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RESEARCH ARTICLE

RURAL EXTENSION: PRODUCTIVE NEEDS DISARTICULATED WITH HUMAN SECURITY

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ABSTRACT

Survive: the great challenge throughout the centuries. Food was considered the restrictive law of man since the earth was not able to produce all the necessary food. Meanwhile, wars have bloomed a new model of agriculture based on mechanization, on the use of fertilizers and agrochemicals, and on extension. However, it brought risks to the farmer's health. The purpose of this study is to draw a parallel between the extension, its reflexes and the challenges regarding the education of the farmer about the dangers of the use of agrochemicals in a market society. Taken from secondary data, it was observed that the classic model of extension fulfilled its role by diffusing a productive model to the capitalist model. In addition to neoliberal policies, this process limits extension services in Brazil, increasing the dangers to the farmer's health and the chances of biomagnification.

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INTRODUCTION

Survive, intransitive verb, defines the ability of some being continue to live, exist and/or resist the situation (Ferreira, 2000). Humanity has always faced great challenges to survive through the centuries. The humans have always been besieged by hostile variables such as epidemics, wars and natural disasters. At present, at the beginning of the 21st century, other contexts limit human survival, such as global warming and infectious diseases. The man has learned to overcome almost every challenge in his walk, except food shortages. Throughout of the centuries the hunger has walked, and still walks, hand in hand with mankind. By this, Thomas Malthus, in his seminal work "Essay on the Principle of Population", defended the idea that human existence is conditioned the ability to feed. In this sense, Malthus (1999) observes that man would not be able to live without food, a restrictive law that leads him to death. At present, the food question has gained a new connotation. In addition to access to food, the sanity of agricultural products became a national concern after Carson(1964) warn to a relationship between chronic diseases and the misuse of chemical pesticides. These concerns are growing, as diseases such as cancer, mental disorders, mutations, infertility, among others, are being correlated with the accumulation of chemicalsin the food chain (Caldas and Souza, 2000; Rigotto, Vasconcelos, Rocha *et al.,* 2014).

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However, the agricultural productivity gains associated with the diffusion of this, and other, technologies in the field cannot be denied. However, these same methods have had an impact on the environment and on human health (Peres, Oliveira-Silva, Della-Rosa, and Lucca, 2005; Rigotto, Vasconcelos, and Rocha, 2014; Silva, Novato-Silva, Faria, and Pinheiro, 2005). Along with increased production have brought other problems that have worried global authorities regarding the health of agricultural products (food safety). However, when thinking about food safety, there is a direct association with the harmful effects of products on the end consumer and it is forgotten that the farmer is the first agent of the food chain. Thus, the lack of knowledge about the degree of toxicity of the pesticides and their correct application causes damage to the health of the farmer and, consequently, to that of the population in general. The productive gains derived from the use of pesticides were not accompanied by the qualification of the farmers, exposing them to the substances harmful to health (Caldas and Souza, 2000; Carneiro, Rigotto, Augusto, Friedrich, and Burigo, 2015; Soares, Almeida, and Moro, 2003). Often these actors do not have the necessary knowledge to handle the products and, for the most part, do not have adequate technical assistance to guide them. Thus, the uninformed farmer can cause damages to both his own health and that of third parties by intensifying biomagnification in the chain (Stoppelli and Magalhães, 2005). In this sense, extension services play an important role in promoting awareness-raising actions. They can transform the world from the reality of the farmer, stimulating him to participate in a liberating educational process (Dethier and

Effenberger, 2012; P Freire, 1992; Oakley and Garforth, 1985). Thus, the extension service acts as a disseminator of information capable of minimizing the damage of pesticides in the population. Brazil, with 5,175,636 farmers, 84% of whom are considered family farmers, occupies the position of the world's largest consumer of pesticides (Carneiro *et al.,* 2015). Despite this, there is no efficient extension service, be it private or public, and with this, Brazilian agriculture poses a danger to human health and natural resources with the risk of contamination. Therefore, the purpose of this study is to provide an overview of the extension services, their reflexes and the challenges for the education of the producers regarding the risks of the use of pesticides on health in a market context. In addition to this introductory part, the document contemplates five other parts. The second is the research design. The third takes an approach to the results and discussions. This session divides me into three subtopics. The first presents the development of pesticides and the diffusion of this technology. In the second one it is presented as the classic model and the governmental action that helped to popularize the pesticides in Brazil. In the third session a characterization of the use of these technologies in the country and the limited orientation to the national farmers are made. And, in the fourth session the final considerations are made.

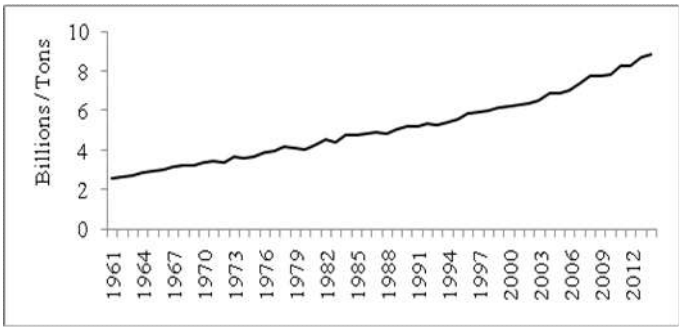
MATERIALS AND METHODS

This is a descriptive study. To do so, it was based on secondary data from the agricultural sense of 2006 in the Brazil. The data were recovered in the Automatic Recovery System (SIDRA), at the Brazilian Institute of Geography and Statistics. He appealed to the National Poison Information System of the Oswaldo Cruz Foundation (FIOCRUZ) for further discussion.

RESULTS AND DISCUSSION

The extension and its context of technological popularization

Malthusian theory asserted that the land would not be able to produce enough food to feed a population that grew faster than the rate of food production. The wars, seen by Malthus as a means of securing birth control and help to ensure a balance between the quantity of food and the population to be fed, beyond adding to the tragic consequences, bloom a new model of agriculture deny the Malthusian premises. In World War I, the Germans, deprived of Chilean saltpeter, a raw material in the production of explosives, engaged in the use of the Haber-Bosch process for the fixation of nitrogen with the purpose of replacing the old material. However, they eventually set up a structure that would give rise to the commercial fertilizer industry based on nitrogen, potassium, and phosphorus (Belik, 2003; Lutzenberger, 2001). As early as World War II, the chemical industry became more potent. Through research, it was discovered that dichloro-diphenyl-trichloroethane (DDT) could be used to eliminate insects. Soon its use extended to agriculture. However, Carson's warning (1964) triggered a national debate over the use of this pesticide, forcing it to become extinct and to conduct further studies. As a result, such studies culminated in the development of herbicides that currently dominate the market and move billions of dollars/reals (IEA, 2012; Lutzenberger, 2001; Mirani and Mirani, 2012). The new technologies coming from the chemical industry, that is, the fertilizers and the defensive ones, would impel a new productive system based on the capitalist molds. In this sense, the challenge was to inform and persuade farmers to adopt new practices. Thus, the classic extension model developed by Rogers and Shoemaker, (1971) contributed to reducing the time between launching an innovation and adopting it by farmers. With this, an educational process was characterized that sought to transform knowledge, guidelines, and attitudes. In this way, the technician and scientist were the bearers of all the needs of agriculture (Fonseca, 1985; Kaufman *et al.,* 2010; Qamar, 2005). Another important aspect, the diffusion popularized of the new technologies and resulted in the Green Revolution. During this period, extension served as a project of productive rationalization in the countryside following the capitalist molds and, consequently, also resulted in the expansion of agricultural production. In the view of (Fonseca 1985), the classic model represented an educational project focused on the interests of capital and stimulated market competition among farmers. Thus, the sum of commercial fertilizers, mechanization, herbicides and rural extension services has revolutionized world agriculture. With this, a gain of productive capacity was installed from then on. Figure 1.



Source: (FAO, 2016)

Figure 1. Expansion of production agricultural with the new technologies

That said, this classic model of extension served the interests of capital, essentially by taking the industry to the field and boosting the productive processes in order to meet the needs of the food industry. The focus was to promote the modification of the social structure and institutionalize its functioning within a market structure. In this sense, the farmer was acculturated, lost the capacity to be a transforming agent and became considered a receptacle ready to receive the modernizing techniques (Paulo Freire, 1983; Rivera, Qamar, and Crowder, 2001). The criticisms of the model diffusionist are centered on subjecting local populations to a destructive acculturation of their traditional knowledge in the name of external knowledge. This, however, does not necessarily mean an innovation for the local population. Thus, the focus of extension would be to teach rural families to discover and determine needs and to help them find solutions to their problems, helping them to escape ignorance and marginality (Fonseca, 1985; Paulo Freire, 1983). Conversely, the knowledge idealized by Freire (1983) requires the curious and transformative presence of the farmer, since the extensionist must also be a strategist who guides his actions according to the daily reality of these individuals.

The national extension model

To understand the risks associated with agrochemicals, we must understand the historical process of this technology in national agriculture. One cannot think of Brazilian agricultural development without associating it with the American

influence. The extension model introduced in Brazil was based on the principles defined by (Rogers and Shoemaker, 1971). Such a model served the interests of the dominant classes that sought to introduce the rural man to the rhythm and dynamics of market society. With this in mind, it is also necessary to understand how the occupation of the Brazilian lands, basically composed by landowners, tenants, occupants, and settlers, is also necessary. However, a small group of landowners concentrates a large part of the national lands and this reflects in the still persistent agrarian structure. In this context, the rural extension has the purpose of guaranteeing the training of farmers and workers, and, above all, promoting the maintenance of the agrarian structure unrelated to the needs of rural populations (Birkhaeuser, Evenson, and Feder, 1991; Fonseca, 1985). Thus, this model served to transform agricultural activity into a commercial activity integrated globally with a development model focused on exports. This system marginalizes farmers of small-scale. Even with changes in the guiding guidelines of extension services over the years, institutions are losing strength. Some are already born legally dead (Caporal, 2011). The adoption of neoliberal policies in the 1980s reduced state participation in different areas and culminated in the privatization of state-owned companies. This set of events and measures change the legal characteristics of extension service provision in the long term.

Given this new globalizing reality, extension systems should be prepared to respond effectively to new challenges and contribute to the promotion of farmers' well-being, as well as be an essential pillar in rural research and development (Qamar, 2005). In fact, the foundations for the institutionalization of private services via public call were founded. Through the calls, different private actors are invited to participate in the provision of public services. In this way, a complex process is evident, once these new actors have to be trained before assuming the new responsibilities, since there is a transfer of the decision-making functions to third parties, starting with the planning and the institutionalization of the initiatives. For Caporal (2011), these services were disconnected from the interests and needs of the communities. In addition to inhibiting the participation of civil society in the management of extension services, it compromises the real needs of farmers. Therefore, new challenges are introduced to the public management in order to contemplate different needs and interests within a dimension that is consistent with the social, economic and environmental dimension (Birkhaeuser *et al.,* 1991; Caporal, 2011; Fonseca, 1985).

The growing risk of agrochemicals in Brazil

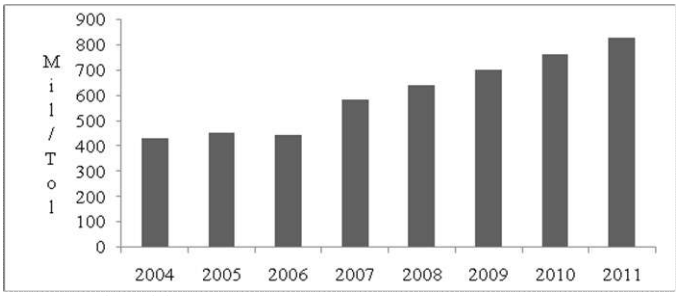
In the federal constitution, Law No. 7.802, of July 11, 1989, defines pesticides as a type of product with physical, chemical and biological components and processes for the production, storage and processing sectors. It also states that its purpose is to change flora and fauna in order to preserve it from harmful agents, either in agricultural or urban areas (Brazil, 1989). As for classification, these can be insecticide, fungicide, herbicide, defoliant, fumigants, rodenticides, rodenticides, molluscicides or nematicides. They can still be divided into different toxicological classes, distributed in levels of toxicity, Figure 2. With the adoption of neoliberalism, the government sought to effectively integrate Brazil into the global market. It opened space for import of agricultural inputs. The government, realizing the efficiency of the agricultural credit policy, strategically conditioned the access to credit to the purchase of this technological package.

Figure 2. Toxicological classes of pesticides based on LD50

Group	Ranking	Strip color on package label
I	Extremelytoxic (LD 50 less than 50 mg / kg body weight)	Brightred
II	Highlytoxic (LD50 of 50 mg to 500 mg / kg body weight)	Intense yellow
III	Moderatelytoxic (LD50 of 500 mg to 5,000 mg / kg body weight)	Intense blue
IV	Lowtoxicity (LD 50 greater than 5000 mg / kg body weight)	Intense green

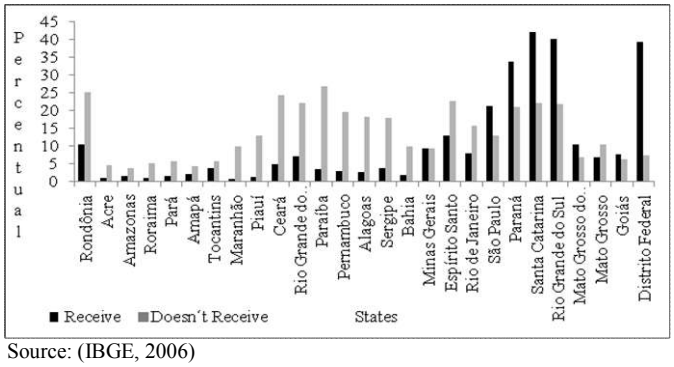
Source: (EMBRAPA, 2008)

In addition to extension services, it has popularized and disseminated the use of these products. The effectiveness was observed in the long term. So much so that in recent years consumption of the active principle has exceeded 350 tons and expanded the use of commercial products. This represents a dependency relationship based on external resources the property, Figure 3.



Source: Adapted from (IEA, 2012)

Figure 3. Commercialized amount of agrochemicals in Brazil



Source: (IBGE, 2006)

Figure 4. Access to technical assistance and rural extension services

This increase in the use of chemical substances accompanies the growth of national production over the last years. But new pests produce substantial losses in crops, leading farmers to spend excessive insecticides. This use is sometimes preventive, but in many cases, it is above the real need (EMBRAPA, 2016). Commodities destined for the foreign market are the ones that most consume pesticides. Soy, as well as coffee, corn, cotton, and sugar cane, receive large amounts of agrochemicals throughout the production processes. Among the states with the highest absorption of this technology, Mato Grosso, São Paulo, Paraná, Rio Grande do Sul, Goiás, Minas Gerais, Bahia and Mato Grosso do Sul stand out (IEA 2012). For Silva *et al.* (2005), the entry of pesticides intensified the exclusion and acculturation of rural workers, increasing impoverishment, health risks and the environment. With the expansion of the use of agrochemicals, it expands the

incidence of intoxication. In the period from 1999 to 2013, approximately 40,000 cases of pesticide intoxication were reported for agricultural use (Fiocruz, 2016). The contamination occurs mainly with people in the age group of fifteen to sixty years, who operate agricultural activities with these products. In rural areas, many young people drop out of school to help with farming and contribute to the livelihood of the household. The result is a large number of low schooling workers handling agrochemicals. Therefore, they find it difficult to understand the instructions of the labels. And the lack of a rural extension service ends up widening the dangers inherent in the use of pesticides. Even with the use of Personal Protective Equipment (PPE), there is a high probability of accidents. In addition, the use of the products is complex, which contrasts with the peculiar context of the life of the familiar farmers. Their traditional and intemperate knowledge configures an incompatibility with the handling of PPE. The inspection and the prescription requirement have made it difficult to access the pesticides. But smuggling poses a challenge to the authorities. Products without labeling and without toxic class and / or class indications are available at more affordable prices to producers. According to (Dorfman and Rekowsky, 2011; Peres, Moreira, and Dubois, 2003), the illegal flow of agrochemicals emerges on the Brazil-Uruguay border due to the large differential in terms of legislation (more permissive and less implemented), and the price of products that are significantly smaller. This situation puts at risk the farmers of the regions bordering Uruguay.

These factors potentiate the risks of intoxication and the appearance of diseases related to the use of pesticides since 76.5% of Brazilian farmers make use of some product of this type. The application of these articles, most of the time, is by costal or stationary sprayer, mechanical and / or animal traction equipment or even by aircraft. This last modality was prohibited in two regions of Rio Grande do Sul due to a large number of small properties. The South Region stands out for the provision of services through cooperatives and representative entities due to a large number of family farmers who develop different cultures. In the state of São Paulo, producer necessity own sources to access the service. In the Federal District the government sources that offer the greater part of the services. The northern and northeastern regions are most affected by the lack of assistance. The provision of services in other regions, which play a more intensive model of agriculture, ends up having regular services offered by public agents, but mostly private actors.Like cooperatives, other actors have been gaining a foothold in the provision of rural assistance services and are important tools for disseminating information and possibly minimizing the damage of pesticides to the population. New methods of information dissemination and learning are being used in extension services (Dethier and Effenberger, 2012; Jin, Bluemling, and Mol, 2015; Qamar, 2005). Decentralization has provided some adjustments in the extension systems, contributing to the structuring of new methodologies in creating alternatives that escape the diffusionist model. However, most of the technical assistance still comes from government entities that are legally obliged to offer the services(Brasil, 2010). These new actors contribute to the dissemination of information among farmers so that they can use the technologies, not only the pesticide, in a profitable and conscious way. The result is greater safety in the health of the farmer and of the food offered to the population. Therefore, one can attain the possibility of surviving with health and dignity.

Conclusion

The purpose of this study was to establish a parallel between extension services, their reflexes and the challenges for producers' education. For this, the risks that agrochemicals represent to health in rural areas within a capitalist market dynamic were taken into account. This dynamic is fundamental to understanding the political organization and the dominant ideas of the present time. It is observed that the interest of capital was driven in the field by the classic model of extension, acculturating the farmers to competitive capitalist dynamics. With the adoption of neoliberal policies, the State intensified the acculturation of farmers in relation to pesticides. Even integrating new actors in the provision of this advice, most farmers do not have access to services, and the most regular farmers are farmers. To the family farmers, the services, to a large extent, are still in charge of the State that does not offer the conditions to guarantee a regular attendance, nor to supervise the entrance of contraband products. In this context, it is noted that a large part of farmers does not have an educator who will advise them on the risks of handling chemicals. Therefore, this set of elements can boost biomagnification of substances along the food chain. In addition, new actors can reduce information asymmetry that limits farmers' ability to survive. However, further studies should be conducted to further this topic.

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