

Pedagogical School Vegetable Gardens: An Educational and Nutritional Concept

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Abstract The purpose of this article is to present the project "Implementation and conduction of technical-pedagogical gardens for schools in the states of Maranhão and Piauí previously discussing the current framework of legal framework in Brazil on the Right to Adequate Food, Food and Nutrition Security and highlighting the relevance and main characteristics of a reference school garden. The proposed implementation of this project is a strategy for structuring gardening models in public education institutions that serve children and adolescents in the age group of 6 to 14 years. This is the initial step towards the consolidation of the "School Vegetable Program for Improvement of Eating Habits", which aims to contribute to the process of a pedagogy aimed at the construction of healthy and sustainable eating habits.

Keywords Public policies, Nutrition security, Food education, Pedagogical school vegetable

1. Introduction

In Brazilian schools, the dietary pattern has been characterized by the excessive consumption of processed foods, which contain high levels of sodium, carbohydrates and fats. Nevertheless, fruits and vegetables are hardly present in these diets [1]. In keeping with this, the incorporation of a healthy and well-balanced diet may have a positive feedback on student's life. The concept of health promotion emphasizes on creating healthy environments. Such conceptualization, aims at improving the student's quality of life, maximizing their potential on learning (...). In fact, health promotion must not be restricted to health service programs. Yet, intersectoral approach should be put into practice, supporting cooperation networks that target on bringing high-quality health habits to society [2].

It is known that changes in lifestyle (e.g. adopting a healthy diet) are effectively associated to the reduction of social morbidity. In this way, nutritional habits play a key-role by directly or indirectly impacting on health. Indeed, such habits are built in the first years of life, the period wherein education about food starts [3,4]. It is noteworthy that preschool and school aged children acquire much of the basis of their behavior and knowledge [5], including alimentary habits.

This work aims to offer a strategy for constituting a reference school vegetable garden. Based on technical and scientific evidence, we propose the composition of the vegetables to be planted, indicating the diversity of cultivation that may work as appropriate food supplement to the school. Of note, proper cultural, social and edaphoclimatic¹ conditions of each region will be respected. We also aim at motivating the school community engagement, by offering training courses, knowledge, planting, until food preparation, thus improving eating habits. To achieve these objectives, we propose the inclusion of innovative interdisciplinary pedagogical activities, in this was combining healthy nutrition is accompanied by environmental consciousness and adequate quality of life.

The Brazilian Agricultural Research Corporation (EMBRAPA) supported this work by setting the composition of a suitable school vegetable garden for each region. EMBRAPA is a governmental Brazilian institution, crucial for the development of technologies for the national agriculture and livestock. In order to provide a reliable methodological approach on the composition of our school vegetable gardens, the Vegetable EMBRAPA, based in Brasília - Brazil, one of the decentralized units of EMBRAPA, which is a reference center in global scale, for its technical-scientific contribution. In specific, the Vegetable EMBRAPA main mission is the generation and transference of technologies, targeting different social segments and strategic actions towards the production of vegetables. In keeping with this, we believe we will improve the interdisciplinary teaching/learning process in selected

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schools, based on the involvement of Pedagogical School Vegetable Gardens, which will be developed with a strong and reliable scientific methodological approach [6].

We implemented this research project in Brazilian city public schools, located in Piau nd and Maranh o, two Brazilian states with the highest rates of food insecurity. These schools provide basic education for children and adolescents (6-14 years old). The city council education department strongly suggested that this range of age group would be the most appropriated to carry out the work.

In the following sections, we review the main concepts, characteristics and legal framework of public policies supporting appropriate feeding as a human right, by specifically focusing on food and nutritional safety in Brazil.

1.1. Adequate Food as Human Right

The public policy of Food and Nutritional Security consolidates an advancement on the human rights of Brazilian population, by the constitutional Amendment n 64, of February 4, 2010. In specific, the right to food is held as a social prerogative expressed in the Article 6 of the Federal Constitution / 88. In summary, this article guarantees that the right to food is not a seasonal government program, but a state policy.

The Human Right to Adequate Food (DHAA – Brazilian abbreviature) operates in two instances: the right to: 1) be free from hunger and 2) access to adequate food. By definition right means: “food availability, adequacy, accessibility and stability to access food produced and consumed in a sovereign, sustainable, dignified and emancipatory way” [7].

1.2. Food and Nutritional Security: Concepts, Legal Framework and Structure

The constitutional right to food was qualified by spread of public policy actions, described in the promulgation of Decree 7,272, of August 25, 2010 [8], which proposes the regulation of the Organic Law on Food and Nutritional Security (LOSAN - Brazilian abbreviature). The LOSAN creates the National System of Food and Nutritional Security (SISAN - Brazilian abbreviature), with the main purpose of ensuring the human right to adequate food. It also establishes the National Food and Nutritional Security Policy (PNSAN - Brazilian abbreviature) and setting the parameters for the preparation of the National Food and Nutritional Security Plan.

Of note, the Articles 3, 4 and 5 of the Law 11.346 / 2006 define Food and Nutritional Security, states that:

Art. 3 Food and nutritional security consists in recognizing the right of everyone 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 diversity cultural and that are environmentally, culturally, economically and socially sustainable.

Art. 4 Food and nutritional security covers:

- I- the expansion of conditions to access food through production, especially traditional and family agriculture, processing, industrialization, commercialization, including international agreements, food supply and distribution, including water, as well as job creation and income redistribution;
- II- the conservation of biodiversity and the sustainable use of resources;
- III- the promotion of health, nutrition and food for the population, including specific population groups and populations in social vulnerability situation;
- IV- the guarantee of the biological, sanitary, nutritional and technological quality of the food, as well as its use, encouraging healthy eating practices and lifestyles that respect the ethnic, racial and cultural diversity of the population;
- V- the production of knowledge and access to information; and
- VI- the implementation of public policies and sustainable and participatory strategies for the production, commercialization and consumption of food, respecting the multiple cultural characteristics of the country.

Art. 5 The achievement of the human right to adequate food, and food and nutritional security requires respect for sovereignty, which gives countries the primacy of their decisions over food production and consumption” [9].

According to the diagnostic document [10], the SISAN has the mission of promoting the Human Right to Adequate Food, throughout Brazilian territory, also promoting and supporting the elaboration of food policies and the National Plan for Food and Nutritional Security, obtaining resources, setting goals, guidelines, building monitoring and evaluation tools. Additionally, SISAN aims at integrating the most diverse governmental and social sectors (focus on the inclusion), ensuring that the entire Brazilian population has access to food in fair amounts and quality.

The SISAN is a component of the Federal Government, States, Municipalities and the Federal District related to Food and Nutritional Security. The Inter-Ministerial Chamber for Food and Nutritional Security (CAISAN – Brazilian abbreviature), as a member of SISAN, was created by Decree No. 6,273, of November 23, 2007 [11]. The CAISAN promotes the articulation and integration of federal public administration entities in the area of food and nutrition security.

1.3. EMBRAPA

The word "vegetable garden" derives from the Latin hortus and is the place where vegetables and other plants grow, such as seasoning and aromatic herbs. Usually, gardens are built in backyards, but also in bigger lands or, still, in vases and boxes [12]. According to EMBRAPA, vegetables are part of plants grown in a vegetable garden characterized by their small size, rapid growth and high

nutritional value. Related to the consumable part of the plant, greens and vegetables can be classified as: leafy or leafy vegetables (chard, watercress, lettuce, almond, chives, coriander, chicory, Chinese cabbage, butter cabbage, spinach, mustard, cabbage, arugula, parsley, celery, milkweed and tapioca); flower vegetables (cauliflower, artichoke, broccoli); legumes (green beans, pea-pie); fruit vegetables (pumpkin, Italian pumpkin, Japanese pumpkin, eggplant, chayote, pea grains, jiló, gherkin, watermelon, melon, green corn, strawberry, raspberry, pepper, pepper, cucumber, okra and tomato); root vegetables (sweet potatoes, beets, carrots, parsnips or parsnips, cassava, turnips and radishes); tuber vegetables (potatoes, yams and yams); bulb vegetables (onion and garlic) and stem vegetables (celery or celery, leeks).

A reference garden, scientifically prepared, contains the required nutrients for a healthy diet (plants have an appropriate nutrient variety for good food supplementation), serving as a parameter for a specific region, by considering the appropriate edaphoclimatic¹, cultural and social conditions.

It is important to point crucial factors for the nutritional composition of a plant, such as light, amount and quality of water in irrigation and the soil chemical composition. [13] demonstrated that the development of a plant relates to: 1) genetic potential, 2) environmental factors and 3) cultural management (e.g. direct or indirect treatment, with soil management and fertilization). More specifically, irrigation helps on plant hydration, providing nutrients essential for the plant development. In addition, light and temperature, help plants to adapt against crops.

The Food Guide for the Brazilian Population [14], regarding nutritional issues for human health, classifies vegetables as healthy nutrients - excellent sources of vitamins, minerals and fibers, with a moderate caloric content. In complement to the low-calorie profile, several antioxidants molecules (e.g. flavonoids) help on the prevention of obesity and chronic diseases, such as diabetes and cardiovascular disease [15] demonstrates that regular and varied consumption of fruits and vegetables prevents Chronic Non-Communicable Diseases (NCDs). Additionally, [16] suggests vegetables consumption of great importance, however, an appropriated balanced and adequate diet, should also consists of proteins (vegetable or animal) and carbohydrates.

In this context, supported by [15] findings, the implementation of a Pedagogical School Vegetable Garden is a potential tool for promoting a healthy diet, also working as a significant instrument for the teaching-learning process,

involving students and school staff. With this in mind, this project sheds light on learning, biology, physics, chemistry, mathematics, environmental sciences in theory and practice. Also helping to spread the word of the significance of a nutritious, healthy, diversified diet, respecting the relationship to the environment [17].

Importantly, to ensure technical quality of the whole setting up process of implementing and monitoring the Pedagogical School Vegetable Garden units, we will be supported by the Vegetable EMBRAPA unit, which has the technological expertise on detecting climatic conditions, soil, cultivars, training. Thus, giving us guidance for an appropriate management on cultivation and cycle of vegetables, and the best application of vegetables on diet. In this project we involved a multidisciplinary team from the Ministry of Citizenship and Vegetable EMBRAPA, including nutritionists, so that these professionals with contribute with their analysis of the nutritional components of the crops under cultivation.

1.4. Food Education: The House as a Nutritional Pedagogical Instrument

Among Latin American countries, Brazil possess great experience in public policies aimed at school feeding, such as the National School Food Program (PNAE)². The PNAE indicates that eating habits contribute to the biological, psychological, social and cognitive development of the student.

The reciprocal interaction between teaching/learning processes and the production of knowledge is a crucial factor. In fact, the development of scientific research and its products/consequences on the practice of food and nutrition education, is a permanent process of new investigations and pedagogical construction of healthy behaviors.

In addition to the production of knowledge and access to information, the Ministry of Health [18] ensures that it is essential to give provide the population the opportunity to develop an autonomous awareness of health, by reducing or eliminating any kind of inequality. Accordingly, item II of art. 3rd of Inter-ministerial Ordinance 1.010, instigates the production of Pedagogical School Vegetable Gardens as an activity involving students and the implementation of produced food at school canteens. That “as important as the implementation of school meals, it is the educational process that must guide it” [15].

Claim that “nutritional interventions for children are more likely to be successful when they are based on practical

¹ Edaphoclimatic conditions refers to characteristics defined through environmental factors such as climate, relief, temperature, air humidity, radiation, soil type, wind, atmospheric composition and rainfall. Edaphoclimatic conditions are related to the influence of soils on living beings, in particular on the organisms of the plant kingdom, including the use of land by man, in order to stimulate the growth of plants. Available at: <https://ciberduvidas.iscte-iul.pt/consultorio/perguntas/condicoes-edafoclimaticas/21084>. Accessed on: 29 May 2019.

² The National School Food Program (PNAE) offers school meals and food and nutrition education actions to students from all stages of public basic education. The federal government transfers supplementary financial amounts to 10 states (from February to November) to states, municipalities and federal schools to cover 200 school days, according to the number of students enrolled in each school system. The program is monitored and supervised directly by society, through the School Meals Councils (CAE), and also by the FNDE, the Federal Audit Court (TCU), the Federal Comptroller General (CGU) and the Public Ministry. Information available at: <https://www.fnde.gov.br/programas/pnae>. Accessed on: 09 mar. 2019.

activities, involve their families, are implemented in the school environment and involve the community in general". Suggests that "the vegetable garden at school represents a generating axis that addresses several school dimensions, integrating multiple aspects that contribute to the integral formation of students and the school community itself".

From a teaching / learning perspective, it seems that the Pedagogical School Vegetable Garden is a social and historical tool to stimulate the human being relationship with the environment in which he lives.

1.5. Pedagogical School Vegetables

In agreement to what has been mentioned above, this project of Pedagogical School Vegetable Gardens was structured on the technological expertise of Vegetables EMBRAPA. By the Pedagogical School Vegetable Gardens, we aim at creating in public schools, educational and nutritional centers, increasing the importance of vegetables consumption in the school community.

The proposal to implement the Pedagogical School Gardens consider that the school and, in this case, the public school in a special way, is a social environment in which children and adolescents spend considerable time in their day, eat and interact with their colleagues and with employees of their institution. What makes the school, educators and employees integrated into the process of promoting and raising consciousness of the pedagogic and nutritional importance and benefits of practicing healthy eating.

1.6. Previous Studies in Brazil Relating to Pedagogical School Hours

This project consists of a concern expressed by the scientific community and government agencies, which has published several scientific works searching for the School Garden as a pedagogical and nutritional tool, including our group:

The vegetable garden is a living laboratory available for different educational activities. The installation process in school environments, provides a set of advantages to the school community, such as addressing issues related to environmental and health education through nutritional and food aspects [19].

To promote comprehensive education for the entire school community, especially children and young people through school gardens, incorporating healthy and environmentally sustainable food as a generator of pedagogical practice [20].

The school garden was used as a didactic resource to explore the theme Healthy Eating, with the proposal to promote meaningful learning. In this same approach, the issue of teaching Natural Sciences for the initial years is also addressed, seeking the reflection of educators about the importance of a pedagogical work having as a guide the

aspects that permeate the daily life of the student. To this end, this study took as a reference the thoughts of several authors. Which point out that it is no longer necessary to teach Science based only on theories, and practice is an essential part for the knowledge acquired to be really effective and have meaning for the student. Thus, taking as a reference the teaching of Science from the perspective of practical intervention in a school garden, it was sought from this interaction, the participation and involvement of the student resulting in various activities on the theme, it is understood that this learning was effective [21].

The school garden as a teaching material for interdisciplinarity in science, mathematics, Portuguese and environmental education, in elementary school II (6th and 7th grade) at the Gleba Jacar  Settlement Project in Nova IPIXUNA - PA. The methodology used was observational, systematic, direct, with a qualitative character. The data obtained for the school garden as didactic material, for complementary pedagogical activities (field research; preparation of reports; discussions about the school garden and socialization of knowledge and visits techniques), increased the assimilation of the content of these subjects, as well as indicated that there is a need to mitigate the rejection of vegetables in school meals (63.2% - elementary I; 38% - fundamental II) [22].

In the contemporary social scenario, the rescue of the link between food and nature is central to the development of educational actions in the area of food and nutrition. In this sense, school gardens can be an important pedagogical strategy, with learning based on direct contact with food and nature [23].

2. Methodology

In this study, the Brazilian states of Maranh  and Piau  were selected for the implementation of the Pedagogical School Garden project. Of note, these states are the second and third Brazilian states, respectively, with the highest rates on food insecurity: 60.9% in Maranh  and 55.6% in Piau 

Vegetables EMBRAPA will provide the required technology to monitor the implementation of the Pedagogical School Vegetable Gardens. The vegetables selection specific for each state, will consider cultural, climate and soil issues, aiming to improve the use nutritional value of the vegetables produced in these gardens.

After its evaluation, this project intends to be implemented as a public policy for many elementary schools, especially in the Northeast of Brazil, where we have states with greater food insecurity. After analysis by the academy, we intend to adapt the scientific methodology to local issues, so that the project can become a reality operationalized by public authorities: municipal, state or federal.

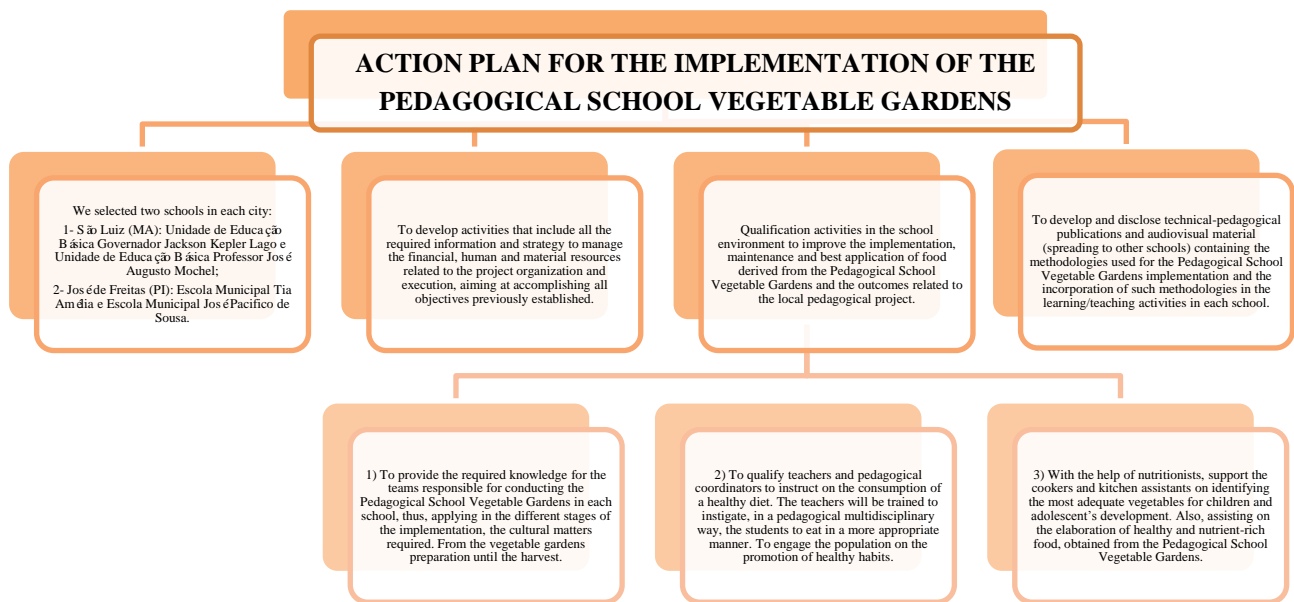


Figure 1. The action plan for the activities

3. Conclusions

We expect to involve teachers in scholar curricular activities that might, in an interdisciplinary manner, lead students towards the understanding on healthy eating as a fundamental factor for quality of life. In this way, we believe that by showing the school garden as a key-factor for different pedagogical activities, will provide a straightforward connection with the environment. Additionally, nature should be understood as a whole, turning into an integrated practice composed of the contents developed in an multidisciplinary way.

In addition, we believe that the direct involvement of the local community in this project, will promote and increase the quality/supply of food consumed by children and adolescents in schools.

The qualification of professionals, educators and students providing the maximum nutritional use of the food grown in these gardens, always respecting cultural and food traditions, also stimulating the consumption of the healthy diet in daily basis of the community. We also support Increased consumption and, as a result, of local vegetable production by the families involved in the project, both for their own consumption and for the sale of surpluses, ensuring, in addition to food security, an increase in household income.

After implementing this project in these two schools, we intend to have the Pedagogical School Vegetable Gardens as a public policy for many other elementary schools, especially in the Northeast of Brazil, the region composed by the states with higher incidence of food insecurity.

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