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THE TRANSVERSALITY OF THE ENVIRONMENTAL THEME: THE USE OF PESTICIDES IN THE PLANTING OF SOYBEANS AND THE IMPACTS ON BIODIVERSITY

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ABSTRACT:
The objective of this research is to analyze the impacts of pesticide use on biodiversity, as well as associate this theme to the transversality of content related to the parameters of the Common National Curricular Base - BNCC, which exemplifies environmental education as a support for teaching-learning related to the contents of geography, history and science, aimed at the 8th grade of elementary school. The choice of theme arises from the lack of production on paradidactic content related to the Northern Region of Brazil, especially the state of Pará, which contribute to the students' better understanding their locality, which can be learned from the representation of the transformations in the dynamics of the landscape due to the planting of soybeans on the PA-287 highway and the impacts caused to local biodiversity by the use of pesticides. The methodological contributions that subsidized the research for its development are based on: the analysis from scientific articles using authors such as: Silva (1982), Saraiva (2005), Osorio (2018), government websites, as well as textbooks and magazines related to the theme
Keywords: Pesticide; Biodiversity; Environmental impacts; Education; Transveraslity

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A TRANSVERSALIDADE DA TEMÁTICA AMBIENTAL: O USO DE AGROTÓXICO NA PLANTAÇÃO DE SOJA E OS IMPACTOS À BIODIVERSIDADE

RESUMO
O objetivo dessa pesquisa é analisar os impactos do uso de agrotóxicos na biodiversidade, bem como associar essa temática à transversalidade de conteúdos relacionados aos parâmetros da Base Nacional Comum Curricular – BNCC, que exemplifique a educação ambiental como suporte para o ensino-aprendizagem referente aos conteúdos de geografia, história e ciências, voltados para o 8º ano do ensino fundamental. A escolha da temática surge a partir da carência de produção de conteúdos paradidáticos relacionados à Região Norte do Brasil, em especial o estado do Pará, que contribuam para os alunos compreenderem melhor e refletirem sobre sua localidade, que podem ser apreendidas a partir da representação das transformações na dinâmica da paisagem mediante o plantio da soja na rodovia PA-287 e os impactos causados à biodiversidade local, pelo uso dos agrotóxicos. Os aportes metodológicos que subsidiaram a pesquisa para seu desenvolvimento, têm como base: a análise a partir de artigos científicos com uso de autores como: Silva (1982), Saraiva (2005), Osorio (2018), sites governamentais, além de livros didáticos e revistas relacionadas à temática.
Palavras-chave: Agrotóxico; Biodiversidade; Impactos Ambientais; Educação; Transversalidade.

INTRODUCTION

This research is the result of scientific production of the scholarship holders of the Institutional Program of Scientific Initiation Scholarship - PIBIC, with the area of study focused on the relationship of environmental themes and transversalities that link common contents of the textbooks of the 8th Year of Elementary School, based on the Common National Curriculum Base - BNCC, reflecting in the elaboration of pedagogical instruments of easy understanding and access.

The construction of the work is based on the intention of stimulating the transversality of the contents of Geography, History and Sciences in relation to the deficiencies of contents that address the Amazon region, but specifically the state of Pará, in the holistic view of students in relation to the importance of environmental study and preservation of the environment, from the survey of questions and discussions through the impact factor in this space.

Thus, it is intended to achieve this construction through the theme of the use of pesticides in the environment, aiming at its economic, social, environmental and historical aspects, through the contents of History and Geography, as well as to relate both with the contents of Science that aggregates the types of vegetation, the soil, the impacts of the removal of animals and native vegetation, among others.

Currently in Brazil, soybeans have great economic importance due to the wide demand in productivity, in this sense, to meet trade and obtain a high quality production,

producers use pesticides in their plantations, causing impacts on the environment, as well as diseases in cultivation workers (ARAÚJO; OLIVEIRA, 2017).

The research of soybean in the state of Pará arises from the evaluation of the behavior of altered cultivars in the state of Maranhão. In fact, the use of these elements considerably improves soybean production, because they have high resistance to abiotic factors, generating efficiency in the productive sector. Therefore, in recent decades the cultivation of soybean with the aid of technologies and the addition of insums in planting have adapted to sandy soils (clay and sand) and adverse environmental conditions.

In 2015, according to research by the Federal University of Mato Grosso-UFMT, soybean, which corresponds to 42% of the total planted area in the country, was the planting that was used the most pesticides, about 63%, followed by corn with 13% and sugarcane with 5% (IBGE-SIDRA, 2012).

It is important to highlight that the use of pesticides as insecticides to control insects, herbicides in the control of weeds, fungicides for fungi, etc., impact the long-term environment and health of populations in agricultural regions, in many cases, causing intoxication.

The debate on industrialization and environmental impacts favors a transversality in the programmatic contents (Geography, History and Sciences) of the 8th year of elementary school, thus sensitizing and discussing the theme of environmental education with students, in relation to their region, such as the recurring impacts of society's action. Thus, elaborating a transversality ensures breaking with the borders imposed in the disciplines, thus integrating different readings and approaches that permeate the same theme of analysis.

The teacher's practice suggests a reflexive provocation regarding the teaching methods of the contents, calling attention to the renewal of methodologies that incorporate the contents through the subject's reality. The starting point for the formulation of the subject is to seek new horizons and especially discuss with students and other teachers ideas, without printing a sovereign knowledge.

It is important to emphasize that teachers, in their education, are not common, a practice of fact from transversality[1].. According to Haubrich, Saldanha and Salvi (2015) the great demand of students and few teachers for only one school sometimes generates an overload on teachers, in addition to the lack of materials, cooperation with the other members of the faculty that seek to move away from projects that do not deal with their specific contents and require time for the preparation of the lesson plan, serving as an obstacle.

The student's development is part of the view of the contents present in the textbooks that can barely understand their local reality. In the case of the Amazon region, it is

[1] According to the Ministry of Education, transversality “are themes that are aimed at understanding and building the social reality and the rights and responsibilities related to personal and collective life and the affirmation of the principle of political participation” (MEC, 2019).

possible to observe few contents being formulated, when compared to a broader perspective in relation to the south and southeast regions (KAERCHER, 2011).

In summary, the difficulty of finding contents that are not proposed from the problems, specificities and landscapes of the Amazon region, in relation to that of the state of Pará, contributes to the commitment to the construction of material that addresses this biodiversity and its impacts on the local context, stimulating the interest of the student to know his region in depth and recognize himself in it.

MATERIAL AND METHOD

BNCC (2017) contributes to the context of contemporaneity, explaining the contents of different curricular components. In Geography (EF08GE10), the industrialization process and new technologies provide new subsidies through the use of natural resources.

The transversality between Geography and Sciences will be based on the parameter (EF08CI16) that will address changes in biodiversity, causing impacts such as: species extinction, through human actions. (BNCC, 2017)

In the parameters of the history matter (EF08HI03), it is essential to analyze the process of industrial revolution, running until the mechanization of the field and agribusiness. Therefore, resulting in conceptual and interdisciplinary proposals. (BNCC, 2017)

Therefore, transversality should be stimulated as a methodological teaching tool, which provides subsidies to teachers and helps students to achieve information, contributing as a basis for their knowledge and proposing alternatives in their daily lives, thus being an agent of transformation.

Given this, the work was divided into four points. In the first stage, the choice of the theme was developed; the second stage was raised bibliographic data; in the third stage, the formulation of the problem, reading and registration. The fourth stage, organization of the subject, writing and production of cartographic material, content that can be systematized from sources of the selected articles with publication between the years 2010 and 2021.

Therefore, this is a scientific study, based on bibliographic surveys on the Internet through scientific articles published by the pages of SciELO, Brazilian Association of Collective Health - ABRASCO, Brazilian Agricultural Research Company - EMBRAPA, Common National Curriculum Base - BNCC, Brazilian Institute of Geography and Statistics - IBGE, Academic Google, articles, textbooks from the Apoema and Alpha collection related to the contents of Geography, Geography, Science and History, likewise, news related to the impacts of pesticides on biodiversity.

RESULT AND DISCUSSIONS

Inserting this environmental problem in the school environment, with regard to the content focused on environmental impacts by the use of pesticides, it is necessary that such discussions reach the understanding of students of basic education, in the attempt

of individuals to become sensitized about such processes, and contribute in their formation to become instrumentalized citizens.

Education is transformative bringing a new look with regard to biodiversity, aiming at understanding how each action influences the environment and seeks a new way of exercising interventions, making it easy to reach conceptions about the effects left on the landscape.

Through all the contextualization of the theme, the authors' reflections will provide support for the surveys presented so far. In this study proposal, the methodological procedures that are intended to be used relate mainly to the analysis of the transversality of contents of Geography, Sciences and History, since the importance that the following issues: environmental, social, economic and historical assume in the problems raised.

In this sense, the Transversal Contemporary Themes have the condition of explaining the connection between the different curricular components in an integrated way, as well as making their connection with situations experienced by students in their realities, contributing to bring context and contemporaneity to the objects of knowledge described in the BNCC.

BNCC has the role of providing better conditions, in the initial years of school up to other levels, that is, creating paths for the individual to act in society. However, there is a need to rethink the means of teaching and the skills used to better understand students, it is not enough just to insert content so that there is an awareness that the theoretician can be aggregated with the learning of daily life and transversal contents.

In cross-sectional studies, knowledge of so-called disciplines that contains links between contents is used, opening new possibilities in educational practice. By teaching contemporary subjects, we seek to involve the student and arouse his interest, because the main objective of this modality is to induce the individual to a complete formation on different themes for his/her performance in society.

> Finally, it is up to education systems and networks. As well as schools, in their respective spheres of autonomy and competence, incorporate to curricula and pedagogical proposals the approach of contemporary themes that affect human life on a local, regional and global scale, preferably in a transversal and integrative way. (BRAZIL, 2017, p. 19).

The interactions between nature and man aim at transformations in the environment, related to biodiversity loss, that is, the reduction or disappearance of a certain biological diversity, which impacts on natural patterns. Thus, the imposition of the green revolution provided the use of pesticides, through agricultural credit incentives.

> Since the mid-1940s more than two hundred basic chemicals have been created to be used in the killing of insects, weeds, rodents and other organisms described in modern language as 'pests', and they are sold under thousands of different brand names. These sprays, powders

> and aerosols are now applied almost universally on farms, gardens, forests and homes – non-selective chemicals, with the power to kill all insects, 'good' and 'bad', to silence the singing of birds and stop the jump ing of fish in rivers, to cover the leaves with a lethal film and to remain in the ground – all that even if the target in sight can be just a few weeds or insects. Does anyone believe that it is possible to launch such a bombardment of poisons on the earth's surface without making it unfit for life? They should not be called 'insecticides', but rather 'biocides' (CARSON, 2010, p. 23-24).

The market segment and the imposition of public opinion in relation to foods destined as a solution to the problems in the families' table, jus the justification for the use of pesticides, not clarifying in fact what is consumed and the evils, besides being a harmful factor for nature.

> Food and Nutrition Security consists in the realization of the right of all to regular and permanent access to quality food, in sufficient quantity, without compromising access to other essential needs, based on health-promoting food practices that respect cultural diversity and are environmentally, culturally, economically and socially sustainable (BRASIL, 2006).

Agroecology can also be used in food production as a tool to unmask the poisons present on the table of individuals. This process of natural factors for biological control in plantations.

In what is conceptualized environmental education, two points stand out, first the naturalistic view that can be considered the biological side, observing nature and man as biological processes, where man is seen as one that interferes in the natural order of things, and the devastating, modifying the stability of these environments. Later, the socio-environmental view that manifests more generally as a set, focusing on the physical, biological and nature as processes related to man, as a mutual interaction, that is, they have a certain evolution together (CIDREIRA-NETO; RODRIGUES, 2017).

For the authors above, the interaction in nature comes with the same objective, to create affective bonds, among these places so that they can more easily notice the differences between these natural environments and urban environments, making it easier to understand the need for an environmental education, since when returning to the urban environment will present an association of differences that diverges the most similar environments.

Therefore, the uses of natural resources have generated great impacts on biodiversity, and this exploitation directly and indirectly affects ecosystems, economy, water and even man, especially when the problem of waste thrown into the environment affects quality of life.

Monoculture has been practiced since colonial times, based on agriculture, land property and labor for export. This practice began with sugarcane exported to European countries. With the introduction of new agricultural techniques, monoculture has undergone a boost, producing on a large scale some products such as coffee, which has

become a major agricultural product for the Brazilian export economy, thus, the cultivation of this product is linked to meeting international demand (ROOS, 2012).

Soybean is characterized as a plantation of economic interest, moving millions in the Brazilian economy, considered as a milestone in the agro-industrial development of Brazil, used for the consumption of animals and humans, as well as as a basis for fuel, among others. Therefore, it is the most exported product today. (SENSIX BLOG, 2021)

In Brazil, the legumes expand through several regions from the 1990s, settling in the Brazilian microregions such as Maranhão, Piauí, Roraima, etc. In the early 2000s, with agricultural modernization and increased production on a large scale, soybean planting was expanding. (SIEBEN; MACHADO, 2006).

The cultivation in Pará emerged in the 1980s, through infrastructure and tax incentives for the implementation of agribusiness in the western region, producing 2 million tons per crop, being among the ten states that produce the most soybeans in the country. (SEDAP, 2019)

Soybean monoculture was inserted into the local economy by the State as a factor of economic development and integration of the Amazon region. The municipality of Paragominas stands out in soybean production, through the tropical climate and yellow latosol soil (deep structure, clayey texture, etc.), in addition to the product flow strategy. Plantations are also found in municipalities such as Conceição do Araguaia, Parauapebas, São Felix do Xingu, Xinguara, Marabá, Dom Elisha, Altamira, among others. Therefore, the soybean path passes through a path of construction of highways and waterways, strategic modes used for the flow and arrival to export ports.

> The flow of soybeans in the Northern region is caused by both the road, rail and waterway modal, since the region has a very high waterway potential. The infrastructure of the Northern region also serves the production of soybeans in the Midwest because it has ports closer to consumers such as European countries, for example (DE SOUZA, 2012, p. 18).

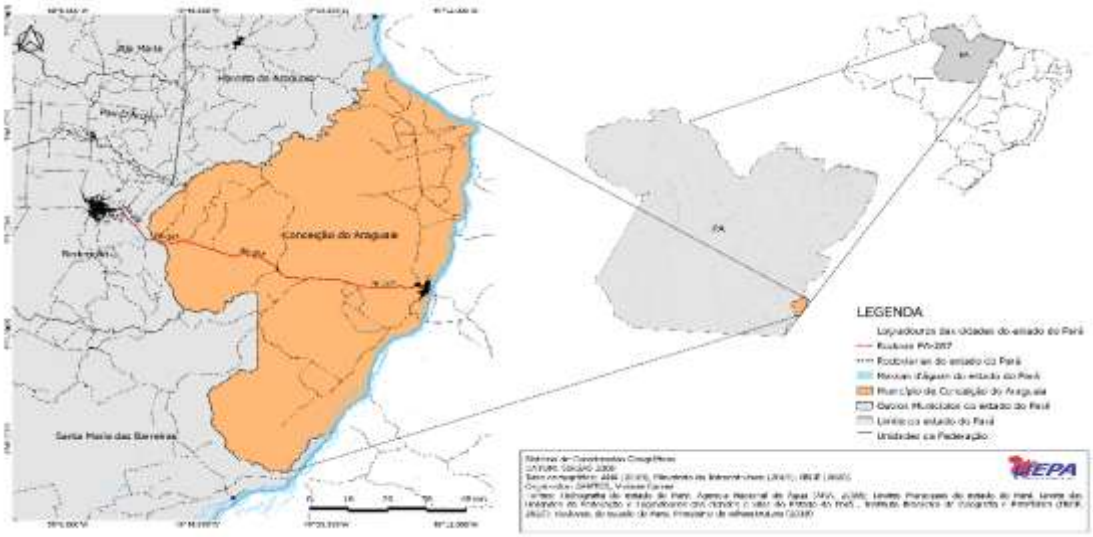
In this way, the area is surveyed and climatic and soil conditions are analysis that do not pose risks to investment in the site. The cultivation of soybeans on the PA-287 highway is accompanied by these studies aiming at an economic potential for the state.

> In Pará, soybean cultivation has been developing due to the comparative advantages it offers, such as the ease of flow of production via the North Export Corridor- Carajás Complex- Itaqui, road infrastructure and electricity. The freight of this is competitive for European consumer centres, thus appearing as an important agricultural frontier. The Government of Pará has been encouraging soybean planting in the region, designing good investment opportunities in the state. (DE SOUZA, 2012, p.12)

The soybean crop in the state of Pará is recent, through the other localities of Brazil, however, the implementation of the crop attracts the eyes of investors in the branch who lease the land for production and export, aligning to new potential areas, such as pa-287, where plantations are established near the roads, facilitating the flow within the

trajectory of the implemented limits, making this factor an ally of the soybean unloading waterway ports, represented in Figure 01.

Figure 01- Location map of the study area: PA-287



Source: Prepared by Hélter Fernandes and Cintia Araújo, year 2022.

In the case of soybean cultivation, planting only one species can cause a process of soil exhaustion, that is, a depletion by the use of pesticides. Deforestation of areas destined for planting causes habitat loss, affecting food, as well as the extinction of so-called fauna species such as capybaras, cotia and jaguars, and in the flora: grassy-woody savannah and park savannah. (BELCHIOR et al. 2017 apud NUNES, 2007).

This practice is associated with a large extension of land, thus, a vast vegetation cover is removed to give way to cultivation, generating environmental impacts and ecological imbalance. The presence of pesticides in soybeans is responsible for occupying large areas, as well as contributing negatively to the environment.

Figure 02- Mosaic of clipping of journalistic articles that represent the impacts of soybean monoculture.

Source: Google Collection

The mosaic of images present in Figure 02 represents the environmental, social and economic impacts of soybean monoculture. The first image demonstrates a plain area where the soil is being prepared to receive the soybean plantation that will later cause a flood pulse, in addition to the loss of environmental quality. The second image reports the cerrado as one of the oldest biomes, mainly in the area studied in this work. In this sense, soybean monoculture threatens the balance of the natural ecosystem. The third

images, on the other hand, alert to the consumption of pesticides in food. Therefore, the image denounces the use of pesticides that also affects indigenous areas. Finally, the million-dollar indemnities through these impacts, thus reporting that the agro is toxic due to the problems caused.
Therefore, soybean planting demonstrates the developmental policy related to primary export goods in the country. This dynamic affects vast territories and different population groups, whether for industry or family farming.

In the stretch between the municipality of Conceição do Araguaia and Redenção (PA-287), where the dynamics of landscapes are transformed directly and indirectly, such as: predominant vegetation, currently little existing, farms with altered soils and consequently more devastation in search of fertile stretches, reducing the presence of animals.

The influence of soybeans is visible in the locations where large demographic areas are installed, bringing impacts. Thus, the environment undergoes changes with individuals in the area. At first, there are also individuals concerned about the water they use, and the future of infertile soil that previously guaranteed the livelihood of families that is sometimes passed between generations (BELCHIOR, et al 2017 apud NUNES, 2007).

There is a great question about soybean production and changes in the structure of biodiversity, regarding environmental care, emerging the need to elaborate material that address these problems to rethink an environmental education.

Thus, the study of environmental impacts on soybean plantations in the state of Pará reveals problems of exposure of individuals and nature to poisons that on the one hand allows a taste and beauty to food, on the other, exposes the areas of agricultural production, endangering soil, water, forests and animals.

In addition to environmental impacts, soy monoculture also affects the health of individuals in nearby areas. The effects of these poisons on human health can provide: intoxication, respiratory diseases, depression, cellular alteration, stomach problems, among others. However, many residents and workers do not have the notion of these risks due to lack of education. (SUNDAYS; BERNARDES et al, 2004).

Given this, soybeans are one of the economic factors that contributes to the environmental impacts on the places it is included, in addition to the expropriation of a portion of the individuals who previously inhabited these areas, preventing access to subsistence (before small family producers). The lack of dialogue of these large producers/industries with the population, affects the local fauna and flora, rivers, streamand soils that are not repaired or in certain cases is only passed on the idea of repair with the image of environmental awareness, without an environmental charge and punishment effected by the State.

Therefore, through gradual studies on these impacts in the region of Pará, especially in PA-287, where soy began to be inserted, the theme in question aims to reach students and other readers with the contribution of transversal contents (Geography, Science and History), showing them and leading them to reflect, and who knows how to encourage them to think about solutions about the factors that are incorporated in the process of soybean monoculture and the impacts of this planting directly and indirectly on the

conviviality of these inhabitants and their environment. Thus, thus providing different concerns and perceptions that contribute to an environmental education.

CONCLUSION

Agricultural crops in Brazil have taken large proportions of vegetation areas, demanding the export market. The green revolution in its dimension provided strategies for rural production, besides presenting tools that incorporated the high productivity of food, such as genetically modified seeds and products inserted in soil and planting, that is, pesticides.

The result of this process is the advance of agribusiness, since more areas are necessary for production and more toxic elements inserted in the soil, so the benefits of this high productivity carry environmental impacts, harming the family farming of small producers.

The intervention of society in nature causes great losses in biodiversity and it is necessary to think about sustainable approaches. In the educational sphere, a look at environmental causes and the influence of actions on the environment is essential.

Therefore, teachers can reflect on the breaking of unilateral paradigms about their content and work them in cooperation with other teachers, in a transversal perspective, which develops new methodological proposals, making students really know their region and environmental problems, thus considering the importance of expanding paths to their performance in society.

According to the BNCC (2017), contemporary cross-cutting themes are understood as subjects that will bring knowledge to students in aspects that contribute to their context of formation as a citizen in society, besides being ethical, social and political. Thus, the implementation of transversal contents that treat the reality of students cooperates for a more integrative education.

Thinking of an environmental problem, soybean that is a great and important economic factor in Brazil, considered a plantation of great relevance in economic development, thus, working the transversality of contents of Geography, History and Sciences caused an overview of perceptions about the Amazon region.

The state of Pará stands out for being one of the poles that produces the most soybeans in the country for flow, therefore, it also contributes as a factor of integration of the Amazon, since the plantations are strategically located on highways or areas of easy access for export.

Thus, the dynamics of the landscape in the middle of highways, generates impact directly and indirectly changing the soil, devastating areas, silting rivers and consequently decreasing the presence of animals and vegetation. Therefore, it can be said that soybean planting alters biodiversity, thus contributing to basic education students reflecting on such problems and understanding them inserted in their daily lives.

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