Pesticides in Peru's Highlands

photos: Bertl.of

Farmers in San Marcos using local herbs in preparation of biological pesticide.

Since the late 1960s, pesticides used to control plagues in potato plantations in the Peruvian highlands have unsettled the balance of Andean ecosystems and given rise to numerous cases of poisoning among farmers.

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Initially, agro-chemicals brought a 'technological revolution' to the farming sector and as a result many farmers changed their techniques because they were encouraged by production and yield results. There were other farmers, however, who continued to use their ancient technologies.

A large variety of pesticides have been introduced into commercial potato production in the Peruvian Andes. It has been estimated that potatoes absorb 20% of the total amount of pesticides used in Peru.

In the highlands, pesticides are mainly used to control the Andean weevils (*Premnotrypes spp.*), potato moths (*Phthorimaea operculella* and *Symmetrischema tangolias*), fleaworts (*Epitrix* spp.) 'rancha' (*Phytophthora infestans*) and various species of nematodes that infest the potato plantations.

When categorising farmers in terms of insecticide use and ties with the market, one can distinguish three types of potato farmers: those who have never used pesticides, those who use them occasionally and those who use them constantly. The most frequently used preparations are fungicides to control 'rancha' and insecticides to control Andean weevils.

The introduction of agro–chemicals

Various strategies were used to introduce agrochemicals into the Peruvian highland markets and potato cultivation in particular. The main strategy was to establish a close relationship with government research centres, producer organisations and centres of higher education. Initially, during the era of large estates, contacts were established through the estate owners. Pesticides were such a breakthrough and were so fast and effective in controlling plagues that farmers soon started using them.

The marketing of agrochemicals has changed considerably over the last 20 years with sales campaigns becoming increasingly more aggressive. In Peru there are approximately 20 companies that import or prepare agrochemicals and most of them reach the potato farmers in the highlands, particularly those in the valleys between the Andes.

Cost has always retricted the use of pesticides especially among low-income farmers. Consequently, more economic products have been created for sale at the weekly markets held in the remoter towns. Low-cost pesticides, such as those made with organic phosphorus compounds, are usually the most hazardous to farmers.

Ecological impact

The greatest environmental problems in the ecosystems of potato farms are caused by the increased use of pesticides. These tend to make pests more resistant and, in a vicious circle, cause new plagues to emerge. Under such circumstances, the economic and environmental impacts are deplorable. Pollution is caused by the pesticides left on the ground and these are spread by the wind to neighbouring areas, contaminating watercourses (ditches, rivers and ponds), causing health hazards and threatening wild animals, pets, pollinating insects and other essential wildlife.

The initial effect in controlling significant plagues was satisfactory. However, pests soon became resistant to the use of pesticides and other substances had to be added. Hence the change from organochlorine insecticides to organophosphates and carbamates. Chitin inhibitors, biological insecticides and botanical pesticides such as pyrethrum were still too expensive to be used in the farming system.

The fact that potato pests and diseases have become resistant to pesticides is a serious threat to farmers. This resistance has developed mainly because farmers have been pressured into selecting pesticides with a specific effect. About 150 species of phyto-pathogenic fungi have become resistant to various fungicides under field conditions. The resistance of *Phytophtora infestans* to metalaxil was reported in 1980.

Another indicator of the level of resistance to pesticides acquired by plagues is the increasing dosage and frequency with which pesticides must be applied. In 1986, 25 kg/ha of commercial aldicarb plus 4.5 litres of insecticide was recommended in Huasahuasi. Ten years later, the technical recommendation was to use 36 kg/ha of commercial aldicarb and 5 litres of insecticides, although farmers tend to use much more than that.

Although the yield obtained with the use of agrochemicals generate more income, the environmental costs tend to be disregarded in profitability analyses. These include the loss of soil quality, the disappearance of essential and pollinating insects, reduced biodiversity as well as water contamination and an increased incidence of poisoning.

Economic impact

Given the state of information at present it is difficult to evaluate the economic impact of pesticides used in agriculture. All the information available on productivity refers to specific experiences. Global tendencies that would allow us to judge their impact on Peru have not been analysed.

The use of pesticides falls into two phases. The first between 1981 and 1987 when a significant amount of pesticides were used. The second began in 1988 when pesticide use levels started to drop sharply (see Graph 1).

The sharp decline in the use of pesticides after 1987 did not affect total agricultural output. Only slight changes were recorded both in terms of cultivated area and the yield. This proves that pesticides

did not play an essential role in maintaining production levels and that they had a limited impact on the domestic economy. However, they did have a positive impact in certain regions and on specific crops.

The Table shows that the cost of pesticides varies between 13 and 27% of total potato production costs. After an exceptionally high expenditure on pesticides of US$1053/ha in 1988, costs have more or less stabalized slightly under US $ 400/ha. In general, the gross margin indicates that when less was spent on pesticides the profit margin was greater.

Table 1: Potato production costs in the Peruvian Highlands and expenditure on pesticides 1987–1997

Year	Total costs US$	Expenditure pesticides US$	% of pesticide expenditure	Estimated return kg/ha	Farmgate price/kg (US$)
1987	3 367	456	13.5	14 000	0.20
1988	5 767	1 053	18.2	12 000	0.39
1989	1 390	383	27.5	16 000	0.29
1993	2 630	395	15.0	20 000	0.16
1994	2 809	612	21.7	18 000	0.18
1997	2 536	386	15.2	20 000	0.15

Source: ONA, 1987-1997; Elaboración: RAAA,1998

Social impact

Farmers realise that the constant application of pesticides affects the quality of tubers, changes their texture and sometimes makes them taste bitter. Many farmers prefer not to eat potatoes treated with pesticide. For their own consumption, they grow crops in higher areas and only use fungicides to control 'rancha' (*Phythophtora infestans*).

Farmers are not always fully aware of the negative effect of pesticides and appear to have resigned themselves to believing that it is the only alternative. Farmers in Chaglla confirmed that 75% of the water sources and areas surrounding their farms were contaminated. Another indicator for establishing the social costs of the indiscriminate use of pesticides is the number of people poisoned each year in the countryside. The health sector does not pay enough attention to this problem, mainly because it is unaware of the danger and there is no policy of conducting epidemiological monitoring programmes in farming areas.

Poisoning is not the only problem. Farmers who use these inputs have become dependent on the technologies derived from other cultures and have forgotten alternative technologies and traditional ways of handling plagues.

Responses and alternatives

In order to respond to the environmental crisis generated by the use of agrochemicals and pesticides in particular, many institutions have started replacing chemical inputs with biological ones while maintaining the conventional farming structure based on single crop farming. Replacing chemical inputs with natural ones is a most significant change. Under this strategy, most of the natural inputs are produced outside the farming system. In other words, the system's dependency continues and a recycling of resources and energy in agricultural ecosystems has yet to be achieved. Furthermore, very few farmers, if any, are involved in the production of new inputs.

The experience gained in the Integrated Pest Management programmes promoted by public and private development projects have proved that it is possible to do without extremely toxic inputs when controlling plagues and diseases. Nevertheless, dependence upon external inputs remains and affects the productive stability of the agricultural ecosystems. Efforts are being undertaken to test the cultivation of specific natural pesticides to overcome this problem (see p 65).

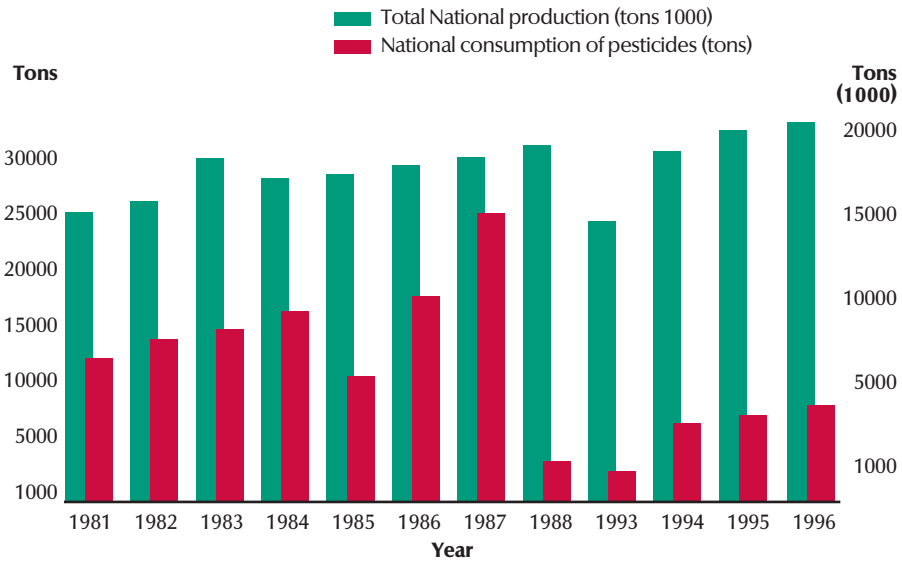
Other local experiences show that farmers are trying to develop sustainable farming using limited amounts of external inputs. They intend to recycle local resources in order to generate inputs and techniques aimed at managing phytosanitary problems in potato farms. The combination of various ecological techniques, participatory training processes and the recovery and adjustment of peasant experiences is helping to reduce some of the damage caused by plagues.

Changing national policies

Through its Agriculture, Environment and Amazon Committees, the Peruvian Congress is responding to concerns about the negative impact of pesticides in the Peruvian farming sector. For example, the *Law Promoting Overall Management for Ecological Plague Control* establishes the political and legal framework necessary to start-up the process of reducing pesticides use and lays the foundation for sustainable farming practices. In addition, it has created a number of opportunities for State and private development projects to gain access to State funds and international technical cooperation and to implement actions based on the overall management of plagues.

In this respect, the RAAA (Action Network on Alternatives to the use of Agro chemicals) has made a considerable effort to generate positive attitudes towards initiatives designed to encourage new laws restricting or banning the most toxic pesticides and enforcing standards. Initiatives among civilians have lead to discussions with the agrochemical industry and government authorities on the viability of agricultural production models. Results obtained from civilian activities in recent years have been successful in generating initial changes in favour of sustainable farming practices. ■

Graph 1 Relation between consumption of pesticides and total national agricultural production between 1981 and 1996.



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