Monitoring Adherence to the International Code of Conduct

Highly Hazardous Pesticides in Central Andean Agriculture and Farmers' Rights to Health

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The WHO has advocated monitoring adherence to the Food and Agriculture Organization's Code of Conduct to reduce use of highly hazardous pesticides in lower and middle income countries. We re-framed Code articles in terms of farmers' rights and drew on survey data, farmer focus group results, and direct observations of agrochemical stores in Ecuador and Peru to construct indicators reflecting respect for such rights. Use of highly (Ia and Ib) and moderately (II) hazardous pesticides was common. Worse indicators were observed in places with lower education, greater poverty, and more use of indigenous languages. Limited government enforcement capacity, social irresponsibility of the pesticide industry, and lack of farmers' knowledge of the Code were all factors impeding respect for farmers' rights. Addressing the power imbalance among social actors requires informed farmer and farmworker participation in monitoring adherence and active involvement of non-governmental organizations and municipal governments. *Key words*: pesticides; developing countries; vulnerable populations; Human Rights; prevention and control; Food and Agricultural Organization; code of conduct.

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INTRODUCTION

There exists widespread international concern about the hazards associated with some pesticides and their inadequate conditions of use. In 2002, the United Nations Food and Agriculture Organization (FAO) adopted a revised "Code of Conduct on the Distribution and Use of Pesticides" (subsequently referred to as "the Code"[1]) that establishes voluntary norms for all public and private entities involved in the distribution and use of pesticides. Although the Code strongly emphasizes the correct agricultural use of pesticides, its impact on reduction of risks to human health and the environment may remain limited precisely because of its voluntary nature.[2,3]

In 2006, FAO produced a Guide to Monitoring Observance of the Code,[4] in which adherence to Code provisions would be jointly monitored by non-governmental organizations, researchers, and farmer and farm worker organizations. Pesticide industry organizations have produced an Industry Guide to the Implementation of the Code[5] that provides a template for monitoring their members. However, small farmers in developing countries, who are disproportionately affected by pesticide poisoning, may have little awareness of the Code, let alone involvement in monitoring efforts.

In 2007, an FAO Panel of Experts on Pesticide Management called on civil society organizations to become involved in the monitoring of adherence to the provisions of the code.[6] In response, the authors re-analyzed data from two projects implemented by the International Potato Center (CIP) in Peru and Ecuador. In both projects, our research teams had collected data that documented pesticide distribution, use, and management practices and that we could use as proxy indicators of adherence to Code provisions. Qualitative data from Ecuador, collected during participatory research on farmers' knowledge of the Code of Conduct, also suggested that framing the provisions of the Code in terms of farmers' rights could promote farmers' participation in decisions related to the use and management of pesticides. Our specific objectives in this paper include:

1. To present a framing of the Code provisions in terms of farmers' rights;
2. To use proxy indicator data on farmer knowledge and practices associated with pesticide use to monitor

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A wall mural produced in one community in central Ecuador proclaims that "Our rights" include "Not buying very hazardous pesticides like those with a red label," and "That pesticides be sold under regulatory controls." All photos by Jackeline Arevalo.

adherence to specific articles of the FAO Code of Conduct, reframed as fulfillment of farmers' rights; and
3. To identify potential demographic, community, and macro variables associated with these indicators in light of a framework of how various social, economic, and agricultural factors influence farmers' crop management and pesticide use.

Persistent Problems of Hazardous Pesticide Use

Despite efforts of the FAO, the activities of the agrochemical industry,[5] and the commitment to pesticide regulation by some governments,[7] adverse health effects related to pesticide use remain widespread:

1. The burden of pesticide poisoning in lower and middle income countries continues to grow. Despite the fact that these countries use only 30% of the total production of pesticides in the world,[8] 53% of the 1.3 billon agricultural workers globally are in developing countries[9] and more than 50% of acute pesticide poisonings occur in developing countries.[10] In Ecuador, for example, reports of cases of mild pesticide poisoning per annum increased from 363 in 1990 to 2,163 in 2000.[10] The incidence of mild poisonings in the Central American subregion demonstrated a progressive increase from 6.3 per 100,000 inhabitants in 1992 to 19.5 in 2000,[11] with likely continued under-reporting.[12] In Brazil, which accounts for almost half of pesticide consumption in Latin America, an estimated 540,000 rural agricultural workers are poisoned annually, with approximately 4000 deaths per year.[13]
2. Extremely and highly hazardous pesticides (World Health Organization [WHO] types Ia and Ib, respectively), including organophosphates and carbamates, are among the 12 pesticides most used on crops in Latin America, Asia, and Indonesia.[7,11,14–26]
3. Official and industry responses to pesticide dangers often focus on narrow "safe use" programs, ignoring deeper social and economic factors, and demonstrating small farmers' vulnerability.[2,21–28] These factors include volatile macroeconomic conditions that leave small farmers with limited options, as well as lack of basic infrastructure, including water and sanitation facilities, adequate housing, and agricultural extension programs.[3,12,14,15,17,19,29]
4. The use of incentives in the form of commissions on sales of agrochemicals for the distributors of pesticides persists, despite international support for a policy of restriction of hazardous pesticide use within the framework of integrated pest management programs.[30]

This ongoing situation calls for a reframing of the Code of Conduct as a tool to confront the vulnerability of those whose health is disproportionately affected by pesticides. Framing the Code in terms of farmers' rights can help elucidate the inequalities inherent in the current system of pesticide marketing and use, as well as transform the Code into a tool for community decision-making around—rather than technocratic management of—pesticide use.

FAO CODE OF CONDUCT AND ITS MONITORING: REFRAMING AS FARMER RIGHTS

A reframing of the Code in terms of farmers' rights was suggested during some of the co-authors' work as

A wall mural produced in one community in central Ecuador demands that stores that sell pesticides "should sell quality, low cost personal protective equipment." At the right, the mural explains the meanings of pesticide label colors: Red and yellow labels are for more hazardous pesticides, while blue and green labels signify less hazardous options. The bottom of the mural reads, "Rights."

TABLE 1 UN Food and Agriculture Organization's (FAO) Code of Conduct Articles on Pesticide Use and Management, Framed as Farmers' Rights, with Extent of Adherence in Peru and Ecuador Study Locations

Code of Conduct Article	Framed as "Farmers have a right to…"	Extent of Adherence[a]
Article 3: Pesticide Use & Management	a. access good quality protection equipment at low enough prices in all the places where pesticides are sold.	Poor quality and price, though some available
	b. receive technical training on integrated pest management and alternative practices including non-chemical approaches to crop management.	Poor, varies across provinces/cantons
Article 5: Reducing health and environmental risk	a. receive information on pesticides which are less hazardous to people's health and the environment.	Fair
	b. count on collection services for used pesticide containers, bags, and packaging.	Poor throughout
Article 7: Pesticide use and availability	a. have access to pesticides of less toxicity so that their application and use would not require use of complicated and costly protection equipment.	Fair, price major disincentive
	b. demand that the import and sale of highly hazardous pesticides, such as those with red labels, be banned.	Poor at time of surveys, current legislative efforts underway
Article 8: Distribution and trade	a. be sold only pesticides that have been registered, have certified quality, and include expiration dates.	Generally good but in certain sales outlets not fulfilled, particularly for poor small farmers

[a]Rated by researchers on a scale of poor, fair, good, excellent, based on consensus judgement using both quantitative and qualitative data.

researchers on the Ecosalud II project. Ecosalud II was a participatory action research project which took place in three provinces of the central-south Andean region of Ecuador from 2004 to mid 2008. Carried out by the International Potato Center in Ecuador with financing from Canada's International Development Research Centre (IDRC), the project aimed to educate small farmers on healthier and more sustainable crop management, thereby improving the health of small farm households currently using WHO Class Ib and II pesticides.[31] EcoSalud II also sought to understand the drivers of unsafe use of highly hazardous pesticides in agriculture and the ways in which empowerment of small farmers could achieve greater sustainability and improve human health.

As one of its activities, Ecosalud II carried out participatory research on farmers' knowledge of the Code of Conduct in June of 2004 in the province of Carchi, Ecuador.[32] Farmers recognized their vulnerability in contexts where they faced multiple risks.[33] Although the Code was unknown to them prior to the Ecosalud II workshops, the farmers expressed a strong desire to learn more about the Code. They explicitly demanded greater dissemination of the Code contents and greater adherence by government authorities and the pesticide industry to the provisions of the Code.

As a way of summarizing key Code provisions and responding to farmers' demands, Ecosalud II staff (including the first two authors of this paper) drew on the growing environmental justice and health and Human Rights literature[15,17,34,35] to frame Code articles as farmers' rights. In keeping with the FAO statement on the rights of farmers (1989),[36] our framing intended to promote farmers' participation in decisions related to the use and management of pesticides, with the goal of guaranteeing human health and environmental conservation. The first two columns of Table 1 lay out our summary of rights in relation to key Code articles.

The FAO's Monitoring Guide[4] deals extensively with why and what to monitor. Less emphasized are: whom to monitor, how to monitor, for what purpose, and with what feedback. In a 2007 report, FAO's Panel of experts on pesticide management urgently called for the development of impact indicators for monitoring adherence to the FAO Code of Conduct at the country level.[6] They argued that indicators must be able to measure the impact of pesticide use not only in terms of cost-effectiveness in agriculture but also in terms of impact on the health of producers and consumers and on effects on the environment. In response, we used farmer rights as a basis for analyzing variables commonly collected in surveys of pesticide use by farmers and farmworkers in developing countries.

METHODS

Settings

Peru. The research areas in the Andean and coastal regions of Peru were chosen based on intensive use of persistent organic pollutant (POP) pesticides in the past, presence of intensive export-based agriculture, and/or an intensive level of local commercialization near a border.[37] Cañete and Huaral, in the department

Figure 1—Study areas in Ecuador and Peru, South America

of Lima, are characterized by high use of POP pesticides in the past and high use of WHO Class Ia and Ib pesticides at present. Huancayo in the department of Junín is a region of intensive production of potato and other Andean crops; use of hazardous pesticides on potato is common. San Martín, in the Amazon basin, is characterized by intensive rice production. Puno, in the high Andes in the southernmost part of Peru and close to the Bolivia border, has considerable potato and grain production (see Figure 1).

Ecuador. Locations in Ecuador were all in the highlands and were characterized by intensive potato production. Twenty-four communities distributed throughout the central and northern Ecuadorian highlands were selected in five municipalities or cantons: Guano, Guamote, and Riobamba in the province of Chimborazo; Quero in the province of Tungurahua; and Montúfar in the province of Carchi (Figure 1). Within cantons, communities were identified by the Ecosalud II research team in conjunction with local agricultural technical assistance partners through a preliminary assessment of potato production volumes. Meetings were held with community leaders regarding interest in agriculture-health interventions. In communities interested in participating in the project, the EcoSalud research team and local partners carried out "awareness visits" with the broader population, usually during pre-existing community meetings.

Data Collection and Analysis

Our research teams used a mix of quantitative and qualitative methods in the two projects.

1. Surveys

Peru. We selected specific locations within each study area with the support of independent technicians and professionals from the General Directorate of Plant and Animal Health (SENASA), the Ministry of Agriculture (MINAG), and local NGOs working on agricultural issues. We designed a survey to collect information on the production system, use, and storage of POP pesticides; current use and knowledge of pesticides, with a particular focus on WHO Class Ia and Ib pesticides; and farmer awareness and application of Integrated Pest Management (IPM). All interviews were carried out in Spanish on-farm, with those owners and workers available on the day of visit (convenience sample). Trained interviewers hired by the project, usually with backgrounds in agronomy, also had the opportunity to record information on-site and observe technical aspects of pesticide handling. A total of 714 farmers and farmworkers from the five study areas verbally consented to be interviewed: 75 in Cañete, 89 in Huaral, 160 in Huancayo, 165 in San Martín, and 225 in Puno. Although refusals were not specifically recorded, few potential respondents declined interviews once assured of confidentiality by the research team's interviewers.

Ecuador. Four hundred eighty farm households were recruited through home visits to as many households in the community as needed to arrive at 20 per community (convenience sample). No farm households visited refused to be interviewed. During June and August of 2005, agronomists and agronomy students trained by the researchers conducted structured interviews in Spanish, the official language understood in at least basic form by the majority of the population. Interviewees included the household member most in charge of crops and livestock (most commonly a man) and the household member most in charge of the home (usually a woman). The selection criterion for the individuals within the households were: being a farmer between the ages of 18 and 65 years old, having lived in the community for at least the past three years, being literate in Spanish, and agreeing to participate in the study.

Interviewers knowledgeable about agriculture used a standardized questionnaire including topics and drawing items from earlier work in Carchi, Ecuador.[20] Interviewers asked about the type(s) of pesticides used and their respective active ingredients, knowledge about the toxicity of the pesticides and their health impacts, relevant safety practices when handling agrochemicals, and farmer awareness and use of of IPM. All participants provided informed written consent. Respondents were distributed as follows: Guano (98), Guamote (41), Riobamba (59), Quero (163), and Montúfar (119).

Survey data analysis. Survey data were analyzed descriptively using EXCEL (Peru) or SAS version 9.1 (Ecuador). To contextualize our findings, data on proportions illiterate and with first languages other than Spanish were obtained for each location from the corresponding country's statistical agency, in Peru, the National Institute of Statistics and Informatics (*Instituto Nacional de Estadísticas e Informática de Perú,* INEI)[38] and in Ecuador, the Integrated System of Social Indicators of Ecuador (*Sistema Integrado de Indicadores Sociales del Ecuador,* SIISE).[39] We cross-tabulated our constructed farmer knowledge indicators by these relevant ecological data. We also obtained data on the proportions of area populations having unsatisfied basic needs (*Necesidades básicas insatisfechas, NBI*), as collected by the statistical agencies,[40] as an ecological poverty indicator to cross-tabulate with pesticide storage practices that might be affected by resource availability.

2. Focus Groups

Ecosalud II activities in Ecuador included community information sessions related to pesticide health impacts and better use and management practices. At the end of the last set of community sessions, any attendees meeting our inclusion criteria (age 18–60, married, involved in farming, and prior participation in EcoSalud II activities on healthy crop management approaches) were invited to participate in focus groups. At each of 28 meetings, we accepted the first of up to 15 volunteers that met our inclusion criteria and agreed on the date and time of the focus group. Oral informed consent was obtained for the recording of the participants' contributions. Overall, forty groups involving 420 participants were successfully facilitated in Spanish by different leaders during each of two periods. In June 2004, the main author of this paper, at that time the Ecosalud II Project Coordinator, and an assistant facilitated four mixed-gender focus groups in Carchi. In February 2007, two health educators, with experience in the implementation of qualitative information collection techniques, facilitated 16 focus groups in Tungurahua and 20 in Chimborazo of men and women separately. One health educator acted as animator and the other as reporter. In order to guarantee the participation of all group attendees, a ball of yarn was passed among the participants. Each focus group lasted approximately one hour. Conversations about the FAO Code of Conduct included discussion of key articles of the Code (Carchi) or farmers' rights (Chimborazo and Tungurahua) and factors facilitating or limiting fulfillment of these farmers' rights. Facilitators first grouped the transcribed material by gender and community using a cross-case matrix, and then identified themes, including those framed through focus group questions and those emerging from analysis of the transcribed discussions.[41] A final cross-case matrix was constructed by communities and by province.

3. Field Observations

In Ecuador, we also had access to field notes and participatory observations collected during Ecosalud II project activities in Chimborazo and Tungurahua during February 2007. Direct observations were carried out in 17 agrochemical stores, 13 in Chimborazo and 4 in Tungurahua, representing all such stores located in the intervention communities in these provinces. Observations were based on a structured guide and primarily focused on the availability of protective equipment and pest management alternatives to hazardous pesticides. Salespeople present in the stores at the time of the visit were asked about their knowledge of pesticide toxicity and label coding, as well as handling practices. Observations and responses were transcribed into common documents. We constructed a matrix of our findings to contrast similarities and differences across communities.

RESULTS

We present our results as a function of the paired Code articles and the farmers' rights framing as laid out in Table 1.

Article 3: Pesticide Use & Management

a. Farmers have the right to access good quality protection equipment at low enough prices in all the places where pesticides are sold. The majority of farmers in focus groups complained that personal protective equipment (PPE) was not available in most agrochemical stores. In observations of Ecuadorian agrochemical stores, only 1 sold all appropriate PPE, 5 stores sold only gloves, and 11 did not sell any PPE. A substantial proportion of focus group participants added that available PPE was often of poor quality. Further, a majority of farmers noted that pesticide companies, as part of their training activities, sometimes gave farmers PPE but that the quality and durability of this PPE was often poor. Some survey respondents complained that a complete set of PPE was uncomfortable (31%) and costly (28%). Many focus group participants estimated the usual costs of a complete set of PPE as approximately US$45, a substantial sum for a small farmer who only earns about US$5 daily. However, some Chimborazo and Tungurahua focus group participants also mentioned strong negative social pressures on individuals who did use a complete set of PPE. Users were seen as clowns or lunatics, and became objects of community mockery. All these factors resulted in limited regular use of effective personal protective equipment (PPE): only 18% of surveyed farmers in Peru and 31% in Ecuador. Hence, applicators frequently wet their bodies with pesticides during mixing and application.

A substantial proportion of focus group participants insisted that PPE be available where pesticides are sold. They argued that the Ministry of Agriculture should require stores to sell good quality equipment that is reasonably priced, comfortable, sturdy, and designed with their participation. Some focus group participants proposed that the government or the pesticide industry should give farmers a set of a good quality PPE. Currently, neither Ecuadorian nor Peruvian governments promote, require, or control the sale of PPE for small farmers (in contrast to agricultural laborers on large farms covered by Ministry of Labor stipulations in both countries).

b. Farmers have the right to receive technical training on integrated pest management and alternative practices including non-chemical approaches to crop management. Eighty percent of farmers in Peru and 69% of farmers in Ecuador had never heard of integrated pest management (IPM) or integrated crop management (ICM). In Ecuador, the 31% that had heard of IPM were familiar with the following components: crop rotation (62%), hilling-up to manage pests and diseases (41%), and the use of pesticides with different active ingredients to avoid build-up of pesticide resistance in pest populations (33%). Lesser-known and less frequently applied technologies were: use of quality seeds (18%), use of resistant varieties (23%), and application of pest traps (2.5%). Apparently, cultural practices handed down for generations were the most well known and practiced by farmers, while technological packages that required training were less well known. The limited interest of pesticide companies in IPM methods and the very limited government investment in agricultural extension partly explains such lack of knowledge among farmers. In Ecuador, less than 1% of the national budget is allocated to technical assistance programs in general, including agricultural training (Planning Office, National Institute of Agricultural Research, *Instituto Nacional de Investigaciones Agropecuarias* [INIAP], personal communication).

A substantial proportion of farmers who do not use IPM approaches did not want to risk their production with crop management techniques that had not been tried by the majority of the community. A majority of focus group participants identified market pressures for high yields of big potatoes without defects as a major factor impeding adoption of IPM. Limited experience or understanding of IPM was exhibited by the many farmers who indicated that high yields and consumer-desired quality could only be obtained with chemicals, saying IPM approaches result in lower total yields and smaller (lower quality) potatoes. Peer pressure was also important, as those who practiced IPM were seen by the community as unemployed and wasting time, with people making fun of them.

Other focus group participants emphasized the need for local governments to assign budgets for farmer training. They wanted agricultural extension workers to advise them on alternative crop management practices in order to learn more natural ways to care for their crops. They said that they would like to know more about production techniques that would reduce the risks of illness or damaging the soil, while at the same time guaranteeing economic viability.

Another factor identified by farmers as discouraging adoption of IPM was that products necessary for IPM are not readily available at agricultural supply stores. The majority of focus group participants noted that less toxic and more "natural" pesticides (those derived from plants, called botanicals, or those based on microorganisms, called biopesticides) are generally not sold. We confirmed such perceptions through direct observations: only 5 stores offered even organic fertilizer, with no stores offering any biopesticides, traps or other IPM inputs.

Article 5: Reducing Health and Environmental Risk

a. Farmers have the right to receive information on pesticides which are less hazardous to people's health and the environment. Seventy-four percent of farmers surveyed in Peru and 69% of those in Ecuador could not accurately link the label's colored stripe with its corresponding degree of toxicity (e.g. red for extremely and highly hazardous). Generally, the proportion of respondents who understood the label color system varied inversely with the proportion of the non-literate population (i.e. in those locations with higher illiteracy among the general population, fewer respondents understood the labeling) (see Table 2). A substantial proportion of

An EcoSalud staff person (left) interviews an agrochemical vendor, with the products behind on shelves.

TABLE 2 Percentage of Non-literate Population* and Percentage Understanding the Meaning of Pesticide Label Toxicity Color Coding in Five Locations in Peru and Ecuador

PERU	Puno (n=225)	San Martín (n=165)	Huancayo (n=160)	Huaral (n=89)	Cañete (n=75)
Non-literate	8.6%	5.9%	4.5%	4.5%	3.5%
Understand toxicity color codes	12%	24%	15%	36%	43%
ECUADOR	**Guamote (n=83)**	**Riobamba (n=118)**	**Guano (n=198)**	**Quero (n=326)**	**Montúfar (n= 240)**
Non-literate	34.6%	27.2%	17.1%	14.7%	7.2%
Understand toxicity color codes	15%	31%	23%	28%	58%

*Non-literacy in Peru is taken from INEI (Instituto Nacional de Estadísticas e Informática) according to the 2005 census. The non-literacy rate in Ecuador is taken from SIISE (Sistema Integrado de Indicadores Sociales del Ecuador) according to the sixth and fifth population censuses and the fifth housing census, 2001. In both countries, the indicator relates to populations 15 years and older.

focus groups participants said that farmers not understanding the labels either did not make distinctions in regards to toxicity or relied on pesticide smell or their own experience as an indicator of toxicity.

On average, 65% of farmers surveyed in Peru and 67% in Ecuador reported never having received training on the adequate use of pesticide products, with the proportion being higher among women than men. Pesticide salespeople were the most common external source of information on pesticides for 42% of respondents in Peru and 30% in Ecuador. However, only 19.2% of Ecuadorian respondents mentioned having received information from salespeople on safety measures when handling pesticides, while 54.6% received this information in Peru. A substantial proportion of Montúfar farmers noted that salespeople most frequently provided information related to application dose, while that related to toxicity, risks, and safety measures was not provided. At best, salespeople may tell farmers to read the labels before using any particular product.

However, such an approach may depend greatly on a salesperson's own abilities and training. Although some salespeople (particularly those hired by pesticide companies) have agronomy training, many small store owners have none, despite Code (article 8.2.7) and Industry guide (article 8) stipulations. We observed an illiterate, indigenous woman managing a pesticide store and a food store side by side in one community, with no orientation by her pesticide company suppliers.

Our ecological analysis found that locations with the lowest proportions of respondents understanding labels also had the highest proportions of the general population for whom Spanish was not their native language. In both Puno, Peru, and Guamote, Ecuador, the majority of the total population is indigenous, 60.8% and 92.6%, respectively.[39,40] In the rural population in Puno, 47.5% cite Quechua and 43.8% cite Aymara as their spoken native languages, and only 8% Spanish as their first language. [38] Article 3.4.4 of the Code states: "The pesticide industry and sales agents must ensure that each pesticide container contains information and instructions in a language and form such that farmers clearly understand pesticide risks." Despite this, in both Ecuador and Perú pesticide label instructions are only available in Spanish, not any indigenous languages.

b. Farmers have the right to collection services for used pesticide containers, bags, and packaging. An average 59% of Peruvian farmers and 30% of Ecuadorian farmers surveyed (weighted averages) stored pesticides in unsafe places, including bedrooms, kitchens, and other rooms in the house. A substantial proportion of focus group participants noted that building a warehouse or a special room outside the house for pesticide storage was beyond their economic means. Given that more than 60% of the population in one canton in Ecuador (Guamote) and all locations in Peru except Huaral had unsatisfied basic needs,[40] it should not be surprising that poverty is an important deterrent to construction of farm facilities for safe storage of pesticides.

The majority of farmers in focus groups reported an almost universal lack of municipal or industry-supported services for pesticide container disposal, in keeping with survey responses that many farmers discarded pesticide containers in their fields (Table 3). Discarding containers in rivers or other water sources was also frequently reported. No focus group participants had ever heard of any proposal from the government or the pesticide industry for disposal of toxic agricultural waste. They were concerned about being charged for this service by local governments, and felt that the pesticide industry should develop concrete proposals to remedy the situation. In fact, during EcoSalud II activities, Montúfar farmers successfully advocated for the municipality to establish a pesticide container collection day. However, the Ecuadorean municipality was forced to negotiate for weeks in order to obtain permission to do so in an adequate fashion at a nearby cement plant. Unfortunately, due to cost, this was a one-off occurrence that could not be maintained. In Peru pesticide companies have recently come together to set up a pesticide disposal facility in the lowland region of the coast, but no such facility existed at the time of our study.

TABLE 3 Percent Reporting Current Use of Various Methods for Empty Pesticide Container Disposal, by Location

Action[a]	Percent Reporting Use				
PERU	Puno (n=225)	San Martín (n=165)	Huancayo (n=160)	Huaral (n=89)	Cañete (n=75)
Left in field	27	60	78	78	49
Burned	51	16	22	65	43
Buried	35	14	2	60	24
Discarded close to home	26	11	20	0	9
Thrown in ditch	8	3	9	30	6
Stored	2	2	2	17	0
Reused	1	4	0	0	0
ECUADOR	Guamote (n[b]=42)	Riobamba (n=59)	Guano (n=99)	Quero (n=163)	Montúfar (n=120)
Burned	43	37	45	46	73
Buried	41	12	29	27	11
Thrown in rivers or streams	10	51	14	26	14
Reused	2	0	11	1	3

[a]Multiple responses possible
[b]The "n" in Ecuador locations corresponds to respondents who were in charge of crop management in each farm household.

Article 7: Pesticide Use and Availability

a. Farmers have the right to have access to pesticides of less toxicity so that their application and use would not require use of complicated and costly protection equipment. Farmers surveyed in Peru indicated that the most widely used pesticides were extremely or highly hazardous pesticides (WHO class Ia and Ib, respectively), including organophosphorus and carbamate insecticides. These results were previously published by Arica et al.[35] Unfortunately, in Puno the research team often heard farmers make statements such as, "We sometimes decide to use pesticides that have caused the greatest health problems because they are stronger and, therefore, more effective to control pests." Ethylene bis-dithiocarbamates (EBDCs) fungicides, known mutagens, were also commonly used.

The situation was similar in Ecuador, with EBDCs such as mancozeb accounting for the greatest weight of active ingredients. Some focus group participants who recognized label colors believed strongly in using red label pesticides, noting their effectiveness against the Andean weevil, a major pest of the potato crop. Although they understood that pesticides could affect their health, these farmers regarded pesticides as an evil that they had to live with in order to subsist as farmers. Unfortunately a majority could not accurately link the label's colored stripe with its corresponding degree of human health toxicity, so they could not be selective and use less hazardous products.

In the 2007 focus groups, participants who had complete a first-time IPM training emphasized the need for farmers themselves to propose alternatives to commonly used and available pesticides. A substantial proportion of them spoke of the need to become organized and collectively refuse to buy red label pesticides, and thereby not give any more money for such products to pesticide companies. Such ideas may have arisen from discussions at an international NGO conference on strategies to reduce the sale and distribution of highly hazardous pesticides held in Quito around that time and widely reported in the media.

Article 8: Distribution and Trade

a. Farmers have the right to be sold only pesticides that have been registered, have certified quality, and include expiration dates. According to the Code, pesticide products undergoing commercialization must comply with labeling norms, such as inclusion of the expiration dates and maintenance of products in their original packaging (Article 8.1.2). Nevertheless, some focus group participants cited examples of salespeople selling pesticides in containers other than their original packaging. It seems that salespeople may repackage products into smaller units and fail to include the expiration date. In the focus groups, farmers warned against buying products that come in unsealed containers or bottles, as expired products may be ineffective.

Factors Facilitating and Limiting Fulfillment of Farmers' Rights

In focus groups, Chimborazo and Tungurahua farmers noted factors affecting greater realization of farmers' rights (see Table 4). Two major limiting factors mentioned by a majority of participants were, on one hand, the low level of social cohesion in rural communities splintered by economic crises, migration, gender conflicts, and other challenges; and, on the other hand, the limited technical knowledge of IPM. Farmers identified

TABLE 4 Social Factors which Facilitate or Limit Fulfillment of Farmers' Rights in Ecuador, as Identified by Farmers

Facilitating	Limiting
Farmers aware of their rights.	Selfishness on the part of some community members, reducing communication of new learning among farmers.
High levels of organization and social cohesion in some communities.	Lack of awareness of Integrated Pest Management (IPM) techniques among women.
Large numbers of people trained in alternative crop management practices in the community.	Lack of implementation of IPM practices learned among those trained.
Good level of comprehension by all farmers of pesticide levels of toxicity and corresponding label colors.	Lack of knowledge about the direct health consequences of pesticides, such as the symptoms of chronic poisoning associated with ongoing exposure to pesticides.
Widespread knowledge of the paths of contamination through the handling and use of pesticides.	Protective equipment for working with pesticides not readily accessible.
Recognition by farmers of the symptoms of mild and chronic pesticide poisoning.	Lack of enforcement of regulations on the control, sale, and elimination of toxic pesticides.
Technicians and organizations working with farmers function well as channels of information.	Lack of local government interest in the promotion of training programs for farmers.
Local government support for the implementation of training programs with farmers.	

social development initiatives of municipal governments (the state entities closest to communities) as important responses to these problems. However, they complained that some municipalities were uninterested in promoting agricultural development programs that endorse sustainable and healthy crop management.

DISCUSSION

Our findings on the handling and use of pesticides by poor and barely literate small-scale farmers in Ecuador and Peru are similar to the vast body of existing evidence on such widespread hazards in other developing countries.[3,7,11,12,14,15,17–20,22–24,42–44] We linked these empirical findings with various articles of the Code to respond to FAO's call for contributions in monitoring adherence. We provided evidence that, though the extent of adherence varied across articles and sections of the Code as well as across geographic areas, pesticide company and governmental adherence to the provisions of the Code is far less than adequate, thus violating farmers rights.

Our study faced a number of limitations. Although ideal monitoring schemes would be based on fully inclusive farmer and farmworker sampling frames, such frames are difficult to achieve in small or medium scale agricultural operations in most lower and middle income country contexts due to the lack of up-to-date censuses. Regular monitoring of Code adherence or farmers rights' observance would ideally include the development of such sampling frames with an agreed identification of whom to monitor, how to monitor, and for what purpose. Such a development would require greater political commitment on the part of national governments and international bodies, and would depend on sustained empowerment of civil society to actively participate in such monitoring.

Pesticide usage varies by crop and agroecological area. Participants in these studies may have been more or less aware of the health risks associated with pesticides than other small farmers. The possibility of over-reporting of ideal practices on surveys due to social response bias may have been present, though such a bias would most likely result in judgments of greater adherence rather than less. Our data did not cover all potentially important topics related to the Code, nor did we completely standardize methods to make our results strictly comparable across countries. However, our use of multiple research methods in different locations permitted triangulation of information and hence provided greater confidence in our findings. Further, although other surveys include similar questions, they are most often framed as farmer behavior only. In contrast, we frame such questions as indicators of industry and government adherence to key Code provisions or as indicators of respect for farmers' rights.

Causes of Limited Code Adherence

The reasons for limited adherence to Code provisions and recognition of farmers' rights lie in a complex web of factors, including contexts, decisions, and interventions by assorted actors at societal levels from micro to macro (see Figure 2). Among the fundamental factors (lower right of figure) are the overall level of development and equity in the society.[45] Poorer farmers were less able to afford appropriate storage facilities or obtain adequate PPE, and locations with higher proportions of illiterate or non-Spanish speaking inhabitants had poorer understanding of pesticide labels. These outcomes are in turn linked to an unequal distribution of public resources with limited investment in rural areas and unequal gender relations (box at lower left), such that women generally reported receiving

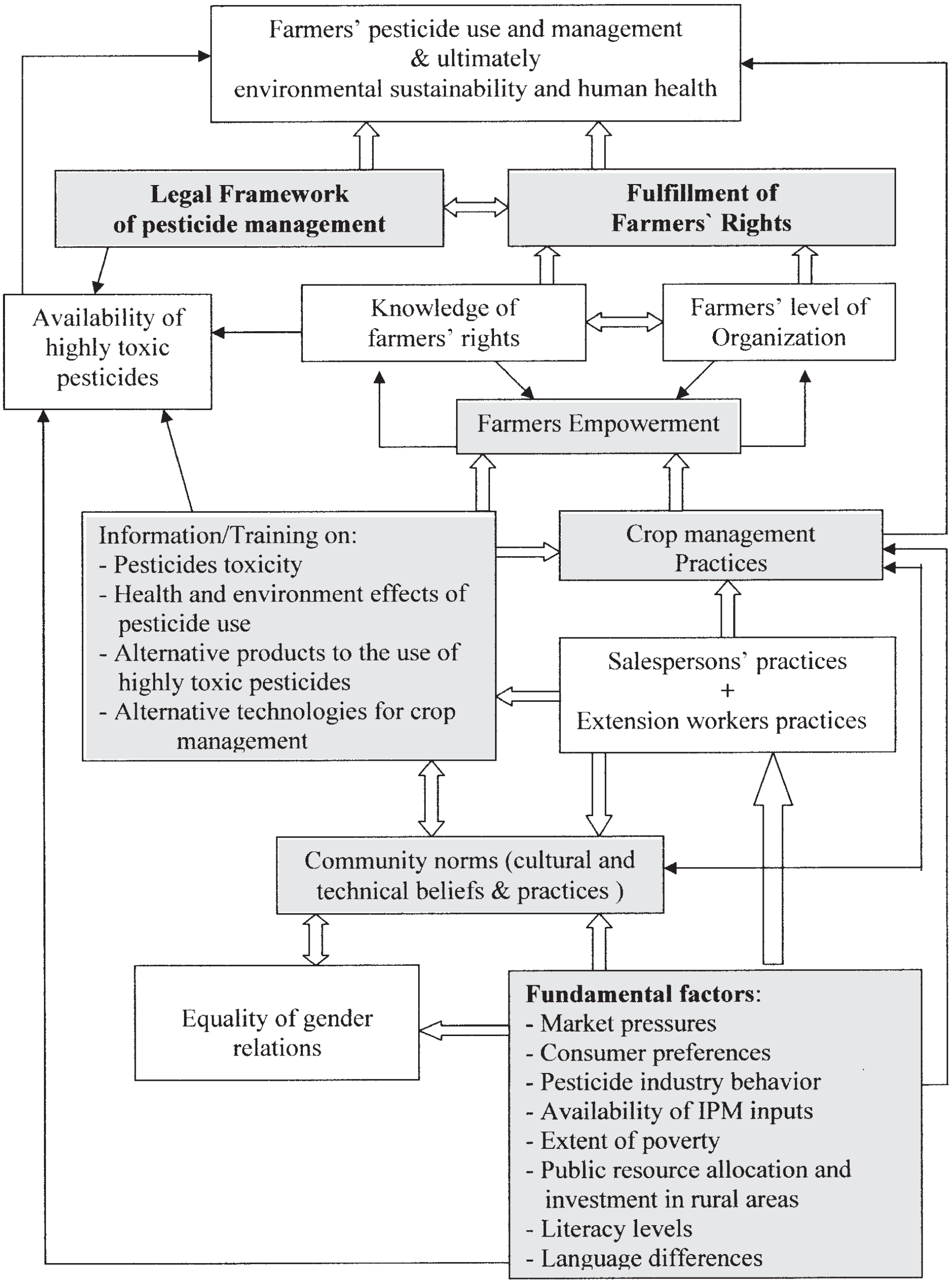

Figure 2—Factors influencing farmers' crop management and pesticide use

training on adequate use of pesticides less frequently than men.

The current structure of commercial input and crop markets was also very important. On the input side, an extensive array of chemical pesticides is offered and marketing of alternative products that might assist with IPM approaches is extremely limited. Effective monitoring and compliance with the Industry Guide are not occurring, indicating an inadequate level of corporate social responsibility, similar to the Brazilian experience.[46] On the crop side, market pressures are tied to processor and consumer preferences for big, unblemished products. Farmers perceive a need for heavy use of pesticides to achieve such products, and believe the adoption of IPM would endanger their ability to meet these standards. In turn, market pressures are linked to community norms enforced in some locations through social derision and isolation of farmers who adopt IPM methods (see Figure 2, "Fundamental Factors" box). The latter is consonant with earlier Ecuadorian research that found pesticide applicators felt that speaking openly about becoming ill while applying pesticides was seen by others as a sign of weakness.[20] Such community norms are substantially shaped by information and training related to crop management in general and pesticide use in particular (middle section of Figure

TABLE 5 Most Commonly Used Insecticides and Fungicides According to Farmers' Interviews by Toxicological Category and Study Area in Peru

Pesticides' Active Ingredients	Trade Name	Chemical Group	Study Regions				
			Puno	San Martín	Huancayo	Huaral	Cañete
Class Ia, extremely hazardous (according to WHO 2005)							
Aldicarb	Temik	Carbamate			**		*
Class Ib, highly hazardous							
Carbofuran	Furadan	Carbamate			***		
Edifenphos	Hinosan	Organophosphate		***			
Metamidophos	Lasser	Organophosphate	***		***		
Metamidophos	Monitor	Organophosphate	**	*	**		**
Metamidophos	Stermin	Organophosphate		***			
Metamidophos	Sukkoi	Organophosphate			**		
Metamidophos	Tamaron	Organophosphate	***	***	***	***	***
Metamidophos + Cypermethrin	Caporal	Organophosphate + Pyrethroid		***			
Methomyl	Lannate	Carbamate				***	***
Oxydemeton-methyl	Metasystox	Organophosphate					*
Class II, moderately hazardous							
Chlorpyrifos	Tifon	Organophosphates				*	
Chlorpyrifos	Lorsban	Organophosphates					***
Chlorpyrifos	Matagusano	Organophosphates	***				
Cypermethrin	Sherpa	Pyrethroid		**	***	*	**
Diazinon	Gusadrin	Organophosphates	**				
Dimethoate	Perfekthion	Organophosphates			*		***
Fipronil	Regent	Phenylpyrazole			**		
Class III, slightly hazardous							
Acetamiprid	Rescate	Neonicotinoid				**	
Alphacypermethrin	Cipermex	Pyrethroid		***		***	***
Isoprothiolane[a]	Fujione	Dithioacetalceteno		**			
Mancozeb + cymoxanil[a]	Curzate	Acetamide & Dithiocarbamate	**		**		
Mancozeb + metalaxil[a]	Ridomil	Phenilamine & Dithiocarbamate	*		*		
Propineb + cymoxanil[a]	Fitoraz	Dithiocarbamate + cymoxanil	*		*		
U, Unlikely to present acute hazard in normal use							
Carbendazim	Protexin	Benzimidazole		**			
Cyromazine	Patron	Triazine					**
Mancozeb[a]	Mancozil	Dithiocarbamate			*		
Penconazole[a]	Topas	Triazole				**	
Propineb[a]	Antracol	Dithiocarbamate	***	***			

Note: Adapted from: Arica D, Kroschel J, Forbes G, Saint Pere K. Final Report: Persistent Organic Pollutants and Hazardous Pesticide in Andean Farming Communities in Peru. Lima, Peru: International Potato Center; 2006 May.
[a]Fungicide.
*Low use; **Moderate use; ***High use

2), particularly the widespread company promotion campaigns. Farmer respondents noted the limited technical information they had received on IPM approaches. We observed and farmers noted the incomplete or erroneous information provided to them by salespeople, an important indicator for Code monitoring. Reductions in funding to support local agricultural extension workers[26] meant that alternative sources of information were also less available than are urged by the Code, except where NGOs were active in training (e.g. Cañete, Peru) and providing alternative management resources. The changes in understanding observed in the 2007 focus groups in Ecuador indicate the potential for stakeholders other than pesticide companies to join forces and provide better information on alternative crop management options.

Vulnerability and Power Relations

The disrespect of farmers' rights apparent in our findings highlights their vulnerability in the relational sense of "being in a vulnerable position."[29,47] In keeping with explicit social justice perspectives,[17,29,33,48] we identify asymmetric power relations as the cause of this vulnerability. Small-scale farmers and farmworkers face direct health and social risks while pesticide industries and government institutions face more distant economic and political risks.[26,49,50] Behavioral risk management

TABLE 6 Insecticides and Fungicides Used on at Least 10% of Farms in Each Ecuadorian Canton, by Toxicological Category

	Guamote (n[a]=41)		Riobamba (n=59)		Guano (n=98)		Quero (n=163)		Montufar (n=119)	
Pesticide Type	#plots	kg ai/ha[b]	#plots	kg ai/ha	#plots	kg ai/ha	#plots	kg ai/ha	#plots	kg ai/ha
Class Ib, highly hazardous (according to WHO 2005)										
Carbofuran	5	1.6	45	1.6	31	1.6	82	1.3	71	4.4
Methamidophos	4	1.5	33	2.0	49	0.6	93	1.8	44	2.3
Methomyl	—	—	—	—	—	—	—	—	12	0.5
Class II, moderately hazardous										
Cypermethrin	8	0.1	47	0.6	12	0.2	—	—	35	0.8
Deltamethrin	—	—	—	—	21	0.02	40	0.3	17	0.04
Diazinon	—	—	10	4.3	—	—	—	—	—	—
Profenophos	10	1.3	55	4.0	22	2.2	36	1.0	54	3.8
Deltamethrin	—	—	—	—	21	0.02	40	0.3	17	0.04
Carbosulfan	—	—	—	—	—	—	37	1.1	33	3.1
Chlorpyriphos	—	—	23	4.7	—	—	—	—	41	2.3
Propiconazol[c]	—	—	—	—	—	—	26	1.9	41	1.9
Lambda–cyhalothrin	7	0.1	—	—	—	—	—	—	17	0.1
Class III, slightly hazardous										
Cypermethrin	8	0.1	47	0.6	12	0.2	—	—	35	0.8
Deltamethrin	—	—	—	—	21	0.02	40	0.3	17	0.04
Diazinon	—	—	10	4.3	—	—	—	—	—	—
Cymoxanil[c]	12	0.1	71	0.2	20	0.4	131	0.2	96	0.4
Acephate	6	0.5	26	1.4	40	2.2	82	0.8	13	0.6
Metalaxyl[c]	11	0.2	54	0.2	—	—	—	—	14	0.1
Cyproconazol[c]	—	—	—	—	—	—	25	0.4	—	—
U, Unlikely to present acute hazard in normal use										
Sulphur[c]	—	—	—	—	27	0.5	58	1.6	50	2.2
Mancozeb[c]	41	1.3	109	2.4	102	1.5	188	2.0	120	7.0
Propineb[c]	—	—	—	—	—	—	69	1.3	44	1.2
Benomyl[c]	—	—	31	ND	—	—	—	—	20	ND[d]
Carbendazin[c]	—	—	—	—	—	—	—	—	13	ND
Carboxin[c]	4	ND	—	—	—	—	—	—	—	—
Chlorothalonil[c]	4	ND	—	—	—	—	—	—	—	—
Linuron[c]	—	—	22	ND	—	—	—	—	—	—
Maneb[c]	—	—	12	ND	—	—	—	—	—	—
Thiophanate -methyl[c]	—	—	—	—	—	—	—	—	10	ND
Metiram[c]	—	—	10	ND	—	—	—	—	—	—
Penconazol[c]	—	—	17	ND	—	—	—	—	—	—

[a] Number of farms or households in each canton (total = 483)
[b] Kilograms of active ingredient per hectare
[c] Fungicide
[d] No data

like that proposed through "safe use of pesticides" campaigns ignore small farmer and farmworker vulnerability. Strategies that generate more equal power relations among social actors and that reduce farmers' underlying vulnerability are indispensable for moving the preventive discussion away from superficial, proximal, and behavioral causes of pesticide poisoning and upstream to issues of access to information, resources, and decision-making power both locally and globally.[16,49–52]

Ways Forward to Greater Code Adherence and Respect for Human Rights

Farmers' and farmworkers' current lack of awareness of the Code indicates a need for sustained education and information exchange between FAO, government bodies, NGOs, and farmers organizations. Such processes should begin with the development of a shared understanding of the Code, pass through reflection on Code implementation, development of proposals for implementation of process and impact monitoring indicators, and continue through to action in keeping with respect for farmers' inherent dignity as human beings.[53] The establishment of social surveillance programs by government bodies at national and local levels in conjunction with organized civil society and farmers' organizations is key to adequate monitoring of compliance with the Code. Such programs could use the indicators we have developed in relation to farmers' rights, complemented with a wider set more directly linked to industry and government responsibilities.[49] Social surveillance programs should include publication, diffusion, and discussion of monitoring results in social and political spaces where such information has historically been unavailable. Such information sharing could act as a catalyst for demands of adherence to Code provisions and promotion of farmers' rights in jurisdictions where legal frameworks alone are unable to guarantee public welfare.[23,35,50] Such mechanisms should focus on human rights,[15,17,29,54] and include small-scale farmers and farmworkers in advocacy processes.[55]

We specifically recommend that NGOs work with farmers in rural communities to promote social organization around the theme of farmers' rights. Inclusion of farmers in the discussions, debates, and political processes required will necessitate moving beyond Pesticide Action Network national member organizations[56] to a broad range of national or regional agricultural and social development NGOs focused on environment, ecology, women' issues, and other themes.[56–58] This is already happening in some instances: an example is the call within the People's Health Movement International and People's Health University for community pesticide monitoring.[57] NGO support of organizing and education work on farmers' and farmworkers' rights and the Code may be a necessary step towards greater inclusion of small-scale farmers in confronting the 'wicked problem'[60] of social risks associated with the use of highly hazardous pesticides.

We further recommend that local municipal governments play a strategic role in disseminating the Code, promoting farmers' rights, and advocating with farmer organizations. Municipal governments can represent local interests by engaging with national authorities who promulgate regulations for the distribution and use of pesticides. With sweeping decentralization processes taking place in lower and middle income countries, municipal governments can participate in surveillance of pesticide commercialization, coordinate the collection of hazardous waste with members of the pesticide industry, and engage in dissemination and promotion of alternative crop management practices. Such actions in rural areas are in keeping with a vision of environmental justice and agricultural development.

Building on a farmers' rights perspective as a guide to advocacy that questions powerful industry actors and prods governments to revise their legal frameworks and surveillance structures offers hope for more just control of pesticide use. With farmers and farmworkers, as well as NGOs and municipal governments, more actively involved in Code promotion and monitoring, broader public policies oriented towards the elimination and/or reduction of the social risks of hazardous pesticide use should be able to move beyond the realm of proposals to more concrete actions for human and environmental health.

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