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Occupational Safety and Health: Vulnerability and perception of risks related to the use of agrochemicals in an irrigated horticulture center of Rio Grande do Norte

Segurança e Saúde do Trabalho: Vulnerabilidade e percepção de riscos relacionados ao uso de agroquímicos em um pólo de fruticultura irrigada do Rio Grande do Norte

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Abstract: The use of agrochemicals in Brazil has been growing in recent years, and many farmers who use these products do not handle them correctly, facing the risk of contamination by non-compliance with safety standards. Thereby, the aim of this study was to conduct a survey on the use of agrochemicals by banana producers in the municipality of Ipanguaçu, Rio Grande do Norte state in order to investigate the handling of these products. To this end, a semi-structured form comprising questions related to sociodemographic matters, agrarian structure of properties, handling of agrochemicals, and perception of risks to humans and the environment was used to collect information. The results show that most rural workers are men (90.48%) aged over 45 years (52.38%), property owners (47.62%), with incomplete elementary education (23.81%). In addition, responses to issues related to the risks to humans and the environment were found, showing that workers with a better level of awareness regarding agronomic prescription know that these products are dangerous, read their labels, and recognize the necessity of using Personal Protective Equipment (PPE). However, deficiency is perceived in the use of correct practices with respect to the grace period of products, the order to remove them, the disposal of empty containers, and the use of all PPE. Therefore, the study reveals that many farmers do not meet the recommendations for the application of this technology, placing their health and the environment at risk.

Keywords: Agrochemicals; PPE; Environment; Rural workers' health.

Resumo: *O uso de agroquímicos na agricultura vem crescendo ano após ano no Brasil, e muitos agricultores que utilizam esses produtos não fazem o manejo de forma correta, aumentando assim, os riscos de contaminação pelo não cumprimento das normas de segurança. Desse modo, o objetivo da presente pesquisa foi realizar um levantamento acerca do uso de agroquímicos pelos produtores de banana no município de Ipanguaçu, RN, a fim de investigar sobre o manuseio desses produtos. Para a coleta de informações utilizou-se um formulário semiestruturado no qual constavam perguntas relacionadas a questões sociodemográficas, estrutura agrária das propriedades, manejo dos agroquímicos e percepção de riscos ao homem e ao meio ambiente. Como resultado, encontrou-se que a maioria dos que trabalhavam no campo são homens (90,48%), com idade acima de 45 anos (52,38%), grau de escolaridade primário incompleto (23,81%) e donos da própria propriedade rural (47,62%). Além disso, foram encontradas respostas para questões relacionadas aos riscos ao homem e ao meio ambiente, por meio das quais se constatou que os trabalhadores tinham certo nível de conscientização com relação ao receituário agronômico, percebiam que os produtos eram perigosos, liam o rótulo das embalagens e reconheciam a necessidade de utilização dos Equipamentos de Proteção Individual (EPIs). Porém, quanto ao respeito ao período de carência do produto, utilização de todos os EPIs, a ordem de retirá-los e o destino das embalagens vazias notou-se deficiência nas práticas corretas. Portanto, a pesquisa revelou que muitos agricultores não atendiam às recomendações necessárias à tecnologia de aplicação, colocando em risco tanto homem como meio ambiente.*

Palavras-chave: *Agrotóxicos; EPIs; Meio ambiente; Saúde do trabalhador rural.*

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1 Introduction

Banana is the most consumed fruit worldwide, where Brazil holds first place as the largest consumer and the second as the largest banana producer in the world (Guerra et al., 2009) and the fruit is the fourth most consumed plant-based food (EMBRAPA, 2009). In our country, the region that excelled in banana production in 2010 was the northeast (38.05%), then the southeast (31.97%), south (14.69%), north (11.70%) and central-west (3.58%), respectively, and in the northeast the main banana producers are: Bahia, Pernambuco, Ceará, Paraíba and Rio Grande do Norte (EMBRAPA, 2010).

The state of Rio Grande do Norte is ranked as the 13th (thirteenth) banana producer state of the country (Guerra, 2008). Among the main producing municipalities, it is observed that the largest production is in the Vale do Açu region, with Ipanguaçu, Alto do Rodrigues, Carnaubais and Açu, as leaders (IBGE, 2006 apud Guerra, 2008).

In agreement with data collected by the Ministério da Agricultura, Pecuária e Abastecimento (Brasil, 2012) [the Ministry of Agriculture, Livestock, and Supply] together with the Secretaria de Defesa Agropecuária (SDA) [Livestock Defense Secretariat], Departamento de Defesa e Inspeção Vegetal (DDIV) [Department of Defense and Vegetal Inspetion] and Coordenação de Fiscalização de Agrotóxicos (CFA) [Pesticide Supervisory Coordination] there are 106 types of agrochemicals that can be used in banana crop.

The use of these products in commercial plantations is increasing worldwide, especially in developing countries that are responsible for 30% of the world market, while Brazil occupies a prominent position, consuming half of what is consumed in Latin America and leading the ranking as the biggest buyer of the latin-american region (Peres et al., 2007). In addition, in 2010, Brazil became the world record holder in the use of agrochemicals (Iglesias, 2010) and continued to grow in the next year, an increase of 10% in cumulative sales up to October 2011, compared to the same previous period (SINDAG, 2011).

According to the Instituto Nacional de Cancer José de Alencar (INCA) [National Cancer Institute José Alencar Gomes da Silva], the Fundação Oswaldo Cruz (Fiocruz) [Oswaldo Cruz Foundation] published an open letter to society, warning of the risks of recent changes in legislation regulating the use of agrochemicals. The text reinforces as scientific studies have proven the damage caused by these chemicals to the health of the population, affecting mainly social segments of great vulnerability, as residents and workers from rural areas, indigenous populations, quilombolas and riverine communities (INCA, 2014).

Despite the synthetic substances decrease the agricultural losses, the inadequate management creates negative health effects on those who have direct contact (employee) or indirect (family nucleous/or consumers), as well as damage to the environment, which alarmingly affects the living beings. Therefore the use of these substances creates risks to both human health and risks relating to the environment (Peres & Moreira, 2007; Pignati et al., 2007) and even if they are used against pests and plant diseases above the recommended amount, they can spread (drift), causing environmental pollution and contamination of humans (Moura, 2008).

Soares & Porto (2007) affirm that toxicological effects on human health through direct means are through the intoxication of rural workers, causing profound and chronic implications. Monquero et al. (2009) say that the acute poisonings occur after maximum exposure, in a short period of time, to the high toxicity substances (Class I and II), with very fast and very noticeable appearance of symptoms, such as headache, dizziness, weakness, diarrhea, among others. On the other hand, the chronic poisonings occur after months or years of small or medium exposure to a toxic product or to a variety of substances, and the clinical picture is undefined.

Palma (2011) proved that the effects of these chemical substances transcend generations, when concentration of agrochemicals in 100% of the analyzed samples of breast milk of women living in Lucas do Rio Verde/MT was found, which shows that there is the transfer of these substances to the newborn child. In contrast, the toxicological effects on human health by indirect route are, for instance, when consumers health is affected when food which residual level is harmful to health is ingested. In consonance with ANDEF (2006), in addition to workers, other people who are not even applying or handling agrochemicals could be indirectly infected when in contact with contaminated plants, clothing and food.

Besides presenting risks to man, the introduction of agrochemicals in the environment can produce undesirable effects, such as the changing of the natural biochemical dynamics by selection pressure exerted on the organisms, showing changes of impact on the functioning of the affected ecosystems (Spadotto, 2006). Still, concerning the environment, their misuse affects the biotic and abiotic components, accumulates in biota and contaminates water and soil through the incorrect destination of packages and the exceeding amount of chemicals recommended by the qualified professional. When agrochemical dispersion occurs in the environment it affects the number and the distribution of animal living beings, on the other hand, when natural predators of disease vectors are affected by contamination the diseases in areas where man lives have an increase (Peres & Moreira, 2007).

In consonance with Peres et al. (2007), several factors are related to the increased risks in the use of agrochemicals, such as: low educational level, absence or deficiency of monitoring and information by technicians, lack of information for product management and return of packaging by manufacturers and distribution centers, lack of knowledge of effective techniques that replace the use of agrochemicals, inappropriate disposal of packaging and chemical waste, maximum use of pesticides, lack of government initiatives on technical assistance and lack of sales control of these synthetic products. The contamination by these products is intensified in small rural communities due to factors such as: deficiency in sanitary conditions and local health system, lack of infrastructure of the population because they have low socioeconomic conditions and the absence or deficiency of the educational level of workers connected to the process (Veiga, 2007). Conforming to Nunes (2010) the absence of a more effective monitoring policy makes employers do not inform their employees about poisoning risks and environmental contamination as well as the need for the use of Personal Protective Equipment (PPE).

According to a study conducted by Espíndola (2011) at the Escola de Engenharia de São Carlos (EESC) [School of Engineering of São Carlos] of the Universidade de São Paulo (USP) [University of São Paulo], most of the small farmers who use pesticides on their crops are aware of the risks caused by the use of products, but still they neglect the danger they represent. Moreover, it was observed that farmers are conscious of handling a dangerous product, but this danger is ignored due three main factors: the lack of information, low educational level and the perpetuation of ancient farming practices. Other than that, there is still the feeling of immunity to danger and the financial issue. Also farmers often use ordinary clothes for the application of toxic, and often mix it with other products inappropriately.

As a result, political views taken as a kind of "protective belt" are necessary because once implemented, these actions come to help the process of rationalization of the use of these products, since they are elements that begin to be incorporated indirectly in the decision-making process of using or not the agrochemical. Examples of possible policies to be adopted may be inductors of structural changes in production technologies, or command-control for situations where public health recognizes the existence of more serious risks to the population (Soares & Porto, 2007).

2 Study area and justification

In this article the city studied was Ipanguaçu/RN (Rio Grande do Norte) which is located in the middle region Oeste Potiguar and microregion Vale do Açu, on the right bank of the Piranhas/Açu River, in which is located one of the main dams - Barragem Armando Ribeiro Gonçalves, with a capacity of 2.4 billion cubic meters. This municipality has borders with Afonso Bezerra (North), Açu (West), Itajá (South) and Angicos (East). The municipality seat has an average altitude of 16 m and coordinates 05° 29' 52,8" south latitude and 36° 51' 18" west longitude, with a distance of about 211 km from the capital (Brasil, 2005; Guerra, 2008).

Regarding to the climate it is very hot and semi-arid, with rainy season and average annual rainfall of 670 mm. The rainy season is between February and May and farming leads as main economic activity, followed by the extractivism and trade (Brasil, 2005; Guerra, 2008).

As reported by Guerra (2008), the region of Vale do Açu has favorable conditions for banana cultivation, however, there is low precipitation for such cultivation, so hydrological complement is necessary (irrigation). As their wetlands are fertile, especially where the municipalities of Açu and Ipanguaçu (Baixo Açu) are located, this area has always been coveted for farming and extractivism (Albano & Sá, 2008).

Due the significant importance of the region in banana cultivation and the risks associated to inappropriate use of agrochemicals, it is observed that this issue is of interest to society as a whole, then it is appropriate to conduct a research in the city of Ipanguaçu/RN, which belongs to the Vale do Açu region, where the economic base is agriculture, and it is undoubtedly a major producer of bananas. It is notable that this is pioneer, since no one has yet conducted this kind of study in the region.

The proposal of this research was to conduct a survey on the use of agrochemicals in the small banana-producing properties in the municipality of Ipanguaçu/RN in order to find data on the sociodemographic and agrarian structure along with data on the risks to environment and man by improper use of pesticides.

3 Methodology

Initially a survey was made in the Instituto de Assistência Técnica e Extensão Rural do Rio Grande do Norte (EMATER) [Technical Assistance Office and Rural Rio Grande do Norte Extension], located in Ipanguaçu/RN to check the amount of producing properties of banana, which revealed that there are 62 small properties in the municipality, in which, the production is intended for both the RN and to nearby states. Furthermore, some of these producers cultivate only banana trees, while others, along with this one, cultivate other crops. For the purpose of research, properties as Baldum, Base Física, Olho D'água and Pau de Jucá were visited in the city of Ipanguaçu. Twenty-one producers were randomly

selected from the original number of 62 banana producers. As selection condition, producers would have to use some agrochemical during cultivation.

The research methodology was developed based on a case study, since a situation apart was used to represent an entire set of cases that resemble this (Severino, 2007). The techniques used in the research were the interview, observation and application form. As stated by Severino (2007), the interview is the information collection technique on a particular subject, directly asked to the interviewed individuals. In consonance with the same author, the observation is when the researcher has access to the object studied and it is necessary in any kind of research. And the form is a questionnaire in which the researcher fills from the informant's responses (Ruiz, 2011).

The use of the form as a method of obtaining the data has several advantages, among them, one that stands out is the possibility of being used in almost every segment of the population, because its fulfillment is done by the interviewer (Marconi & Lakatos, 2010). The use of a form was chosen because the research was carried out with small farmers and rural households with significant levels of illiteracy.

A semi-structured form based on several authors, as Araújo, Nogueira & Augusto (2000), Soares, Almeida & Moro (2003), Castro & Confalonieri (2005), Monquero et al. (2009), Ávila et al. (2009), Gasparini (2012) and Preza & Augusto (2012) was designed. The number of visits per day and the time of each visit ranged in half an hour minimum and a maximum of one hour and a half . The form was divided into two segments. The first segment dealt with is the sociodemographic issue of respondents and their agrarian structure; and the second segment investigated the management of agrochemicals and perception of risks to man and the environment. The daily observation reports was also part of the research. The data analysis was carried out from simple statistic, taking into account the sample size. The data provided by respondents were presented in graphs and tables.

Table 1. Sociodemographic characterization of banana producers, Ipanguaçu/RN.

Selected variables	Percentage (%)
Total sample (21)	
Genre	
Male	90.48
Female	9.52
Age Group	
Less than 18 years	0.00
Between 18 and 22	0.00
Between 22 and 30	9.52
Between 30 and 45	38.10
Over 45	52.38
Level of Education	
Illiterate	4.76
Incomplete Primary	23.81
Complete Primary	4.76
Incomplete Elementary	14.29
Complete Elementary	9.52
Inomplete High School	4.76
Complete High Scool	14.29
Incomplete College Education	9.52
Complete College Education	4.76
Others	9.52
Work relationship	
Owner	47.62
Salaried	4.76
Familiar	23.81
Sharecropper / tenant	23.81
Contract for daily or harvest season	0.00
Others	0.00
Occupation	
Applicator	4.76
Technical assistance	0.00
General service	80.96
Others	14.29

Source: Authors.

4 Results and discussion

4.1 Socio-demographic characterization and agrarian structure

Initially it was asked about the gender, age, education level, employment relationship and occupation of small banana producers in the municipality of Ipanguaçu/RN. For a better understanding, Table 1 was elaborated. From the sample taken, 9.52% are female and 90.48% male. These results agree with the research by Espíndola (2011) in the municipality of Bom Repouso/MG, Araújo et al. (2007) in Nova Friburgo/RJ and Almussa & Schmidt (2009) in the city of Sertãozinho/SP who found predominance of male workers in rural properties. Preza & Augusto (2012) also found that the majority of rural workers in the municipality of Conceição do Jacuípe/BA are male (96.50%).

The age groups of respondents are between 22-30 (9.52%), 30-45 (38.10%) and over 45 (52.38%). This result agrees with other studies on rural workers against the use of agrochemicals, such as Gasparini (2012), in the municipality of Nova Friburgo/RJ, in the production of flowers, eighteen of the twenty respondents are male and most of them are between 31 and 40 years old. The average age of the individuals interviewed by Preza & Augusto (2012) was 38 years old, and the age group most representative was 30 to 39.

Regarding to the education level, it is observed that the incomplete primary school (23.81%), incomplete

elementary school (14.29%) and complete high school (14.29%) were the most cited. This reality found in the municipality of Ipanguaçu/RN is similar to the data of a research conducted in Bom Repouso/MG that found 32.37% of workers with incomplete primary school, 25.43% with incomplete elementary school and 11.56% with no formal education (Espíndola, 2011). A similar fact was also found by Araújo et al. (2000) in the irrigated perimeter of Vale do São Francisco/PE and Camocim de São Félix/PE, in which 41% of rural workers had not completed primary education and 41% were illiterate. In Nova Friburgo/RJ, most had education up to 5th grade of elementary school (Gasparini, 2012). Concerning the rural workers educational issue, who used agrochemicals in vegetable production in the Northeast of Brazil, Preza & Augusto (2012) confirmed that 45% of the study population have completed the first cycle of elementary school and only one person completed high school, while the proportion of illiterates was 31%, with an average age of 39.

In general, the research shows that the minority (4.76%) are salaried employees and the majority (47.62%) are owners of their own farm and perform general farm services, from planting, application of agrochemicals, until the harvest of fruits (banana). Preza & Augusto (2012) also found that 58.6% of agrochemical users in the Northeast brazilian region were owners of cultivated land, 10.4% were tenants and 31% were employees.

The last question on the sociodemographic characterization addressed the occupation that they developed on the property. In line with them, a quantity larger than 80.96% perform general services (complete management of production). This result was expected, since this is a case of small farms, with labor dedicated to family and with a few employees. In a research by Gasparini (2012) it was also found that in the farms visited the family labor was predominant, and production techniques passed on from generation to generation, where they are involved throughout the production cycle.

Regarding the agrarian structure, most producers have banana plantation area between 1 to 5 hectares (47.62%). In second place comes to the area from 6 to 10 hectares (38.10%) and in third the area from 11 to 15 hectares (14.29%). It was not cited any area larger than 15 hectares for specific cultivation of bananas, as shown in Figure 1. It is worth noting that some of them only produce banana, while others add other crops such as: papaya, watermelon, mango, beans, corn etc. It was noticed that the planting of a particular culture depends on the time of the year and other factors that agriculture is limited to. In the study of Castro & Confalonieri (2005), the region of the municipality of Cachoeiras de Macacu/RJ also had characteristics of small farms, where 45% had areas with up to 10 hectares.

The variety of banana produced in 57.14% of properties visited is only of Silk banana, and the second Silk and Pacovan (19.05%), third Silk, Pacovan and Green Rind banana (9.53%) as described in Table 2.

4.2 Management of agrochemicals and perception of risks to humans and the environment

4.2.1 Agrochemicals, humans and environment

Only 11 types of the 106 types of chemicals used in banana crop, including fungicides, herbicides, insecticides, nematicides, bactericides, among others (Brasil, 2012) were cited by respondents in the municipality of Ipanguaçu/RN, and all cited pesticides are allowed in banana crop.

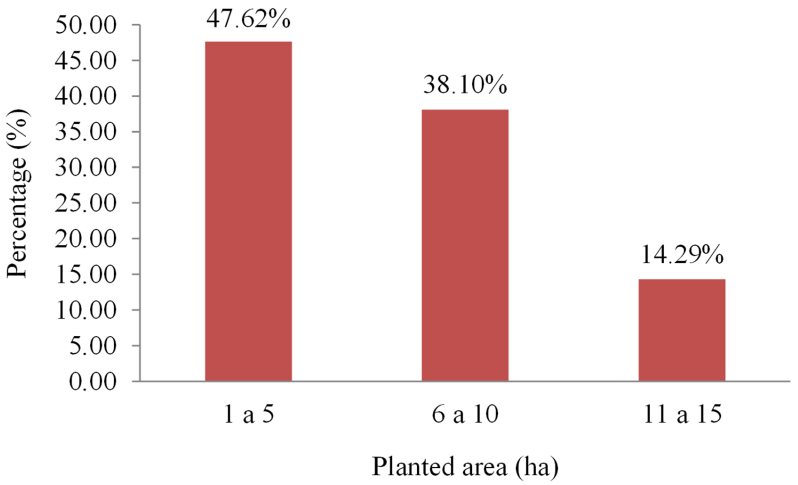

Figure 1. Area for production of banana, Ipanguaçu/RN. Source: Authors.

Among the types of chemicals used, it was possible to be seen that most are herbicide (60.47%), followed by fungicide (34.88%) and lastly the insecticide/nematicide (4.65%). But these results differ somewhat from the agrochemicals used by farmers in the region of Araras/SP (Monquero et al., 2009) who used more insecticide (41.90%), then the herbicides (23.2%), fungicides (20.90%) and acaricidal (14.00%).

Depending on the type of agrochemical utilized (herbicide, fungicide, insecticide, etc.) there are different methods of application. The knapsack sprayer (67.74%) and the atomizer (29.03%) were the most frequently cited by respondents. This resembles Araújo et al. (2000), in which the backpack sprayer used was the application equipment. In Cachoeiras de Macacu/RJ, 75% of respondents used the costal manual spray as application equipment (Castro & Confalonieri, 2005).

In agreement with the names of agrochemical given by respondents and further research on the virtual page of the Ministério da Agricultura, Pecuária e Abastecimento (Brasil, 2012) [Ministry of Agriculture, Livestock and Supply], in Table 3 there is the group, the type, the risk to humans and the environment and the active ingredient to which it belongs. It is noted that 9.09% are slightly toxic (Class IV), moderately toxic 36.36% (Class III), 27.27% highly toxic (Class II) and 27.27% highly toxic (Class I) to humans. As for the environmental class, 36.36% of pesticides cited are medially toxic (Class III) and 63.64% highly toxic (Class II). Monquero et al. (2009) found that 11.3% of the agrochemicals used in Araras/SP region were extremely toxic, 24.50% highly toxic, 45.30% averagely toxic and 18.90% slightly toxic to human class.

The listed agrochemicals in Table 3 were cited by producers interviewed at least once. All farmers acquire the products in points of sale, either in nearby cities as Açu/RN, or in cities a little more distant, as Mossoro/RN and Natal/RN. Gasparini (2012) cited in his research that the purchase of pesticides and fertilizers was done most of the time, directly in rural

Table 2. Percentage of banana varieties produced in smallholdings, Ipanguaçu/RN.

Banana variety	Number of properties	Percentage (%)
Only Silk	12	57.14
Silk and Pacovan	04	19.05
Silk and Green Rind	01	4.76
Silk and *Grand Naine*	01	4.76
Silk, Pacovan and Green Rind	02	9.53
Silk, Pacovan e *Grand Naine*	01	4.76
TOTAL	21	100.00

Source: Authors.

Table 3. Group, type, risk to humans and the environment and the active ingredient of agrochemicals used in smallholdings of banana, Ipanguaçu/RN.

Group	Type	HC	EC	Active ingrediente
Bipyridylium	H	II	II	Dicloreto of paraquate
Bipyridylium	H	I	II	Dicloreto of paraquate
Replaced Glycine	H	IV	III	Glyphosate
Replaced Glycine	H	III	III	Glyphosate
Triazol	F	I	II	Propriconazol
Triazol	F	III	II	Tebuconazol
Triazol	F	I	II	Difenoconazol
Benzimidazole	F	II	III	Thiophanate-methyl
Strobilurin	F	III	III	Azoxystrobin
Triazole and Estrobirulina	F	II	II	Epoxiconazole + Pyraclostrobine
Benzofuranyl methylcarbamate	I/N	III	II	Carbofuran
Class	-	HC	EC	-
IV	-	9.09%	0.00%	-
III	-	36.36%	36.36%	-
II	-	27.27%	63.64%	-
I	-	27.27%	0.00%	-
TOTAL	-	100.0%	100.0%	-

Herbicide (H), Fungicide (F), Insecticide/Nematicide (I/N), Human Class (HC), Environmental Class (EC), I (extremely toxic/highly dangerous), II (highly toxic / very dangerous), III (moderately toxic / dangerous), IV (low toxicity/slightly toxic). Source: Authors.

properties, with the weekly visit of the commercial representatives of chemical industries, and in some sporadic situations, in agricultural stores in the city center of Nova Friburgo/RJ.

On the question of whether guidance of use was received or not, only two (9.52%) of the 21 producers do not receive guidance on how to use agrochemicals. Of the nineteen (90.48%) who receives guidance, most of them gets the guidance from an agronomist in the point of sale (59.09%), followed by an engineer or a hired agricultural technician (36.36%). Furthermore, in consonance with the respondents, 95.24% buy the agrochemical through agronomic prescription (mandatory form, by law, fulfilled for pesticide marketing control) and only 4.76% buy the products on their own. This result is alarming due proving that there are producers who still buy agrochemicals without prescription, however, a situation even more frightening was observed by Araújo et al. (2007) in Nova Friburgo/RJ in the agronomic where prescription was used in only 36% of negotiations.

As for the reading of agrochemical labels, a little more than the half reads them (52.38%). This finding is compatible with Castro & Confalonieri (2005) results, which state that 52.50% of respondents read the labels on the product and 47.50% do not read. Those who did not read alleged to have already known the products and apply them for a long time, among other similar reasons.

4.2.2 Likely risks to humans and their perceptions

4.2.2.1 Practices

The Table 4 shows that the majority does not respect the grace period of the product (71.43%). Interestingly, they receive guidance use, but do not respect the re-entry period in the area. Testimonials on this question causes concern: "*Sometimes even in the same time, madam"* (Às vezes até na mesma hora, moça). During spraying, the applicators only performs the function that was assigned to them (63.64%), however, there are applicators who drink water during the spraying (31.82%) or smoke and drink coffee (4.55%). As reported by Coelho & Coelho (2008), in respect of re-entry, rural workers do not respect, they enter without PPE and the areas are not marked properly.

The Table 5 summarizes the PPE mentioned, as well as the commonly used by the workers. All of them said they use some type of PPE, in this situation the boots (100%). However, only one (4.76%) uses the complete PPE (gloves, respirator, face visor, smock, hydro-repellent pants, arab cap, apron and boots) and 66.66% use respirators to protect themselves from chemicals in the respiratory tracts. Preza & Augusto (2012) revealed that in the use of PPE, 55.20% of workers admitted to only use the mask or a plastic cover with gloves and / or boots. It is important to note that the lack of any personal protective equipment increases the contact with synthetic chemicals and it enables its accumulation in the body, and subsequently increases the probability of poisoning (Ávila et al., 2009).

About the sequence to remove the PPE, the pants (66.67%) are the PPE taken last of all by agrochemical applicators, followed by boots and gloves (14.29%) and the smock (4.76%), as shown in Figure 2. However, no one cited the respirator, which in agreement with ANDEF (2006) is the PPE that must be removed last. Often the respirator was the first to be removed, as shown in the following speech: "*We first take the respirator, right? Because it is suffocating, it's too bad*" (*A gente tira primeiro o respirador né? Porque fica sufocando, é ruim demais*).

4.2.2.2 Perception

The field work is dangerous because there are a number of factors that contribute to such environmental risks, whether from, physical, chemical, biological, ergonomic and accidents. For Coelho & Coelho (2008),

Table 4. Concerning to the grace period and activities during the product application by the banana producers, Ipanguaçu/RN.

Selected Variables	Percentage (%)
Concerning to grace period	
No	71.43
Yes	28.57
Activities during the product application	
Only performs the function that was assigned to them	63.64
Drink water	31.82
Others	4.55

Source: Authors.

Table 5. Use of each PPE necessary to agrochemical application cited by banana producers, Ipanguaçu/RN.

PPE	Frequency (%)
Gloves	80.95
Respirators	66.66
Face visor	33.33
Smock	38.10
Hydro-repellent pants	42.86
Arab cap	42.86
Apron	19.05
Boots	100.0
All PPE	4.76

Source: Authors.

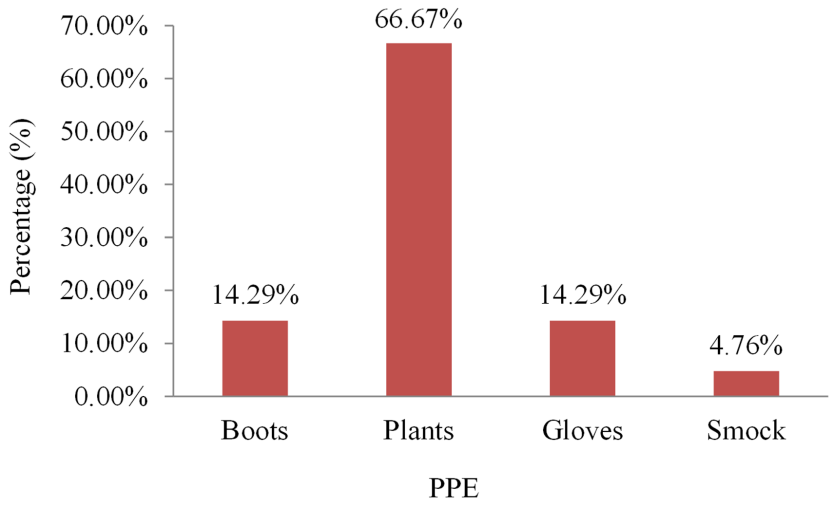

Figure 2. PPE that is removed last after application of agrochemicals by banana producers, Ipanguaçu/RN. Source: Authors.

work in rural areas involves a number of risks to the farmer. Conforming to the banana producers in this research, it is observed in Table 6, how dangerous they consider to work with these synthetic chemicals (85.71%), they state that: "*Every pesticide is highly dangerous"* (*Todo agrotóxico é altamente perigoso*). On the need to use PPE, 14.29% of respondents said it was not necessary and the other 85.71% said it was really important.

The workers said they did not use regularly or did not use PPE because they feel uncomfortable (61.90%) to use it in the region's climate, that is semi-arid, however, 38.10% affirm tolerating its use even on the hottest days. Monquero et al. (2009) also found that the main reasons presented by respondents for not using PPE are: the fact of being very hot, uncomfortable and the difficult breathing and movement. The same thing happened in the study of Castro & Confalonieri (2005), where most of the workers claims that PPE is uncomfortable, because the region is hot. On the other hand, Conceição & Mattos (2008) reported that workers considered that the PPE made it difficult to carry out the farming activities.

When asked if the family felt harmed by the use of agrochemicals, a little more than a half (52.38%) stated that they did not feel harmed. It is important to stand out that some properties are distant from the houses where family members live and, often, products and application clothes are left in the workplace. Thus, the contact with the product is only with the applicator. Farmers exposed to agrochemicals are those with the highest numbers of poisonings by these products (Ávila et al., 2009).

When asked about whether they already know someone who has been ill because of some agrochemical, the majority (76.19%) said they knew someone and others (23.81%) were unaware of it. This proves that the problem is not in isolated situations, but in situatios

Table 6. Producers perception on agrochemical risks, Ipanguaçu/RN.

Selected Variables	Percentage (%)
Danger of working with agrochemicals	
No	14.29
Yes	85.71
Need of using PPE	
No	14.29
Yes	85.71
Opinion about PPE	
Unconfortable for the climate	61.90
Tolerable	38.10
Family feel harmed	
No	52.38
Yes	47.62

Source: Authors.

known to the entire community. Cases where the respondent himself had problem in the blood because of the agrochemical and the doctor forbade him to use it; as well as cases of intoxication mentioned by them of known people who have had problems with poisoning by skin and blood; vomiting; shutdown of the kidneys; cancer and even death because of the chemicals. On the other hand, in a survey conducted by Gasparini (2012), he quotes that there were rare episodes of poisoning by agrochemicals among flower producers in rural communities in the municipality of Nova Friburgo/RJ.

4.2.2.3 Symptoms

Some feel various symptoms after herbicide application, as shown in Table 7, others, no symptom (57.14%). It is observed that those who do not feel any symptoms are closely related to non-use of extremely

Table 7. Symptoms felt after application of agrochemical by banana producers, Ipanguaçu/RN.

Symptoms felt after the application	Number of owners	Frequency (%)
Burning sensation in the throat and lungs	04	19.05
Congestion of respiratory tract	03	14.29
Cramps	00	0.00
Desquamation	01	4.76
Diarrhea	00	0.00
Headache	07	33.33
Chest pain	02	9.52
Weakness	03	14.29
Cough	02	9.52
Mouth and throat sores	03	14.29
Eye irritation	01	4.76
Skin irritation	02	9.52
Skin color change	01	4.76
Nausea	03	14.29
Hoarseness	01	4.76
Dizziness	04	19.05
Other symptoms	04	19.05
Without symptoms	12	57.14

Source: Authors.

Table 8. Destination of application clothes and empty containers of agrochemicals by banana producers, Ipanguaçu/RN.

Selected Variables	Percentage (%)
Clothing destination	
Do the laundry separately of other clothes	90.48
Other destinations	9.52
Containers destination	
Point of sale	38.10
Other	61.90

Source: Authors.

toxic agrochemical to human health. Since most do not feel any symptoms, Ávila et al. (2009) comments that they may also come to develop a clinical picture in relation to pesticide poisoning, especially if you do not use the basic preventive measures.

The most frequently mentioned symptoms were: headache (33.33%), dizziness (19.05%), sore throat, and lungs (19.05%), among other symptoms. In the study carried out in Cachoeira de Macau/RJ, by Castro & Confalonieri (2005), the most frequent symptoms were dizziness, headache, body pain and blurred vision.

4.2.3 Possible risks to the environment

In relation to the clothes destination, the vast majority, in line with Table 8, wash them separately from other garments (90.48%), but some have claimed washing them in the riverbed (9.52%), which represents an environmental risk. In the case of packaging, none cited that left them in a central gathering. Most give another destination to these packages, such as throwing them in the trash, burning them, leaving the packages in the workplace, burial and savekeeping (61.90%). Only 38.10% said they send the packages to a point of sale and 01 of the 21 respondents said performing the triple washing, while in the study of Castro & Confalonieri (2005), 27.50% of farmers burn the empty containers of agrochemicals, 27.50% throw them on the meadow or river, 25% bury them and others adopt another destination.

5 Final considerations

In Ipanguaçu/RN, as well as in many places where agriculture predominates, most of those working in the field are men aged over 45 years old and with low level of education, where it is found that this activity is not being transmitted hereditarily, because the children no longer want agricultural activity as their profession. Still, the majority of respondents are owners of their own farm and performs general farming services (from planting, application of agrochemicals and harvesting of fruits).

According to the data observed, it is noticed that the producers' area of banana plantation in the

city is a maximum of 15 hectares and generally, in addition to this culture, others are employed, such as papaya, mango, watermelon, beans, corn, and others. All producers produce the silk banana and most only produce this variety of banana. This happens because the price per thousand is more expensive. As reported by them, it is more advantageous in the sale, but more susceptible to disease and has a shorter cycle than the Pacovan variety.

For the banana crop, the herbicide is the agrochemical more used by those producers, because the central problems faced by them in culture are with weeds. Fungicides are used only during the rainy season when the occurrence of *Sigatoka* disease, for example, is higher. It was also noted that regarding the fungicides almost every farmer uses one. But in relation to herbicide, there is a standardization of the synthetic chemical product. This is partly because almost all the farmers buy in the same stores of agricultural products.

The toxicological class varies just as the product and its risks to humans and the environment. The results show that the workers have some level of awareness regarding the agronomic prescription, the perception of chemical risks, reading the label, what should be done during the application of the product and the need to use the PPE. It was observed a certain knowledge about the correct way of chemical application, as is standed out by some producers: "*Look lady, it is not good to apply it when it's hot, this is not good for the soil or to the plant. It is better to apply it in a peaceful time, windless"* (*Olha moça, não é bom aplicar no sol quente, não é bom para o solo e nem para a planta; é melhor aplicar em horários calmos, sem ventos*). However, concerning the product grace period, use of all PPE, order to remove it and the disposal of empty containers, there is a weakness of knowledge and disability in the correct practices. The destination of clothing after application, usage guidance of the agrochemical and who receives this guidance are topics to be improved in this practice. Most of wokers receive the usage guidance, but they should work better at it, as the guidance received is from the point of sale, and often the person who guides does not know the property or the history of the plantation area.

Concerning to PPE, most of them consider it uncomfortable for the weather, in addition, many do not use the proper equipment, they wear jeans instead of hydro-repellent pants, cap instead of the arab cap etc. What we see is that they are aware of the danger but do not meet the recommendations. Many times is trying to prevent that the problem is increased, by the agrochemical accumulation in their garments and also another factor observed is that they ignore the order to dress up and remove the PPE.

A distortion of results is perceived, because a portion of the producers do not feel any symptoms and the other portion, report feeling. The symptoms perceived by producers show the problem in the incorrect use of agrochemicals. As for those who do not feel any symptoms, there are two hypotheses: they can not associate a symptom felt by chance to the use of products; or the symptoms will then be presented with the years, the so-called chronic poisoning. As the crops often are far from home, family members are not much affected by the effects, demonstrating once again that the most affected is the applicator itself. Also, it is seen that in the region cases of illness due to these synthetic products are known for many farmers.

The environmental damage occurrs at the moment of giving destination to empty containers, most of the respondentes commit acts of burning and leaving the containers in the workplace, contaminating the soil and the river, considering that it is located near the municipality of Ipanguaçu/RN and when it rains, this product is certainly leachated. The laundry in the river also affects the biotic and abiotic components of nature.

Based on the above considerations, it is observed that most producers are aware of the dangers in agrochemical handling, but are exposed to the risks of these synthetic chemicals without adequate protection. Moreover, they have little sensitivity to environmental issues, perhaps because they are people with advanced age and have low level of education.

It is government's responsibility for alternative initiatives of social action on production. Educational campaigns to farmers in order to show that there is a reduction in damage to the rural workers' health when there is a greater use of PPE, control of agrochemical application, collection of agronomic prescription, surveillance programs on farmers' health, environmental education programs, among others.

To minimize the effects on the environment, the monitoring through laboratory analysis of the active ingredient levels, the improvement of information related to returning agrochemical containers to points of sale or deployment stations/centrals for receiving empty containers to decrease direct and indirect contamination, since the applicators perform an improper disposal, which causes environmental pollution, could be suitable initiatives.

Finally, the monitoring of qualified professionals allied to the supervision of use and sale would be quite interesting for the organization of the agricultural sector in Brazil. As well as it would bring some encouragement to an alternative ecology-based agriculture in the pursuit of sustainable development, in other words, an economically fair agriculture, socially balanced and environmentally correct.

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