



## Violated Rights in Rural Populations Exposed to Transgenic Soybean Crop (Preliminary Study)<sup>1</sup>

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### Authors' contributions

*This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.*

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### ABSTRACT

**Introduction:** In Latin America the introduction of GMO (Genetically Modified Organisms) involves a risk of harm to human health, to the environment and a violation of human rights in exposed populations.

**Objective:** To investigate risk conditions of pesticide exposure in a population devoted to subsistence farming and surrounded by GMO crops, through the analysis of the fulfillment of State obligations to guarantee basic human rights.

**Methods:** A survey was conducted among local farmers in San Juan, in the Canindeyú Department (Py) in January, 2016 concerning farming practices. The compliance with state obligations was performed by analyzing the National Constitution and the Law of Phytosanitary Control.

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**Results:** 43 Settlers were interviewed, out of which, a hundred percent (100%) are dedicated to farming, of which 53,5% (23/43) are dedicated to subsistence farming and 46,5% (20/43) are dedicated to income and subsistence. Their median level of education is 4,9 years. The population is surrounded by monocultures that are close to a 100% of the families, climate conditions are not taken into account, nor are they informed, also they were not trained in agrochemical handling and knowledge. An irregular handling of the proper preservation of recipients was described, also a lack of suitable spray equipment, washing of clothes, and child safety inside their home during massive spraying.

**Conclusion:** There is a risk of permanent exposure to pesticides in a context of a repeated violation of human rights of that population.

*Keywords: Violated rights; GMO; soybean crops; farmers; critical epidemiology.*

## 1. INTRODUCTION

An Important agrarian change occurred in recent years, particularly in South America, involved the introduction of transgenic soybean resistant to glyphosate that changed the agricultural model to one dependent of a massive use of agrochemicals [1]. Transgenic soybean seed is incorporated into Paraguay in the 1999-2000 agricultural cycles and thereafter the area planted with soybeans was expanded rapidly. Soybean production is concentrated in the eastern region, where it is estimated that there are 3,264,489 hectares of soybean crop particularly in the departments of Caaguazú, Itapúa, Alto Parana, and Canindeyú [2,3].

In 2015 31 million kilos and 20 million liters of pesticides were used in an extension area of 3,500,000 hectares of transgenic soybeans. This extension represents an increase of 31% in relation to the 2009-2010 harvest [3]. The indiscriminate use of pesticides in the country was marked by various committees of the United Nations since 2007 to 2012 [4-8]. In the reports they recommended the Paraguayan State to carry out effective and frequent inspections, studies and evaluations to face the negative consequences of the spraying in rural communities considering that as the main guarantor of human rights, the State has the obligation to respect, the obligation to protect and the obligation to fulfill the realization or satisfaction of fundamental rights. In this sense, the Constitution of Paraguay [9] recognizes a broad framework of rights, while stipulating basic safeguards that must be implemented and developed by the public authorities to maximize the effectiveness of the enjoyment of rights for all people and in the different territories that make up the country. In the particular case of the rural population, in addition, there are other administrative rules such as; the Agrarian Statute

referred to the rural real estate and Control law No. 3742 [10] of plant protection (phitosanitary) products for agricultural use. In all these regulations, the state emerges as the main responsible for respect and protection against threats or damage to third parties and the progressive realization of fundamental human rights.

Pesticides can cause severe and chronic damage in human health. Many of them can cause damage in the genetic material. This modification in the genetic information has been associated with a high risk of developing cancer [11]. Glyphosate is an active ingredient of Roundup and it is a widely used herbicide in genetically modified crops. The World health Organization has recently classified this herbicide as; "probably carcinogenic". "Epidemiological evidence supports strong temporal correlations between glyphosate usage on crops and a multitude of cancer types that are reaching epidemic proportions, including breast cancer, pancreatic cancer, kidney cancer, thyroid cancer, liver cancer, bladder cancer and myeloid leukemia" [12].

The San Juan settlement is located in the General Francisco Alvarez Caballero region, of the Canindeyú Department and was officially authorized by the Institute of Rural Welfare in 1997. Due to the lack of State assistance regarding services for productive and social support, the settlement began to be disintegrated, despite the fact that the land is very fertile and suitable for family farming, rich in natural resources, forests and waterways. Initially the settlement was comprised by 800 families; today there are only approximately 450 families [13].

In this context, we place this study in an interpretative framework that links the rights

perspective with principles of social and critic epidemiology [14]. We assume that the contact of a population with pollutant substances depends to a great extent on their lifestyles and favorable or negative conditions that are imposed by a social and cultural situation. The protective or destructive character of these conditions is associated with the respect and guarantee of fundamental rights, or their corresponding violations. Therefore we propose as something of vital importance to insert problem analysis as the dynamics of exposure of the population to pollutant substances in the environment, forms of exposure, different vulnerabilities of groups, persistence over time in the understanding of such macro determinants, without which any effort of interpretation may be deprived of its explanatory basis [14,15].

Some characteristics of family farmers that currently make up the San Juan settlement are described in this paper, as well as its connection with pesticide spraying practices that constantly take place in fields cultivated with transgenic soybeans that surround the population. The category that characterizes such practices would be defined by the permanent violation of fundamental rights of peasant families living in San Juan.

### 1.1 Objective

To investigate the risk conditions of pesticide exposure in population devoted to subsistence farming and surrounded by GMO crops, through the analysis of the fulfillment of State obligations to guarantee basic human rights.

## 2. METHODS

This study, with a social epidemiology approach, is framed as part of a broader research that will investigate severe and chronic exposure to pesticides in children ages 5 to 10 of a project (14INV 180) funded by the CONACYT [16].

It was established as target parents or tutors of children who live in San Juan Department of Canindeyú (Py) in January 2016 [17].

A questionnaire with 25 closed questions was made, it was translated by two bilingual professionals (Spanish-Guarani), members of the research team and experienced in handling interviews with bilingual people. Subsequently, the two got together to compare versions, agree on a common translation, discuss discrepancies,

document decisions and agree on a consensus version. Quality control is carried out through a "test-retest" in a subsample of 10 individuals, similar to the target population, who were interviewed in order to administer the questionnaire. In those questions that presented difficulties in understanding, a deeper inquiry was performed, in order to facilitate the process of analysis and the corresponding adjustment of the items, thus ensuring a version that was considered optimal, that was later applied to the study sample.

Variables related to social micro and macro determinants of pesticide poisoning were considered for the questions. The analysis concerning whether there exists a violation of rights or not, was performed by the relationship of these factors with the obligations contained in specific articles of the Paraguayan Constitution and Law No. 3742 of products for plant protection control of agricultural use in force in Paraguay.

The protocol was approved by the Ethics Committee of the Catholic University. The principles of respect for persons, beneficence and justice were taken into account. At all times, free participation (established by informed consent) and data protection was guaranteed by the confidentiality of respondents (use of alphanumeric codes).

## 3. RESULTS AND DISCUSSION

In Table 1 can be noted that the adult population surveyed in San Juan, only reaches the basic literacy skills level. UNICEF considers to complete five years of schooling as the minimum required for basic literacy which involves literacy at an early stage. In fact, at national level, the social category that has less cultural capital and less writing exercise is within the group of farmers, fishermen and agricultural workers [18]. It is noted in this regard that the constitution, in article 73 recognizes the right to comprehensive and permanent education, which as a system and process is done in the context of the culture of the community. Particularly, one of the State's obligations under article 76 is to foster secondary, technical and agricultural education. Similarly, the constitution, in article 115, clause 13 requires the State to contribute to the education of the farmer and his family, to qualify them as active agents of national development and to create regional centers for the study and agrological typing of the soil, in

order to establish agricultural areas in suitable regions (art. 115, paragraph 14). The situation of the population surveyed in this regard reveals that none of these conditions are guaranteed by the state.

The average residence in the settlement is 12 years or more and out of the 800 families that initially acquired those lands, currently there are only 450 families or less left. This population decline is associated with the fact that complaints of massive, both terrestrial or aerial spraying had no response from the state and the community that initially was an area with mountains, wildlife, crystal clear streams today is a huge and rough territory [19]. Forced migration is part of a pattern that is repeated in the departments most affected by the expansion of agribusiness (Alto Paraná, Caaguazú and San Pedro) that lost rural population in the period from 1992 to 2002 [20]. The absence of state regulation and minimum protection in spraying and pesticide use is also a condition that is repeated in other communities surrounded by transgenic soybeans [21]. It is mentioned here that the constitution, in article 6 recognizes the right to quality of life and the state is obliged to promote it through plans and policies that recognize conditioning factors such as extreme poverty and impediments of disability or age. Also in article 115 thereof, it provides for the State's obligation to allot plots of land ownership to beneficiaries of land reform with the necessary infrastructure for settlement and rooting, to preferably support Paraguayan peasants in the plans of agrarian reform, and to rationalize and regulate land use and farming practices to prevent degradation. Again, all such state obligations are not met with the population studied.

A level of impact of these conditions can be observed, in the fate of the settlement crops (Table 1). The dedication to the cultivation for consumption is slightly greater, compared with smaller percentage of the crop that combines consumption with income. The latter is concentrated in a few sectors that are able to sell the product to the community in nearby towns. The fact represents one of the impacts of agribusiness in family farming and food production. Agricultural production is reduced to the minimum required for subsistence in a context where the agriculture on large-scale surrounds and chokes it, besides little or no support from national state institutions and local governments [21,22]. This situation is linked to the provisions of article 115 of the National

Constitution that the State shall adopt a tax system and other measures to encourage production, discourage large scale landholding (latifundio) and ensure the development of small and medium rural property, according to the peculiarities of each zone; also it must established systems and organizations to ensure fair prices to peasant producers, granting agricultural loans, at low cost and without intermediaries, and encourage intensive and diversified agricultural production. The characteristics and conditions of agricultural production in the studied community reveal that these state obligations are not met.

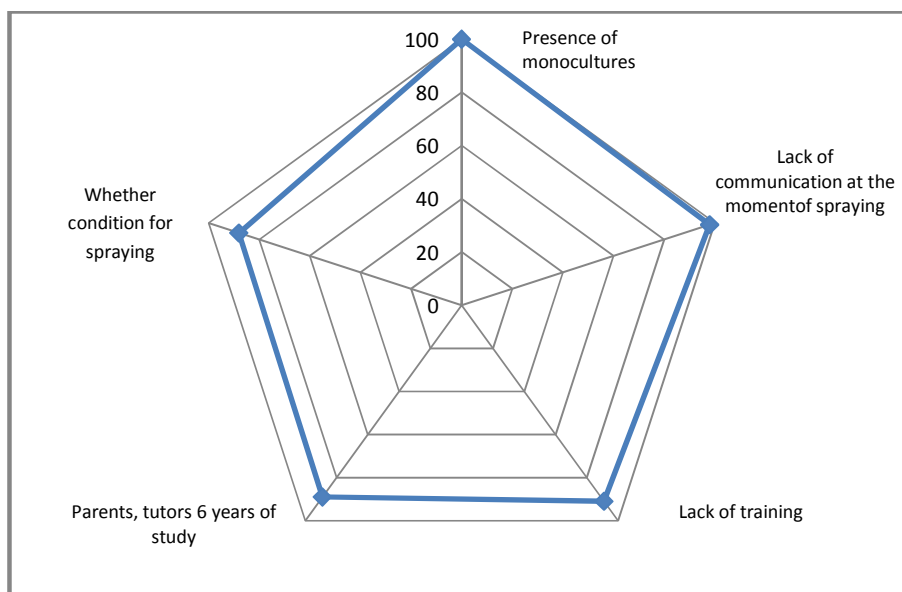
In Fig. 1 these features are described. Planting is carried out to the edge of the settlement, sometimes separated by a street and in others there are no separations because the crop starts at the edge of the land of the families. Pesticide spraying of soybean crop that surrounds the community is made without notice and regardless of weather, especially wind direction on the day of spraying; to this must be added the absence of barriers and buffer zones that are legally required [12]. Adults surveyed also did not receive any training regarding the handling of pesticides, their characteristics and classification. This situation constitutes one of the modalities of insertion of the transgenic soybean: It is planted to the edge of the settlement under the conditions described, forcing the closest families to live with the agrochemical in a permanent manner [21] The fact represents a clear risk factor for the health of those exposed and it is an environmental risk unknown by the State and regarding which it omits to take any precautions, even in relation to the most vulnerable people such as children, pregnant women and elderly persons [22]. In this situation, a series of unfulfilled state obligations converge. On the one hand, the constitution, article 68, guarantees the right to health as a fundamental right of the individual and in the interest of the community; article 7 guarantees the right of everyone to live a healthy and ecologically balanced environment, article 8 provides for the regulation of activities that are likely to cause environmental nuisance by restricting or prohibiting those that qualify as dangerous. Furthermore, Law No. 3742 of control of phytosanitary products for agricultural use, in articles 59 to 69, provides the conditions and mechanisms in which aerial spraying must be made, establishing a buffer zone of two hundred meters between the application area and every human settlement, schools, health centers and posts, temples, squares, places of

public gathering and waterways in general, in which cases should fumigations be immediately suspended (whether people or animals that do not participate in the operation are exposed, or if there is any risk resulting in pollution of

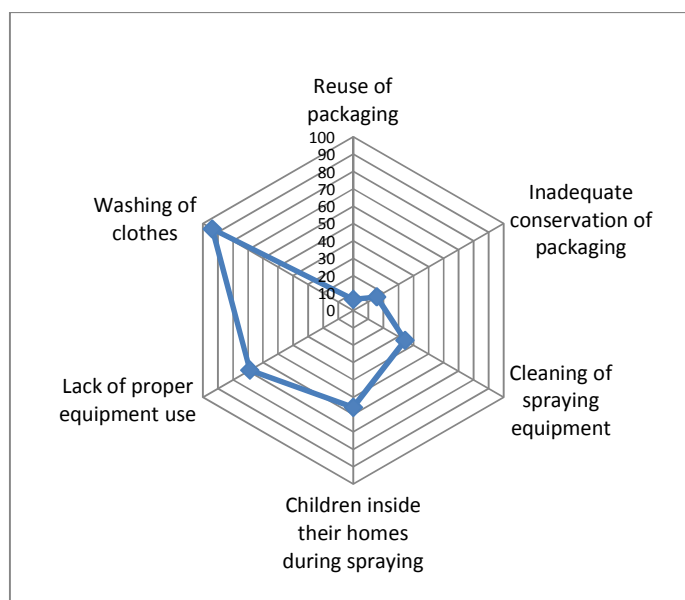
waterways, or unfavorable weather conditions) and the need to inform the responsible state institution 24 hours before the operation. All such regulations are not met in the case of the population under study.

**Table 1. Socio-demographic profile of the population under study**

Variables	Parents/Tutors		Children
<b>Age</b>			
$\bar{X}$ (SD)	41,3 (11,7)		7,5 (1,7)
	<b>N°</b>	<b>%</b>	
Under 30	8	18,6	
30 to 39	14	32,6	
40 to 49	11	25,6	
50 to 59	7	16,3	
60 and more	3	7,0	
<b>Gender</b>			
Female	23	53,5	
Male	20	46,5	
<b>Years of study</b>			
$\bar{X}$ (SD)	4,9 (± 1,9)		2,5
<b>Years in community</b>			
$\bar{X}$ (SD)	12,9 (5,7)		12,9 (5,7)
<b>Dedication to family agriculture</b>			
	<b>N°</b>	<b>%</b>	
Yes	43	100,0	
No	0	0,0	
<b>Designation of cultivation</b>			
Sustainability	23	53,5	
Income	0	0,0	
Income and sustainability	20	46,5	



**Fig. 1. Macro determinant conditions of pesticide exposure**



**Fig. 2. Micro determinant conditions of pesticide exposure**

The presence of certain practices associated with the management of family farms in the settlement must be added to these macro determinant conditions. Fig. 2 shows high percentages regarding the routine preferably conducted by women of washing clothes worn by the adult during fumigation of their family cultivation which is carried out without the use of proper equipment. Likewise, the cleaning of the spraying equipment is made near the house, although in smaller percentage. A certain level of improper storage of containers and a minimum percentage of reutilization can also be noted. These practices have to be related to the lack of training indicated in Fig. 1 and the level of basic literacy of the population recorded in Table 1. It should be noted that the conditions for washing clothes and handling of the spraying equipment, are associated with non-compliance with what is provided for in article 115 of the constitution regarding the state's obligation to contribute to the education of the farmer and his family, and in this specific case, in handling packaging of plant protection products, as provided by article 48 of law no. 3742 it is the responsibility of producers or users to perform the triple washing or pressure washing of containers immediately after emptying the container during preparation of the broth or mixture, in addition to perforate the base and return empty containers to collection centers or mini-centers indicated in product sales invoice issued by the marketer or distributor of the product. They must also have a place for

temporary storage of empty containers, where they remain until they are actually returned.

From the perspective of critical epidemiology and according to the findings of a series of unfulfilled state obligations that represents a violation of rights, the situation of the population of San Juan, is characterized by a constant exposure to pesticides which represents an aspect of a set of processes that have destructive / deteriorating properties for the living conditions of families. The existence of this permanent exposure creates a situation which is no longer an eventuality but as an imposing way of determination [15], a particular quality of the permanent exposure that involves a high epidemiological vulnerability of the affected population who possesses little control over exposure conditions. In this set of processes, the weakness, and in several of the rights gathered, the absence of state capacity to guarantee and protect fundamental rights is highlighted. The violation of such rights is a repeating pattern in which framework, the ways to take care of the health and disease of the population of San Juan must be understood.

#### 4. CONCLUSION

1. The population of San Juan has little control over the conditions of permanent exposure to pesticides, situation that involves high epidemiological vulnerability.

2. Reduction of agricultural production limited to subsistence, due to lack of State support and expansion of soybean crops.
3. There is a permanent violation of human rights as a result of the expansion of agribusiness in the region.
4. Permanent monitoring of the health of families living in the place, with particular emphasis on the most vulnerable populations (children, women, pregnant women and elderly persons) due to continuous exposure to pesticides is recommended.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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