

## Research Article

# Effect of the use of pesticides in the environment generated by potato producers from Yarowilca- Peru

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### Abstract

The objective of the work was to determine the effects of the use of pesticides in the environment generated by potato producers from Yarowilca, Peru and to express the relationship between pesticide contamination in crop fields and the level of knowledge of farmers about pesticide uses and risks. The type of research was correlational because relationship between variables was established. Methodology: The research is of non-experimental design because the variables were not manipulated. The population was 853 farmers and a sample of 245 study subjects. As a result, of the total sample, it was found that only 5% have a good knowledge of its storage and correct use; and that 27% have regular knowledge about environmental contamination by pesticides. It was concluded that the degree of knowledge about pesticide storage has a significant influence on the use made by farmers. Farmers regularly know the dangers to which they are exposed and the risks that pesticides cause to nature if they handle them incorrectly. Farmers noted that there is no training on the risks of good pesticide management.

**Keywords:** Crops; Environment; Farmers; Pollution; Pesticides; Risks

### Introduction

Pesticides are complex substances of chemical origin, these are very necessary to solve the problems that agricultural crops present, however, they can cause a set of greater risks than their benefits if they are not used properly. Among the products used in agricultural practices are pesticides, essential for potato cultivation, but it also

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**Citation:** Guillermo GCC, Efraín DEN, Evangelista LLT (2024) Effect of the use of pesticides in the environment generated by potato producers from Yarowilca-Peru. J Agron Agri Sci 7: 057.

**Received:** January 18, 2024; **Accepted:** January 30, 2024; **Published:** February 6, 2024

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constitutes one of the greatest environmental problems both in public health and in the alteration of soil quality, due to indiscriminate and uncontrolled use.

The use of pesticides and other agrochemicals is due to the fact that the crops are continuously exposed to pests, weeds, pathogens, etc., hence the use of chemical products, because they help for the development and growth of the potato crop. The risks caused by the excessive use of pesticides in the population exposed to their use are: headaches, nausea and vomiting, as well as stomach pain and diarrhea. It should be added that the intensity of the symptoms will depend on the type of pesticides, their toxicity, frequency and application dose.

Meanwhile, a series of diseases in humans such as hepatitis, congenital malformations, mental disabilities, organs in poor condition, types of cancer such as leukemia, skin cancer, tumors, among others, have also been recognized.

Currently the use of agrochemicals has decreased, the reports of cases of cancer and other diseases have changed the perspective of many people regarding the consumption of organic food. The consumption of these every day is growing and is becoming an alternative in agricultural production throughout the world. However, there are still many problems with the use of pesticides, causing a risk to the health of consumers and to natural resources such as the soil. The economic implications as a consequence of the use of pesticides are serious. In addition, two major problems are created: increased residues left in plants and environmental pollution. Pollution of the environment, caused by pesticides, remains in the soil, is carried by the air to neighboring areas, and reaches the waters of the ditches, rivers and lagoons or percolates to the phreatic levels; threatening the health of man and animals.

The problem of agricultural activity in recent times has been generating concern about the applications of chemical products, without professional opinion, which generates serious environmental alterations to the ecosystem, especially in areas where the farmer does not have technical advice. Farmers apply pesticides because of the need to protect their crops, without taking into account the toxicity of the product, which leads to chemical residue contamination of crops and impacts on soil, air and water. This is why it is important to know the processes of agronomic management in the different crops that are sold on the local and national market.

The high rate of pesticide applications has made crops vulnerable, generating the appearance of new pests that did not exist before, and nowadays it can be seen that a weekly application of pesticides is made on crops, leading to an increase in insect pests and applications with various active ingredients, more powerful, which increases the production cost of the crop. These inputs are usually herbicides, insecticides, acaricides, fungicides, nematicides, which are the most frequently used. These applications cause various damages to flora and fauna, which have a negative impact on the environment. However, the use of pesticides with a higher residual effect on the beneficial

fauna, through their disappearance in the crops. This is caused by the lack of knowledge on the part of farmers who do not know how to differentiate between a beneficial insect or a crop pest.

According to what was stated, the problem posed was the following: What are the effects of the use of pesticides on the environment generated by potato producers from Yarowilca - Peru?

The objective was to determine the effects of pesticide use on the environment generated by potato farmers from Yarowilca - Peru and to express the relationship between pesticide contamination in crop fields and farmers' level of knowledge about pesticide use and risks.

## Materials and Methods

**Location:** The study was conducted in Yarowilca - Huanuco (Peru) and the study was carried out in three areas which are the Centros Poblados of San Jose de Tashga, San Antonio de Colpa and Quilcayhuarin in the Choras Region.

The tomato growth period (April 29 to October 25, 2019), with a portable thermohygrometer (Extech RHT20), the climatic variables recorded inside the plastic house were minimum, mean, and maximum temperature (°C) and relative humidity (%).

**Design:** The type of research carried out is applied because the results will be put to immediate use in order to avoid the problem phenomenon. The level of research is correlational because the relationship between the variables is established. The research is of non-experimental design because the variables were not manipulated. The methodology used was a literature review of journal articles, research articles, electronic books and databases published between 2014 and 2021, which allowed us to guide us and find valuable information that contributes to the research of the central theme.

**Population and sample:** The population was represented by the 853 farmers of the Centro Poblado San José de Tashga, San Antonio de Colpa and Quilcayhuarin, in the district of Choras, province of Yarowilca - Huánuco - Peru.

The sample size was applied with the following formula:

$$n = \frac{z^2 p \cdot q \cdot N}{\epsilon^2 (N - 1) + Z^2 \cdot p \cdot q}$$

n = sample size

p y q = confidence level at 95%

Z = standard deviation of población

N = variance of population

E = allowable error (5%)

$$n = \frac{3,8416 * 0,5 * 0,5 * 853}{0,0025 * (853 - 1) + 3,8416 * 0,5 * 0,5}$$

$$n = 244,79 = 245 \text{ farmers}$$

The sample is conformed by 245 farmers.

**Data collection techniques:** It was determined by observation. Instrument: Observation sheets were made. The observation sheet helped to measure both variables which were the use of pesticides in

potato cultivation and the effect on the environment and health. The enquiry was carried out by means of surveys to the producers, using the questionnaire as a survey research instrument. The processing of the information was carried out by collecting the data individually, in order to avoid errors in the answers. The tabulation of data or tables was determined according to the variables of each hypothesis (information management, statistical study of data for the presentation of results). The analysis of the statistical results was determined by highlighting fundamental trends or relationships in accordance with the objectives and hypotheses. The interpretation of the results, supported by the theoretical framework, in the relevant aspect.

## Results and Discussion

Table 1 shows that 20% of the farmers in Choras district have a weak knowledge of pesticide storage and that pesticides are used on a regularly, because they consider that the characteristics and capacity of the storage facilities used for pesticides still need to be improved, and that pesticide inspections should continue to be carried out, taking into account their environmental impact.

	Level	Weak		Average		Good		Total	
		n	%	n	%	n	%	n	%
Knowledge on pesticide storage	Weak	33	13%	21	9%	36	15%	90	37%
	Average	49	20%	44	18%	40	16%	93	38%
	Good	9	4%	0	0%	13	5%	62	25%
<b>Total</b>		<b>91</b>	<b>37%</b>	<b>65</b>	<b>27%</b>	<b>89</b>	<b>36%</b>	<b>245</b>	<b>100%</b>

**Table 1:** Levels of knowledge on pesticide storage: weak, average and good.

As Jaller [1] tells us, the inappropriate disposal of pesticide containers has a negative impact on the environment, as they may contain residues that can cause soil and water contamination or affect human health, which is what we can observe with these potato farmers. They lack knowledge about what to do with pesticide containers. This is due to the lack of infrastructure for the storage of application and protection equipment, waste and recycling of containers, as indicated in their study on the management of pesticide use, [2].

On the other hand, it was found that only 5% of the farmers have good knowledge for the correct storage of pesticides, and they are used in the correct way.

Therefore, with a significance of less than 5%, the null hypothesis is rejected, and therefore the degree of knowledge in pesticide storage significantly influences the use of pesticides by farmers. There was a moderate positive association between the degree of knowledge in storage and the use of pesticides, with a contingency coefficient of 0,529.

Table 2 shows that 12% of the farmers consider that they have a good knowledge of pesticide transport and use pesticides well, having safety sheets for handling well, having safety sheets for handling, transporting and storing pesticides.

	Level	Weak		Average		Good		Total	
		n	%	n	%	n	%	n	%
Knowledge on pesticide transport	Weak	67	27%	44	18%	29	12%	140	57%
	Average	23	9%	23	9%	29	12%	75	31%
	Good	17	7%	0	0%	13	5%	30	12%
<b>Total</b>		<b>107</b>	<b>44%</b>	<b>67</b>	<b>27%</b>	<b>71</b>	<b>29%</b>	<b>245</b>	<b>100%</b>

**Table 2:** Levels of knowledge on pesticide transport: weak, average and good.

Furthermore, it is observed that only 9% of the farmers consider that they have a regular knowledge of the transport of pesticides, as well as that these products are used in an ordinary way. They believe that it is convenient that the transport of pesticides should be improved, as well as the safety data sheets, in order to obtain a correct use of the products and to avoid any contamination of the environment. Agrochemicals provide benefits in agricultural activity, but they can also be a risk to health and the environment. This is because the improper handling and disposal of these products can cause contamination to the different environmental components, especially to surface and groundwater sources; triggering possible risks of intoxication in living beings. And also agreeing with the importance of the same, as [3] indicates that it is necessary to better understand the impact of pesticides applied in horticulture, to know their destination and their means of transport through different environmental sectors, in order to improve their selection and form of application. It is observed that the significance level is less than 5%, which implies rejecting the null hypothesis, assuming that the level of knowledge of pesticide transport significantly influences the use of pesticides by farmers in Choras district. Similarly, there is evidence of a moderate positive association between the variables studied, with a contingency coefficient of 0.596.

Table 3 shows that 32% of the farmers in the district of Choras have a weak knowledge of personal protective equipment, which does not allow them to use pesticide products correctly. This is due to the fact that they do not have a good knowledge of the application techniques they use for their crops, as well as not knowing very well the parts of the protective equipment they use, putting their health at risk, because they do not have a good knowledge of its correct use. According to Díaz and Muñoz [4], human actions can cause damage to the health of workers. In the rural sector one of the risks due to lack of preventive measures is the indiscriminate handling and use of pesticides and that all this is due to the lack of information regarding the handling of agrochemicals as indicated by [5]. On the other hand, Muñoz [6] indicates that through a survey carried out in the district of Chota, information was collected on the use of pesticides, obtaining that 56.3% do not adequately manage the use of pesticides while 43.7% do. Likewise, 47.5% of the farmers show symptoms that indicate damage to their health due to exposure to these products. Finally, Yucrea [7] indicates that scientific evidence shows the negative impact of both lead and pesticide contamination, both acutely and chronically affecting different organs, including both male and female infertility.

	Level	Weak		Average		Good		Total	
		n	%	n	%	n	%	n	%
Knowledge on pesticide equipment	Weak	78	32%	21	9%	19	8%	118	48%
	Average	9	4%	23	9%	40	16%	72	29%
	Good	21	9%	21	9%	13	5%	55	22%
<b>Total</b>		<b>108</b>	<b>44%</b>	<b>65</b>	<b>27%</b>	<b>72</b>	<b>29%</b>	<b>245</b>	<b>100%</b>

**Table 3:** Levels of knowledge on pesticide equipment: weak, average and good.

A significance of less than 5% was found, allowing the null hypothesis to be rejected, leading to the decision that the degree of knowledge of personal protective equipment significantly influences the use of personal protective equipment by farmers in the Choras district. A contingency coefficient of 0.719 was also found, which determines that there is a high positive association between the variables analysed.

Table 4 shows that 27% of the farmers in the district of Choras have a regular knowledge (average) of environmental contamination by pesticides, and they do not use pesticides properly. This is because they do not know the types of pesticides, this percentage of farmers consider that there is no constant training to avoid environmental pollution and to know how to use pesticide products correctly, in such a way that it would help environmental pollution and to know how to use pesticide products correctly, in such a way that it would help the yield of the crop fields and avoid more risks to the environment. In agreement with Mora [8], in his descriptive study, he determines that the lack of interest and knowledge in the handling of agrochemicals causes negative impacts on the health of the people who carry out their activities in the crop. Finally, according to Tobón-Marulanda [9], the poor management of pesticides can generate negative impacts on water resources, due to the reduction and contamination of water, affecting the health and life of flora and fauna and humans in the area.

	Level	Weak		Average		Good		Total	
		n	%	n	%	n	%	n	%
Knowledge on pesticide equipment	Weak	34	14%	21	9%	26	11%	81	33%
	Average	9	4%	65	27%	28	11%	105	42%
	Good	49	20%	0	0%	13	5%	62	25%
<b>Total</b>		<b>92</b>	<b>38%</b>	<b>86</b>	<b>35%</b>	<b>67</b>	<b>27%</b>	<b>245</b>	<b>100%</b>

**Table 4:** Levels of knowledge on pesticide equipment: weak, average and good.

It is evident that the significance level is less than 5%, allowing us to reject the null hypothesis, taking the decision that the degree of knowledge of environmental pollution by pesticides significantly influences the use of pesticides by farmers in the district of Choras. A contingency coefficient of 0.535 is also observed, which means that there is a moderately positive association between knowledge of environmental pollution and the use of agrochemicals.

## Conclusion

The degree of knowledge about pesticide storage has a significant influence on the use of pesticides by farmers, with a significance level of less than 5%, indicating that workers with more knowledge about pesticide storage will perform their functions better, thus avoiding accidents that could harm the rest of the farmers in the Choras district.

The degree of knowledge of pesticide transport has a significant influence on the use of pesticides by the farmers, since the significance level is less than 5%. This is reflected in the fact that the farmers of the Choras district, when they receive adequate knowledge of pesticide transport, will do it correctly, and at the same time they will look for the company's managers to take the necessary measures for an efficient implementation of the means of transport. The degree of knowledge of personal protective equipment has a significant influence on the use of the products by the farmers, with a significance level of less than 5%, which indicates that the farmers in the Choras district, when they receive adequate training in personal protective equipment, will take into account the recommendations given to them because they are aware of the dangers to which they are exposed if they come into direct contact with the pesticides. The degree of knowledge of environmental contamination by pesticides has a significant influence on the farmers, because of the significance level of less than 5%, the farmers are aware of the dangers they are exposed to and also of the risks they cause to nature in case of improper handling of pesticides. There is a moderately positive association between the degree of knowledge and the use of pesticides, with a significance level of less than 5%, showing that some farmers in the district of Choras have an adequate educational background and therefore for these farmers the correct handling of pesticides is important; however, there is a population that does not have the necessary knowledge and does not take the necessary precautions with the use of pesticides.

## Acknowledgment

If necessary, acknowledgments or recognitions to individuals, institutions, funds, and research grants that made important contributions in the design, financing, or carrying out of the research are included.

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