Schools are a very effective tool for cultivating farmer learning and empowerment – encouraging critical thinking skills and self-sufficiency among farmers. Others argue that, as the approach has increased in popularity, new issues and challenges have emerged – especially with respect to

maintaining quality in implementation and ensuring that the core principles of the approach continue to be reflected (LEISA, 2003, p. 3). The following sections will review cases where FFS have worked and cases where problems and failures have arisen, including explanations for these outcomes.

2.2.2 When and Why Farmer Field Schools have Found Success

Decreased Pesticide Use, Increased Yields and Incomes

> IPM Farmer Field Schools (FFSs) for rice farmers in Asia have been immensely successful. Since the Indonesian National IPM Programme initiated the first FFS in 1989, the approach has reached over two million rice farmers. These farmers have increased their yields and incomes, reduced pesticide use, and use inputs such as water and fertilizer more efficiently. (LEISA, 2003, p. 4)

A review of the literature on FFS finds many such claims about FFS. Many studies indicate that as a result of the nearly global implementation of the methodology, hundreds of thousands of farmers have been able to reduce pesticide dependency while consistently maintaining or improving yields thereby reducing spending and improving economic gains (see van den Berg, 2004; Asmunati, van de Fliert, W. & van de Fliert, E., 1999; Mancini, 2006; FAO, 2000; Torrez et al., 1997-98).

Reports of IPM training in Sri Lankan FFS outline decreased pesticide application levels and crop yield increases as high as 25 percent (Nanta and Ekneligoda, as cited in FAO, 2000, p. 18). While in Bangladesh, FFS-schooled farmers experience rice yields 8-13 percent higher than their non-FFS counterparts (Ramaswamy, et al., as cited in FAO, 2000, p. 18). Similar impacts are reported by studies of Vietnam, Ghana, Cote d'Ivoire and Burkina Faso (as cited in Kenmore, 1997). Regarding profits, the FAO reports increases of 40 percent in Sri Lanka, 30 percent in Thailand, and 10-25 percent in China (2000, p. 18). In Latin America, studies find that while profit increases may not be

excessive, farmers have been able to "eliminate highly toxic compounds from their production system and substantially reduce pesticide use and production costs while not adversely affecting production per area" (Sherwood, 2001, p. 4).

Increased Knowledge and Learning

A key study by Godtland, Sadoulet, de Janvry, Murgai, and Ortiz (2004) finds that farmer knowledge increases through participation in FFS. Follow-up on the FFS pilot program in Peru demonstrated that farmer participants have "significantly more knowledge about IPM practices" than non-participants. This impact on knowledge was also found to motivate significant improvements in potato crop productivity (Gotdland, et al., 2004). In Latin America, Sherwood (2001) finds that improvements to farmer skills are clearly evident and these skills are directly linked to improvements in other areas, including crop loss reduction, income and economic benefits, reduced application rates of agricultural chemicals, and increased number and variety of natural pests.

Regarding long-term impact, a case study from Sudan concludes that FFS can be considered as a transformational learning process that equips farmers with a long-term effect in terms of farmer knowledge, attitudes and practices (Khalid, 2002). The use of exploratory activities (Rola, Jamias, & Quizon, 2002; Feder et al., 2004, p. Vii.) and follow-up activities have been used successfully, post graduation, in order to spread knowledge horizontally through fora and networking (Thiele et al., as cited in Gonsalves et al., 2005, p. 6). Reports also find that in the years after training, knowledge on IPM, acquired through experiential learning was retained or even increased (van den Berg, 2004).

Development Goals

Developmental benefits of FFS have also been argued as key indicators of success (van de Fliert, Pontius, & Roling, 1995; Bartlett, 2002). The FAO argues that FFS has an "important trigger function, by introducing farmers to experiential learning methods whilst enhancing group building and social skills... which can subsequently be applied to broader areas of people's lives" (as cited in van den Berg, 2004, *Section 4.2*). Nathaniels (2005) states that participants have experienced benefit in terms of greater control and enhanced *human capital* (ownership of knowledge and the learning process); *natural capital* (productivity and sustainability of land and water); and *social capital* (formation of groups and networks)... and this has "contributed to capacity-building among rural populations [and] improved amelioration of farming livelihood problems" (p.1). The role of *financial capital* (savings, or money from crop sales) is outlined as a less reliable route to empowerment (Bartlett, 2002).

Bartlett (2002) finds that FFS has proven to be an effective entry point for farmer "empowerment" on a significant scale, under a range of social and physical conditions, in Nepal, Sri Lanka, Indonesia, Philippines, Vietnam and China. FFS have been shown to promote self-sustaining learning groups that organize and conduct field trials, train other farmers and negotiate services with government agencies advocating for personal issues and rights. Such impacts have provided farmers a stronger voice vis-à-vis the state (Bartlett, 2002). In Bangladesh specifically, women have reportedly garnered financial and social capital through participation in FFS and are found to be taking greater control in household decision making, claiming entitlements from local government, collectively managing productive assets, and challenging oppressive practices such as early marriage

(Bartlett, 2002). In Mali, some women, "who have never previously had their own plots said their new skills had given them the courage to farm independently of their husbands" (Luther et al., as cited in Norton et al., 2005, p.7).

The FAO has found increased self-regard, social skills, and interaction with service providers resulting in spontaneous activities, new structures, and policy change, at the individual, group and community level (as cited in van den Berg, 2004). Van den Berg defines such impacts and actions as "spontaneous" and "widespread" and maintains that farmers themselves identify increased "creativity, independence, and collaboration" as impacts of FFS training (2004). While Dilts (2001), defines the developmental impact of FFS in terms of farmer activity in post-FFS contexts. "Alumni have frequently remained involved in a wide-range of self-directed activities, including research, training, marketing, and advocacy on agricultural issues" (p. 18-21). Reports of multi-country contexts, particularly Latin America, outline continued learning as well as improved social and political skills, local relationships and collaboration and connection with outsiders, and policies on agroecological management (CIP-UPWARD, 2003; Braun et al., 2006; van den Berg, 2004; Mancini, 2006; and Khisa and Heineman, 2004).

New topics in FFS

FFS researchers report that the FFS methodology can be used successfully to address non-IPM topics. The FFS methodology, curricula and learning processes have been applied predominantly to rice but have been adapted for the livestock sector, land productivity issues and a range of social, health issues and environmental issues. An FAO impact assessment attributes benefits to sectors outside of agriculture – including the

areas of education, environmental protection, and public health (as cited in van den Berg, 2004).

Yech (as cited in LEISA, 2003), and Vuthang (2002) detail the successes of Farmer Life Schools (FLS) in addressing issues ranging from poverty, to domestic violence – including specific health problems. In FLS, the focus is shifted from agroecosystems analysis to "human ecosystems" analysis, and from Integrated Pest Management to Integrated Livelihood Management (LEISA, 2003, p. 11). Along the Trans-Asia highway, between India, Thailand, Cambodia and Vietnam, FLS have been utilized to "curb risky behaviour" where the movement of people and the extent of HIV and AIDS is spreading.[11] FLS are found to work well with both IPM FFS graduates (Vuthang, 2002), and farmers with no experience in FFS (Minjauw, et al., as cited in LEISA, 2003).

Kenyan Field Schools for animal health and production demonstrate initial successes in adapting agroecosystem analysis to make animals the focal point of the training (Minjauw, et al., as cited in LEISA, 2003). The IPM FFS has also been expanded to incorporate human health topics in rural communities. Van den Berg and Knols (2006) explain that the "strong link with agriculture" and the "role of farmers in creating or controlling the conditions of the disease/illness" are touch points for the use of FFS for health issues. Van den Berg and Knols argue that combined health-agriculture curriculum can benefit human health goals at no cost to agricultural goals (2006). They advocate for "adaptation of the IPM Farmer Field School, to make the ecology and disease control implicit in the IPM curriculum – by purposely involving farmers and other interested actors in the management [of health] in their environment" (para. 7).

[11] HIV and AIDS means human immunodeficiency virus and acquired immune deficiency syndrome.

Evidence from Sri Lanka suggests that while women show the most interest in the health component and men in the agricultural component, both genders stand to benefit from active participation in addressing health issues (van den Berg and Knols, 2006). Measured impacts have included decreased pesticide use; altered use of personal protection measures; and improvements in nutrition, housing conditions, access to health care and environmental management – both inside and outside of the home (van den Berg and Knols, 2006, para. 8). In Southern India, FFS for cotton farmers has targeted both IPM and tangential topics of farmer livelihoods, including the natural environment and human health of farmers, particularly women (Mancini, 2006).

Constructive Relationships

FFS contribute to the building of constructive and active relationships between farmers, extension agents, researchers and other stakeholders (Simpson and Owens, 2002). "After decades of stagnation, one of the most uplifting findings is that of the capacity of the FFS experience to bring a sense of real vitality into the interactions between extensionists and farmers" (Simpson and Owens, 2002, *Conclusions*). Reports from both Ghana and Mali find that farmer opinions of extension have changed significantly through FFS while relationships between farmers and extension agents have improved in both directions (Simpson and Owens, 2002). In Southern India, farmers report greater means to achieve improved village governance due to improved collaboration and connection with experts and outsiders through FFS (Mancini, 2006).

Rueda et al. (2003, as cited in Gonsalves et al., 2005) explain that improved relations between farmers, NGOs and other institutions has eased the adaptation to new market contexts. In Kenya, FFS networks of over 3000 farmers have functioned to secure

supermarket contracts for IPM tomatoes. Since the skills required for shipping the right quality and quantity of product at the right time are new to these farmer-owned networks, institutional partners work with FFS to help incorporate business and management topics into the curriculum (Luther et al., as cited in Norton et al., 2005). In Uganda, a demand-driven FFS program has partnered with NAADS (Uganda National Agricultural Advisory Service) to receive institutional and policy support in favour of growth and favorable market conditions for smallholders (Friis-Hansen, 2004). Concurrently, Simpson and Owens (2002) explain that as FFS rely increasingly upon external institutions for support, and to fulfill needs for market strategies, financing etc., the opportunities for increased collaboration between stakeholders is elevated, relationships and information networks are further developed, and levels of trust and support are fostered.

Women's Participation

Women's participation is cited as both an *end goal* for FFS and a *means* to achieve success in terms of agricultural goals, learning goals, and development goals. In Vietnam, gender quotas for the participation of women are set, and the ratio for women facilitators is close to one-third (Tuyen, 1997). In this context, Tuyen (1997) explains that women farmers tend to take women trainers as their example and they find it easier to communicate with, and relate to other women farmers.

Reasons for Success

Successes attributed to FFS programming include economic, social, and environmental impacts. The reasons for these impacts are summarized in Table 2.

Table 2 Summary of Reasons for Success in FFS

Impact of FFS	Reason(s) for Success
Decreased pesticide use, increased yields/ incomes	➢ IPM knowledge and training[12]
Increased knowledge and learning	➢ Intentional cycle of learning ➢ Farmer participation in the learning process (curriculum development, field study etc.)[13]
Human development goals	➢ Experiential and self-directed learning ➢ Group interaction and self-directed learning ➢ Programmer investment in post-FFS activities ➢ Use of key farmer technicians and farmer interest groups, post-FFS[14]
New topics in FFS	➢ Strong linkage with agriculture ➢ Role of farmers in creating/controlling mediating conditions ➢ Practical facilitator training in FFS approach ➢ Purposeful involvement of farmers ➢ Incorporation of new methods for experimentation principles (for human/animal subjects) ➢ Involvement/education of both genders ➢ Support of local institutions and government ➢ Availability of topical information/training resources specific to the location and the language (including the illiterate)[15]
Constructive Relationships	➢ Strong farmer-facilitator engagement ➢ Networks of trust/support/collaboration between farmers, extension agents, researchers, and other stakeholders[16]
Women's participation	➢ Women facilitators ➢ Intentional goal (quota) for female participation[17]

Source: Author, 2007, reference footnotes 12-17)

2.2.3 When and Why Farmer Field Schools have Struggled or Failed

Quality Learning

Not all Farmer Field Schools have been judged successful. Poor quality of learning means failure for FFS. Lack of attention to the quality of learning is also a leading causal factor for low overall impact of FFS (Braun et al., 2006). "Quality learning" underscores the important distinction between the adult education/capacity-

[12] van den Berg, 2004
[13] CIP, 2001b; Pumisacho and Sherwood, 2005, p. 145.
[14] Norton et al., 2005; Braun et al., 2006, p. vii; Haiyang, 2002, p.1.
[15] van den Berg and Knols, 2006, para. 1; Mijauw et al., as cited in LEISA, 2003; Singh, as cited in LEISA, 2003; Simpson and Owens, 2002.
[16] Simpson and Owens, 2002.
[17] Haiyang, 2002; Tuyen, 1997.

building goals of FFS programming, and the more simplistic information diffusion objectives of more traditional extension programs.

It follows that learning in FFS be measured by evidence not only of knowledge accumulation, but of changes in attitudes and behaviors and overall improved capacity for problem solving and decision-making in the field (Braun et al., 2006). It should be noted however, that it is difficult to find literature which presents evidence-based findings about the impact of FFS on farmer capacities and decision-making skills. Instead, many studies equate learning with knowledge scores based on a comparison of results of pre- and post-FFS testing (Hidalgo, Campilan, & Lama, 1999-2000).

In terms of changes in knowledge, evidence from various regions, including the African context, demonstrates that FFS outcomes are not necessarily any greater than for a more traditional delivery oriented program (Simpson and Owens, 2002). Over the past ten years, CARE Bangladesh has organized more than 12,000 Farmer Field Schools with approximately a quarter of a million participants (Bartlett, 2005). The methodology was adapted for fish-rice systems and significant changes included lengthened period of training; reduced intensity/frequency of sessions; reduced focus on experiential learning; increased focus on marketing; and organizational development. Findings indicated that these FFS resulted in increased adoption of innovations, but they did not lead to improved understanding of the underlying science, or to systematic experimentation among the targeted farmers (Bartlett, 2005).

Quality Facilitation and Facilitator Training

Variation in extension staff, just as in any teaching environment, results in variations of FFS quality. Evidence from Africa indicates that, in terms of FFS learning

goals, "the level of experimentation among farmers appears to be more a result of the influence of the local extension officer than the FFS process itself" (Simpson and Owens, 2002, *The Integration of FFS...*). Specifically, the threat of facilitators resorting to a "teaching role" poses the greatest risk to the overall effectiveness of FFS programs (Feder, et al., 2004, para. 4).

Overall, Gallagher et al. (2006) find that a majority of extension staff and service providers are not skilled and innovative facilitators. On the contrary, facilitators find it very difficulty to shift from a top-down "technology transfer" mindset to becoming a facilitator of adult learning in the real sense (p. 3). Simpson and Owens (2002) also find that "the ingrained attitudes and patterns of behavior acquired under the past decade of T&V [training and visit] lay close to the surface" (*Conclusions*). Studies of FFS in Africa find that without continued support to the contrary, traditional facilitator/extensionist habits begin to reassert themselves and eat away at the initial gains in improved interpersonal farmer-extensionist relations (Simpson and Owens, 2002).

When the facilitator role is filled by an agricultural expert, engineer, or technician from outside of the farming community, rather than a farmer, facilitation suffers. "Well trained farmers have been found to be better facilitators since they have the respect of the community and know local conditions better" (Gallagher, et al., 2006, p. 4); and because "other farmers appreciate learning from peers with similar experience who speak their own language" (Thiele et al., as cited in Gonsalves et al., 2005, p. 3).

Failures in achieving quality facilitation are tied closely to failures in facilitation training, or the training of trainers (TOT) process. Thiele et al. (as cited in Gonsalves et al., 2005) find that without an adequate TOT program – that focuses on both the technical

elements of participatory experiential education, and of agroecology – subsequent FFS programs do not fulfill their potential. Simpson and Owens (2002) suggest that maintaining the education/training level of facilitators is an obstacle that is not surmountable in a single, season-long TOT. While Feder et al. (2004) outline that the average quality of training, and of trainers and their commitment to bottom-up approaches, has likely been negatively affected in the move to mass volume.

Addressing farmer realities

Curricular Content

Ineffective FFS and low post-FFS diffusion rates have been linked to curriculum issues including content that is too sophisticated, content that is irrelevant or overvalued, content that fails to address environmental and health implications, and content that generates communication problems (Feder et al., 2004). Problems arise when content fails to center on the specific priorities of the community and the specific needs and interests of the farmer (Luther et al., as cited in Norton et al., 2005).

Simpson and Owens (2002) cite an example from Ghana where cabbage production had been encouraged, yet no local market for cabbage existed. Commonly, FFS are found to focus too strongly on the economic realm and the concept of pest management – a minor production impact for farmers. As a result, farmers do not place importance on environmental and health variables and practices which would lessen pesticide need and application (Feder et al., 2004). At the same time, unnecessary stress on the underlying science can degrade the performance of graduates and decrease the likelihood and speed of diffusion of new knowledge among farmers (Feder et al., 2004).

Program Goals and Objectives

FFS has been found to work best in the context of a progressive demand-driven extension policy process, in which accountability among extension staff is towards farmers rather than towards their superiors (Gallagher, 2002). Conversely, Davis (2006) finds that dangers arise when FFS implementation is donor-driven. Isubikalu (2006) summarizes that "most development projects, like the FFS, are externally initiated, donor driven, with preset plans and objectives" (para. 3).

Bartlett (2005) argues that conducting FFS as part of a larger project or programme which is managed and funded externally, means that too often the "soft" side of the FFS – the educational and social issues – play a secondary role to "hard" issues of pesticide application rates. Similarly, Malarin (2002) finds that institutions commonly prioritize "productivity" over "real quality requirements" (p.2, 4). When government departments, NGOs, and donor agencies are responsible for managing the agricultural intervention, the needs and resources of these organizations are positioned as equal to, or superior to those of the farmers involved (Bartlett, 2005). Gallagher also finds that the FFS approach can be promoted aggressively by donors without sufficient monitoring, evaluation and reporting (2002).

Maintaining the FFS Process

Coordination/Planning of Sessions

FFS are plagued by logistical issues surrounding the coordination and planning of regular sessions. Feder et al. (2004) report common errors such as the untimely pairing of training activities with funding transfers; training not being fully synchronized with the growing season calendar; the irregular supply of training materials; the irregular

availability of meals for participants; as well as high rates of farmer absenteeism in Field School sessions. In Mali, it has been found that the main problems with IPM FFS do not relate to the FFS process, but instead, involve village conditions which prevent farming at all – including water constraints and farmer obligations in the community (Luther et al., as cited in Norton et al., 2005).

Institutional Support

As is the case with donor relations, it has been found that institutional relations can impinge upon the FFS process. Roling (2002) explains that with the trend of political and administrative decentralization, municipal governments, NGOs, and other local institutions are playing an increasingly important partnership and support role for agricultural development and FFS. This institutional support for FFS becomes increasingly important for larger-scale programming (Roling, 2002). While the implications of this form of service delivery do not appear clear, some findings demonstrate that the FFS process is challenged by the elements of variation that exist between institutional actors (see Esprella & Aguilera, 2003, and Cerna & Porras, 2003, as cited in Gonsalves et al., 2005).

> Many different groups now call their activities 'FFS' and fears are emerging that tradeoffs are being made that lower the quality of the approach... the term 'FFS' may become jargon to add to project documents, without those involved fully understanding the basis for a successful FFS programme. (LEISA, 2003)

Program Reach and Dissemination

Social Equity

A well-known impact study by World Bank economists questions the validity of the benefits of FFS (Feder, et al., 2004). It is argued that studies reporting positive findings are biased by the negligence of inputs including labour and fertilizers, as well as

by prejudice in the selection of program location (village location), and farmer participants – based on such characteristics as access to markets, education level and interest in innovation (Feder et al., 2004). This bias leads to an over-estimation of FFS impact and FFS adoption levels (Feder et al., 2004; see also van de Fliert, 1993, *Purposeful selection for FFS,* as cited in Feder et al., 2004). This position draws attention to the question of social equity in FFS, or the "reach" of FFS programming – and the claim that benefits of participation in FFS are unevenly distributed and skewed toward isolated pockets of society.

Roling (2002) concludes that, "to he who has shall be more given" (p.23-24) – meaning that farmers with the most access to land, capital and education stand to benefit most from new technologies and extension programs (see also Gallagher et al., 2006, p. 4). Access to land is commonly outlined as a pre-requisite for participation in FFS (Bartlett, 2002). The threat of an "elite bias" in FFS is supported by experiences of FFS which favour those who are literate and numerate, while leaving out the majority of illiterate farmers (Simpson and Owens, 2002; Roling, 2002). Studies of IPM in Mali found that those able to take notes are in a greatly advantageous position, while illiterate participants struggle to understand and remember content (Luther et al., as cited in Norton et al., 2005). Paredes (2001) finds that FFS is generally more attractive to a certain "type" of farmer. Farmers differ in their levels of resources, their willingness to take risks and their incentives to change production methods. Paredes (2001) concludes that the FFS methodology, while positive for some groups of farmers, is not reaching broader populations in the community, and may be contributing to social divisions (see also Sherwood, 2001, p. 4).

Bartlett (2002) finds that FSS is limited by the fact that is does not explicitly aim to raise the voice of the poor vis-à-vis the rich, or of women vis-à-vis men. In Nepal, social exclusion of marginalized populations from FFS is an issue (Singh, as cited in LEISA, 2003). With respect to gender, Fakih (2002) argues that the methodology has not been adequately re-conformed for gender mainstreaming. Bartlett argues that despite women's membership in FFS, world-over the learning process fails to address women and women's issues (Bartlett, 2002). In Mali, the fact that women in FFS learn less overall than men, is in part attributable to sessions missed because of domestic duties (Luther et al., as cited in Norton et al., 2005). Mancini (2006) specifically questions availability and opportunity costs for women – pointing out that FFS involves too much work for (overworked) women, and that adoption of IPM further increases the demand for female labour in the family.

"Dissemination" is defined as the spread of FFS-acquired learning through informal interactions among farmers (Rola et al., 2002, para. 11, 12). In terms of the number of farmers involved in a given FFS, The International Potato Center (CIP) finds that the coverage is low (2001). The study of Indonesian Field Schools by Feder et al. (2004) finds no significant impact on yields, or environmental or health indicators, or on the overall performance of graduates and their neighbors (Feder et al., 2004). While a study of FFS in the Philippines finds that while graduates generally have higher knowledge scores than non-participants, and the knowledge is retained, very little diffusion to other community members occurs (Rola et al., 2002; Khalid, 2002; Eveleens et al., as cited in Roling, 2002, p. 12).

Comprehensive studies of FFS world-wide find that follow-up farmer-to-farmer informal communication alone cannot be relied on to diffuse new learning to others in the community (Rola et al., 2002; Feder et al., 2004). While some information and observable field practices diffuse, the more "abstract" management and problem-solving skills do not (Bruan et. al, 2006, p. viii; Rola et al., 2002; Feder et al., 2004, p. Vii).

Studies of FFS in Bangladesh demonstrate that while graduates tend to continue practicing improved agricultural methods and benefit from the income, this has not impacted non-participants, and continuous effort and time need to be invested in order to sustain groups and mobilize those who are socially and politically marginalized (Banu and Bode, 2002). Rola et al. (2002) find that intentional tactics are required since FFS-trained farmers are often outside of the informal network of farmers that exchange information on a regular basis.

Gender Equity

As mentioned, many scholars argue that women and women's issues are neglected in the area of agricultural training and in FFS specifically (Tuyen, 1997; Fakih, 2002; Bartlett, 2002; Luther et al., as cited in Norton et al., 2005; Mancini, 2006). According to Tuyen (1997), women have been under-represented in FFS from the start. While 50 percent of farmers in Vietnam are women, as of 1995, only 13 percent of the 37,000 farmers who had been through FFS were female (Tuyen, 1997). This is true even in cases where women have been taking on more of the responsibilities for agricultural production due to the out-migration of men for urban work or their involvement in other income earning opportunities (Haiyang, 2002, p.1). Tuyen finds that trainers play a major role in negotiating and ensuring a fair representation of women in the FFS (1997).

Replication and Scaling-up

Critics of the Farmer Field School methodology cite the failures in delivering the impact of programming beyond a small group of farmers; either through the formal approach of *replication* – whereby farmers are trained to facilitate more FFS; or through *scaling-up* – whereby more introductory FFS are implemented involving new farmers and farming communities at the national level and beyond (on definitions: Rola et al., 2002; on difficulties: Feder et al., 2004; Quizon, Gershon, & Murgai, 2000; van den Berg, 2004; Barrera et al., 2001, as cited in Norton et al., 2005).

Numerous reports find that – even though farmer graduates of FFS are a more viable option than outside extension staff – instances of FFS "replication" are lower than expected, and/or of low quality (Rola et al., 2002; Banu and Bode, 2002). And with respect to scaling the methodology up, findings demonstrate that as a resource-intensive model, the FFS is faced with the same scaling up problems as other participatory research and development approaches (CIP, 2001b). Davis (2006) finds that FFS have failed to translate into changes beyond the local level.

Difficulties implementing the methodology in other scenarios and cultures, outside of the original Indonesian context, have been especially salient. In Latin America, challenges have been encountered in moving farmers beyond pesticide usage, toward the utilization of "cultural controls" and tactics based on ecological "principles" (Sherwood, 2001, p. 4). In Egypt, the hands-on, participatory focus of the FFS has been opposed by traditional approach of technology transfer (van de Pol, as cited in LEISA, 2003). In Bandgladesh, it has been found that the poor are too poor to participate (Banu and Bode, 2002). Here, the preoccupation with strategies to diversify livelihoods and build social

capital leaves little time for participating in FFS sessions, beyond the learning of new technologies to improve yields and reduce input costs (Banu and Bode, 2002). In any case, farmers involved in FFS tend to become "adopters" rather than "expert adapters" and the impact of FFS remains localized, with farmers taking little interest in replicating the process.

Progress in the Egyptian context occurred incrementally following adaptations to the methodology (including the separation of males and females, shortened sessions, and reduction of practical group activities); more intense training for facilitators; and the joint reinforcement of supportive relationships involving farmers, facilitators and project management (van de Pol & Awad, 2002). It is also argued that in order to facilitate the scaling-up of successful experiences, FFS can be readily combined with other approaches and can be integrated into existing groups and extension services (Tripathi and Wajih, as cited in LEIZA, 2003, p. 24). Gallagher et al. (2006) find that such successes are already being realized in parts of Asia and Africa.

Cost Effectiveness

Criticisms about failures to replicate and scale up FFS relate in large part to the high cost of implementation and of training programs and the threat of reduced cost effectiveness (Davis, 2006). The entire FFS methodology has been pegged as an "expensive intervention method that has limited financial sustainability... [that] could be better replaced by other forms of mass demonstration" (Quizon et al., 2000, as cited in Roling, 2002, p. 11). Quizon et al. (2000) argue that implementing large-scale FFS is extremely ineffective cost-wise. Estimates of cost for FFS range from $49/farmer in Indonesia, to $27/farmer in Bangadesh, to $30 in Ecuador (Mauceri, 2004). Mass media

approaches are aimed only at the distribution of knowledge. While these methods are incomparable to FFS in terms of learning potential or capacity-building goals, these methods are significantly cheaper, costing $1.50 per farmer for farmer field days, and $0.50 per farmer for pamphlets (Quizon et al, 2000; Thiele, Nelson, Ortiz, & Sherwood, 2001).

In some cases, cost-effectiveness has been heightened through experimentation with tactics like semi-auto or auto-financing, clustering of FFS and the use of farmer facilitators (Gallagher, 2003; Okoth et al., 2002, as cited in LEISA, 2003; Gonsalves et al., 2005; Luther et al., as cited in Norton et al., 2005). Yet successes have been small and localized and governmental/institutional appropriation has been minimal (Okoth et al., 2002, as cited in LEISA, 2003; Thiele et al., as cited in Gonsalves et al., 2005).

Explanations of Failure in FFS

Problems and failures in Farmer Field Schools are attributed to many reasons. These reasons are summarized in Table 3.

Table 3 Summary of Explanations for Failure in FFS

Failed Impact of FFS	Reason(s) for Weakness/Failure
Quality learning	➢ Failure to involve farmers in the participatory, action-oriented learning process ➢ Failure to prioritize capacity-building over knowledge transference[18]
Quality facilitation/ facilitator training	➢ Variation in Extension staff ➢ Resorting to traditional transfer of technology ➢ Lack of facilitator support (institutional) ➢ Use of external technicians versus farmers (overworked/under-motivated, issues with knowing the language/culture, respect issues) ➢ Inadequate/low quality Training of Trainers (TOT)[19]
Addressing farmer realities - through curriculum and program goals/objectives	**Curricular Content** ➢ Lack of attention to curriculum ➢ Content is overly sophisticated, irrelevant/over-valued,

[18] Braun et al., 2006; Hidlago et al., 1999-2000; Bartlett, 2005.
[19] Malarin, 2002; Thiele et al., as cited in Gonsalves et al., 2005; Luther et al., as cited in Norton et al., 2005; van de Pol, as cited in LEISA, 2003; Simpson and Owens, 2002; Feder et al., 2004; Gallagher, 2006.

	or generates communication problems ➢ Failure to address farmer needs and priorities (including environmental and health issues) ➢ Over-focus on pesticides and economic issues[20] **Program Goals and Objectives** ➢ Accountability to work superiors, not farmers ➢ Donor-driven versus demand-driven (pre-set plans/objectives, funding pressures) ➢ Agricultural/pesticide issues prioritized over education/social issues ➢ Insufficient monitoring, evaluation and reporting[21]
Maintaining the FFS process - through session planning and institutional support	**Coordination/planning of sessions** ➢ Inattention to details of the culture and community ➢ Failure to address logistical issues: material supply, session scheduling, meal planning, and absenteeism[22] **Institutional Relations** ➢ Weak/failed institutional support, bureaucratic inefficiency ➢ Tradeoffs between institutional goals and development goals ➢ Lack of understanding of FFS process[23]
Program reach and dissemination of impact - toward social and gender equity	**Social Equity** ➢ Bias toward certain farmers/communities ➢ Failure to account for heterogeneity of farmers: the poorest of the poor, the illiterate, women ➢ Reliance on informal communication versus intentional initiatives post-FFS[24] **Gender Equity** ➢ Failure to re-conform for gender mainstreaming ➢ Failure to account for bias in selection criteria ➢ Failure to account for lower level of education, gender division of labour, and local traditions that constrain women's participation[25]
Replication/scaling up the FFS process, and cost effectiveness	**Replication and scaling up** ➢ Failure to address the local context: the culture of technology transfer, differences in socio-economic conditions; social stigma of manual labour. ➢ Under use of the farmer facilitator (versus outside technicians) ➢ Low farmer confidence levels ➢ Poor collaboration between facilitators, farmers and project staff[26] **Cost Effectiveness** ➢ High cost of implementation and training ➢ Low reach in terms of impact ➢ Failure to internalize social and environmental impacts

[20] Feder et al., 2004; Luther et al., as cited in Norton et al,, 2005.
[21] Gallagher, 2002; Davis, 2006; Bartlett, 2005.
[22] Feder et al., 2004.
[23] Roling, 2002; Malarin, 2002; LEISA, 2003; Gonsalves et al., 2005; Feder et al, 2004.
[24] Sherwood, 2001; Peredes, 2001; Gallagher, 2006.
[25] Haiyang, 2002; Tuyen, 1997; Banu and Bode, 2002.
[26] Gallagher, 2003; CIP, 2001b; van de Pol & Awad, 2002; Banu and Bode, 2002; van de Pol, as cited in Norton et al., 2005.

	into cost-benefit analysis ➢ Under use of farmer-facilitators (to curb high transportation and salary costs of formal extensionists) ➢ Under use of financing techniques: semi-auto/ auto-financing, cluster models, marketing networks and self-management ➢ Low appropriation by government/institutions [27]

Source: Author, 2007, reference footnotes 18-27.

2.3 Conclusion on Farmer Field Schools

Farmer Field Schools have been proposed as a more participatory and lasting alternative to traditional forms of extension education. The defining elements which set FFS apart are premised in people-centered, knowledge-intensive and location-specific programming aimed at improving farmer capacities.

Although the literature on Farmer Field Schools is not overwhelmingly consistent on certain aspect of FFS – including the intended goal for programming – it is clear that traditional objectives for the transfer of knowledge on pesticide use and crop productivity are only a part of the overall goal. Working at the community level to foster farmer capacities and broader development impacts has clearly become a priority.

The evidence on FFS is also inconclusive. FFS has experienced many evolutionary transformations through its implementation for new topics and in new cultures and contexts. Evidence suggests that the Farmer Field School methodology will succeed when the following key factors are met:

1. Farmers are able to attend and participate in the action-oriented learning process
2. The experiential learning, group- and capacity-building themes are maintained
3. There is investment in follow-up activities, post-FFS

[27] Davis, 2006; Feder et al., 2004; Quizon et al., 2000; van den Berg and Knols, 2006; van den Berg, 2004; Okoth et al., 2002, as cited in LEISA, 2003; Gonsalves et al., 2005; Luther et al., as cited in Norton et al., 2005; Gallagher, 2003; Thiele et al., as cited in Gonsalves et al., 2005.

4. New topics are linked to agriculture and involve farmers
5. Facilitators receive practical training in the FFS approach
6. The participation of both genders is encouraged and facilitated
7. Local institutions and government play a support role
8. Adequate training resources are available
9. There is strong farmer-facilitator engagement
10. Networks of trust, support and collaboration between farmers/facilitators/researchers are developed

Evidence also indicates that FFS are at risk of failing in many areas, including quality learning; quality of facilitation and facilitator training; addressing farmer realities (through curriculum and program objectives); maintaining the FFS process (through session planning and institutional support); reach and dissemination of impact (toward social and gender equity); and replicating/scaling-up impact (and cost-effectiveness). The reasons for such failure include:

1. Low incidence of farmer participation in the action-oriented learning process
2. Prioritization of knowledge transfer over capacity-building
3. Variation in extension staff/staff training
4. Over-reliance on external technicians/under-use of farmer facilitators
5. Lack of attention on curriculum planning and development
6. Co-optation of project plans/objectives
7. Insufficient monitoring/evaluation/reporting
8. Failure to account for local realities/norms/culture
9. Unsupportive institutions
10. Social and gender bias in programming
11. Failure to initiate intentional initiatives post-FFS

12. Poor collaboration between facilitators/farmers/project staff

13. High cost of implementation/training, weak government buy-in

In summary, FFS fail in small part due to weaknesses in design, but mainly due to weaknesses in the delivery process. Design "flaws" consist of goals which should be but are not explicitly added to the FFS agenda – including goals to ensure equitable gender enrollment, steps to ensure that farmers are taking on facilitator roles, strategies for follow-up post graduation and for farmers to assume some/all of the costs of an FFS. Weakness in delivery principally includes the failure to maintain the participatory learner-centered orientation of the FFS methodology – from the initial planning stages through to project completion, evaluation, and future planning. In such cases, the methodology is put into practice incorrectly or ineffectively. Different countries and local contexts present different challenges for FFS – including variations in traditional gender roles or the existing policy or power dynamics of a given place. Thus FFS may fail in different ways and for different reasons in different places.

This thesis asks whether the Farmer Field School is an appropriate methodology for achieving the human health goals of the Ecosalud project in the context of Ecuador. What are the specific conditions in Ecuador? Can FFS succeed under these conditions? What adjustments will be necessary to achieve success? To answer these questions it is necessary to assess the conditions in Ecuador using the list of threats to success identified here. The field research undertook this assessment. The methodology used is described in the next chapter.

CHAPTER 3: RESEARCH METHODOLOGY

The goal of the research is to assess the potential for FFS as a methodology to be used by the Ecosalud project to achieve human health goals in Ecuador. The intent of the research was to assess the current performance of FFS in one region of Ecuador and to present findings that might be generalized. The research included an assessment of the Farmer Field Schools on two distinct bases: analysis of the current implementation of the methodology (as of 2005-06); and analysis of the methodology in terms of addressing human health issues at the farm level.

3.1 Research Strategy and Rationale

In qualitative research, a case study is used to examine a particular event, process, program or group of people bounded by time and/or place (Creswell, 1998, p.249). This study focused on potato farming communities of the Andean mountain region within the province of Chimborazo, Ecuador (see Map of Ecuador). Data were collected on three FFS programs operating in Chimborazo province, Ecuador, between October 2005 and March 2006.

The FFS programs in Chimborazo acted as both instrumental and intrinsic cases. The cases themselves were of "intrinsic or unusual" interest because of their specific context, location and institutional relations; and they were also instrumental in better understanding the broader research issues of the thesis – including the use of FFS for the pursuit of human health goals.[28]

The three specific communities of Cebadas, Totoras, and San Fransisco were chosen for two reasons: first, each community had active FFS projects during the study

[28] For more information on intrinsic and instrumental case studies, see Creswell, 1998, p. 250.

period of October, 2005 to March, 2006; second, these case studies had been ear-marked as being part of the Ecosalud project – meaning these same regions and the same implementing bodies would be involved in FFS again over the next two years, through the Ecosalud project. Further, these study sites were recommended by the coordinator of the Ecosalud project and by the coordinator of the Provincial Potato Platform as being appropriate study sites.[29]

While a substantial amount of evidence exists on the FFS methodology, an in-depth exploration of real FFS programming in Ecuador will add to the stock of empirical knowledge. Field study was an important element of the research for two reasons. First, there is little to no secondary data on the implementation of FFS in Ecuador for human health goals. Second, there have been very few documented reports of FFS which reflect the voices of those in "the field" – including the facilitators of FFS, and importantly, the farmers who stand to gain or lose the most from the development of the methodology. "A major reason for doing field research is to get an insider's view of reality" (Singleton, Straits, B., Straits, M., & McAllister, 1998, p. 297).

Secondary research was conducted in the capital city of Quito. This was important since the International Potato Center (CIP), and the National Agricultural Research Institute (INIAP) are both located in Quito. CIP is a scientific nonprofit institution dedicated to the increased and more sustainable use of potato and other roots and tubers and to the improved management of the cultural resources in the Andes and other mountain areas (CIP, 2001a). The Ecosalud project was administered out of the CIP office. CIP's principle research partner is INIAP, Ecuador's government-run agency

[29] The Provincial Potato Platform is highly involved in FFS in the province of Chiborazo. For a description of the Platform, see Section 4.1.4 *Chimborazo Province*.

responsible for agricultural research and extension in farming technology. INIAP plays a strong supportive and strategic role to the Fortipapa project and the Provincial Potato Platform in Chimborazo Province. In Ecuador, CIP and INIAP have promoted the FFS in the most important potato producing provinces through a network of local institutions (Thiele et al., 2001). Other key actors involved with FFS in Ecuador also lived and worked in Quito. [30]

3.2 Research Design and Methodological Approach

Many of the elements of the research design were established and re-designed during the course of study. Singleton (1988) contends that this is typical of the nature of field work where the design is "necessarily emergent rather than predetermined" (p. 305) since the observed setting is not under the researcher's control and activities are generally not known in advance. In the case of FFS in Ecuador, the incidence of active FFS, the ease of observing activities and the accessibility of key people and field sites were all unknowns at the outset of the field visit.

Upon arriving in the field, initial meetings with the Ecosalud project coordinator were useful in aligning the research design of the thesis with gaps and questions in Ecosalud project design. While Ecosalud project workers had committed to utilizing FFS in order to "broaden the vision of ecosystem health in small-scale farming," several research interests were communicated concerning FFS (personal communication, February 2, 2006). Key research questions concerned the following aspects of FFS: the status of topics on healthy and sustainable crop management including the *use of pesticides* and *personal protective equipment* (PPE) and the *disposal of chemicals* in

[30] The International Potato Center is known by the Spanish acronym CIP (Centro Internacional de la Papa). The national agriculture research institute is known by its Spanish acronym INIAP (Instituto Nacional Autonomo de Investigaciones Agropecuarias).

communities; *social equity* – specifically *women's access* to programming and the *equal opportunity* for the *participation* and *empowerment* of farmers; *scaling-up*, the *dissemination of information* and *cost effectiveness* of the approach; and potential for *social networking and collaboration amongst farmers and stakeholders. Marketing* and *economic* themes in FFS were also presented as research questions (personal communication, February 2, 2006).

Methodological Approach

Methodological approaches for the research were interpretive and narrative/descriptive (Creswell, 1998; Bordens & Abbott, 2002). This involved the systematic collection of qualitative data for both understanding and describing the Farmer Field School experiences and, to a lesser degree, for describing the broader systemic framework for agricultural development and FFS project planning in the region.

Via first-hand observation (including systematic note-taking) and participation (in FFS, agricultural planning meetings and Ecosalud project work) it was possible to gather information concerning FFS in the communities. (See Appendix A for a calendar of research events). Formal surveys, semi-structured interviews, focus groups, and informal communication were used for data collection and to compose a more complete and accurate picture of the Ecuadorian context. (See Appendices B-G for field research tools).[31]

Primary data collection involved participatory observation, photographing and systematic note-taking in many training and speaking events and workshops. This included three FFS projects, a Training of Trainers (TOT) program, bi-weekly meetings

[31] All research tools (interviews, surveys etc.) have been translated from Spanish to English for inclusion in this thesis.

of the Potato Platform of Chimborazo province ("La Plataforma Agroindustria de la Papa de Chimborazo"), and several Ecosalud workshops and information sessions (in Chimborazo province); as well as several FFS researcher workshops; and a three day national agriculture conference (in Quito). Interviewing was conducted with FFS facilitators; members of the Provincial Platform; FFS Researchers (at CIP, INIAP and other organizations); and the coordinator of the Ecosalud project. Surveying and focus groups involved both farmers in FFS as well as non-participating farmers from the same communities. Informal conversation was also carried out with a pesticide vendor at an agro-chemical outlet in Riobamba.[32]

When possible, secondary data collection was conducted in order to triangulate the data and increase validity. This research included reading and note-taking of Ecosalud project reports, documents from the Provincial Potato Platform in Chimborazo and FFS-related documents and reports from partner offices in Riobamba and from CIP and INIAP.

Although a major strength of the heavy reliance on primary data collection was the incorporation of first-hand accounts of those living the realities "on the ground" in Ecuador, there were also many drawbacks.[33] The biggest issue was accessing the FFS communities and the farmers living there. Given distances and the fact that two of the three communities were inaccessible by bus, research was limited to days when an FFS was taking place. This became an even bigger issue once FFS sessions became more irregular during the second half of the research period. Qualitative analysis of qualitative

[32] Interviews, focus groups etc. included the use of a voice recorder and occasionally the use of a translator for Quichua/Spanish-speakers.
[33] For more information on the special problems posed by qualitative approaches and qualitative analysis of qualitative data see Bordens and Abbott, 2002.

data was difficult due to the large amount of raw data to be dealt with. Bordens and Abbott explain that this is common in qualitative approaches (2002).

Another research challenge was the constant scheduling of events in different locations and the need for nearly constant travel between the main study sites of Riobamba and the capital city of Quito. This trip translated to a four hour bus ride, and the trip was made no less than 30 times over the course of the study. This was sometimes physically exhausting, and at times the trip was made impossible by the presence of road closures and strikes. This could also be stressful since it involved travel through the night, which is inadvisable for a single foreign woman.

Scheduling was also made difficult by numerous planning changes and cancellations (See Appendix A). This difficulty was compounded by the fact that nearly all communication in Ecuador takes place via cell phone and text messaging – which meant purchasing a phone, attaining all relevant contact information and quickly learning the etiquette of "text messaging culture".

At the same time, many of the working relationships were extremely comfortable and enjoyable and transition into the FFS project work and related planning and project meetings was quite smooth.

Anonymity and confidentiality

Anonymity and confidentiality were guarded through the use of coding in field notes in lieu of names of people. Consent was obtained prior to any formal surveying, interviewing or focus group discussions.

Language and Communications

Many of the indigenous farmers involved in the research spoke only Quichua, especially the older women. This factor, paired with many linguistic intricacies and colloquialisms, made extensive one-on-one communication difficult in the communities. Through the use of a translator, and the switch to farmer focus groups (versus individual interviews) this barrier was overcome for the most part. Focus groups tended to be more beneficial as well in that the women seemed more comfortable speaking and sharing in a group setting and more information was communicated through this means than on a one-to-one basis.

Twelve semi-structured interviews were conducted with various stakeholders in FFS. Two focus groups were carried out with FFS members from FFS. Ten surveys were conducted with FFS participants from two communities. Ten surveys were conducted with non-FFS farmers from the same two communities. One informal interview was conducted with an agro-chemical vendor in Riobamba.

Nine FFS sessions and two Training of Trainers sessions were attended. Two planning meetings for FFS were attended in Riobamba. Two workshops were conducted with a newly-formed FFS working group in Quito. Six Provincial Platform meetings were attended in Riobamba. And a three-day conference on Agroecology was attended in Quito. The results of these research efforts are presented in Chapter 4.

CHAPTER 4: FARMER FIELD SCHOOLS IN ECUADOR

4.1 The Ecuadorian Context

Ecuador, so named for its location on the equator, is one of South America's smallest republics. It lies between Peru and Columbia, with the Pacific Ocean bordering to the west (see map of Ecuador). Geographically, the country is separated into four ecological zones: the coastal lowland regions, the Andean Sierra, the Ecuadorian Amazon and the Galapagos Islands. The Andean region, which "forms the backbone of the country" (Murphy, Box, & Brown, 1997, p. 28), covers approximately one quarter of the territory and consists of two main mountain chains which extend over 650 kilometres north to south, and 50 to 80 kilometres across. The national capital of Quito and most of the other major Andean cities are situated in these mountain ranges.

The four ecological zones also form the four administrative regions of the country. Ecuador is comprised of twenty-two provinces and its populace of 13.5 million makes it the most densely populated country in South America (CIA, 2006). The country's geographical diversity is matched by its ethnic and cultural diversity. Roughly four cultural groupings exist: the *Mestizo* population of mixed Spanish and indigenous blood (65%); the *Afro-Ecuadorians* (3%); the *Indigenous* (25%); and descendants of the *Spanish* and other European colonizers (7%) (CIA, 2006).

Ecuador is considered to be a lesser developed country, ranking 83rd out of 177 countries on the human development index (UNDP, 2006). Approximately 37 percent of the population lives below the poverty line ($2/day). Five percent of the total population is classified as undernourished (UNDP, 2006). The Gross Domestic Product per capita is $3,963 USD. The ratio of estimated female to male earned income is 0.55. Public

expenditure (% of GDP) on health is 2 percent, while spending on education is 3.4 percent. Life expectancy at birth is 74.5 years, and the percentage of people ages 15 and older who can read and write is 91 percent (UNDP, 2006).

4.1.1 Political Situation

Since May 24, 1822, when Ecuador gained independence from Spain, the country has experienced numerous internal clashes, revolutions, and economic turning points. The first 40 years of independence alone saw "40 presidents, dictators and military juntas" (Roos & van Renterghem, 1997, p. 12).

The period following the two World Wars saw a marked fall in commodity prices resulting in harsh economic downturns. During this time, several land disputes (considered wars by some) have erupted with neighbouring Peru over the Amazonian region, and several more presidents came to power and were deposed over a ten year period. During the mid 1960s a military junta came to power and looked to a strong program of modernization and President Kennedy's "Alliance for Progress" doctrine to aid the country in its quest for peace and prosperity (Roos & van Renterghem, 1997).

In the 1970s, the principle strategy of economic development involved the securing of foreign loans and import substitution to encourage local industrialization and the diversification of manufactured exports (Sherwood, n.d.; Roos & van Renterghem, 1997). Yet, government protectionist measures and artificially inflated exchange rates were not sufficient to build national capital. Even heavy borrowing was not able to cultivate the development of a dynamic manufacturing industry. Since the agricultural sector played a secondary role to urban interests, distorted markets and disparities in

access to resources meant that the poor and rural sectors paid the societal cost of industrialization (Sherwood, nd; Liutkus, 2006).

As a result, poverty increased, the breach between both commercial and subsistence farming and the rich and the poor was aggravated and unrest among the populace deepened. The failed push for industrialization left the door open for an alternative macroeconomic model. The year 1979 saw a "back to the barracks" process of re-democratization take place.

By the 1980s, with burdensome debt obligations it became inevitable that the International Monetary Fund (IMF) be brought in to alleviate economic problems. At this time, throughout Latin America the IMF, the World Bank, and the Inter-American Development Bank were encouraging economic stabilization, through liberalization, privatization, and deregulation in order to promote commodity exports and economic globalization (Sherwood, nd; Martinez Valle, as cited in North & Cameron, 2003). Strong clashes between Guayaquil's free-marketers and Quito's state-led ideologists rose to deter any effective policies or programs from being implemented. Throughout the 1980s conditions reached crisis proportions – with government cuts, high job loss and a drastic fall in purchasing power of wages (Petras & Veltmeyer, 2005).

The 1990s witnessed a continued downward spiral for Ecuador. The governmental objective concerning the privatization of social services entailed new laws concerning decentralization and agricultural and forestry modernization (Sherwood, n.d.). Such adjustment programming disarticulated and weakened many of the traditional peasant organizations in the region. Yet, in the 1980s and early 90s, a powerful indigenous movement "emerged in response to the acute conditions of rural poverty." This ongoing

politicized project of indigenous peasant struggle for political power in Ecuador has played a role in bringing down several presidents and has erupted in several massive national indigenous uprisings beginning in 1990 (Martinez Valle, as cited in North & Cameron, 2003, p. 90; Cameron, as cited in North & Cameron, 2003). Martinez Valle (as cited in North & Cameron, 2003) finds that in highland Ecuador, the vast majority of these peasant organizations have had "little internal cohesion and little capacity to negotiate with external institutions and actors" (p. 95); while Korovkin (as cited in North & Cameron, 2003) finds that organization of the rural poor alone, has not been enough to provide a route out of poverty.

The period of 1998-2000 saw the country's worst economic crisis to date. "[T]he government was near bankruptcy, the currency lost 40% of its value against the dollar, the poverty rate soared to 70% and inflation reached levels of 91%" (Ecuador, n.d., p. 5). In one week of January 2000 alone, the Sucre fell 20 percent in value. In 2000, under conditions of massive inflation and the virtual collapse of the banking system, dollarization was implemented. The first outcome of this process was a 360 percent devaluation of the Sucre. This had the immediate effect of forcing more than 200,000 people into unemployment (Herrera, 2001). At the end of the 20th century, indigenous and peasant demands for rural development continued to grow, but a new network also evolved – comprised of state agencies, local NGOs, and international development actors "forming close albeit controversial ties with communal organization" (Segarra, as cited in North & Cameron, 2003, p. 142).

In 2003, President Lucio Gutierrez announced an end to the profiting of the rich and a renewed hope for the poor (Petras & Veltmeyer, 2005, p. 169). Yet, with the

signing of a new IMF loan for $205 million, and approval of the Free Trade Area of the Americas (FTAA) agreement, hopes for this new presidency diminished, and Gutierrez was forced from office in April, 2005 (Challenges to Neo-Liberalism, n.d.). At this time, Ecuadorian newspapers reported that the new president, Alfredo Palacio, had called for the country to undergo "a profound soul-searching in the wake of the political crisis" (Hedgecoe, 2005, para. 1). Considering the long and tumultuous political history of Ecuador, one can easily understand how the country has earned the title of "one of the most corrupt nations in the region" (Penhaul, 2005, p. 12).

4.1.2 Economic Performance

"Ecuador is one of the poorer countries of the South American continent" (Roos & van Renterghem, 1997, p. 30). Its economic problems can be traced to "the crippling burden of foreign debt" as well as "persistent budgetary deficits, the price volatility of Ecuador's exports, and chronically high levels of inflation and unemployment" (Roos & van Renterghem, 1997, p. 48). The situation of peasant and indigenous communities in particular, has deteriorated significantly as a result of Structural Adjustment Programs (SAPs) implemented since the early 1980s (Martinez Valle, as cited in North and Cameron, 2003, p. 103).

Only 39.1 percent of the Ecuadorian population participates in the formal workforce (Burgess, Compant, & Doyle, 2003). Since the 1970s, Ecuador has virtually been run by the oil industry. Despite this more than half of Ecuador's foreign currency earnings come from agriculture and fishing (Ramon and Albo, 1994; Roos & van Renterghem, 1997).

Currently, debt repayment is the government's most pressing problem and any moneys earned from the export of oil are allotted to debt service. In 2003, the national budget allocated 2 percent of GDP to agriculture, but 36 percent to debt service (Petras & Veltmeyer, 2005). The UNDP makes the point that, "debt constraints have made it difficult to make domestic investments that would increase human capabilities and stimulate economic growth" (UNDP, 2004, p. 72).

4.1.3 Agriculture in Ecuador

Agricultural workers comprise over 30 percent of the work force of Ecuador and a far greater percentage of the population is involved in subsistence farming (World Resources Institute, 2006). Potato cultivation and related activities generate employment for more than 100,000 people every year, of which half are women. Some 90 percent of producers are small and medium-scale, and there is virtually no export production, nearly all potatoes are destined for domestic consumption (Orozco, 2005b).

The Structural Adjustment Programs (SAPs) initiated at the beginning of the 1980s increased levels of poverty and social inequality in most of the countries in the region. The decline was especially notable in the Andean region and the countryside where poverty increased more so than in urban areas, "resulting in a visible pauperization of the majority of rural producers and rural indigenous producers in particular" (Martinez Valle, as cited in North & Cameron, 2003, p. 85). While farmers had no choice but to opt into and maintain market relations, overall in Ecuador, average agricultural growth rates and incomes fell (Martinez Valle, as cited in North & Cameron, 2003).

Population in the rural sectors declined while rural-to-urban migration meant that urban populations swelled (Martinez Valle, as cited in North & Cameron, 2003). This led

to processes of agricultural modernization which resulted in the sharp division between a small elite sector of large-scale agribusiness that produced for world markets and an immense peasant sector that was rapidly being driven out of agriculture altogether (Martinez Valle, as cited in North & Cameron, 2003). "By the 1990s, the principal connection with the market for small-scale peasants occurred, not through agricultural production, but rather through urban migration and the sale of labour" (Martinez Valle, as cited in North & Cameron, 2003, p. 94). Throughout the Andean region, women became increasingly engaged in both small-scale agricultural production and temporary salaried agricultural work (Kay, as cited in North & Cameron, 2003, p. 90).

SAPs and "initiatives for the agricultural sector were designed in accordance with the dominant neoliberal macroeconomic framework ...without any accompanying support policies for the agricultural sector ...which has resulted in policies that oriented toward neither sustainability nor equity" (Martinez Valle, as cited in North & Cameron, 2003, p. 86-87). Policies stemming from modernization have had some positive impacts including the re-emphasis of the role of agriculture in development, but for the most part, these policies have had particularly harmful consequences for agriculture and the rural sector (Sherwood, n.d., p. 2; Martinez Valle, as cited in North & Cameron, 2003).

Adjustment programs drastically reduced the role of the state in rural development (Martinez Valle, as cited in North & Cameron, 2003). At the municipal level in the Andean region, the legal framework for modernization, in place since late 1995, has only recently become a reality. Sherwood (n.d.) explains that "public funding for agricultural extension and research has decreased dramatically" and the "popular change paradigm for the day has become technology transfer" (p.2). Funds for research and technology that

previously would have been channeled to INIAP (the national agriculture research institute), or provincial ministries of agriculture, have been transferred to World Bank and International Development Bank projects who are "searching for ways to privatize extension/research functions" (Sherwood, n.d., p. 2). The bulk of responsibility for managing resources has been downloaded to communities, yet financial cuts from the national budget and international donations have been slow to funnel through to municipalities (Sherwood, n.d., p. 2).

Ecuador, like much of South America, has undergone large-scale change since the days of the hacienda farm.[34] Land reform has brought re-divisions of farm land and policies that link farmers to commodity markets. Policies stemming from SAPs indicate a declining availability of agricultural land to peasant farmers – whereby although the number of small-scale farms has grown, the total quantity of land available for purchase has shrunk (Martinez Valle, as cited in North & Cameron, 2003). The division and sale of communally owned lands has resulted in extremely small parceling of land, private control and ownership, and the exploitation of ecologically sensitive lands (Martinez Valle, as cited in North & Cameron, 2003).

In Ecuador, SAPs led both the volume and profitability of production for the international market to decline (Martinez and Uriola, as cited in North & Cameron, 2003). Agricultural intensification has led to ecological disturbance and land degradation. With respect to potatoes, "chemically intensive technologies have allowed for increased potato production but at great costs to ecosystem health and to farmers exposed to toxic substances" (Sherwood, Nelson, Thiele, & Ortiz, 2000, p. 24).

[34] Haciendas refer to large ranch-style farms often run by colonizers which were common from the late 1950s through to the mid 70s.

4.1.4 Chimborazo Province

Chimborazo has been described as an "impoverished Andean province" (Martinez Valle, as cited in North and Cameron, 2003, p. 129). It has the highest indices of poverty and indigence in the highlands (Martinez Valle, as cited in North and Cameron, 2003, p. 131). The literacy rate is 60 percent compared to a national average of over 90 percent (Sherwood, n.d., p. 6; UNDP, 2006).

Farming is based heavily on the potato, along with grains, legumes, and pasture rotations. Potato prices fluctuate, as is common in the country, and market integration is weak. Overall, resource conditions are poor and access to water is limited. The wet season falls between June and December with an average rain fall of 200-800 mm/yr (Sherwood, n.d.).

The province has also been described as "culturally-oriented" (Sherwood, n.d., p. 6), "notable for having the highest proportion of indigenous population of any province in Ecuador" and the largest proportion of Quichua-speaking population (Martinez Valle, as cited in North & Cameron, 2003, p. 145). The mountain region is composed of a split of Quichua Indigenous peoples and Mestizos. Spanish is the dominant language of the city centers.

The communities have a long history of social – as opposed to physical – capital formation, and a remarkably high level of indigenous peasant activism which was catalyzed by the progressive Catholic church. The existence of this rural civil society has been described as a necessary, but insufficient precondition for meaningful rural development (Martinez Valle, as cited in North & Cameron, 2003, p. 129).

There is a culture of cooperation and sharing amongst farmers and they are frequently highly organized. However the context of permanent and temporary migration and the expansion of market integration has eroded this culture and spawned greater competition (Martinez, as cited in North & Cameron, 2003, p. 94, 135).

At the end of the 20th century, Chimborazo had the highest concentration of NGOs (over 350) of any province in the country (Martinez Valle, as cited in North and Cameron, 2003, p. 145; Sherwood, n.d.). NGOs take over the responsibilities of the state and are described as "functional" to neoliberal economic policy (Martinez Valle, as cited in North and Cameron, 2003, p. 160). Yet poverty persists and the public sector is described as "weak" with low rates of collaboration and ineffective community-based development (Sherwood, n.d.).

Martinez (as cited in North & Cameron, 2003) has explained that since the 1990s, and the radical change in the macroeconomic context of the Andes, many of the older well-established NGOs have had to redefine "priorities, methods and roles in development" – away from a focus on peasant organization and agrarian reform, toward more neoliberal prescriptions for rural development and an explicit emphasis on productive projects for markets, including business training and the formation of microenterprises (p. 160-1). Cabrera and Vallejo (as cited in North & Cameron, 2003) have stated that Andean NGOs abandoned their roles as nonprofit organizations to become "organizations which sell specialized services" (p. 97). It is also common to find numerous development organizations working (and competing) in the same communities (Martinez, as cited in North & Cameron, 2003).

Chimborazo province has a Provincial Potato Platform (La Plataforma Agroindustria de la Papa de Chimborazo) which has been operating since 2003. "The Platform" is viewed as an alliance among diverse local actors, representing public and private sectors, who come together to achieve common objectives related to potato production or marketing. The Platform is comprised of agricultural organizations as well as farmers and representatives of INIAP, the national agriculture research institute.

As mentioned, the Fortipapa project played a key role in the establishment of the Platform. Other stakeholder groups also played a central role, including INIAP and other public institutions, universities and local governmental bodies, agricultural producers, private and non-governmental entities, and other strategic partners. The need for the Platform was linked to impacts of modernization which are described as having changed the culture of farming; "...instead of selling at markets and fairs [farmers] are now forced to compete with one another as they sell to middle-men in the wider market ...this is a reality now, and they are not prepared to respond to it" (personal communication, February 16, 2006).

The Platform is described as having three main components targeted at small-scale potato producers: training; production; and marketing. The stated objectives of the Platform are as follows: produce a given quota of potatoes of the highest quality in the industry; identify and communicate market needs and opportunities (in terms of potato variety and quantity); network actors; and attain empowerment goals (personal communication, November 16, 2005). During the research period, 197 men and 127 women were Platform members, and approximately 85 of these farmers were participants in a Farmer Field School (past or present) (personal communication, January 11, 2006).

4.2 FFS and Potato Farming Communities in Ecuador

4.2.1 Farmer Field Schools in Ecuador

Since the early 1990s, in Latin America the focus of national and regional agricultural research institutes has been on working with communities on potato IPM. The FFS methodology was first considered for the Andes region as a response to severe losses faced by potato farmers due to pests, diseases and market variations. In 1999, the FAO's Global IPM Facility (GIF) and CIP conducted the first comprehensive Training of Trainers (TOT) in Latin America (Sherwood et al., 2000) This intensive three month activity involved 33 extensionists from rural development agencies and research organizations in Ecuador, Bolivia and Peru. "The thematic platform was the potato ...a priority food security crop in Andean rural highlands" with "major soil fertility demands and pest problems" (Luther et al., as cited in Norton et al., 2005, p. 14.) Training content included soil and plant health needs for potato farming in the Andes.

Only for the first two years after 1999 did FAO support play a support role for FFS in Ecuador. During these early years, FAO funding enabled INAP and CIP to conduct several Training of Trainer (TOT) sessions in FFS methodology, at first in potato and subsequently in a diversity of crops such as tomato, cotton and agro-forestry. Regardless, this resulted in the training of hundreds of professional extensionists from NGOs and community-based farmer promoters (Luther et al., as cited in Norton et al., 2005).

Since this time, "in response to pressing potato-farming demands and tremendous pest problems and pesticide abuse in Ecuador, CIP and INIAP have promoted the Farmer Field School methodology in the most important potato producing provinces of the

country" (Luther et al., as cited in Norton et al., 2005, p. 14). "To date, over 75 FFS facilitators from diverse governmental, non-governmental, and community-based organizations have emerged [from TOT] ...more than 100 FFS have been conducted in the country, producing more than 1,500 graduates" (Pumisacho and Sherwood, 2005, p. 144).

Luther et al. (as cited in Norton et al., 2005) state that the central goals for IPM FFS in this context have remained unchanged. Partners are striving to enhance farmer understanding of agroecosystems and to strengthen local decision-making and technology development capacities for more productive and sustainable agriculture.

The Ecuadorian model of FFS incorporates many of the principles and elements of the Asian model, including the agroecosystem analysis. Luther et al. (as cited in Norton et al., 2005) explain that the practice of FFS in Latin America has brought a number of innovations to the methodology – on account of the unique farming systems, ecologies, institutions, and politics of the region (Thiele et al., 2001). "Location-specific strategies have evolved to meet the demands of the farmers" to address the unique community contexts and to respond to the existing capacity and interest of the institutions involved (Luther et al., as cited in Norton et al., 2005; Thiele et al., 2001, p. 5). Thiele et al. (2001) explain that the introduction of FFS in this region has involved more than the re-writing of extension manuals. Community actors were hesitant to blindly accept "external ideas" but greater success has been had in exploring "common principles" and adapting local methods accordingly (Luther et al., as cited in Norton et al., 2005).

Sherwood et al. (2000) state that, in Ecuador, "the FFS methodology [has strengthened] extension approaches that previously centered on technology transfer

modes of change" (p. 25). It is argued that FFS have contributed to the dissemination of information and technologies as well as enhanced understanding and social organization that have enabled participants to identify diverse opportunities for decreasing dependency on pesticides and chemical fertilizers, while maintaining or increasing production per area (van den Berg, 2004, and Barrera et al., 2001, as cited in Norton et al., 2005). Pumisacho and Sherwood (2005) contend that "in certain regions, FFS graduates have doubled crop productivity" (p. 144). FFS in Ecuador have also employed Farmer Field Days and site visits between schools in order to exchange ideas and raise public awareness (Sherwood et al., 2000).

Support for Training of Trainers was officially terminated in 2003 and donor agencies have sharply decreased financing for agricultural development. Local governments, non-governmental organizations, knowledge generating organizations and even participants have taken on the financial and institutional burden of both TOT and FFS. Funding cuts led to a shift in the modality of TOT (from intensive 12-week training sessions to distance educational designs such as three day meetings every other week for six months) followed by local implementation of pilot FFS projects (Norton et al., 2005). Luther et al. (as cited in Norton et al., 2005) explain that NGOs are finding it increasingly difficult to respond to on-going rural development demands from communities and they report extreme difficulties freeing up staff under the pressure of time bound and objective driven projects.

The drastic severance of funding, including the withdrawal of the FAO from FFS work in Ecuador, has led the national agricultural research institute to take drastic measures. "The public institutional crisis has led INIAP to accept funding from CropLife,

the pesticide industry consortium" (Luther et al., as cited in Norton et al., 2005, p. 18).[35] This decision is said to have created a conflict between public and private interests surrounding the movement toward the "safe use of pesticides" (SUP) (Luther et al., as cited in Norton et al., 2005). This campaign was internally financed by FMC, who together with technicians from INIAP began to develop training and FFS-like sessions to promote the "safe use of pesticides" (Schut, 2006, p. 8).[36] Many farmer organizations and NGOs involved in the promotion of agroecology and IPM programs have called for INIAP to re-evaluate its collaboration with CropLife (CEA, 2004, as cited in Norton et al., 2005). As a response to growing concern and criticism of their campaign, CropLife recently changed the name of its campaign to "correct use of pesticides" (Schut, 2006, p. 8).

Luther et al. (as cited in Norton et al., 2005) argue that the main challenges for FFS are political and institutional in nature – including the need to establish both finance and technical support mechanisms. They suggest that public investment and/or self-financing mechanisms in agriculture will be necessary to extend reach to more than a small group of farmers (Luther et al., as cited in Norton et al., 2005).

Luther et al. (as cited in Norton et al., 2005) explain that in some provinces, FFS partner organizations are working to establish direct ties to food industry markets. Some of these efforts have resulted in the securing of production contracts with the agrifood industry (including Frito Lay, and Kentucky Fried Chicken) – providing fairer prices and

[35] CropLife, previously termed the Latin American Crop Protection Association, is part of a global federation, CropLife International, which represents the plant science industry and a network of associations in 91 countries. CropLife does not sell pesticides but represents the image and the interests of companies including Bayer CropScience, DuPont, Monsanto and FMC (CropLife International, 2006).
[36] Food Machinery and Chemical (FMC) Corporation is one of the world's largest chemical companies with positions in agricultural, industrial and consumer markets. FMC is a member corporation of CropLife International (FMC Corporation, 2005).

helping farmers to avoid the variability of national markets. In Chimborazo province, this role is being carried out by the Provincial Platform. Luther et al. (as cited in Norton et al., 2005) suggest that more work is needed to further develop such market opportunities for FFS and to coordinate production among groups in order to meet volume demands throughout the year.

FFS in Ecuador are surviving through funding and institutional support primarily from local-level organizations. These organizations are challenged to work within their own levels of capacity and interest while maintaining commitment to the location-specific demands of the farmers and their quality of life.

4.2.2 Pesticide Use and Exposure in Potato Farming in Ecuador

In Ecuador, the potato crop is found in the cool Andean highlands and is a very important staple in the national diet (Crissman, Cole, Sherwood, Espinosa, & Yanggen, 2002, p. 3). Around the late 1940s both agrochemicals and pesticides were introduced to potato farming in Ecuador. While chemical fertilizers had the impact of increasing yields and facilitating the intensification of production through shortened crop rotations, fungicides and insecticides aided control of such foliage damaging insects as the Andean Weevil, and especially Late Blight (the fungus responsible for the Irish Potato famine) (Dale, 2004; Sherwood et al., 2000, p. 24). Between 1970 and 2003, spending on pesticides in the country increased from $3 to $60 US per hectare (CEA, 2005).

Studies have been tracing the use of agrochemicals in Ecuador since as early as 1984 (Barsky, 1984, as cited in Yanggen, Cole, Crissman, & Sherwood, 2004). Impact studies have found multiple health effects of pesticide use, including neurological damage, genetic and reproductive disorders, and cancers amongst farmers and

community members (BBC World Service, 2004; Yanggen et al., 2004; Crissman et al., 2002). A project by the Rockafeller Foundation in the 1990s found that neurological impairment associated with exposure to pesticides affected as much as two-thirds of the rural population (Orozco, 2005a, p.3). In Carchi, the northern most province of Ecuador, pesticide poisonings are among the highest recorded in developing countries (Cole et al., as cited in Crissman et al., 2002, p. 6; Yanggen et al., 2004). In Riobamba itself, pesticides are listed on the top ten list of causes of death (personal communication, December 6, 2005). Sherwood (CEA, 2005) explains that farmers affected by pesticide use are less productive since approximately eleven days of labour are lost for an incident of intoxication – meaning costs in the thousands for rural farmers and for the public health sector.

The most common agrochemicals come as liquids or wettable powders and are applied by mixing with water and using a backpack sprayer which includes a hand held spray nozzle. "Often farmers do not know what products they buy" (Sherwood, n.d., p. 6) and "given costs associated with spraying, farmers combine several products together in mixtures known as 'cocktails' applying a combination of pesticides, fungicides and fertilizers all on a single pass through the field" (Crissman et al., 2002, p. 5). Most often men are responsible for the mixing and application of pesticides (Crissman et al., 2002).

Pesticide intoxications have been demonstrated to farmers in Ecuador through the use of a fluorescent tracer device which employs the use of ultraviolet light to indicate the spread of pesticides to parts of their bodies and their work and home environments. Such studies found traces of pesticides on applicators' hands, arms, feet, legs, back and face (Yanggen & Cole et al., 2003; Yanggen, Crissman, & Espinosa, 2003). Traces were also

discovered on clothing, and around the washing area where the spraying tools had been cleaned, and also on the bodies of wives and children, even when they had not been in the application area (Yanggen & Cole et al., 2003; Yanggen & Crissman et al., 2003).

Such findings indicate that toxic pesticides are reaching not only the applicators, but are also having an effect on farm families (Crissman et al., 1998; Crossman et al., 1998, both as cited in Mera-Orcés, 2000). "Next to the men that apply pesticides in the field, women and children also get in contact with pesticides and can suffer from acute voluntary and involuntary intoxication" (Mera-Orcés, 2000, p. 23). Mera-Orcés contends that programme strategies directed to reduce health risks of pesticides in potato production must consider social dynamics and sociological dimensions of the farm family and of the community (2000). In a related vein, Crissman et al. (2002) argue that the considerable economic burden caused by pesticide poisonings (in terms of lost workdays and treatments costs) impacts all of Ecuadorian society.

4.2.3 Ecohealth and Farmer Field Schools in Ecuador

In 1999, INIAP and CIP partnered to implement a research and intervention project on the potato crop in Ecuador called Ecosalud, or "Ecohealth." The Ecosalud project takes an "ecosystem approach to human health," premised on the understanding that ecosystem management impacts on human health in multiple ways (Forget and Lebel, as cited by Crissman et al., 2002, p.7). [37] The broad goal of Ecosalud is to "improve the welfare of rural residents by improving the sustainability of agricultural

[37] The Ecosalud project takes an ecosystem approach to human health: a holistic, gender sensitive, participatory approach to the identification and remediation of human health problems (Forget and Lebel, as cited by Crissman et al., 2002, p.7). Under this initiative, "health" is defined as a "state of complete physical, mental and social well-being and not merely the absence of disease" (World Health Organization, as cited by IDRC, 2005). The project parameters (1999-2007), build upon earlier work (including Tradeoffs Analysis, 1990-93). Ecosalud is funded and supported by the International Development Center, (IDRC), Ontario, Canada. (IDRC, 2006; Lebel, 2003).

production systems in the Andes of Ecuador – in terms of the reduction of health risks and the promotion of health benefits" (Orozco, 2005a, p. 1). Accordingly, in seeking to improve human health and well-being while simultaneously maintaining a healthy ecosystem, the emphasis is on the design of solutions based on ecosystem management rather than health sector interventions (IDRC, 2006).

Phase 2 of Ecosalud (hereafter termed "Ecosalud") began in 2005, with a focus on scaling-up impact (from earlier work) to the north and central sierra of Ecuador, and the specific provinces of Carchi, Tungurahua, and Chimborazo (Orozco, 2005a). The focus of the project is two-fold. One thrust is toward understanding the complicated relationships between farm-level management strategies and the use of chemical inputs and impacts on human and ecosystem health. A second priority is to develop intervention strategies aimed at changing farmer behaviours and reducing exposure to pesticides (Lebel, 2003; Orozco, 2005a).

Specifically, the objectives of the Ecosalud project are as follows:

- Establish an expanded pesticide-related baseline survey of the health characteristics of an at-risk sample population (in three provinces)
- Use participatory methods to intervene with the sample population to change behaviour for reducing exposure to pesticides
- Return to measure improvements in health as a result of exposure reduction in the sample (Crissman at al., 2002, p. 7)

Expected outcomes for the Ecosalud project are as follows:

- Human empowerment in agricultural production and human health
- Increased local public awareness of pesticide health risks and opportunities in the Andean region of Ecuador
- Improved health status of farmers (women and men) affected by the use of pesticides

- Healthy sustainable crop management practices at the community level
- Gender equity in potato crop management systems at the community level
- Dialogue among diverse stakeholders - from the farm household and community level up to the municipal, provincial, and national level - in the agricultural and health sectors concerning pesticide issues and appropriate intervention strategies (Yanggen et al., 2004, p. 78; Orozco, 2005a, p.3)

In terms of intervention strategies with farmers, the Ecosalud perspective acknowledges that "interventions based on dominant [or "traditional"] ways of learning, doing, and organizing are blocking rural progress in developing countries" (Forget and Lebel, 2001, as cited in Yanggen et al., 2004, p. 78). Accordingly, the intervention stage aimed at changing farmer behaviour will primarily involve the implementation of the Farmer Field School methodology.

While the intervention aspect will incorporate the continued use of IPM FFS in Ecuador, new goals will be incorporated which are aimed at advancing human health objectives. Specific goals for the Farmer Field School methodology include the following:

- Improved ecosystem management including the integration of themes on environmental pesticide contamination (natural and physical), and product disposal
- The integration of health issues into the teaching of healthy crop management – including the themes of "exposure reduction" and "pesticide risk reduction," and curricular content intended to raise consciousness about the dangers of pesticides
- The promotion of personal protective equipment (PPE)
- The promotion of social equity (particularly the participation of women)
- Scaling-up of impact to the farm household and community levels in terms of the reduction of health risks and the promotion of health benefits

(Yanggen et al., 2004, p.78; Orozco, 2005a, p. 1; Ecosalud Project Coordinator, personal communication, August 22-26, 2005, February 2006).

Accordingly, Ecosalud also plans to implement TOT for future trainers of FFS in order to integrate health issues into the teaching of healthy crop management systems (Orozco, 2005a). To a lesser extent, Ecosalud also has plans for other participatory interventions in health, including community education supplemented by the use of mass media (Orozco, 2005a). FFS will be funded by Ecosalud (70%) and by institutional partners (30%) (personal communication, February 2, 2006).

To foster stakeholder participation, the Ecosalud project utilizes planning committees, called "Ecosalud Platforms" which work at the provincial level to connect with relevant actors at the local level, including FFS facilitators.

4.3 Empirical Data: Farmer Field Schools in Chimborazo, Ecuador

Data were gathered on three cases of Farmer Field Schools in three communities in the province of Chimborazo, in Ecuador (see map of Ecuador). These communities are Cebadas, Totoras, and San Francisco (San Fransisco de Bishud). FFS projects in these communities were all associated with external agricultural assistance organizations and also with the Provincial Potato Platform of Chimborazo (hereafter termed, "the Platform"). Two FFS were co-facilitated by technicians from UDUCACH (Unión de Oganización Campesinas de Chimborazo), an organization specializing in agriculture and livestock; and la Diócesis (the Diocese) of Riobamba, which works on the provision of land and micro credit to small farmers. The third FFS was co-led by a farmer-facilitator, a bilingual Quichua- Spanish-speaking FFS graduate from near the FFS community; and a

technically-trained agricultural worker from Fundación Marco, the office of Agricultural Assistance and Training for the province.

Fundación Marco also oversees the coordination of the Provincial Potato Platform. All three technically-trained facilitators for the three FFS served as members and organizational representatives of the Provincial Potato Platform. All of these organizations are located in the capital city of Riobamba. All of the technically-trained facilitators also lived in Riobamba.

During the study period, a Training of Trainers (TOT) program was also being carried out in the province. This program was hosted by INIAP and it took place in Totorillas, near the town of Guamote, approximately 60km from Riobamba.

4.3.1 The Study Communities

Cebadas

The community of Cebadas is located in the canton of Guamote and the parroquia of Cebadas.[38] The population of the community is 6,739, and it lies approximately 2,950 metres above sea level (masl). Cebadas is at least 80 kilometres south of the capital city of Riobamba (personal communication, 2006).

Totoras

The community of Totoras is located in the canton of Alausi, and the parroquia of Achupallas, Totoras. The population is approximately 2,222 people, and the elevation is 3800masl. The community is located approximately 117 kilometres south of Riobamba (personal communication, 2006).

[38] "Canton" is a Spanish word which translates loosely as "county." Cantons are tertiary subdivisions, below provinces, that correspond with the municipal levels of government. Cantons are subdivided into "parroquias" or parishes.

San Fransisco

San Francisco de Bishud has only recently gained community status. The community is in the canton of Guamote and the parroquia of Palmira. It has a population of 878 people, and it lies at 3492masl, approximately 104 kilometres south of Riobamba (personal communication, 2006).

4.3.2 Field Data: Evidence of Success in FFS

These three cases of Farmer Field Schools did not demonstrate success in all of the areas outlines in Table 2, however, there was some evidence of success.

Increased Knowledge and Learning

It was not possible to measure farmer learning in terms of improved capacities for decision-making since none of the Field Schools were completed by the end of the study period. Those involved with FFS "on the ground" (farmers, facilitators, and technicians) did not generally equate "learning" with "capacity-building." Instead, farmer learning was viewed as the accumulation of knowledge and information about new techniques (personal communication, February 11, 2006). While researchers spoke of farmer learning in terms of improved capacities and management skills, they still resorted to the testing of farmers through multiple choice questions in order to measure impact (personal communication, December 7, 2005).

A focus group with 15 members of one FFS revealed that farmers appreciate the learning and information exchange about crop management techniques. In at least two communities, participants stated that they had become more aware of market demands and strategies for marketing through the FFS (personal communication, January 23, 2006). Farmer Field Days were outlined as being especially useful for this. Farmers

explained that potato production in the Field School was good and learning about production factors, such as potato variety, and quantity demands led to improved crop marketing (personal communication, January 23, January 21, and February 13, 2006).

Human Development Goals

Several facilitators and technicians cited increased self-esteem as a common outcome of FFS. This outcome was not directly observed; however, several women members reported that although participation in FFS was difficult and time consuming, they felt that their increased learning about crop management increased their value in their families as a result of their new economic understanding and contributions. Some women also reported improved time management skills (personal communication, February 13, 2006).

New Topics in FFS

Market orientation and marketing of the potato has been introduced to FFS in Chimborazo through the partnership with the Provincial Platform. Even though farmers overwhelmingly report that they are unclear about what is expected of them – in terms of production for the Platform and overall market demands within the province – they repeatedly report that they are keen to learn more about these themes in FFS (personal communication, February 13, 2006).

The Ecosalud project proposal to incorporate environmental and human health themes with agriculture in FFS is also generally well accepted by the farmers. Farmers also define this as a central issue of interest for future training in FFS, especially women farmers (personal communication, January-March 2006).

Constructive Relationships

In theory, involvement in FFS in Chimborazo province qualifies a farmer for membership in the Provincial Platform, and for participation in Training of Trainers programming as well as special events such as Farmer Field Days (personal communication, February 2, 2007). In practice, five of ten members surveyed in one FFS indicated that the FFS had linked them to the Provincial Potato Platform and its members. Nine of the respondents indicated that they intend to sell their harvest in the market or through another type of business, and this market relationship was facilitated through the FFS via the Platform and institutional partners. Farmers reported that this more secure linkage with market buyers relieves a great deal of risk and assures sale of the crop (personal communication, February 13, 2006). Additionally, three of the ten indicated involvement in a credit program through the FFS.

Three of ten farmers surveyed indicated that the FFS had led them to participate in Farmer Field Days, while two more indicated that they were introduced to other agricultural training opportunities and workshops through FFS. All ten participants indicated that their interest in other agricultural learning opportunities had been fostered through the FFS.

Of ten non-FFS farmers, four reported knowing about the Provincial Potato Platform and two of these four were graduates from an earlier FFS. Three of these farmers reported involvement in a credit program. These same three farmers were all aware of the current FFS in their community.

Women's Participation

It was not possible to determine the initial number of women enrolled in each of the three FFS. However, on average, any one FFS session drew fourteen farmer participants, and six of these were women. Of the 325 farmers associated with the Provincial Potato Platform of Chimborazo, 127 are women.

In short, successes in the FFS case studies relate to increased learning about crop management techniques and the theme of marketing. Human development goals such as increased self esteem and status of the members were also noted, as were constructive (institutional) relationships leading to the attainment of marketing and credit benefits. New topics such as marketing and health themes were well accepted and women's participation in Field Schools was nearly on par with men's.

4.3.3 Field Data: Evidence of Problems/Failure in FFS

Quality of Learning

The national coordinator of FFS has explained that reaching quality "capacitization" or training is a key problem in FFS (personal communication, February 2, 2006). FFS participants spoke several times about being confused by facilitators who "use confusing language and speak too quickly." Some participants, especially older women, indicated (through a translator) that they were unable to understand or take notes without translation into Quichua (personal communication, January 23, 2006). Several women used a thumb print to sign the research consent form, rather than a signature.

FFS in this region of Ecuador are intended to target Late Blight through IPM, and to reduce chemical inputs for treatment of this common potato disease. An expert potato science researcher provided some key questions to test farmers on this topic. Ten Farmers

responded to these survey questions in month five of the FFS project. The results are presented in Table 4. All of the correct responses are based in the fact that late blight is caused by a fungus. Most incorrect answers indicated that climate factors like rain and humidity are the causes of the disease, not a fungus.

Table 4 Survey Responses from FFS Farmers on Late Blight

Q.1 What causes late blight?	5 correct responses
Q.2 Why does late blight appear in humid and rainy times?	7 correct responses
Q.3 What happens with late blight when the crop is planted in higher altitudes or areas of less rain?	6 correct responses
Q.4 The variety Gabriela was not affected by late blight when it was first introduced, now it is. What is the reason?	0 correct responses

Source: Author, 2007

Many of the key researchers and experts divulged that they are aware that FFS facilitators do not always implement the methodology according to intended uses. They explain that there is no monitoring system in place to respond to this, "...facilitators are basically left on their own 'in the social wild' to put the method into practice, and self-evaluate progress" (personal communication, February 1, 2006). Formalized reporting of FFS is also outlined as an issue that needs attention.

One scientific researcher also explained that indigenous farmers are heavily influenced by inherited beliefs, and all of the new knowledge and experience provided through formal research and development and FFS has failed to alter some aspects of farmer behaviours and practices (personal communication, October 21, 2005).

Researchers outlined that there is a communication gap between researchers of the science and the FFS facilitators who work most closely with farmers in the field, and this gap results in the transmission of outdated and even erroneous messaging (personal communication, December 7, 2006). In one FFS, the "prueba de caja" or "proof box"

technique was used to accumulate baseline data about agricultural knowledge amongst participants. However, farmers were able to see the answers selected by others, and CIP researchers explained that the phrasing of some of the questions was flawed and misleading (personal communication, December 7, 2006).

Quality of Facilitation and Facilitator Training

The national coordinator of Farmer Field Schools in Ecuador explained that in his experience, when FFS in Ecuador have failed, the reason has been facilitators who do not know the methodology very well, and/or are not committed to implementing the theoretical components and the practical process (personal communication, February 2, 2006). The initial coordinator of the Provincial Platform of Chimborazo suggested that the problems being experienced with FFS in the province were attributable to the facilitators and lack of training in the methodology (personal communication, February 9, 2006).

The three FFS were facilitated by three agricultural technicians from outside of the communities. They were chosen by the Platform or by their own organizations to lead their respective FFS. Formally, one FFS was co-led by a local farmer trained in FFS, however it appeared that this role was largely in Quichua-Spanish translation. The external facilitator for this FFS admitted that his own role had evolved from one in which he assisted the farmer-facilitator with technical themes and information, to more of a central role as lead facilitator.

Generally all FFS sessions were led in a traditional teaching style with the facilitator or guest speaker standing in front of participants, in a classroom space, presenting information or fielding questions. Diagrams and/or laptop images were used to

describe potato and plant afflictions and associated fertilizer and pesticide needs. Farmers were sometimes told they would "need to look at plants in order to judge amounts required." During the research period there were no FFS sessions which incorporated agroecosystem analysis.

Technicians described the role of the FFS facilitator as being to transmit messages, teach new skills and information, exchange information between farmers and facilitators, teach members to improve their production, learn from practical exposure to new techniques, train the group, transfer information to them, foster group organization and confidence levels of small producers, and allow farmers to share their experience and knowledge (personal communication, February 16, 11, 2006).

The facilitators had mixed feelings about the methodology and the potential for achieving agricultural development in rural farming communities (February 11, 2006). Two facilitators explained that their FFS were progressing well, but then failed, while the other believed that his FFS was still successful. Lack of "motivation and excitement for the work" was cited as an issue. One facilitator stated, "I have no vested interest in the FFS" (personal communication, March 2, 2006). On several occasions, facilitators complained of being over-worked since the FFS was only one of many requirements of their job. They had insufficient time and energy to focus on the Field Schools and to "prepare lessons." For this reason they advised that in the future, facilitators should be drawn from TOTs (February 16, 2006). Lack of sharing between facilitators was reported as a major concern, and one facilitator reported feeling "left out of exchanges with researchers" (personal communication, March 2, 2006).

In the three FFS studied, not one of the facilitators had been trained in the FFS methodology, and only one had a resource or guide book on FFS (personal communication, February 11, 16, March 2, 2006). One facilitator expressed the need for training and had enrolled in a TOT. The other two facilitators expressed more confidence in their current level of facilitation skills stating that "the dynamic is not that different from other methods" (February 16, 2006). The need for "tools" to better "transmit" the message was also expressed (February 16, 2006).

Visits to the Training of Trainers program in the province revealed learning techniques that were far more experiential. Farmers participated in nearly every stage of learning, including morning ice breakers and specimen gathering and identification in the field. The TOT trainer normally deflected participant questions to others, rather than answer them directly.

Speaking broadly about the implementation of FFS in Ecuador, one FFS researcher explained that Chimborazo province presents unique challenges in extension education due to the indigenous farming culture of *mingas* and communal or shared work.[39] This culture contrasts with farming in the north of the country where the Mestizo population is accustomed to concepts of competition and formal education (personal communication, November 25, 2005).

Another expert researcher explained that a power imbalance exists between farmers and technicians and this is promoted by the culture of traditional extension in Ecuador (personal communication, November 16, 2005). "In formal Research and Development it is still the culture to *direct* farmers' actions ...we know we have to fight

[39] *Minga* is a term used by the indigenous societies of Central and South America, which means "the coming together of people for the betterment of all" (Free the Children, 2005).

against the customs that farmers have adopted from their fathers before them" (CIP researcher, personal communication, October 21, 2005). Two of the facilitators explained that they felt that the indigenous culture specifically was very passive and paternalistic "...waiting for organizations to help before acting on their own behalf" (personal communication, February 11, March 2, 2006). Women farmers especially were described as needing constant guidance, supervision and repetition (personal communication, March 2, 2006). Meanwhile, farmers address all outside workers (including thesis students) as "engineers." They commonly sat quietly in FFS sessions taking notes or listening to the facilitators. One farmer in a FFS expressed that "many technicians do not know the realities of farmers and our communities ...they do not visit us here ...I know, I live here ...I know what it is like and I know that they do not come" (personal communication, February 5, 2006).

Curricular Content

The national coordinator of FFS in Ecuador explained that community issues and interest vary throughout regions, and therefore the curriculum of FFS must be based in these individual realities (personal communication, February 2, 2006). All three facilitators reported that the FFS curriculum was designed with the input of the members; and yet, the curriculum was identical for two of the Field Schools (personal communication, January 30, March 2, 2006).

Facilitators explained that FFS themes were selected by farmers, but that several additional themes were added based on organizational need (February 16, 2006). In two cases, the themes outlined on the formal curriculum schedules included many of the elements from the methodological process of a Field School (Figure 3), however, many

activities (approximately 20 of the 28 listed) were outlined as being the responsibility of the facilitators, or visiting specialists, as opposed to the farmers themselves. The third FFS curriculum document outlined two areas: "What activities we will do" and "What we want to learn." While agroecosystem analysis was scheduled in several sessions, some of the key areas (i.e. "types, uses and toxicity of chemicals") were outlined as being "presentations" versus field-based studies. At the same time, at least two full days were allotted to marketing and market themes alone.

Of the FFS sessions attended, topics included: a promotional presentation and demonstration from an FMC chemical company; a guest lecture on soil and crop analysis and fertilizer requirements; a group evaluation of FFS; a presentation from a credit cooperative and program registration; discussion on soil analysis; livestock vitamin injections/castrations; planting of chemical and non-chemical plots; discussion of the importance of the lunar calendar; soil sample collection; seed sorting; testing of farmer knowledge ("preuba de caja"); lecture and questioning on costs of production; question and answer on livestock health; and selection of productive milking cows.

Survey results and discussion in FFS revealed the topics of greatest interest or importance to farmers. Ranked responses from 22 members in one FFS revealed that credit, quality seeds, and animal issues were most important. In a second FFS, 10 members outlined frost, access to credit, potato and animal afflictions, and market prices as their main issues. The topic of credit and "shared risk" cooperatives were of high importance to many farmers (personal communication, January 23, 2006). Nine of ten survey respondents indicated that they earn an income from animals or other crops besides the potato, and six indicated that they made more money from these activities.

Survey responses of ten non-FFS farmers indicated the most common issue of concern to be frost, followed by potato diseases, and water supply for crops. Access to credit and agricultural training were also indicated to be issues for these farmers and all of them stated that they need more information or assistance with the marketing of their potatoes.

In casual conversation with farmers, many of them (especially women) outlined that health issues related to pesticide use was an important topic they wished to learn about. A community meeting to report the initial findings of the Ecosalud project drew an extremely large and vocal group of both male and female farmers.

Program Goals and Objectives

Farmers in FFS explain that through their involvement with the program they expect to learn to farm potatoes better and to study about other themes that are important to them. They also expect to farm potatoes both traditionally and in test plots and to share or sell the harvests from these fields.

At the same time, farmers outlined their desire for continued service/support concerning not only how to produce, but also how to sell. One facilitator explained that the economy around them has shifted and farmers are not prepared to shift with it (personal communication, January 11, 2006). One farmer explained that all of the farmers in the community know that they will need to produce more potatoes now (due to the forces of macroeconomic trends promoting market integration), but he fears that they do not know how to do this safely. He also feels that the agricultural technicians, or "engineers," are not working to involve them in the new economy (personal communication, February 13, 2006).

As mentioned, all three FFS were implemented through partner institutions working in collaboration with the Provincial Potato Platform. The Platform has its own goals and objectives for Farmer Field Schools. The focus is on the "Plan of Production" which involves linking potato production with marketing. As such, the Platform involves itself with Farmer Field Schools, in part, as a means toward fulfilling potato production quotas for commercial agreements with local restaurants and potato chip manufacturers etc. The national coordinator for FFS in Ecuador explains that FFS provide a direct link to farmers – who will provide the production to the Platform (personal communication, February 2, 2006). The long term strategy to "institutionalize" the Platform includes plans to organize producers by zone and link them to technical assistance and to credit. This involves continued implementation and support for FFS through the Platform – including the provision of resources such as seeds, fertilizers, and field plots; technical assistance; access to credit and shared risk programs; and planning for crop marketing (with a six percent commission cost) (personal communication, October 12, 2005).

These Platform goals motivated many aspects of the three Field Schools, including the selection of two of the communities (farmer participation was voluntary). One facilitator explained that his main task in FFS had shifted toward "the plan of production" – informing farmers where to sell production and why (personal communication, February 16, 2006). While another facilitator felt that the success of his FFS was tied to success in terms of Platform goals (personal communication, March 2, 2006). Many Platform members have also advocated for legal frameworks which would hold that all Platform members be FFS graduates and be accountable for potato quotas.

While some members of one FFS reported that "there are no clear goals and the overall purpose of the group is unknown," others complained that technicians were preoccupied with their own agenda and that they were "not always concerned with farmer's actual problems and needs unless it related to increasing production" (personal communication, February 13, 2006). The coordinator of the Fortipapa project also found that the institutional presence is too strong, and farmers need to be bigger participants with their demands being treated as project objectives. He explained, "There will never be sustainability with this degree of paternal dependency" (personal communication, February 15, 2006).

Chambers (1983) finds that it is common to have unequal ethnic and class power relations between the "urban and the rural" – "the core and the periphery." While urban-based professions are perceived of as powerful, educated and well-off, the rural poor are perceived of as uneducated and weak. The perceptions are held by both the rich and the poor. Even the initiative of enabling poor to "better help themselves" necessitates the assistance of outsiders "who have more power and resources and most of whom are neither rural nor poor" (Chambers, 1983, p. 3).

The coordinator of CIP reported that as a result of the shift from core funding to project-based funding, work has become very much project-driven – operating on the timelines, funding cycles and objectives of donors. It was also explained that when "trainers" are employed to work on an FFS, they have their own "training objective" – stemming from their organization affiliation – versus a "learning objective" for the FFS itself (personal communication, October 21, 2005, February 9, 2006).

Several actors involved in FFS in the province are of the opinion that, in terms of the Platform and FFS, "you can't have one without the other" "...if one fails, the other will fail" (personal communication, October 2005-March 2006). An FFS expert explained that, "originally, FFS in Ecuador equaled IPM, today they are key to – and complimentary to – platforms and markets ...conceptually, many of the lines concerning the FFS process have been blurred... it is unclear whether FFS and platforms can be separated" (personal communication, November 16, 2005).

Conversations and interviews with farmers, facilitators, technicians and researchers revealed different interpretations and opinions on the overall goal of "agricultural development" and the role of the FFS. While some researchers saw the need for agricultural development which incorporates social, environmental, and economic aspects of farmer welfare, others sought to shift the focus from economics and production toward social and health issues, while still others felt that economics, crop output and farmer incomes "are everything" (personal communication, February 2, 16, 2006). For example, the national coordinator of FFS from INIAP explained that "agricultural development" is taking place "when farmers earn more than they are accustomed to" (personal communication, February 2, 2006).

Accordingly, many actors, including the new Platform coordinator, have stated that a very important new role for FFS is "the training and organization of farmers in order to consolidate the new institutionalization of potato production in the Sierra region of Ecuador" (personal communication, February 9, 15, 2006). The national FFS coordinator explained that FFS now work to "increase farmers' competitiveness through

training, to improve their production of quality products, and to insert them into the markets" (personal communication, February 2, 2006).

Only one or two researchers spoke of FFS in terms beyond "knowledge-building," "transfer of new technologies," and "farmer organization;" to include elements of "improved capacities, empowerment and sustainability." Researchers also interpreted agricultural development as not only *meeting* market demands, but as the "*development* of favorable market conditions" (personal communication, February 9, 2006).

Coordination and Planning of Sessions

In terms of carrying out the FFS methodological process, the biggest issue was coordination and planning of the FFS sessions. This issue affected the overall quality of FFS in all three communities, and led to the projects being termed "failures."

Facilitators explained that a typical FFS should comprise 15-16 sessions over at least seven months, with a frequency of one session every 15 days (personal communication, February 22, 2006). Yet during the entire six month research period sessions were extremely erratic, with only 10 sessions taking place in all three communities combined. Facilitators explained that sessions were to begin by 9 or 10am, however, participants were overwhelmingly unclear about the frequency of sessions and the start time (personal communication, October 2005-March 2006). Farmers were confused by the instruction that FFS would occur "every 15 days, or every second Monday." One FFS member reported that sessions normally happen once per month (personal communication, February 21, 2006).

In Cebadas, of the ten sessions that were scheduled over the six month research period, only five took place, and one was a presentation related to another project. The

average number of days between realized sessions in Cebadas was 32. In Totoras, six sessions were scheduled during the research period and three were realized. The average number of days between sessions was 37. In San Fransisco, three were scheduled and two were realized. The number of days between the two sessions was 14. As of the final day of research (March 10, 2006), the number of days that had passed since the last FFS session in each given community was 25 days in Cebadas, 17 days in Totoras, and 101 days in San Fransisco.

The national coordinator of FFS in Ecuador describes "desertion of members" as a severe problem. While 15-20 percent of farmers drop out of TOT, this rate increases in FFS, where often only half of the original members remain throughout (personal communication, February 2, 2006). The three study Field Schools had enrollments of 22-25 farmers each. On average, the number present at any given session was 14. The highest attendance at any one session was 22 farmers, while one session had only a single farmer attend. On several occasions in at least two of the FFS communities, members complained outwardly about the infrequency of FFS sessions, and the poor punctuality of the facilitator (especially given the long distances traveled by some). In one instance a farmer in the FFS field was irate about the fact that more that two months had passed since the last FFS session. When asked what could be improved for FFS in the future, participants were quick to respond, "Stick to the schedule!" (personal communication, January 23, 2006).

FFS members explained that sometimes dates (or date changes) were not relayed to those in the community. Although facilitators attempt to communicate sessions through monthly meetings in the capital city, on the first Saturday of every month, if a

representative was unable to make the trip, it appeared as though no plans were made in that community for the month.

While the farmers blame the facilitators, the facilitators also blame the farmers. Poor efforts and low farmer attendance in these monthly meetings and in FFS were cited by facilitators as being detrimental to the over all program and to their own interest in FFS (personal communication, January 23, February 4, 2006). "Participants join and quit all the time, and you can't start over each time ...there is no continuity" (FFS facilitator, personal communication, February 16, 2006). More than halfway through one FFS season a new member asked, "What is an FFS?" (personal communication, February 13, 2006).

Institutional Support

The national coordinator for FFS in Ecuador explains that next to a trained facilitator who is committed to the process, "...the provision of support and supervision for facilitators is crucial to success in implementing FFS – and he and other researchers admit that this type of support has been "missing for years" (personal communication, February 2, 2006).

While the Provincial Platform had played a big role in initiating and supporting the three study Field Schools, this institutional support was severely affected when the Provincial Platform Coordinator resigned in early 2006 and the position was left vacant for two months. Logistical issues such as lack of access to a vehicle and quality seeds were sited as specific needs that went unfulfilled at this time (personal communication, March 2, 2006). Facilitators explained that during this entire period, there was no means to reach two of the FFS sites, and seed shortages meant that neither site was able to plant

more than the experimental field (personal communication, February 11, 2006). FFS participants stated that, the Platform had lost credibility in their eyes (personal communication, February 16, 2006).

Program Reach and Dissemination of Impact

In terms of program "reach" and social inclusion, it appears that FFS reaches farmers that are poor, but not the poorest. Farmers involved in FFS reported having homes made of blocks or bricks, or mixed wood and brick, and all had electricity. The average age of members was between 30 and 40 years. Of ten non-FFS participants from the same community, surveying revealed that all but one had electricity and their houses were of the same material (one farmer had an adobe/mud house). The average age of these non-participants was 40 years.

The national coordinator of FFS explains that in the past, participation in FFS was voluntary, but since the development of the Platform it is common that participating zones and farmers are identified by the platform in consultation with local government (personal communication, February 2, 2006). In at least one FFS, members were chosen by the facilitator's organization, based on level of farming experience (February 16, 2006). The availability of land was also outlined as a requirement for farmer participation in both FFS and TOT (personal communication, November 23, 2005).

Farmers in FFS appear to be better "networked" than other farmers in the community. Many farmers in FFS report being involved in so many meetings they are unsure which to attend. Participants in FFS are provided the opportunity to join credit and financing schemes through the organizational affiliations of the facilitators and a condition of registration is involvement with the host organization. At the same time,

surveying of ten non-FFS farmers in one of the host communities revealed that five did not know anything about the FFS program and nine responded that they would have participated had they been asked – the tenth was a woman living alone who said she would not have time. Of these ten farmers, four were involved with another training or support service, including other FFS, the Provincial Platform and an organic farming project. One non-FFS farmer reported feeling "unlucky" about never having received information about credit opportunities (personal communication, February 21, 2006).

Surveying of ten FFS participants revealed that men, women, children and hired labourers all participate in tasks at the farm level (including disinfecting the field, weeding, harvesting, purchasing and sowing the seeds, buying and applying the pesticides, laundering the clothing used in spraying, and attending training courses). Of 14 tasks, husbands conducted 5.2 tasks, wives 5.1 tasks, labourers 3.1 tasks, and children 2.7 tasks. Findings for non-FFS participants revealed the family members did more tasks and there was less hired help. Wives did 7.4 tasks, husbands 7.3 tasks, children did 3.2, and labourers averaged one task. FFS programming was open to children but only one or two actively participated, while labourers (without their own land) did not appear to be a target population.

Regarding the dissemination of information from FFS, of ten non-FFS farmers, five reported knowing one or more participants and having information from FFS shared with them. While the requirement to share learnings was not an explicit condition of participation in FFS, the facilitator of one FFS encouraged participants to meet in groups, outside of the FFS to discuss and disseminate information to other farmers about topics learned in the FFS (i.e. about seed fairs, and the Provincial Potato Platform). In the other

two FFS, dissemination of learning was not tied to objectives of the FFS, instead it was based in religious reflection on values and the ethical call of farmers.

FFS members in two communities expressed a keen interest in sharing their learning with the entire community, to "work and learn together ...improve lives and decrease the migration of men out of the communities" (personal communication, February 13, 2006). When questioned, these farmers did not have any specific ideas about how they would do this.

Some researchers were of the opinion that mass media tactics (i.e. radio messages, pamphlets etc.) are an alternative to FFS in terms of reaching and disseminating information to larger numbers of farmers. One researcher argued that replication is not as important, since "farmers will soon find [replication of FFS] boring" (February 2, 2006). These researchers find tools like radio programs and Farmer Field Days beneficial since they reach entire communities and not just 20 or so FFS participants (personal communication, February 2, 2006). Other researchers explain that "FFS is not meant to reach the average farmer." Instead, the model is designed to reach a few key farmers (10 percent) who will socialize the practice, serve as examples to others, and "flip" the norm (personal communication, February 16, 2006).

Chambers (1983) summarizes that outsiders under-perceive rural poverty. Chambers finds that "external" professionals (development workers, government workers, researchers, educators etc.) are caught in the "urban trap." Accordingly, due to biases concerning geography, project goals, donor investment, gender, and professional interest etc., the poor are unseen and unknown. The "poor are little seen, and even less is the nature of their poverty understood" (p. 25).

Gender Equity

As mentioned, survey responses on the question of farm level tasks revealed that women are as equally active in agriculture as men. While women's participation in TOT is low (15 percent or less), in FFS it is closer to 50 percent. At the same time, the national programmer for FFS explained that there has yet to be one woman farmer facilitator of FFS in Ecuador. In the TOT program, four of the 42 participants were women, but only two attended regularly. Women are not given the opportunity to volunteer for TOT, or to be nominated by a community member, instead they must be delegated by a representative from the program (personal communication, November 9, 2005).

FFS which focus solely on "field agriculture" often thematically dissuade the participation of women since their interests center more on crop marketing and food preparation. However, in at least two of the FFS, women were being motivated to learn about potato farming due to the high out-migration of men. Speaking from ten years of experience coordinating FFS in the country, the national coordinator outlined that low participation of women is not attributed to lack of interest, but more so "due to lack of freedom to participate ...cultural barriers" (personal communication, February 2, 2006).

Observation in the FFS sessions revealed that cultural elements do impede women's full participation. Older indigenous women generally have lower levels of formal education (FFS facilitators, personal communication, February-March, 2006). At least three women in each community were unable to write, or unable to communicate in Spanish – the dominate language of the FFS. None of the facilitators was able to speak Quichua, and only occasional translation provided summaries of key points. As well, the

two to three children present at any given FFS session could require a great deal of attention (or breastfeeding) from women participants.

Women members reported the following barriers to participation: *machismo;* the inability of many of the older women to speak or read Spanish; and responsibilities for other activities including cooking, child and animal care which occupy them all day.[40] Women reported that this last issue made it especially difficult to participate in FFS since sessions were so irregular and disorganized. The majority of women participants responded that they need assistance with organizing their time and other tasks before they can be free and able to participate in FFS. The use of a woman facilitator able to speak and understand Quichua was also outlined as a suggestion to improve women's attendance and participation (personal communication, February 13, 2006).

Women are frequently stereotyped as "quiet, disinterested, and passive participants." Two facilitators explained that women in FFS need to be "spoon-fed ...they have very low self-esteem, and if they speak at all, they speak very slowly and quietly ...it is very hard to communicate with women" (personal communication, February 16, 2006). This opinion was expressed by facilitators more often than by male farmers and husbands. Cameron (as cited in North & Cameron, 2003) summarizes that indigenous-peasant organizations in Ecuador remain highly patriarchal institutions that often "marginalize women from local decision-making" (p. 184).

A focus group with seven males in FFS revealed that men believe women should be included in FFS so that they can know more and assist men with production – because

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[40] *Machismo* is the term used in Spanish to mean an "attitude of the high-handedness of males before women" (*Real Academia Española,* 2007).

they are equally capable to do so and because the need is increasing for them to take over farming tasks as men are forced to migrate for work. Men also reported that women often stayed home or left FFS sessions to complete other tasks (personal communication, February 13, and 21, 2006).

One facilitator explained that women members learn better when they are separated from their children and their spouses. He also relied on his female co-facilitator to interact with the women (personal communication, March 2, 2006). Similarly, women in FFS stated that they would be more attracted to attending FFS solely *for* women, led *by* women.

Replication and Scaling Up

The "unspoken rules" for FFS farmers to graduate and then go on to TOT and replicate the FFS process was not made explicit in the programs. While many participants from two Field Schools stated that they very were interested in leading an FFS in the future, they also said they had not received training or advice about how to follow through with this. While one farmer was already participating in the Training of Trainers program, several farmers did not know that farmers *could* lead FFS, nor did they know what a TOT was (personal communication, February 13, and 21, 2006).

The national coordinator of FFS outlined this as being a common issue in Ecuador.

> The biggest problem with FFS is that we often train professionals [versus farmers] and these technicians and experts do not always do more FFS ...they have other work. In reality, less than 20% do FFS after their training. So we see untrained professionals doing the job, or we see unsupported farmers doing the job. (personal communication, February 2, 2006)

As mentioned, the three FFS facilitators involved in this study were untrained in FFS. Yet, they all indicated interest in leading FFS again, and all three have been highlighted as key players in the execution of FFS within the Ecosalud project (personal communication January 13, 23, and February 6, 2006).

Financing

Institutional partners covered the required materials and financing of the three study FFS (50 percent was paid by the Platform and 50 percent by the facilitator's employing institution). FFS members provided in-kind support including labour and lunch food (personal communication, February 11, 16, March 2, 2006). Any money accumulated from the harvest of the FFS fields was to be shared among members.

Transportation is cited as one of the biggest costs in the FFS programs. In the study Field Schools each technician required access to a vehicle for the entire day in order to travel an average of three to four hours (round trip) to the field sites. All of the facilitators sited this as a major logistical and economical issue (personal communication, February 11, 16, March 2).

Researchers explain that with no potential for farmers to contribute to FFS financing, and low replication of the process by farmer facilitators, financing for FFS has become a big issue in Ecuador. Researchers employed in the agriculture sector explain that this issue is tied to changing global patterns in international development.

> As in most of South America, the government has washed its hands of extension here in Ecuador. [It] no longer provides or supports service through funding. There has been an effort to work with NGOs, yet the presence of these has halved since the 1990s. At the same time, donor preferences and international funding has been realigned with interests outside of the agricultural sector, toward urban and health issues... And international funding has moved away from Latin America altogether... (personal communication, February 2, 9, 2006)

It was also explained that the Platform was introduced in order to fill this void and build institutional participation and collaboration, and then later, to incorporate the participation of farmers/producers. "NGOs operate in partnership with the Platform in taking on extension roles, but they do not have big budgets for this" (personal communication, February 9, 2006). Martinez Valle (as cited in North & Cameron, 2003) has summarized that in Ecuador rural development programs have been relegated to the realm of anti-poverty programs and the state has ceased to provide credit, marketing support, and technical assistance to the peasant sector.

The lack of resources and finances and of donor interest has divided people (personal communication, Februrary 16, 2006). The fact that INIAP, the National Agricultural Research Institute has forged a funding relationship with the pesticide industry consortium, CropLife, has further delegitimized the role of the government (and INIAP) (personal communication, February 2, 2006). Ecosalud project staff did not appear to have good relations with the staff at INIAP. One FFS researcher explained that due to trust issues and weak relations, "there is no longer utility in working in collaboration with government" (personal communication, February 2, 2006).

Policy and Regulatory Frameworks

> Breast milk has value but it is free. No one profits ...no sales or taxes are collected ...hence the push to convince mothers to use powdered milk. Such is the case with much of the use of chemicals in agriculture in Ecuador. (Brazilian agronomist, Sebastiao Pinheiro on the topic of Ecuadorian Agriculture and Globalization, CEA conference proceedings, October 27, 2005)

The national coordinator of FFS suggested that any definition of "agricultural development" in Ecuador must include change at the policy level" (personal communication, February 2, 2006). A speaker at the First National Conference on Agroecology in Quito (CEA, 2005) argued that neither industry nor the government have

demonstrated the political will to change the situation with pesticide impacts on health in Ecuador. Neither IPM nor agroecology is supported. The sale of toxic pesticides is not regulated and any laws that do exist target the consumers not the producers. The use of highly toxic pesticides is especially problematic because these products are the oldest and the cheapest and the patents have expired – meaning that the products can be reformulated as generic products for local sale at low cost to the company (FFS expert, CEA, 2005). Government subsidies have included the provision of inputs and chemicals to farmers, and repayment has been required in cash (personal communication, February 2, 2006).

It was also explained that FMC, one of the biggest chemical companies (an American transnational), has a campaign to continue selling very toxic products throughout the third world (personal communication, February 9, 2006). And many agricultural and FFS researchers in Ecuador argue that the biggest barrier to change with respect to health practices in farming are the political connections between people in the pesticide industry and people in government (personal communication, February 9, 2006). It is argued that "there is no clear acknowledgement of the conflict of interest that exists between the private industry and public entities" (FFS expert, CEA, 2005). Some people tied to pesticide interests (including CropLife) have made statements that "intoxications are uncommon" and promoted the "safe use of pesticides." While the World Bank has qualified that "safe use" cannot be viewed as an alternative to the restriction of dangerous pesticides" (Sherwood, CEA, 2005).

One expert (personal communication, January 20, 2006) highlighted that the next steps to improving the issue with pesticide use and health (from greatest to least important) should be:

1. eliminate the most toxic products
2. sustain technologies that are less harmful
3. provide training in Integrated Pest Management
4. promote use of personal protective equipment (PPE)

4.3.4 Field Data: Themes of Pesticide Use, Human and Environmental Health FFS in Chimborazo

Personal protective equipment (PPE) was never mentioned or utilized during any of the FFS sessions during the research period. Since none of the sessions included practical field study or experimentation on potato plants, there was no opportunity to view the handling of pesticides in FFS. During the planting stage, fertilizers were handled, mixed and applied by bare hand. Food and drink were often shared in the field.

One FFS session included a guest speaker from the chemical company FarmAgro.[41] Participants were given a demonstration of pesticide and fertilizer application and they were encouraged to purchase products in bulk to save costs. Chemicals were not highly toxic (blue label) and no protective measures were utilized or mentioned by the salesman. Used products were dumped on the FFS test-field and containers were tossed in an unmarked bin nearby.[42]

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[41] FarmAgro belongs to Food Machinery and Chemical company (FMC), one of the world's largest chemical companies with positions in agricultural, industrial and consumer markets. FMC is a member corporation of CropLife International (FMC Corporation, 2005; and CropLife International, 2006).

[42] In Ecuador a colour labeling system is used on agricultural chemical products. There are four colours, red is the most toxic (dangerous), followed by yellow, blue, and green.

Surveys, interviews and focus groups revealed data from both FFS-farmers and non-participants on themes related to pesticides, pesticide use, health and the environment (See Appendices). The results of these surveys are found in Tables 5-7.

Table 5 Survey Responses from FFS-Farmers on all Topics

#/Gender of Respondents	Question/Answer
10 Males/ Females	**Number of times pesticides sprayed on most recent potato crop?** Average of *2.9 times.*
	Are you involved in preparing the chemicals and applying them? 7 *prepare.* 6 *apply.*
	Do you read the labels on pesticide containers? 5 chose *always.* 2 chose *never.*
	What colours indicate the highest/lowest level of toxicity? 8 correctly identified *red* as highest. 4 correctly identified *green* as lowest.
	Of 8 types of PPE, how many do you: **Know of/always use/never use?** *know of* average of 5, *always use* 1-2 (Rubber boots and plastic back covering were selected most, followed by gloves and long-sleeved shirt. *never use* average of 3 (Goggles was selected most, followed by mask, plastic poncho, then gloves.)
	Reason for non-use of PPE? *Not accustomed to using,* or *items are unknown*
	Identify activities which can cause contamination during the mixing or application of pesticides. Almost all activities were indicated to *contaminate a lot.* (The following activities were selected at least once under *do not cause contamination*: wetting fingers, wind blowing in the face, touching the face/eating during spraying, blowing in hose to clear blockage.)
	Identify bodily symptoms of an intoxication. An average of 7 of the 10 symptoms were identified. (Symptoms chosen most frequently as *non-indicators* were cramps, 5 times; red hands and teary eyes, 4 times; headache, vomiting, salivation and walking as though drunk (1 time).
	Where are pesticides stored? All 10 selected *special room out of the house.*
	Do you think storing food, clothing and pesticides together affects your health? All 10 indicated *yes.*
	How do you eliminate pesticide containers? 7 selected *burn,* 4 *bury,* 1 *throws in the river or ditch.*
7 Females	**Who does what at the farm level?** 7 *launder clothing from pesticide spraying,* 4 *disinfect the field,* 2 *buy the pesticides, 1 applies pesticides/sets traps.* 7 have never *received training about pesticides.*

Source: Author, October 2005-March 2006

Table 6 Focus Group with FFS-Farmers

#/Gender of Respondents	Question/Answer
15 Males/ Females	**Do you experience symptoms attributed to poor management of pesticides?** Symptoms identified by several farmers included *illness, headache, vomiting.* (Farmers indicated that "resistance to poisons" is associated with "physical strength and manliness").

Source: Author, October 2005-March 2006

Table 7 Survey Responses from non-FFS Farmers on all Topics

#/Gender of Respondents	Question/Answer
10 Males/ Females	**Do you use pesticides on your field? If so, number of times pesticides sprayed on most recent potato crop?** 7 *use pesticides.* 6 *sprayed 2-3 times*, one *sprayed 10 times.* 3 *do not use pesticides* at all.
	What colours indicate the highest/lowest level of toxicity? 2 correctly identified *red* as highest, *green* as lowest. 5 were unable to identify. (3 do not use pesticides).
	Of 8 types of PPE, how many do you: **Know of/always use/never use?** *Know of* average of 4.4, *always use* 1.7. (Rubber boots and long-sleeved shirt were selected most. *never use* an average of 3 (Plastic poncho and rubber pants were selected most, followed by goggles, gloves, plastic back cover, then mask).
	Reason for non-use of PPE? *Not important, not accustomed to using, items are uncomfortable, item is unknown, do not need it* (organic farming).
	Do you think storing food, clothing and pesticides together affects your health? All 10 indicated *yes.*
	How do you eliminate pesticide containers? 4 selected *burn,* 3 *bury* (only 7 use)
	What was your reason for non-participation in FFS? Of the 4 who were asked but declined, 2 said *FFS is too irregular,* 1 said *not enough time*, 1 said *do not want to use chemicals.*
6 Females	**Who does what at the farm level?** 6 *launder clothing from pesticide spraying*, 3 *buy pesticides*, 2 *apply pesticides/set traps.* 6 have never *received training about pesticides.*

Source: Author, October 2005-March 2006

In two FFS communities, farmers in FFS, and non-participating farmers both commented that FFS is where farmers learn to use pesticides. "The only users of chemicals are those who have learned the use of pesticides from 'technicians'" (personal

communication, February 5, 2006). Some members reported that they did not use chemicals before joining the FFS and that the rest of the community does not use pesticides at all. These same members explained that they wanted to start using pesticides in order to increase crop output (personal communication, February 5, 21, 2006).

In the Training of Trainers session, biological pest control, organic farming principles and non-chemical test fields were incorporated but human health dimensions were not explicitly mentioned or addressed. The TOT used blue label pesticides that were applied using backpack sprayers. Package recommendations included the use of gloves, boots, and face mask however none of these were utilized. Participants frequently came into hand contact with chemicals and with foliage that had been freshly sprayed. Participants went straight from the field to the lunch table. The women's restroom did not have running water.

Language, Recommendations, and Practices

Amongst representatives from the Ecosalud project, INIAP, and the varying agricultural organizations involved in current FFS, there is a lack of consistency on the *language* surrounding the use of pesticides. The phrases "correct use of pesticides" and "safe use of pesticides" are often used interchangeably to explain best practice. Key researchers explain the there is no such thing as the "safe use" of pesticides (especially for the most toxic products). Farmers, FFS facilitators, technicians, and pesticide representatives/salesmen used this phrase often. FFS facilitators themselves have expressed the want for definitions of "cleaner" production and "more healthy crop management" before they would feel comfortable strategizing to incorporate these themes into development proposals (personal communication, January 11, 2006).

There is also mixed messaging amongst facilitators and other actors regarding *recommendations* on the use of pesticides; and in the *practices* they exhibit at the farm level. Some facilitators advocate for the use of chemicals "only when required," based in "field-level investigation," and then proceed to instruct farmers based on photo images of plants, theoretical information, or traditional tools like the lunar calendar.

Some facilitators stand behind the use of PPE, yet they do not use these items in the field. The same is also true for the disposal of chemical containers. Researchers often argue that asking farmers to use PPE is totally unrealistic, based on current technologies. The coordinator of CIP has researched the topic of PPE and he finds that its use is an impossibility (farmers find it too hot, uncomfortable and costly). It is argued that the focus should be on removing the most dangerous toxins from the market. "Encourage IPM and get pesticides off of the plants and out of farmers' environments" (personal communication, February 9, 2006).

And while nearly all experts stand in firm opposition to the use of any and all of the more toxic varieties of pesticide, the national research institution does not have a clear position on this issue. The messaging here is contradictory since "even the FAO, and CIP have Croplife sitting on the board of the IPM committee" (personal communication, February 9, 2006). And while some contend that the "safe use of pesticides" should be a fixed topic in FFS, others explain that SUP creates a misplaced feeling of safety among farmers and should not be interrelated with FFS at all (personal communication, February 26, 2006).

Similarly, researchers find that it is ridiculous to reduce the notion of health in agriculture to a discussion about protective equipment. They find it is confusing and

contradictory to promote the use of protective equipment since this suggests that continued use is permissible. "There is a big difference between not dying and health." We need a "unified vision for farming in Ecuador" (personal communication, February 1, 2006).

While most technicians and researchers claimed that organic agriculture was not an option for FFS, some technicians suggested that this should be a bigger emphasis in agricultural development in the country. Several of the farmers interviewed outside of FFS indicated that they were able to grow potatoes organically and then sell for $12/qq.[43] Although prices in Ecuador are highly variable for potato, depending on the type of potato, etc. currently, the break-even point for a farmer is $5-8/qq (FFS expert in Ecuador, personal communication, April 3, 2007).

Purchasing Trends

Data gathered from informal conversation with a pesticide salesman at one of the local outlets in Riobamba revealed that no chemicals were available that were of the highest "red level" of toxicity. The salesman commented that these are "sort of banned now" (personal communication, February 15, 2006). The salesman explained that farmers come in frequently but sales fluctuate with the market prices of crops. He stated that farmers "don't ask about colours, they only ask about the cost per quantity ...and what products they should buy ...which ones are best" (personal communication, February 15, 2006).

The salesman explained that he had received some training in the use of agro-chemicals, but "not too much." He was able to identify "blue and green" label chemicals

[43] qq is the symbol for a quintal or 100 pound sack of potatoes. A quintal is equal to roughly 50 kilograms (personal communication, April 3, 2007).

as the lowest toxicity. The store did not carry any personal protective equipment, and the reason stated was that "farmers don't like to spend their money on equipment, they don't ever ask for it" (personal communication, February 15, 2006).

Institutional Relations

Many persons – including farmers, facilitators and researchers on FFS – advocated for vast improvements in the level of communication, cooperation and collaboration taking place amongst facilitators, technicians, and formal researchers in the country. It quickly became apparent that internal relations and politics plagued communication amongst even the most powerful and intricately involved players working on FFS and pesticide use in Ecuador. The situation between those involved with Ecosalud and INIAP was particularly tense; however, there were also breaches in communication and sharing between Ecosalud representatives and other (FFS and pesticide) researchers in the country. The situation appeared to be motivated by misunderstanding, personal history and conflict, insecurity, and genuine concern about cooptation of agricultural development and FFS by private party interests and pesticide companies.

These tensions were not openly acknowledged or addressed. Personal conflicts had inflated to the institutional level and were, in effect blocking development and improvements in the lives of farmers.

The Ecosalud Project

Ecosalud researchers position FFS as a key intervention for project objectives. The first nine new FFS for Ecosalud will be called "Healthy FFS" and will include health topics; preventative versus curative crop techniques; and the use of personal protective equipment (personal communication, January 11, 2006). Many relevant actors in

Chimborazo support this idea – although there are many suggestions and some hesitations about the project. One person tied to the project stated that "themes that affect potato production must be the focus of FFS" (personal communication, February, 16, 2006).

Most experts on FFS and pesticide research in Ecuador hold the opinion that while FFS may be adequate for the topic of IPM, they are not sufficiently tackling the pesticide problem – including human health impacts and the use of personal protective equipment (personal communication, December 7, 2005). FFS facilitators themselves admit that the theme of "correct use" of pesticides is new to them, they are not used to it yet, and they need more training. However, they are optimistic for change in the area of health themes in FFS (personal communication, January 30, 2006).

Although it was unclear whether Ecosalud would utilize facilitators trained through a formal TOT program, the plan was under way to begin by training existing technicians/facilitators in "healthy crop management" (personal communication, January 11, 2006). In this work, "lack of farmer information" was viewed as a significant barrier to health advancements (personal communication, February 2, 2006). Yet, some FFS experts argue that the depth of the Ecosalud training must be longer than the proposed one or two days if the project is to reflect the true design goals and participatory objectives of the Farmer Field School methodology, and not just "transfer of technology" (personal communication, February 2, 2006).

At least one FFS researcher expressed concern with the introduction of Ecosalud as a "new" project – considering that there is ample room to join the work already being done with FFS in the country. The worry was that Ecosalud workers would be isolated from potential partners and focus only on individual goals rather than foster the goals and

the participation of all actors involved in the process. This researcher proposed the reintroduction of a *shared* vision and working partnership which would incorporate actors in agricultural and in human health "...always putting farmers first" (personal communication, February 16, 2006). It was also suggested that chemical vendors should receive training since they are in direct contact with so many (uneducated) farmers (personal communication, February 16, 2006).

One expert with a great deal of experience at the farm level warned that the use of the most toxic chemicals (i.e. Carbofuran) is more widespread than is currently perceived of, or reported in the country. It was suggested that, in some cases, both technicians and farmers exaggerate reductions in the use of these products due to pressure from specialists and project evaluators, and to receive praise and continued funding (personal communication, February 15, 2006). It was unclear whether this was the case in Chimborazo province.

CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Discussion

The State of Farmer Field Schools in Chimborazo, Ecuador

The Farmer Field School methodology has been proposed as a more participatory and lasting alternative to traditional forms of extension education. FFS is set apart by the strong emphasis on people-centered experiential learning. Farmer Field Schools, like any other approach, are a tool, and their effectiveness depends on both the *context* and the way in which they are *implemented* in practice. The case study data presented in Chapter 4 revealed that although FFS in Chimborazo, Ecuador are enjoyed and appreciated by farmers and they exhibit some successes in terms of knowledge transfer, relationship-building and broader development goals; overall these FFS fail to represent a paradigm shift in agricultural extension and in many ways are emulative of earlier extension traditions.

The unique political, economic and cultural *context* of Ecuador presents unique challenges for FFS implementation. Many of the micro-level problems and challenges faced by farmers in Chimborazo and the FFS program correlate to the profound changes which have taken place in the economic and political context of the country. Political crises in recent years have spawned abrupt changes in the national government. Poverty levels in the countryside are high and have been exacerbated by Liberal economic policies – narrowly focused on free markets and globalization. These policies have had particularly harmful consequences for agriculture and the rural sector including the drastic reduction of public expenditures for agricultural research and development.

The responsibility for funding and support of agricultural programs has been decentralized and relegated to local-level actors, yet governmental funding has been slow to funnel through to municipalities. And in Ecuador, there is little political or institutional will to take on the responsibilities of agricultural extension. Many NGOs have surfaced or evolved to assume these responsibilities – however these organizations are often torn between prioritizing and addressing peasant goals, and more prescriptive approaches to rural development which emphasize productive projects for markets. It has been stated that the public institutional crisis in Ecuador and the withdrawal of FAO from FFS was the catalyst event which led INIAP to accept funding from CropLife, the pesticide consortium.

Overall, the implementation of structural adjustment programs in Ecuador has had many detrimental impacts, especially for the small-scale rural farmer. The cumulative impact – including agricultural policies which prioritize neither sustainability nor equity – has limited the opportunity for Andean farmers to use their knowledge, culture, and productive practices to build more healthy and equitable societies.

The case studies demonstrated that, in small part, failures in impact of FFS correlate with flaws in the initial *design* of the FFS methodology. Some "methodological flaws" which could be targeted include the fact that there are no explicit targets or goals for *women's participation* in FFS programming, *farmers* are not formally designated as facilitators, there is no clear process outlined regarding *follow-up* action plans after graduation, and the ownership of *financial responsibility* for FFS is not clearly identified. Findings from the three case studies of FFS in Chimborazo revealed that there is much

disagreement amongst experts on these topics and on "best practice" for FFS. Further, each of the FFS exhibited difficulties in these areas.

Foremost, the case study findings demonstrated that FFS are at the greatest risk of failing due to weaknesses in *delivery* of the process – when the methodology is put into practice incorrectly, or ineffectively. Specifically, findings demonstrated weaknesses in the following areas: *maintaining the FFS process* (through session planning and institutional support); *quality of facilitation, facilitator training and quality of learning*; addressing *farmer realities* (through curriculum and program objectives); *program reach* (toward social and gender equity) and *dissemination of impact*; and *scaling-up impact* (toward cost-effectiveness).

Issues of *program delivery* corresponded to issues with the donor or *implementing organizations* of FFS in Chimborazo – namely the Provincial Potato Platform and INIAP. In Chimboazo, the Platform works with and oversees many Farmer Field Schools. While the aim of the Platform is to work collaboratively with public and private actors to link small potato farmers with markets, in the cases studied, Platform objectives and the "Plan of Production" seemed to overshadow Field School objectives to engage farmers in training and investigation in pest management and reduce reliance on pesticides. Indeed, in the FFS programmes studied in Chimborazo, given the absence of participatory process, the title of "Farmer Field School" is altogether questionable.

The central problematic areas, or areas of failure, for the three study Field Schools are as follows:

Maintaining the FFS Process

The biggest issue for all three Field Schools was the way in which each of them failed to maintain the FFS process. Although FFS are designed to comprise approximately 15-16 sessions over at least seven months, after six months of field research only 10 sessions had taken place for all three FFS combined! Session planning and coordination was extremely weak and facilitators often failed to consider community realities including scheduling conflicts with local cultural activities, and difficulties in relaying messages about scheduling changes.

Institutional support from the Provincial Platform was intermittent and unreliable. And the danger of this institutional reliance was made evident when Field School sessions all but came to an end when the support of the Platform began to waver due to its own internal issues. Some facilitators were left with more responsibilities in their own work and without some of the key resources for FFS (including access to seeds and a vehicle). The trend of canceling and skipping sessions also created an internal snowball effect whereby both farmers and facilitators became increasingly frustrated and unmotivated to participate as time passed and attendance declined; each blamed the other.

Quality of Facilitation and Learning

Poor quality of facilitation seemed to correlate to poor quality of learning. Since not one of the three central FFS facilitators was trained in FFS they were not well-equipped to implement the participatory action-oriented learning process of the methodology. All of the facilitators were primarily trained and employed as agricultural and/or animal technicians and so they appeared quick to revert to practices of knowledge-

transference and "teaching farmers" information and skills stemming from their own areas of expertise.

Facilitators also held many other responsibilities in their jobs and they complained of being over-worked and under-motivated for the extra work that FFS sessions entailed. At times, it appeared as though the pressure to fulfil institutional objectives and the Platform's Plan of Production was very strong and may have directly detracted from the capacity-building goals of FFS.

A power dynamic and a cultural disconnect between farmers and technicians also appeared to impact upon the quality of facilitation and learning in FFS. Farmers viewed all outside aid workers as educated and important "engineers from the city," while technicians viewed farmers as passive and dependent (upon outside help). It appeared as though technicians were ill-equipped to understand or adapt to the local culture. Instead, cultural qualities were perceived of as barriers to formal learning and progress in the communities. Language barriers also made it very difficult for some farmers to connect with the technicians, and this likely made the work less appealing for the facilitators who were non-natives of the communities.

Addressing Farmer Realities

In Chimborazo, the connection of Farmer Field Schools to the Provincial Potato Platform appeared to both *help* and *hinder* FFS in addressing farmer realities. It was clear that farmers needed to learn the skills and capacities to determine which markets to enter and the resources to be able to pursue these options. And farmers themselves outlined *credit, access to seeds* and *market prices* as key areas of concern for them. Accordingly, the Platform's thematic focus on production and marketing was of great interest to them.

However, farmers explained that they also expected that FFS would guide them in learning how to produce in a safe manner with lower amounts of pesticides. And evidence indicated that not all farmers in FFS have the know-how to identify pesticide toxicity levels, handle products using protective equipment, or properly dispose of containers. Some FFS farmers related having experienced health symptoms of a pesticide intoxication.

The objectives of the FFS overwhelmingly appeared to be driven by the Provincial Platform's "Plan of Production" and its quotas for the production and sale of potatoes. A representative from INIAP – who equated "agricultural development" with farmer earnings – described how FFS provide a direct link to farmers – "who will provide the production to the Platform" (personal communication, February 2, 2006). Platform members themselves have proposed solidifying this relationship and the focus on production by mandating that all Platform members be FFS trained, and held accountable for potato quotas. Two FFS facilitators confirmed that their roles in FFS were tied directly to the objectives of the Platform. Observed FFS sessions were dominated by topics of credit programming, production costs and the use of pesticides. One presentation from a pesticide vendor even promoted "reduced costs for bulk purchases."

In the case studies, the co-dependent relationship between the Provincial Platform and Field Schools meant that the institutional goals of the Platform regarding potato production appeared to supersede interests to ensure environmental and social sustainability for farmers. Rather than working to foster the development of farmer capacities and management skills, the Platform appears to be creating dependency amongst farmers. The farmers are perceived more as beneficiaries than as actors. Near the

end of the research period farmers both in and outside of FFS explained that they were becoming disillusioned with the FFS program, and bothered by the overly strong focus on economics and production for the Platform. Even the Platform project coordinator suggested that the institutional presence in FFS is too strong – warning that "There will never be sustainability with this degree of paternal dependency."

Program Reach and Dissemination of Impact

Arguably the weaknesses of these FFS, in terms of program reach (toward social and gender equity) and dissemination of impact (to farmers outside of FFS), were due in some part to design flaws in the methodology, but in greater part to implementation issues and the unique cultural context of the Field Schools.

The FFS design outlines that "where possible, the FFS should reflect the socio-cultural heterogeneity of the interest group," yet there are no explicit targets or program goals for women's participation. The numbers of women participants were left to chance. Although evidence of women's participation in FFS in Ecuador was akin to men's, women were often the last ones to arrive and the first to leave FFS sessions. The role of women did not appear to be valued and there were no special arrangements made to account for local traditions and realities which inhibit their free participation. Although men have begun to promote the role of women in farming, this is simply because of their own need to leave the farm in search of urban work. Both women and men reported that a "machismo" culture still deterred women from potato farming and from full participation during sessions. The traditional division of labour has remained strong and women's roles in childcare mean that they are often unable to join or fully participate in FFS. Their lower levels of formal education and poor understanding of Spanish also meant that they

were unable to follow the rote-learning style implemented in these cases of FFS – including the heavy reliance on lecturing and note-taking. It is noteworthy that a woman farmer has never facilitated an FFS in Ecuador.

Social equity is difficult to assess in the Ecuador cases, since it is unclear – even in the methodological design – whether FFS is *meant* to reach high numbers of farmers. Regardless, it was apparent that non-participating farmers would have been keen to participate, had they been asked. However, it appears that – especially since the development of the Platform – the selection process, for both communities and for farmers, tends to be based more on the interests of the organizations than the interests of farmers. FFS participants outlined that "peones," or labourers were responsible for many farm-level tasks, including the application of pesticides and harvesting. However, since the availability of land was a requirement for farmer participation in both FFS and TOT sessions, these workers would be unlikely to receive FFS training.

Regarding dissemination of impact beyond the FFS, the methodology design outlines that the "most important factor is the construction of a plan for follow-up." Yet again, the particulars of expected actions for farmers are not made explicit. In the context of the three case studies, farmers, facilitators and researchers alike were clearly conflicted about if, and how, they should follow-up with activities aimed at "disseminating impact" to greater numbers of farmers.

Replicating, Scaling up and Cost-effectiveness

The three case studies did not appear to be moving toward increased replication, scaling-up or cost-effectiveness of the FFS process. The design of FFS does not explicitly state that all facilitators be trained farmers. In the case studies, it was accepted that all

three facilitators were technicians from outside of the community. No doubt, the integrity of each FFS was altered by the fact that technicians seemed overworked and under-motivated to conduct regular sessions. Meanwhile, FFS participants perceived these external technicians as "experts" who would deliver information while they themselves listened and took notes. This situation potentially served to aggravate the power imbalance between the farmers and the urban technicians who facilitated the Field Schools. Further, there was no indication that farmer graduates would carry on the FFS process – many were not even aware that this was an option for them to pursue.

In terms of cost-effectiveness, the use of technicians in the place of farmers severely affected the expense of each Field School due to salary expenditures and high transportation costs. Gallagher (2003) has stated that transportation is one of the biggest costs in an extension programme. As outlined in Section 2.1.3 in the FFS design, there is an explicit goal for FFS groups to become independent and seek local support separate from external funding. In these three cases, no expectations were placed on the farmers to finance the Field Schools. One hundred percent of funding came from the partner organizations; and profits from the test fields were to be shared rather than re-invested in future FFS. Considering the high cost of implementation and the low appropriation of the methodology by farmers, it would seem that there is little hope for FFS to become more cost-effective or for the process to be scaled-up to reach greater numbers of farmers.

Using Farmer Field Schools in Ecosalud Programming

The goal of Ecoslaud is to "improve the welfare of rural residents by improving the sustainability of agricultural production systems in the Andes of Ecuador – in terms of the reduction of health risks and the promotion of health benefits."

As outlined, the Ecosalud project includes a heavy reliance on FFS as an intervention strategy aimed at "changing farmer behaviours and reducing exposure to pesticides." Accordingly, the project details several specific goals to be achieved through Field Schools. These goals are as follows: the promotion of *healthy sustainable crop management* and *personal protective equipment* (PPE); *farmer empowerment* and the promotion of *social equity* (particularly the participation of women); *scaling-up of impact* to the household and community level and increased *public awareness* of pesticide health risks and opportunities; and improved *stakeholder involvement* amongst agricultural and health sectors, from the community to the national level, concerning pesticide issues and appropriate interventions.

Healthy and Sustainable Crop Management

In the FFS study cases it would be very difficult to utilize sessions to teach healthy sustainable crop management given that the programming was so weak and the sessions were so erratic. Information about health concerns was not a focus of sessions and neither facilitators nor technicians had adopted the themes or practices of "pesticide risk reduction" at the field level. Cultural issues also seem to be an issue since Ecuadorian farmers both in and outside of FFS confirmed that notions about pesticide resistance are commonly associated with physical strength and notions of "manliness."

Finally, many agricultural and FFS researchers in Ecuador outlined that the "biggest barrier to change with respect to health practices in farming" are the "political connections between people in the pesticide industry and people in government." INIAP is responsible for overseeing nearly every FFS in the country and they were also responsible for initiating the campaign for the "safe use of pesticides." It is possible that

this conflict of interest might explain why pesticide policies in Ecuador are targeted at consumers rather than producers, and why the notion of "safe use" seems to be acceptable to many facilitators and farmers associated with FFS. Both farmers in FFS and non-participating farmers were heard to explain that FFS is where farmers *learn* to use pesticides, and many FFS sessions were indeed heavily focused on this topic.

Promotion of Personal Protective Equipment (PPE)

Several FFS experts have stated that the promotion of PPE is an unrealistic goal for FFS – given current technologies. Farmers both in and outside of FFS confirm that they are very much unaccustomed to using many of the equipment options and discomfort is a big deterrent. Experts want to see the focus shift to getting "pesticides off of the plants and out of farmers' environments." Many of these same experts would contest that it is confusing and contradictory to promote the use of protective equipment and to suggest that continued use of pesticides is permissible.

Achievement of Empowerment and Equity Goals

FFS in the three case studies seemed to promote some degree of empowerment and social equity goals. The number of women participants neared that of men, and women members reported that increased economic understanding led them to feel more valued within their families. Many participants also reported improved awareness about broader market demands and marketing strategies. However as mentioned, design flaws, implementation flaws, and cultural barriers all served to prevent the full participation of women and of landless farmers in FFS. Field Schools do not appear to work to challenge these barriers and the use of external technicians can actually *amplify* inequities.

Scaling-up Impact and Increasing Public Awareness

The case studies suggest that relying on FFS to scale up impact to the community level and increase public awareness of pesticide health risks and opportunities may not be advisable. Both the literature and key FFS experts in Ecuador highlight that the key to scaling-up impact is through the horizontal process of FFS farmer graduates enrolling in TOT training and replicating the FFS process. In Ecuador, less than 20 percent of farmers do this. In the case studies, untrained professional were leading FFS and there was no indication that farmer graduates would carry on with the process in the future. The use of technicians versus farmers also severely affected the cost-effectiveness of FFS which would correspondingly limit the potential for scaling-up the methodology.

The messaging from FFS experts about information dissemination is mixed, and it is equally unclear within FFS whether farmers are *meant* to intentionally share their knowledge outside of the group. While farmers seem keen to do this, and some non-FFS farmers have reported that this was happening, overall, participants were unable to provide any specific examples about how they would disseminate what they had learned.

Increased Stakeholder Involvement

Finally, the Ecosalud project has in fact been working to improve stakeholder involvement amongst agricultural and health sectors from the community to the national level. Yet at the same time, the FFS approach does not *guarantee* improved communication between farmers, facilitators, technicians and researchers. Indeed, the use of external technicians in FFS has potentially served to *strengthen* the power imbalance between community dwellers and city dwellers. While most FFS participants report

improved relations with the Platform, they have also complained that facilitators are only interested in farmer problems if the "Plan of Production" is under threat.

It became clear that in and beyond Chimborazo province, those involved with Farmers Field Schools and with agricultural and pesticide issues held a variety of different perspectives on the *meaning* of "agricultural development" and the intended *role* of an FFS. While some actors would propose the use of FFS to organize farmers and increase their *competitiveness* to *improve production* and be inserted into markets; others would use FFS to improve farmer *capacities* and *empower* them to understand and alter the agricultural systems around them. While the first position might entail a vision of agricultural development directed toward *meeting* market *demands*, the second position might advocate for self-initiated farmer action aimed at the *creating* of favorable market *conditions*. The various stakeholders involved in health issues in potato farming were as equally divided on the notion of "best practice" for farmers in FFS – including the "safe" or "correct" use of pesticides in FFS.

5.2 Conclusion

This research set out to determine whether the Farmer Field School is an appropriate methodology for achieving the human health goals of the Ecosalud project in the context of Ecuador. Field studies of three FFS in the Andes have demonstrated that the methodology was plagued by *design flaws* and especially by weaknesses in *implementation*. Further, the unique Ecuadorian *context* comprises a political and economic climate that places a particular focus on increased potato production and reliance on pesticides.

The national government has all but withdrawn support for FFS, but other interested parties like the Provincial Platform continue to support them. However, such organizations appear to be torn between objectives to fulfill crop quotas and marketing contracts, and objectives to fulfill the capacity-building goals of Farmer Field Schools working to improve the sustainability of agricultural production systems and the reduction of health risks. In short, it may be difficult to use FFS to pursue reductions in pesticide usage since, in reality it appears as though both INIAP and the government are positioned to benefit from the ongoing sale and use of pesticides in Ecuador.

Beyond Highland Ecuador

These case studies have served to highlight issues and tensions which might develop in Farmer Field Schools in any context – where development agendas are torn between objectives to achieve *sustainability for the environment and for humans*, and objectives directed at ensuring that small-scale farmers are able to *enter markets and compete* in an ever-globalizing world where conditions favour success for the large-scale producer and reliance on external inputs to meet market demands.

The negative repercussions of pesticide use on human health are not isolated to Ecuador. The intensification of agriculture and promotion of agro-chemicals has occurred in most low and middle income countries. According to the World Health Organization, (as cited in BBC, 2004), up to 25 million farm workers in the developing world suffer an incidence of pesticide poisoning each year. Konradsen (2006) explains that "acute pesticide poisoning has become a major public health problem with more than 300,000 deaths each year around the world" (p.1). And the World Bank (2007) has found that pesticide overuse, misuse, lack of formal training, and inadequate protection while

handling pesticides are all widespread problems in developing countries. In the interest of human and environmental health then, it would appear that intervention is in order.

The Future of Ecosalud and Recommendations for Further Research

The Ecosalud project has proposed using Farmer Field Schools as an intervention strategy aimed at "changing farmer behaviours and reducing exposure to pesticides." However, given the distance that lies between Ecosalud project goals and the current state of FFS in Ecuador, project administrators will have to make some important decisions concerning both the *methodological design* of FFS and especially strategies for *practical implementation* of the approach. If the case studies in Chimborazo are indicative of the work in other farming communities that Ecosalud wishes to reach, then project success and sustainability will necessitate some important *organizational changes* within the institutions and partnerships responsible for FFS implementation. Some recommendations for Ecosalud include the following:

Institutional Relations

The three case studies revealed that marketing topics are clearly of interest to small-scale potato farmers who – in the new open market context of Ecuador – require the skills and capacities to determine which markets to enter and the resources to be able to pursue these options. At the same time, the Ecosalud project is a small project with neither the economic nor institutional resources to run FFS on its own. Building a strategic alliance with the Potato Platform is a wise option. However, the scenario of co-dependence between the Platform and FFS will have to be resolved in order for Ecosalud to achieve its goals regarding health and equality themes in FFS.

Ecosalud must recognize that FFS in Chimborazo appear to be dependent on the Provincial Potato Platform. At the same time, there is evidence that FFS within the Platform are quite weak and that over-reliance on the Platform for institutional and financial support can create a very fragile situation for the Field Schools. This seems especially true when the responsibility for maintaining FFS is placed in the hands of just one representative within the Platform. Accordingly, Ecosalud could ask and encourage the Platform to increase the resources dedicated to organizing, managing and administering Farmer Field Schools.

With respect to FFS content, the evidence suggests that in Chimborazo, FFS that started out with a focus on integrated pest management have evolved to take on a more diverse range of issues, and currently, the marketing of crops appears to be central. It has even been said that the line is now blurred between a Field School and a micro-enterprise scheme or production system operating for the Platform. While farmers obviously benefit from and appreciate any market advantages that result from such institutional support for the production and marketing of their crops, this is not the intent of a Farmer Field School and is not the intent of the Ecosalud project.

Clearly, Ecosalud and other relevant actors must work to resolve this situation and rebalance priorities in FFS. A first step is to ensure that every Field School is requested by farmers, financed (at least in part) by farmers, and run by farmers. If the three cases studies are indicative of broader trends in farming communities, then marketing themes can and should remain a focus in FFS, however, technical assistance from the Platform should not be forced. Participants might benefit from being transferred greater ownership of FFS and of the overall learning process in order to decrease external dependency and

empower farmers with the required skills and capacities to manage production and negotiate new market relations independently – thereby improving overall sustainability in the long term. The challenge for Ecosalud will be to gradually reduce external reliance and to re-organize FFS around people, not markets.

With specific respect to health themes, it is again likely that change is needed. The Platform's "Plan of Production" entails quotas for potato production, but there are no quotas for social or environmental targets. Even the coordinator of the (Fortipapa) Platform project has expressed concern that "things cannot keep going as they are, with farmers and the environment being contaminated by inputs ...the focus must be on two things, production and social aspects of farmer's lives" (personal communication, February 15, 2006).

Ultimately, actors in Ecosalud would likely benefit from a firm decision regarding if and/or how they will work with the national research institute. INIAP is responsible for overseeing nearly every Field School in the country and for leading TOT for FFS. It will be difficult to develop a separate parallel system for the training of facilitators and implementation of FFS. Gaining buy-in from INIAP for the insertion of Ecosalud themes into TOT programmes would mean vastly higher numbers of farmers would be impacted over a shorter time span. However, this could undermine the goals of Ecosalud given the uncertain motivations of INIAP regarding pesticide use. An INIAP associate has explained, "we are living a contradiction, while we promote agroecology, we also have agreements with some enterprises and with producers of various agro-chemicals" (personal communication, February 2, 2006). Accordingly, Ecosalud should only proceed in its use of INIAP programmes if the agroecosystem health dimension can be effectively

pursued inside INIAP. Compromise with the "safe use of pesticides" approach would only undermine Ecosalud goals.

Finally, Ecosalud coordinators might benefit from more diverse institutional partnerships and a process for broader institutional learning. There are various researchers in the country involved in interesting and promising work in the area of pesticide impacts on human health and interventions for change. Many of these experts are particularly knowledgeable about FFS experiences throughout the country. And yet there is almost no cooperation or communication amongst these researchers. Some researchers even perceive of Ecosalud workers as being exclusionary and they would like to see this change. Since the health issue impacts upon numerous areas, institutional ownership, funding, and support could potentially be shared amongst the different sectors of health, agriculture, education, irrigation and environment.

Organics

Another option for Ecosalud to advance its health objectives would be to reintroduce the option of organic agriculture into the range options available to farmers in FFS. Ecosalud is so-called because of its alignment with the Ecosystem Approach to Human Health, or "Ecohealth" research initiative. Under this initiative, "health" is defined as a "state of complete physical, mental and social well-being and not merely the absence of disease" (World Health Organization, as cited by IDRC, 2005). However, the project goals of Ecosalud tend to equate "health improvements" with "reductions in pesticide exposures." As one FFS researcher explained, "there is a big difference between not dying and health." The methods of organic agriculture can offer clean production methods without many of the negative consequences. Promoting the organic market

might create a demand for crops which are not only safer for the producers, but for the consumers as well. This is surely a great step closer to the holistic vision of Ecohealth which conceives of health as more than merely the absence of disease.

While the field work exposed many perceptions about the viability of organic farming in Ecuador, farmers were encountered that were part of an organic agriculture micro-enterprise, which included the farming, organic-labeling, and sale of organic potatoes at competitive prices (personal communication, February 5, 2006; FFS expert, personal communication, April 4, 2007). These farmers were under the impression that *no one* in their community used pesticides – "unless they had learned to in FFS!" (personal communication, February 5, 21, 2006).

Language, Recommendations, Practice

Throughout Ecuador, FFS stakeholders – including farmers, facilitators, researchers, and government officials – have different understandings of the concept of "agricultural development," different ideas about the intended *role* of a Farmer Field School, and different suggestions for "best practice" concerning pesticide use and health practices in FFS. Messaging from Ecosalud seems to be unclear and weak – whereas the messaging from chemical marketers and vendors is unified and clear in advancing the continued use of pesticides in potato farming in Ecuador. Ecosalud might benefit from acting quickly to make informed and firm decisions regarding themes of pesticide use in FFS – including PPE and waste disposal. These decisions should be translated into recommendations and clearly communicated to farmers, facilitators, researchers, government and the general public. Importantly, those working in the field must also remain steadfast in emulating "good practice" as defined by the Ecosalud project.

Facilitation of FFS

Ecosalud would likely benefit from the use of TOT trained *farmers* in the place of externally recruited *technicians* with little or no training in the FFS methodology. Farmer-facilitators can increase community buy-in of the program as well as the participation of women. Their example to farmers in the program might also increase motivation and confidence levels to replicate the FFS process after graduation. Utilizing farmer facilitators is also a cost saving strategy since they live in or near the community and have reduced transport and salary costs compared to formal extensionists (Gallagher, 2003).

Under this model, close attention should be paid to the broad needs of the facilitator and to the progression of the overall process. External agricultural technicians should only visit Field School sessions intermittently in order to support farmer-facilitators on specific technical topics. Researchers working in the formal science of agro-ecology should do the same in order to bridge the "gap between the laboratory and the farm field" (ex-coordinator of the Provincial Platform, personal communication, December 7, 2006).

Cost Effectiveness

With respect to financing of FFS, Ecosalud workers should consider that there is very little core funding available in the country for FFS-type initiatives. Since Ecosalud itself is externally-funded, this means that the long-term sustainability of FFS could be threatened. Transferring some of the responsibility over to farmers, while not popular in Ecuador, has been shown to work elsewhere. Auto- or semi-auto financing of FFS has

also been shown to increase ownership of the program, which might be a means to address the high drop-out rates experienced by FFS in Ecuador.

Recommendations for Further Research

Based on analysis of the three Farmer Field Schools in Chimborazo, further research is certainly warranted. It should be stressed that the research only incorporated three FFS over one cycle of FFS in Chimborazo province. Accordingly, it is not possible to surmise whether these Field Schools and the problems identified are typical or *representative* of other FFS in the region or elsewhere in Ecuador – or conversely, whether these cases are *exceptions* to the norm. For example, an in-depth study of communities where INIAP-trained farmers had facilitated the FFS process would further understanding of the contribution of IPM toward achieving human health and sustainable farming goals through FFS. It would also be worthwhile for other researchers and practitioners of FFS to engage and reflect on the case studies outlined here, in order to identify any commonalities or trends which may exist and the potential need for intervention or further research in Ecuador.

The pressure on Ecosalud to involve itself with "safer use of pesticide" programs invites research on the emergence of such "green-washing" by agricultural chemical firms in other parts of Ecuador and in other countries. Have other FFS programmes been co-opted in this manner? What have been the responses of FFS organizers and their supporters?

Martinez Valle (as cited in North & Cameron) outlines that organic production (particularly for specialty export markets) is both "politically and economically viable" as a policy option in Ecuador (p. 104). And Hellen and Higman (2003) outline both the

potential for small-scale organics and the difficulties that might discourage organic agriculture in Ecuador. This theme surely needs to be further explored for its implications for both IPM FFS and Ecosalud goals in the country. Have FFS moved further in the direction of organic agricultural production in other countries? What challenges have they faced and how have they overcome them? Have they been successful at integrating such production into larger marketing chains? What alliances have emerged between promoters of FFS and fair trade and organic marketing organizations?

Final Words...

Decades of experience with various development models world-over has indicated that *economic* gains alone are not sufficient development goals; they do not "trickle down" to meet the immediate material and social needs of disadvantaged people. Further, associated *technological* advances often come at a *cost* to natural and human environments. The case of Ecuador is no different. Due to relatively recent changes in the global market, small-scale farming is undergoing a shift away from subsistence farming toward commercial orientation and bigger scale production for markets, supermarket chains, and even the world market. Meanwhile, small-scale potato farmers are becoming increasingly pauperized. And amongst these smallholders, the use of pesticides to try to gain or maintain market access has meant devastating impacts on human health.

As mangers of their rural environment, farmers have a role and the right to participate in reducing their own health risks. In order to end the reliance on pesticides and achieve human health goals through use of the Farmer Field School methodology, Ecosalud will need to rely on strategic alliances with its partners. Yet project administrators will need to work intentionally to cultivate a culture of cooperation

between institutional actors with diverging interests and philosophies. Above all, stakeholders must work to ensure that project goals are not undermined by competing objectives which might serve to advance economic *profit* before the health of *people*.

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Appendices

Appendix A Calendar of Research Events

Research Event/ Meeting/ Conference	**Date**	**Location in Ecuador**	**Duration** ***X** = Cancelled Event
	2005		
Meeting with Ecosalud project coordinator and team re: project work	Oct. 5	Traveled from Quito to Quero, to Riobamba	1 day
Met with community leader for a tour of the area and local projects	Oct. 6	Riobamba and surrounding communities	1 day
Emailed (FFS) contacts in Ecuador, read FFS documents	Oct. 8-9	Quito	2 days
Met with Ecosalud coordinator, met all of CIP staff, spoke with relevant actors	Oct. 10	Quito	1 day
Attended Provincial Platform meeting, met with key actors and presented thesis proposal	Oct. 12	Riobamba	1 day
Started refresher Spanish classes with basic Quichua instruction	Oct. 13- 24	Quito	7 days
Work and research at CIP library, met with CIP contacts	Oct. 21	Quito	1 day
Worked on thesis proposal , met with Ecosalud coordinator	Oct. 24-25	Quito/ Riobamba	2 days
Attended Ecosalud meeting, presented thesis proposal, decided on case study communities and partners	Oct. 26	Riobamba	1 day
Attended "First National Conference on Agroecology and Seed Fair"	Oct. 27- 29	Quito	3 days
Worked/ researched/ scheduled work at Fundacion Marco – the office of Agricultural Assistance and Training (which coordinates the Platform)	Nov. 1/ Nov. 4	Riobamba	1.5 days
Attended FFS session to observe etc.	Nov. 7	Cebadas, Chimborazo	1 day
Attended FFS session to observe etc.	Nov. 8	Totoras, Chimborazo	1 day
Attended Training of Trainers (TofT)	Nov. 9	Totorillas, Chimborazo	1 day
Meeting with FFS farmers from Carchi province at Fundacion Marco	Nov. 14	Riobamba	X
Attended FFS session to observe etc.	Nov. 15	San Fransisco, Chimborazo	1 day
Attended 2nd Provincial Platform	Nov. 16	Riobamba	1 day

meeting			
Met with FFS researcher (ex-CIP employee) at World Neighbours	Nov. 18	Quito	½ day
Work/ research at CIP	Nov. 21	Quito	1 day
FFS session #2	Nov. 22	Cebadas	X
TofT session	Nov. 22	Totorillas	X - No transportation
TofT session #2 (day 2 of 2)	Nov. 23	Totorillas	1 day
Thesis planning meeting with Ecosalud coordinator	Nov. 25	Quito	½ day
FFS session #2 (siembra)	Nov. 26	Totoras	X
FFS session #2	Nov. 28	Cebadas	X- Missed ride?
FFS session #2	Nov. 29	San Fransisco	1 day
Submitted thesis proposal to all partners in Ecuador (including INIAP, requested permission to continue attending TofT	Nov 29 Dec. 2	Riobamba	2.5 days
FFS session #2 (plot planting)	Dec. 1	Totoras	X
Met with Ecosalud coordinator and Ecosalud's Canadian research partner to review thesis	Dec. 5	Riobamba	Several hours
Attended Ecosalud provincial meeting (sharing of initial results).	Dec. 6	Riobamba	1 day
FFS session	Dec. 7	Cebadas	X
Meeting with partners at CIP about their work and my own	Dec. 7	Quito	1 day
TofT session #3	Dec. 6-7	Totorillas	X- Did not attend (at request of INIAP)
FFS session #2	Dec. 9	Totoras	1 day
Meeting with potential research assistant	Dec. 10	Riobamba	Few hours
Drafted proposal for research partner at CIP (requesting input for survey questions). Translated ethics consent forms.	Dec. 11	Riobamba	Few hours
FFS session	Dec. 12	Cebadas	X – No transportation avail. (Alt. facilitator?)
Meeting with a second potential research assistant (hired her)	Dec. 12	Riobamba	Few hours
Researched at CIP. Met with CIP partners (two) and Ecosalud project coordinator. (Christmas Party)	Dec. 13	Quito	1 day
Worked on survey questions for FFS farmers (with CIP partner)	Dec. 14-17	Quito	1.5 days
Meeting with head of INIAP	Dec. 16	Quito	X
Worked at CIP (library research)	Dec. 16	Quito	½ day
Meeting with head of INIAP	Dec. 19	Quito	X

Meetings with two FFS facilitators	Dec. 20	Riobamba	X
TofT session #4	Dec. 19-20	Totorillas	X – Did not attend (at request of INIAP)
Met with research assistant, worked on survey questions for FFS farmers	Dec. 20	Riobamba	Several hours
Informal interviews with three FFS facilitators re: input for thesis focus (only one was successful)	Dec 21	Riobamba	3 hours
Worked on surveys/ interviews	Jan. 2-5	Riobamba	4 days
Spoke with all FFS facilitators to try to learn 2006 FFS schedule (none scheduled)	Jan. 5	Riobamba	½ hour
Attended 2006 planning meeting for two partner organizations (re: FFS etc) (no planning done)	Jan. 7	Riobamba	Several hours
Meeting with Provincial Platform coordinator at Fundacion Marco	Jan. 9	Riobamba	X- learned he resigned the position
Met with research assistant to work on survey / interview questions	Jan. 10	Riobamba	½ day
Attended 3rd Provincial Platform meeting, spoke with FFS facilitators re: issues with FFS scheduling	Jan. 11	Riobamba	1 day
Met with Ecosalud project coordinator re: thesis research interviews / surveys	Jan 11	Riobamba	Several hours
Attended Ecosalud meeting with provincial health workers	Jan. 13	Riobamba	1 day
Met with FFS thesis research student	Jan. 14	Quito	Several hours
Meeting with head of CIP	Jan. 16	Quito	X
FFS session	Jan. 17	San Fransisco	X
Attended platform meeting re: new coordinator	Jan. 19	Riobamba	Several hours
Attended 1st ever meeting of FFS working group	Jan. 20	Quito	½ day
Attended non-FFS meeting (with many members)	Jan. 23	Riobamba	1 day
Re-evaluated research possibilities! Completed drafting all interview questions, reviewed with assistant and FFS researcher	Jan. 23- 29	Riobamba	3.5 days
FFS session	Jan. 30	Cebadas	X
Met with another FFS facilitator	Jan. 30	Riobamba	Several hours
Interviewed FFS researcher at her home	Feb. 1	Quito	Two hours
Interviewed coordinator of	Feb. 2	Quito	Two hours

Ecosalud project at CIP			
Interviewed head of INIAP at INIAP	Feb. 2	Quito	Two hours
Interviewed another FFS researcher at World Neighbours (part 1)	Feb. 2	Quito	Two hours
Attended 2nd planning meeting for two partner organizations (re: FFS etc)	Feb. 4	Riobamba	Several hours
Interviewed non-FFS farmers and one Provincial Potato Platform member	Feb. 5	Cebadas	1 day
FFS session	Feb. 6	Cebadas	X- sharing of Ecohealth results with farmers/FFS members
Interview with FFS facilitator	Feb. 6	Riobamba	X
Interviewed ex-coordinator of Provincial Potato Platform	Feb. 7	Riobamba	2 hours
Interviewed head of CIP (and worked at CIP)	Feb. 9	Quito	2 hours
Interviewed 1st FFS facilitator	Feb. 11	Riobamba	2 hours
FFS session; surveying and focus group session with FFS participants	Feb. 13	Cebadas	1 day
Meeting with research assistant	Feb. 15	Riobamba	X – did not show up
Attended Provincial platform meeting (new coordinator selected)	Feb. 15	Riobamba	½ day
Interviewed INIAP representative on the Provincial Platform	Feb. 15	Riobamba	½ hour
Interviewed new Provincial Platform coordinator	Feb. 15	Riobamba	½ hour
Met with research assistant to review completed interviews	Feb. 15	Riobamba	1.5 hours
Interview with 2nd FFS facilitator	Feb. 15	Riobamba	X
Interviewed 2nd FFS facilitator	Feb. 16	Riobamba	2 hours
Meeting with FFS researcher at World Neighbours and continued interview (part 2 of 2)	Feb. 16	Quito	1.5 hours
Worked on presentation of preliminary results for all stakeholders in Chimborazo province, and tried to get in contact with 3rd FFS facilitator for interview etc.	Feb. 17-March 1	Riobamba and Quito	Several days
FFS session	Feb. 20	Cebadas	X – bus strike, roads blocked
FFS session	Feb. 20	Totoras	X- moved to the 21st
FFS session, interviewed the one	Feb. 21	Totoras	½ day

FFS participant who showed up. Interviewed a few non-FFS farmers			
Attended FFS curriculum revision meeting under Ecosalud project	Feb. 22	Riobamba	½ day
Interview with 3rd FFS facilitator	Feb. 22	Riobamba	X – did not show up
Met with research assistant to review interviews, went to chemical/ pesticide vendor to conduct informal interview	Feb. 22	Riobamba	½ hour
Attended 2nd ever meeting of FFS working/ research group – (another thesis student's presentation of preliminary findings)	Feb. 23	Quito	½ day
Organic farming fair	Feb. 24	Cebadas	X- No transportation
Presented preliminary results for all stakeholders in Chimborazo province at platform meeting (and feedback session)	March 1	Riobamba	½ day
Interviewed 3rd Facilitator	March 2	Riobamba	1 hour
Met with research assistant to review all data	March 3	Riobamba	1 day

Appendix B Interview for Farmer Field School Facilitators

Preliminary Questions

1. What is **your** current involvement with ECAs?
2. How were you chosen to facilitate the ECA?

Part A: Transdisciplinarity

I - ECAs

3. What do you think **the role** of an ECA is?
4. Do you believe that ECAs are the **most useful** method for improving agricultural development?
5. What is your opinion of how the ECA is running so far?
6. What are the **biggest problems** that you encounter?
7. What do you think could be done **to fix** these problems? (How do you think that the ECAs can be improved for the future)?

II - Facilitating

8a.) Did you have any **training** to lead ECAs (CDC?)
b.) What (if any) training **materials** do you use?
9. What are your thoughts about the amount of sharing and communication that goes on **amongst facilitators / between facilitators and researchers?**
10. What could be done to make your job as a facilitator **easier**?
11. With respect to human health,
What do think the biggest **"roadblock"** is for improving the **correct use of pesticides** by farmers?

Part B: Participation

12. How was that **community** chosen to have an ECA? Who decides this?
13. How were each of the **members** chosen?
14a). Were the farmers involved in the planning of the **curriculum** for the ECA?
b.) What is your opinion about the level of farmer participation in **research and sharing during** each ECA session?
15. Who **pays** for the ECA and the costs of materials (seeds, pesticides etc.)?

Part C: Equity

16. Do you encourage farmers to **share information** with others in the community? (How?)
17. Do you do anything in particular to facilitate the participation of **women** in the ECA?
18. What do you think can be done to **improve women's** participation?

Part D: Other Support Systems

19. Do you think that there is a need for **other support structures** for farmers? (i.e. dias de campo, or Provincial Potato Platforms)
20. How do you think that the work of the Chimborazo Provincial **Potato Platform** is linked to ECA's?
21. Do you have any ideas about how the Platform could be **improved** so that these systems better compliment each other?

Anything else you would like to add?

* If you think of anything, even after I leave PLEASE contact me!

Appendix C Interview for Farmer Field School Researchers/Technicians

Preliminary Quesitons
1. What is **your** involvement with ECAs?

Part A: Transdisciplinarity
I - ECAs
2. What do you think the role of an ECA is?
3. Why were ECAs introduced to Ecuador?
4. Do you believe that ECAs are the **most useful** method for improving agricultural development here in Ecuador (Chimborazo)?
5. What do see as the **strengths** of using ECA's here (Chimborazo)?
6. What do you believe are the biggest **issues/challenges** associated with ECA's in Ecuador?

II – Planning for Agricultural Development
7. If you had to define **"agricultural development"** how would you do it?
8a.) How would you describe the role of **local government** in agricultural development in Ecuador?
b.) How would you describe the role of **local government and policy makers** in specific regard to **pesticide use** in potato farming?
9. What is **your position** on the use of pesticides to manage the potato crop in Ecuador? (What do you recommend?)

III – Transidsciplinary Work
10. What are your thoughts about the level of communication and sharing that goes on **between researchers and facilitators of ECAs -** concerning the content and implementation of ECAs?
11a). Importantly, what are your thoughts on the level of communication/sharing that goes on **amongst researchers** on the topic of potato crop management and pesticide use?
b.) What (if anything) would you like to see change regarding this issue?
12. With respect to human health, what do think the biggest "roadblock" is for improving the **correct use of pesticides** by farmers?
13. Would is your advice regarding **future use of ECAs** for improving production and human health in potato farming communities of Ecuador?

Part B: Participation
14. Do you think researchers are sufficiently "in touch" with the specific issues/realities of **farmers?**
15. In your experience, do you feel that ECAs are succeeding at **increasing farmer participation** in research and education on potato crop management?

Part C: Equity
16. Who decides **which communities** get chosen for an ECA?
17. Who decides **which farmers** participate in ECAs?
18. Who **funds** ECAs in Ecuador (Chimborazo)?
19. What are your thoughts on the **participation of women** in ECAs?

Part D: Other Support Systems
20. Do you think that ECAs need to be complimented by **other learning systems and support structures**? (p.e. dias de campo, radio broadcasts, or Provincial Potato Platforms)
21. Are **you involved** with the Provincial Potato Platform of Chimborazo?
22. How do you think the work of the Chimborazo Provincial Potato Platform is linked to ECA's?
23. Do you have any ideas about how the Platform could be improved so that these systems **better compliment** each other?

Anything else you would like to add?
* If you think of anything, even after I leave PLEASE contact me!

Appendix D Interview for Platform Members (Chimborazo Province)

Preliminary Quesitons

1. What is **your** involvement with ECAs and other potato programs in Chimborazo?
2. How were **you chosen** to be in involved in these programs?

Part A: Transdisciplinarity

I - ECAs

3. What do you think the role of an ECA is?
4. Do you believe that ECAs are the **most useful** method for improving agricultural development here in Ecuador (Chimborazo)?
5. What is your opinion about how ECA's are running here in Chimborazo?
6. What do you believe are the biggest **issues or challenges** associated with ECA's here in Ecuador?
7. What do you think could be done **to fix** these problems? (How do you think that the ECAs can be improved for the future)?
8. With respect to human health, what do think the biggest "roadblock" is for improving the **correct use of pesticides** by farmers?

Part B: Participation

9. Do you feel that researchers are sufficiently "in touch" with the specific issues and realities of **farmers?**
10. In your experience, do you feel that ECAs are succeeding at **increasing farmer participation** in research and education on potato crop management?

Part C: Equity

11. What are your thoughts on the **participation of women** in ECAs?
12. What do you think can be done to **improve women's** participation?

Part D: Other Support Systems

13. How do you think that the work of the Chimborazo Provincial Potato Platform is linked to ECA's?

Appendix E Focus Group Questions for FFS-Farmers

Part 1 - Transdisciplinarity

1. What were your **expectations** for the ECA? (What did you hope to learn or experience?
2. Are those expectations being **met**? (Are you satisfied with the FFS?)
3a). For yourself, what are the **best parts** of the FFS?
b). What do you think could be done to improve FFS – to help farmers like yourselves in the future?

Part 2 - Participation

These questions are about **your participation** in all aspects of the ECA:

5a.) Did you participate in the decision to have a FFS **in this community**?
Yes ____ No ____
b.) Were you involved in the decision of themes and topics to be studied in this FFS?
Yes ____ No ____
c.) Do you participate (actively), and share your own ideas during **each of the FFS sessions**? (do you feel comfortable doing this?)

Part 3 - Social Equity

6. What is going to happen with the harvest from the crop planted in this FFS?
7. Do you (actively) share what you have learned in this FFS with other farmers that are not a part of this FFS? (If yes, explain how you do this, and with whom?)
8. After you graduate from this FFS, would you like to facilitate a FFS (and take TOT training) (if yes, do you think that you will be able to do this? Explain...)

WOMEN PARTICIPANTS:

9. Is it difficult for you **as a woman** to participate in this FFS?
10. What things would **make it easier** for women to participate in FFS in the future?

MEN PARTICIPANTS:

11. Yourselves, as men, what do you think about the participation of women in FFS?

ENTIRE GROUP:

12. At any time, have you experienced bad effects on your health from using pesticides in your field? (or has any anyone in your family? Explain...).

Extra Questions:

A) How did you find out about this ECA?
B) Would you be willing to **pay** to be involved in this ECA?

Appendix F Survey for FFS-Farmers

Topics Relating to Potato Production in the Ecuadorian Andes

Community: _____
Date: _____

*** Use an "X" to indicate each of your answers**

Section A. - General Information

1. Sex: Male ___ Female ___
2. Age: ____ years
3. What is the main material of the house you live in? (circle one)
   1. Block or brick ___ 2. Adobe or mud wall ___
   3. "Bareque" ___ 4. Wood ___
   5. Mixed (brick, wood) ___ 6. Other, specify _____

4. Does the house have electricity?
   Yes ____ No ____

5. In your household, who carries out different activities related to the potato crop?

Activity	Husband	Wife	Both	Sons/ Daughters	Other (Specify)
a. Buying the tools					
b. Preparing the earth					
c. Disinfecting the ground					
d. Buying the fertilizers					
e. Buying the seeds					
f. Sowing					
g. Weeding					
h. Applying traps					
i. Buying pesticidas					
j. Applying/ spraying the pesticides					
k. Preparing the food					
l. Harvesting					
m. Selling					
n. Washing the clothes from pesticide application					

6. From the list, choose the 3 most crucial or serious farm-level problems that you experience.
   ***Use Number 1** to indicate the issue that is the biggest or **most serious** for you in the field.
   1 = the biggest problem 2= the next biggest problem 3= the third

   * If you think that something is missing from the list, please tell me and we will add it.

   a.) Enfermidades of potatos ___
   b.) Enfermidades of animals ___
   c.) Quality of potato seeds ___
   d.) Human health problems ___
   e.) Selling of your potato crop ___
   f.) Environmental problems ___

g.) Frost ___
h.) Access to credit ___
i.) Transportation of potato-related goods ___
j.) Supply of labour ___
k.) Access to training ___
l.) Storage of potato harvest ___
m.) Water supply for your potato crop ___
n.) Market prices ___
o.) Quality of soil ___
p.) Access to technical assistance ___
q.) _____
r.) _____

Section B. – Information about Pesticides / Pesticide Use

7. Do you read the labels that are included on pesticide packaging? (circle the response)
Never ___ Once in a while ___ Always ___

8 a.) On pesticide container labels, what colour indicated the **highest level** of toxicity?
Red ___ Blue ___ Green ___ Yellow ___

b.) What colour indicates the **lowest** level of toxicity?
Red ___ Blue ___ Green ___ Yellow ___

9. In the last crop of potatoes you harvested, how many times did you apply pesticides(or pesticides mixed with fungicides?
____ times

10.a.) Do you participate in the preparation of pesticides?
Yes ___ No ___

b.) And also in the application of pesticides?
Yes ___ No ___

c.) What personal protection equipment (PPE) do you use when you use pesticides?
*__First,__ put an "X" beside every item that you know about (or have heard about).
__Then,__ for each one of these items, indicate the frequency of use.

personal protective equipment (PPE)	Yes, I know about this item	Never Use	Sometimes Use	Always Use
Gloves				
Rubber boots				
Plastic ponch				
Rubber pants				
Plastic back cover				
Long sleeved shirt				
FACE mask				
Goggles				

11. If you **DO NOT** use protective equipment, or you do not use it often, what is your reason?
*choose **ONLY** the most important reason
* If you have another reason that is not on the list, please tell me and we will add it.

a. I don't know about the those items ____
b. The equipment is not available in the agroquímicos store ___
c. The equipment is available, but the price is very expensive ____
d. The protective equipment is uncomfortable to use ____

e. I don't believe that they are important to use ____
f. Other reason? _____

Section C – Information about your Environment

12. Where do you keep the pesticides that you buy?
    a. In the room where you sleep ___
    b. In the kitchen ___
    c. In a special room, away from the house ___
    d. Other place: _____

13. Do you think that it affects health to keep food, clothing, and pesticides together?
    Yes ____ No ____

14. How do you dispose of pesticide containers?
    a. Throw in the river or stream ___ c. Burn ___
    b. Bury ___ d. garbage collection truck ___
    e. Reuse ___ For what? _____
    f. Other _____

Section D. – Information about Health

15. Do you think that each of the following activities is able to cause pesticide contamination *while you are* mixing or spraying?

Activity	**Will not contaminate**	**Will contaminate a little bit**	**Will contaminate a lot**
Getting your back wet while spraying			
Getting your hands or fists wet while spraying			
Blowing the fuse of the pump when it is obstructed or covered			
Smoking while spraying			
Eating while spraying			
Touching your face with your fingers			

16. Which of the following symptoms do you think are symptoms of a pesticide intoxication:

Symptoms / signs	**Yes**	**No**
Nausea		
Headache		
Sweating Dizziness		
Cramps		
Vomiting		
Salivation		
Red hands		
Tears from the eyes		
Drunk-like walking		

Section E – Information about Late Blight (la lancha)

17. What causes la lancha?
a. Rayo ____
b. A mushroom ____
c. Rain ____
d. Fog ____

18. Why does la lancha appear in rainy and humid times?
a. Because humidity and rain cause la lancha ____
b. Because humidity and rain permit the fungus that causes la lancha to grow and be able to infect other plants ____
c. Because the potato plants are weakened with excess of humidity and rain ____
d. Because with too much rain it is not possible to apply fungicides ____

19. What happens with la lancha when we sow in high places or in the less rainy season?
a. It increases la lancha ____
b. Potatoes become more durable (resistant) to la lancha ____
c. The fungus of la lancha grows less ____
d. Nothing changes, la lancha continues the same ____

20. The variety of Gabriela is an example of a potato variety that when it was introduced to farmers, it was not ill with la lancha. Today it is a variety that is easily affected by la lancha. Why was the reason for this change?
a. The variety Gabriela changed and now can be infected with la lancha ____
b. The mushroom that causes la lancha changed and now can make Gabriela ill ____
c. The climate has changed and now Gabriela is sick with la lancha ____
d. The excess of chemicals has made it so that Gabriela is sick with la lancha ____

Section F – Information about Economics

21.a) Do you earn money from any other crops or animals besides the potato?
Yes ____ No ____
b) Does MOST of your income come from potato farming?
Yes ____ No ____

22 a.) Are you currently enrolled in a credit program that lends you money?
Yes ___ No ___
b.) If you are not, would you like to be?
Yes ___ No ___

23.) a). Do you sell your crop at market, or to some type of company?
Yes ___ No ___
b.) If not, do you have enough crop available that you **would like to** sell?
Yes ___ No ___

Section G – Information about Other Support Systems

24. Prior to this FFS, had you ever received information or training on pesticides?
Yes ____ No ____

25.a) Indicate **all** of the training or information services that you are **currently** involved with:
a. Farmer Field Schools ___
b. Farmer Field Days ___
c. Other courses/ workshops ___
d. Provincial Potato Platform meetings ___

b) If these types of services were available to you, would you likely participate in them?
Yes ___ No ___

26. If you are **not** currently involved with the Provincial Potato Platform, are you **aware** of it?
Yes ___ No ___

27. Do you need / want assistance with the marketing of your crop?
Yes ___ No ___

THANK YOU FOR YOUR PARTICIPATION!!

Appendix G Survey for Non-FFS Farmers

Topics Relating to Potato Production in the Ecuadorian Andes

Community: _____ **Date:** _____

*** Preliminary Questions**

1. Is the potato one of your most important crops?
Yes ___ **No** ___

2. Would you like to participate in this survey related to potato farming practices in Ecuador? (To help me with my thesis research for a university in Canada)
Yes ___ **No** ___

3. Consent Form Complete? / Copy Given?
Yes ___

Section A. - General Information

1. Sex:. Male ___ Female ___

2. Age: ____ years

3. What is the main material of the house you live in? (circle one)
a. Block or brick ___ b. Adobe or mud wall ___
c. "Bareque" ___ d. Wood ___
e. Mixed (brick, wood) ___ f. Other, specify _____

4. Does the house have electricity?
Yes ____ No ____

5. In your household, who carries out different activities related to the potato crop?

Activity	Husband	Wife	Both	Son/ Daughter	Other (Specify)
a. Disinfecting the soil					
b. Buying the fertilizers					
c. Buying the seeds					
d. Sowing the crop					
e. Weeding					
f. Applying traps					
g. Buying pesticidas					
h. Applying/ spraying the pesticides					
i. Preparing the food					
j. Harvesting					
k. Selling					
l. Washing the clothes from pesticide application					
m. Attending courses on protecting the crop					
n. Attending courses on protecting human health and the environment					

6. From the list, choose the 3 most crucial or serious farm-level problems that you experience.
*__Number 1__ = most important issues, then **2, 3.**
* If you think that something is missing from the list, please tell me and we will add it.

a.) Potato Infirmities ___
b.) Animal Infirmities ___
c.) Quality of potato seeds ___
d.) Human health problems ___
e.) Selling of your potato crop ___
f.) Environmental problems ___
g.) Frost ___
h.) Access to credit ___
i.) Transportation of potato-related goods ___
j.) Supply of labour ___
k.) Access to training ___
l.) Storage of potato harvest ___
m.) Water supply for your potato crop ___
n.) Market prices ___
o.) Quality of soil ___
p.) Access to technical assistance ___
q.) _____

Section B – Information about Other Support Systems

7. Have you received information or training on pesticides?
Yes ___ No ___ If yes: _____

8.a) Indicate **all** of the training services or information sessions you are involved with currently:
a. Farmer Field Schools ____
b. Farmer Field Days ___
c. Other Agricultural courses/ workshops ___
d. Provincial Potato Platform meetings ___
e. Other _____

b.) If these types of services were available to you, would you likely participate in them?
Yes ___ No ___

9a). Do you receive **any** assistance from **any** institution at this time?
Yes ___ No ___
b). If yes, what institution? _____

10. Are you aware of the FFS currently happening in this community?
Yes ____ No ____

11. Were you asked to participate in the FFS?
Yes ____ NO ____

12. What is your reason for **not participating** in the FFS?
a. Did not know about it ____
b. Not interested ____
c. Do not feel comfortable attending training sessions / workshops ____
d. Did not fit the requirements ____
e. Do not have enough time / money ____
f. Other _____

13a). How many people do you know in this community that are involved in the FFS?
a. one or two people ____
b. approximately 5 people ____
c. more than 10 people ____

b). Do any of these people ever share information with you that they learned in the FFS?
Yes ____ No ____

14. Are you aware of the "Provincial Potato Platform- Chimborazo"?
Yes ___ No ___

15. Do you need or want assistance with the marketing (sale) of your crop?
Yes ___ No ___

Section C. – Information about Pesticides / Pesticide Use

16.a) On pesticide container labels, what colour indicated the **highest level** of toxicity?
Red ____ Blue ____ Green ____ Yellow ____

b.) What colour indicates the **lowest** level of toxicity?
Red ___ Blue ___ Green ___ Yellow ___

17. With respect to your last potato crop, how many times did you apply pesticides (or pesticides mixed with fungicides)? ____ times

18. a. Are you yourself involved in the mixing or applying of pesticidas?
Yes ____ No ____
b. Which types of personal protection equipment (PPE) do you use when you mix and apply pesticides?
c.) What personal protection equipment (PPE) do you use when you use pesticides?
*__First,__ put an "X" beside every item that you know about (or have heard about).
__Then,__ for each one of these items, indicate the frequency of use.

personal protective equipment (PPE)	**Yes, I know about this item**	**Never Use**	**Sometimes Use**	**Always Use**
Gloves				
Rubber boots				
Plastic ponch				
Rubber pants				
Plastic back cover				
Long sleeved shirt				
FACE mask				
Goggles				

19. If you **DO NOT** use protective equipment, or you do not use it often, what is your reason?
*choose **ONLY** the most important reason
* If you have another reason that is not on the list, please tell me and we will add it.

a. I don't know about the those items ____
b. The equipment is not available in the agroquímicos store ___
c. The equipment is available, but the price is very expensive ____

d. The protective equipment is uncomfortable to use ____
e. I don't believe that they are important to use ____
f. Other reason? _____

Section D – Information about your Environment

20. Do you think that it affects health to keep food, clothing, and pesticides together?
Yes ____ No ____

21. How do you dispose of pesticide containers?
a. Throw in the river or stream ___ c. Burn ___
b. Bury ___ d. garbage collection truck ___
e. Reuse ___ For what? _____
f. Other: _____

Section E. – Information about Economics

22. Do you keep track of all of the money that you spend on your potato crop each season?
Yes ___ No ___

23a.) Are you currently enrolled in a credit program that lends you money?
Yes ___ No ___
b.) If you are not, would you like to be?
Yes ___ No ___

24a.) Do you sell your crop at market, or to some type of company?
Yes ___ No ___
b.) If not, do you have enough crop available that you **could** sell?
Yes ___ No ___

THANK YOU FOR YOUR PARTICIPATION!!

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