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Environmental Education and Sustainable Agricultural Production: A Strategy for Food Security*

[English Version]

Educación ambiental y producción agropecuaria sostenible: una estrategia para la seguridad alimentaria

Educação ambiental e produção agrícola sustentável: uma estratégia para a segurança alimentar

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Abstract

Objective: The objective of this article is to establish relationships between environmental education and agricultural production for food security, based on an agrarian foundation and a sustainable development approach. The guiding question was: how to understand environmental education, sustainable agricultural production and food security in light of current figures and events? **Methodology:** The hermeneutic methodology was used for the approach, from documentary content, as a source of information that allowed for an objective and scientific search on the guiding question. The research team aimed to comprehend and interpret the knowledge and reality surrounding environmental education and agricultural production, based on both general and scientific references related to the issue, as well as non-scientific reports that contextualize the problem. **Results:** The findings on population, hunger, food insecurity, malnutrition, obesity, poverty, extreme poverty and deforestation are presented globally in Caquetá, Colombia. The most contextualized interpretation in the research is made from the rural community of the municipality of Florencia, Caquetá, which presents high levels of food insecurity. In this context, environmental education and food production for food security represent a crucial aspect in achieving sustainable development. However, despite the emergence of environmental education and sustainable development several years ago, these subjects remain a topic of extensive scientific, academic, political, social, and economic debate, with numerous publications but relatively few positive outcomes to show. **Conclusion:** The issues of hunger, malnutrition, and poverty can be effectively addressed through practical training in environmental education and food production within the framework of sustainable development. Such an approach must be equitable and balanced in terms of environmental, economic, and social factors, with sustainable food production serving as the overarching theme for environmental and agricultural education in communities.

Keywords: environmental education; food production; ecological balance; food supply; hunger.

Resumen

Objetivo: en este artículo se tiene por objeto establecer relaciones entre la educación ambiental y la producción agropecuaria para la seguridad alimentaria, a partir de una fundamentación agraria y un enfoque de desarrollo sostenible. La pregunta orientadora fue: ¿cómo entender la educación ambiental, la producción agropecuaria sostenible y la seguridad alimentaria a la luz de las cifras y acontecimientos actuales? **Metodología:** para el abordaje se usó la metodología hermenéutica, desde contenido

documental, como fuente de información que permitió una búsqueda objetiva y científica sobre la pregunta orientadora. Se buscó comprender e interpretar el conocimiento y la realidad sobre la educación ambiental y la producción agraria, a partir de referentes de tipo generalista y científica afín al problema, e informes no científicos que sitúan el problema y el contexto. **Resultados:** los hallazgos en torno a población, hambre, inseguridad alimentaria, desnutrición, obesidad, pobreza, pobreza extrema y deforestación se presentan de modo global en Colombia y el Caquetá. La interpretación más contextualizada en la investigación se hace desde la comunidad rural del municipio de Florencia, Caquetá; la cual presenta altos niveles de inseguridad alimentaria. En este contexto, la educación ambiental y la producción de alimentos para la seguridad alimentaria son una fortaleza para lograr un desarrollo sostenible; aunque, luego de varios años de la aparición de la educación ambiental y el desarrollo sostenible, hoy por hoy son un amplio centro de debate científico, académico, político, social, económico, con innumerables publicaciones, pero con pocas realidades favorables que mostrar. **Conclusiones:** los problemas de hambre, malnutrición y pobreza se pueden mejorar con formación práctica en educación ambiental y producción de alimentos en el marco de un desarrollo sostenible, que sea equitativo y equilibrado en lo ambiental, económico y social; donde la producción sostenible de alimentos sea el eje transversal de la educación ambiental y agropecuaria en las comunidades.

Palabras clave: educación ambiental; producción alimentaria; equilibrio ecológico; suministro de alimentos; hambre.

Resumo

Objetivo: o objetivo deste artigo é estabelecer relações entre a educação ambiental e a produção agrícola para a segurança alimentar, com base numa fundação agrária e numa abordagem de desenvolvimento sustentável. A questão orientadora foi: como compreender a educação ambiental, a produção agrícola sustentável e a segurança alimentar, à luz dos números e desenvolvimentos atuais? **Metodologia:** a metodologia hermenêutica foi utilizada para a abordagem, a partir do conteúdo documental, como fonte de informação que permitiu uma pesquisa objetiva e científica sobre a questão orientadora. Procuramos compreender e interpretar o conhecimento e a realidade da educação ambiental e da produção agrícola, com base em referências gerais e científicas relacionadas ao problema, e em relatórios não científicos que situam o problema e o contexto. **Resultados**: as conclusões sobre população, fome, insegurança alimentar, subnutrição, obesidade, pobreza, pobreza extrema e desflorestação são apresentadas

globalmente na Colômbia e em Caquetá. A interpretação mais contextualizada na investigação é feita a partir da comunidade rural do município de Florencia, Caquetá, que apresenta elevados níveis de insegurança alimentar. Neste contexto, a educação ambiental e a produção alimentar para a segurança alimentar são uma força para alcançar o desenvolvimento sustentável; embora, após vários anos da emergência da educação ambiental e do desenvolvimento sustentável, são hoje um amplo centro de debate científico, acadêmico, político, social e económico, com inúmeras publicações, mas com poucas realidades favoráveis a mostrar. **Conclusões:** os problemas da fome, subnutrição e pobreza podem ser melhorados com formação prática em educação ambiental e produção alimentar no âmbito do desenvolvimento sustentável, que é equitativo e equilibrado em termos ambientais, econômicos e sociais; onde a produção alimentar sustentável é o eixo transversal da educação ambiental e agrícola nas comunidades.

Palavras-chave: educação ambiental; produção alimentar; equilíbrio ecológico; abastecimento alimentar; fome.

Introduction

Population growth and limited food production have made food security a critical issue of global concern. Environmental problems such as inadequate land use, climate change, and water scarcity, among others, have led to 2.3 billion people experiencing food insecurity and 828 million suffering from hunger (FAO et al., 2022). This is the result of erroneous and unsustainable human actions that have exceeded the environment's capacity to produce enough food to feed an estimated global population of 9.7 billion people by 2050 (World Bank, 2022).

The negative impact on the Environment began with the Industrial Revolution (1850-1970), when various industries were created that allowed the accumulation of money, economic growth and gave rise to capitalism. The industrial boom gave rise to the green revolution and the agricultural boom motivated productivity with genetic improvements, the use of synthetic agrochemicals and mechanized food production, together with population growth. These events led to waste generation and pollution, which alter and extinguish biodiversity and native resources (Pita-Morales, 2016), and therefore, risk human balance and sustainability on the planet.

The effects of human actions and the rapid deterioration of the environment gave rise to concern for the care of nature. In 1970, the Club of Rome stated that the growth model of the moment will take the planet to the limit of its capacity in 100 years (Pita-Morales, 2016). This historical event has led to the discussion of sustainable development (SD) as a means of meeting present needs while ensuring the environmental, social, and economic components for future generations. This concept was officially introduced through the Environmental Summits in Stockholm in 1972 and Rio de Janeiro in 1992 (Madroñero-Palacios & Guzmán-Hernández, 2018).

Increased concern for the environment has underscored the importance of environmental education (EE) as a means of generating knowledge, raising awareness, and changing human behavior in ways that promote care for and sustainable interaction with nature, and ensure human-nature subsistence (Pita-Morales, 2016). In Colombia, EE began in the 1970s with the *National Code of Renewable Natural Resources and the Environment.* In the 1990s, the legal framework for EE originated with Law 115 of 1994, which, in 2002, allowed the participation of the social, educational, and environmental sectors (Alvear & Urbano, 2022).

Despite political advances made in environmental summits, extensive literature, and the development of regulations and policies on EE and SD over the last five decades, the results of human actions continue to exacerbate environmental problems, decrease natural resources, and compromise the minimum

food production required for human and planetary sustenance. The Biodiverse Colombia project, with 60 million hectares in forests, has logged 171,685 hectares of which 70% occurred in the Amazon (González, 2021). In this scenario, famine affects 7.5 million people (UN, 2022), with 54.2% experiencing food insecurity (Aristizábal, 2022). Additionally, 36.3% of the population live in poverty, 46.5% of the rural population live in poverty, and 19.5% live in extreme poverty (DANE, 2022).

While this study discusses EE, sustainable agricultural production, and food security globally, several data points are based on observational experiences in rural communities in Florencia, also known as the "Golden Gate of the Colombian Amazon." Florencia is the capital of the department of Caquetá and is located at 01°36'51.08" north latitude and 75°36'22.04" west longitude, 242 meters above sea level, with an average temperature of 27°C and an average annual rainfall of 3,840 mm. It comprises seven townships, 178 villages, has a population of 187,408 inhabitants, and covers an area of 2,292 km² (229,200 hectares). This gives Florencia a share of 0.2% of the total Colombian territory. (DANE, 2021; Jurado, 2016). This gives Florencia a share of 0.2% of the total Colombian territory.

However, through the implementation of EE, Florencia has been able to develop sustainable agricultural and livestock production alternatives that allow for the conservation of the water wealth and biodiversity of local ecosystems. Despite being currently exploited inappropriately, these alternatives have resulted in minimal technological development and low per capita income in the area. In addition, the availability of soils and MA makes it possible to meet human food needs, since fibers, plants, and biological inputs represent 50% of the world economy (Hernández, 2011).

Current and future challenges suggest that EE is a necessary strategy for regional development and sustainable, productive, technological, and competitive agricultural in food production (Mansilla-Obando et al., 2022). EE in communities becomes indispensable to creating dynamics and processes that allow contextualized solutions to face a global economy that imposes rules of production and consumption (Villadiego et al., 2017).

However, fifty years after the beginning of EE as a strategy to mitigate environmental problems, the reality presents great challenges for humanity. Mitigating climate change, global warming, deforestation, pollution, loss of biodiversity, overexploitation of resources, food insecurity, hunger, malnutrition, and poverty, among others, are evidence of anthropogenic actions that have failed to satisfy present human needs. This suggests that the EE strategy has been unsuccessful in light of the outcomes. For this reason, EE and sustainable agricultural and livestock production make sense to generate social, environmental,

and economic awareness that fosters knowledge, skills, and values that will allow addressing these difficulties.

Therefore, contextualized EE can be the best training strategy in food security to contribute to sustainable agricultural production practices, balanced nutrition, and healthy eating. To establish the context and interrelationships of "Environmental education and sustainable agricultural production: a strategy for food security," this paper provides a synthesis of the main theoretical contributions of various technical and conceptual elements that facilitate understanding of their contextualization and the different interrelationships that arise within and among them.

Environment

The Environment, with its natural resources, is an accumulation of interrelationships between biotic and abiotic factors acting on living beings, the atmosphere, and renewable natural resources. Adequate development of the physical, social, cultural, and economic aspects satisfies human needs. The Environment is a responsibility to be cared for and preserved, which concerns both the current and future population. This responsibility demands a change in behavior within the institutional economic structure so that political and social actors support and act to minimize global poverty (Guillén et al., 2021; Moreno & Domínguez, 2001).

Currently, bad anthropic actions have caused environmental damages that require integrated work to be overcome (Le Clercq & Cedillo, 2022). These require protection and commitment efforts, as well as urgent actions to mitigate negative impacts. An appropriate EE would motivate the transition to a culture of environmental awareness (Mansilla-Obando et al., 2022), because nature surrounds man and influences his development and actions (Martínez & Cruz, 2014).

Renewable and non-renewable natural resources, physical, biological, and human environmental factors have suffered from environmental exploitation, urban development, industrial, and agricultural production. This has led to changes and degradation of the environment and its resources to the point of altering its structure, relationship, composition and productivity (Durango et al., 2019).

In the end, the environment is the sum of everything; it is a space for the life of diverse living beings, where they interrelate and converge with non-living elements and others created by man. However, the negative environmental impacts

caused by man must be corrected and efforts must be made toward creating a sustainable environment to contribute to the reduction of hunger, poverty, malnutrition, and inequality gaps.

Education

When different governments are interested in conducting comparative studies on educational outcomes and opportunities, social and economic policies are created for improvement. This suggests that the government sees education as a means to improving the quality of human life. Education is a key tool for the development of a country, a community, or an individual, as it enables economic, social, cultural, family, and organizational benefits (Carrero et al., 2016). It is a systematic bidirectional communication that integrates didactic elements to promoting learning among the people of a community (Ladewig et al., 2022).

In Colombia, education is defined as a process of permanent, personal, cultural, and social formation that creates an integral concept of the human person in terms of dignity, rights, and duties. In formal, non-formal, and informal education for peasants, the government and territorial entities are responsible for technical training in agricultural, livestock, fishing, forestry, and agro-industrial activities that contribute to improving human conditions, work conditions, food production, and quality of life of the rural population (Law 115 of 1994).

Nonetheless, education as a process of cognitive exchange among society members, began 70 years ago in rural areas. Agrarian reform and rural development policies were annexed to initiate social change (Carrero et al., 2016). This exercise, as non-formal education, provides elements to training the rural population and promotes long-term knowledge as an efficient means of learning.

However, the non-formal education provided to rural communities is far from the reality of the producers, because it is shared in a general way without recognizing their own needs, and without including the knowledge that exists in each community (Arias, 2017). Thus, the training given denies participation and commitment in the construction of viable and sustainable projects (Villadiego et al., 2017). In addition, it denies the opportunity to intervene and transform the current agrarian worldview, which is permeated by processes of rural living and globalized agricultural marketing. This creates tensions that affect the social fabric and modify ways of thinking, acting, feeling, and living of Colombian peasants.

Environmental Education

The concept originates from environmental concern and related problems. In this sense, pedagogy, in the idea that every child experiences and relates to nature, assumed in 1930 the proposal "Progressive Education," which objective was to learn by doing.

In 1958, the EE appeared before a fragile environment that moved the world, and the need for a SD to preserve it. The environmental conferences appeared: 1) Stockholm, in 1972, stressed the urgency of knowing the environment and developing sustainable actions to make good use of its resources and provide opportunities to current and future generations; 2) Earth Summit, in 1992, promoted education toward SD; 3) The Johannesburg Summit, in 2002, proposed SD educational actions; 4) Nagoya-Japan, in 2015, suggested having more trainers, initiating policies, integrating sustainable practices, empowering young people and asking governments for EE programs for their communities (Ortiz-Torres, 2022; Orgaz-Agüera, 2018).

After several years with environmental problems, the alternative solution has to be EE. The objective should not only be to learn of environmental problems and their impact on people, but also to carry out a real analysis from a social, political, economic, ethical, legal, and cultural point of view (Rodríguez, 2022).

Development models have prioritized an unsustainable economy for the life of society and the planet (Martínez & Cruz, 2014), although some time before, it was warned that man with his actions would devastate the environment in a short time (Hardin, 1968). The current environmental crisis requires a good society-nature relationship, with sustainable models that recognize the limits of social development, economic growth, and the exploitation of natural resources. In this, EE is a precise means of energizing the interrelationships and the recognition of oneself and with others.

EE is a rational practice; it is a social, formative change and transformation of values, ethics, critical skills, policies, attitudes, and personal growth aimed at improving the quality of life of communities (Lomas, 2022; Sauvé, 2016). EE is an integral accumulation of knowledge, a dialogue of knowledge, cognitive ability, attitudes and values (Sauvé, 2016; Leff, 2006).

A more elaborate definition of EE states:

> EE is the process that consists of recognizing values and clarifying concepts in order to promote the necessary attitudes to understand and appreciate the interrelationships between man, his culture and his biophysical environment. EE also entails participation in decision-making and in the very elaboration of a

> behavior code with respect to issues related to the quality of the environment (Ayes-Ametller, 2010, p. 45).

Consequently, the purpose of EE is to change ways of acting, thinking, relating, taking advantage of, producing, and living with the natural environment. For this, it is necessary to learn the characteristics of the environment in which one lives, understand and comprehend the relationship of man with nature, and propose from his own reality, the construction of ethical environmental values, to act responsibly with nature, and for the good of this and human survival.

The EE in interdisciplinary work and dialogue makes it possible to identify the specific educational area, although in light of the current social, environmental and economic challenges it has not been impressive at all. In addition, man in his desire for economic development ignores environmental effects and limits the satisfaction of needs for future generations (Ortiz-Torres, 2022; Ortíz, 2013) .

The importance of sustainable EE is to be an integrating force for the formation of communities, for the benefit of their own performance for food production(Jurado-Mejía et al., 2020). Thus, EE becomes an action component to train man in his social, cultural, and environmental context, and it also makes it possible to form a balanced transformative culture in its social, economic, environmental, and cultural axes. Additionally, it provides knowledge in production processes and the ability to solve environmental problems.

The current development model favors inequality, that the wealth and power of a few coexist with the hunger, poverty and need of many. In this, the man-environment relationship generates negative impacts that have the planet in crisis. For this reason, contextualized EE enables knowledge and production alternatives to comprehend, understand, and solve the social, environmental, and economic complexity of the reality of its environment. Therefore, the EE must be practical, transversal, and interdisciplinary, to make the environment a habitable living space, where obtaining and maintaining quality of life is possible.

Agricultural Production

The Colombian agricultural sector has deficient food production for reasons such as: misdirected government subsidies, expensive agrochemicals, low agricultural production, difficulties in marketing, low technical capacity and little financial capacity. Thus, bad production practices have negative environmental impact which show the competitive disadvantage of the small agricultural producer compared to imports and the sustainability of the sector.

The government promotes neoliberal economic policies that give large companies control of agricultural production and its process (Ray et al., 2021). Agricultural production is needed that improves planting infrastructure, reduces costs, and facilitates marketing (Valencia, 2022). In this reality, a friendly production with the environment is necessary, one that also involves economic and social aspects for the rural producer, that is, agricultural production with sustainable strategies (Fonseca, 2022). Likewise, also necessary are reconvert agricultural practices of traditional production for sustainable practices according to the needs of protection, sovereignty, protection of ecosystems and quality of rural life (Ávila-Foucat, 2017).

Currently, agricultural production is not sustainable, associated with the climate, nutritional, and economic crisis; it requires a good relationship between man and nature (UN. CEPAL et al., 2021). Hence, food production, in a healthy environment for food security, must work on natural infrastructure, social justice and extensive food production to reduce hunger in the population (Mohamed & Smith, 2013). The change to sustainable production systems is possible, as long as the small producer has available skilled labor, and they have the need to earn their own livelihood and that of their family when the State stops giving away money through social plans. (Fonseca, 2022).

In Colombia, there is the "*Familias en Acción*" program that supports less favored families. This promotes a welfare society that, waiting for government aid, is less and less interested in agricultural production. Thus, the environment is only seen as a provider of natural resources to bring economic benefits.

Colombia has primary economy production systems related to animal production systems and agricultural production systems to a lesser extent. However, bad work habits in these systems are altering the environment, since they are very profitable and production is insufficient to feed the population.

Agricultural Production Systems

The current globalization of the agricultural sector demands systems with high productivity and innovation in production and added value. For this, the environment, society and agrarian economy must be equitably sustainable with differentiating elements that allow them to be competitive and forge development for themselves and for their region. This is made possible with research, generation of knowledge, and permanent development (Jurado-Mejía, 2014).

In the Colombian context, experts believe that integrated agricultural production systems have the potential to generate productive proposals in

accordance with environmental capacities and sociocultural needs. But there is concern about an altered planet, scarce resources, man connected to what the earth can provide, scant food production and a growing population, and a State that does not encourage agricultural production, given its global economy model (Martínez & Palma, 2016). Food production can improve if it is no longer seen solely as family subsistence production systems (Villanueva, 2018) and if integrated food production systems are worked in the production of specialized sustainable foods (Russo et al., 2018).

Therefore, agricultural production systems must be a set or integration of elements, resources, techniques, land tenure, labor, and an organization of rural or peasant communities that permanently specialize in food production.

Sustainable Development

At the Stockholm Summits in 1972 promoting education and environmental problems was proposed, in Rio de Janeiro in 1992 Sustainable Development (SD) was the theme. However, given the increase in poverty, violence, inequality, and exploitation of natural resources, the United Nations Organization declared the "Decade of Education for Sustainable Development 2005-2014," with the aim of integrating sustainable development principles, values, and practices in education and encouraging behavioral changes to preserve the environment and enable an equitable and fair economy for current and future generations.

In the same way, the "Brundtland Report" proposes satisfying needs now, without compromising the needs of future generations as the essence of SD. The following stand out: 1) the notion of needs (the essence of the poor); and 2) the idea of state restriction on the capacity of the environment to satisfy present and future needs (Handal et al., 2015). Achieving this implies that it is economically viable, environmentally sustainable, and socially equitable. Thus, SD is environmental, social, and economic progress (Rentería-Vera et al., 2022). It's also cooperative sustainability with interactive economic, environmental, and social equity (Vildåsen et al., 2017).

Although it is believed that SD has an identity, is known, understood, and has applications in the reality of agricultural production systems, the way in which it is currently worked is not friendly to the environment. For this reason, agricultural production with SD is urgent and essential (Rentería-Vera et al., 2022). A healthy environment can indefinitely sustain whoever inhabits it (De los Milagros, 2015), with a vision of SD in: 1) meeting needs, 2) achieving quality, 3) achieving economic growth, 4) attending to demographic concerns, 5) choosing

appropriate technologies, and 6) use, protection, and restoring ecosystems for humanity (Miranda et al., 2017). This entails managing agricultural land, which currently accounts for less than 7.6% of the total (Hernández-Alemán et al., 2022).

Due to the foregoing, SD must be intergenerational when acting with the environment to address the issues of poverty and inequality (Vildsen et al., 2017). Equality, stability, and effectiveness as criteria for analyzing agricultural production provide sustainability that goes beyond economics by incorporating physical, biological, and social factors to address issues with poverty, hunger, and inequality (Rivera et al., 2017).

Food Security

The right to a healthy diet, —a basic component of human development— is not guaranteed in Colombia, particularly in Caquetá. The cause is ridiculous food losses and wastes that have significant economic, social, and environmental repercussions each year (Giménez et al., 2022; Guevara, 2021).

A lack of clarity regarding the socioeconomic backdrop, state social policies, production models, and market regulations has put the food security of households in danger (Salomone, 2016). In addition, the global financial crisis, the degraded state of the environment, the severity of natural disasters, food production, and affordable access to food are requirements for changing production methods and achieving a healthy, accessible, socially acceptable, and culturally appropriate level of food security (Martinez & Palma, 2016).

In terms of food safety, the term "availability" first appeared in the 1980s; later, in the 1990s, "access to food" was used to apply to both economic and physical factors. In the 1990s, "innocuity" as a notion and cultural preferences were added. From that point on, food security was considered a human right, which is now what we know it to be. But what exactly is food security?

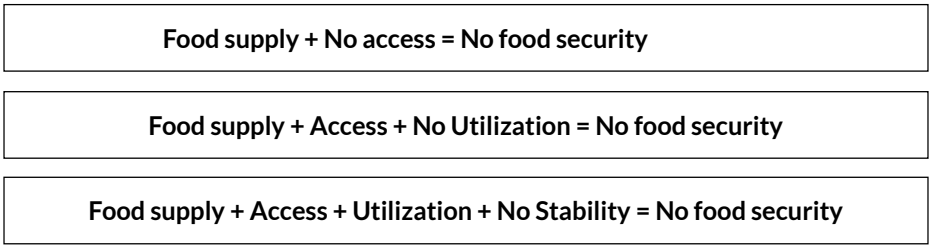
The definition of food security is when all members of a community have constant physical and financial access to enough healthy, nutrient-dense foods to meet their nutritional needs and food preferences to lead active, healthy lives with wholesome diets (Acosta et al., 2022; WFP, 2018). Clement et al. (2019) define ,availability, access, nutrition, sanitization, and stability of food as having constant physical, social, and economic access to sufficient uncontaminated and nutritious foods (WFP, 2018). On the other hand, healthy eating is understood as the satisfaction of energy and nutritional needs at all times. It is distinguished by being complete, balanced, sufficient, appropriate, varied, and unrestricted (MSPS & FAO, 2016). Accordingly, there is food security when every individual is never

hungry. This means having enough nutrients for a healthy, productive, active, and full-bodied life. It also means having a secure diet that is nourishing, acceptable, and sustainable within one's own culture. This means being self-sufficient and making decisions that are in line with social justice.

Now, the availability of food takes into account farming, harvesting inventory, production, absorption capacity, and distribution to the populace. Access to food refers to the population's ability to obtain adequate quantities of these through various management techniques —access must be both physically and financially feasible. The use of food refers to obtaining the necessary amount of nutritional value to achieve people's wellbeing. Finally, stability refers to the assurance of a food supply for the population even during times of economic or environmental adversity. Guarantying food security when the four dimensions are met simultaneously is possible.

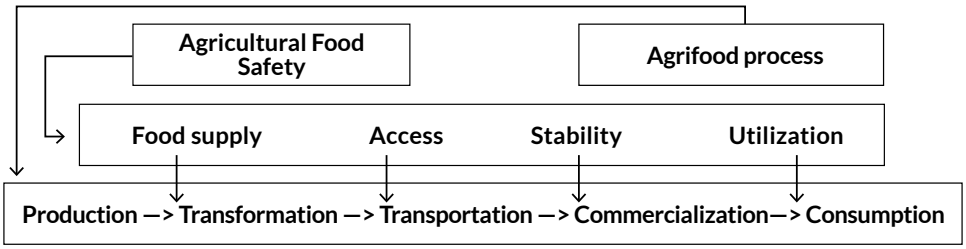
As a result, food security refers to a family's ability to obtain a sufficient quantity of food to meet all of its members' dietary and nutritional needs. If one of the requirements does not meet the standards, there is no food security. Figure 1 illustrates a thesis.

Figure 1. Completion of Food Security Dimensions.



The production of agricultural products, which forms the basis of food security, gains significance when key players are brought together and take part in the flow of agricultural products that address particular needs. Following is an illustration of the relationship between the stages of the agro-food production process and the dimensions of food safety:

Figure 2. Agricultural Food Safety and Production Processes.



The stages of the agro-food process function as a system, indicating interactions that are coherent from production to consumer expenditure. The cycle is repeated to demonstrate that the agricultural process is more than just mechanical; rather, it is a focus on healthy and sustainable living.

Communities in Florencia, Caquetá, demand an organized policy that protects the right to food. Reducing poverty, eradication of hunger, and eradicating all forms of corruption is possible thanks to a commitment from the government, businesses, institutions, and urban residents who work together on comprehensive reforms to improve the quality of life in rural areas. This commitment includes food production, formal employment, sustainable production, commercial viability, and a political, social, and ethical commitment.

Methodology

The research was conducted using a hermeneutic methodology from documentary content, allowing for the extraction and storage of objective and scientific data to better understand and interpret current knowledge and state of play regarding environmental education, sustainable agricultural production, and food security in light of a reality marked by hunger, poverty, and malnutrition. The findings made possible having a discussion and formulating conclusions.

The search was conducted using relevant scientific references and non-scientific reports that positioned the issue and its context. Research on the aforementioned topics is valuable and useful because it is supported by scientific evidence (Vera, 2009). As a result, the methodology was applied to the mentioned topics and it was successful in establishing the significance and originality of each topical selection from the perspective of the researcher, which was proposed in four stages: description, search, organization, and information analysis.

1. Description: It was decided to be clear, specific, and comprehensive. The document search was focused on finding an answer to the question: How should we understand environmental education, sustainable agricultural production, and food security in light of current statistics and events?

2. Search: To place the issue and its context, the referenced documents were (1) broad in nature, (2) scientific or specialized, (3) related to the issue, and (4) non-scientific.

The scientific search was carried out in various databases: the key words "environmental education AND agricultural production AND food security" were entered into ProQuest (p), ScienceDirect (sd), Scielo (sc), and Scopus (sp), and the following number of articles were found: p (2270), sd (11), sc (0), and sp (0). A "p" was added AND Colombia (1726), complete texts (1726), scientific journals (95), expert-evaluated articles (82), and the most recent 12 months (6). After reading the samples, two were eliminated because they were from Ecuador and Mexico, one was eliminated because it was about environmental education and contamination, and the end outcome was three articles. The following was added: AND Colombia (5), research article (4), most recent 12 months (0), and most recent 2016 (2) —were excluded because they refer to Cuba— ultimate outcome (1).

The Boolean operators used in the search strategy for SC were modified, however, the keywords "environmental education," OR "agricultural production," OR "food security" were retained (345 results). After including the term "Colombia" with the "AND" operator (22 results), the search was refined to the Colombia collection (19 results) and narrowed down to articles published between 2017 to 2019 (17 results) resulting in two relevant articles. Further, the search was conducted using the keywords "environmental education," OR "agricultural production," OR "food security" in Spanish, limiting the search results to publications between 2018 to 2021 (31 results), Colombia (five results) and refining the search to single articles only (75 results), resulting in two relevant articles. Lastly, to ensure that the search was up-to-date, a search in DOAJ for the years 2022 and 2023 was conducted, which completed the search.

3. Organization: Each document was systematically arranged in calculation journals that the researcher had designed. Then, the document's construction was started after creating thematic folders using the information management program Mendeley.

4. Analysis: The information that was gathered and organized was analyzed to determine which documents were most useful for the study's proposed theme.

The information was analyzed by determining the contribution that each paper would make, trying to do so with critical thought to support the description of the guiding question..

Results

The most notable findings are presented from the broad to the particular, beginning with the most extreme numbers and concluding with Colombian research assertions.

Each year, 130 billion tons of food are wasted globally, which is equal to one-third of global production (Guevara, 2021; FAO, 2012). In Colombia, where there is a national food supply of 28.5 million tons, there are losses of 9.76 million tons, or 34% of the total (NDP, 2016). Despite having extensive land areas, the Caquetá department only produces 12.49% of the food it consumes and relies on an external flow for 87.51% (Jurado-Mejía et al., 2020); the department's seat Florencia produces less than 13% of the food it needs and has inadequate food security (Garay, 2017).

Due to agricultural practices that do not meet this need, as well as the fact that a third of those practices are lost, the growth in population also increases food consumption (Amna et al., 2023). Globally, 200 billion people experience food insecurity due to lack of access to sufficient and nutritious food, increasing their risk of malnutrition and poor health. In Latin America, 42.5 million people were affected by hunger in 2018. This amounts to 6.5% of the total population, with Venezuela reaching a level of 21.2%, despite the fact that 55% of the region's population is undernourished. The official 2018 statistics are as follows: the world 10.8%, Africa 19.9%, South America 6.5%, Asia 11.2%, and Antarctica 6.2%. (FAO et al., 2019).

According to the Worldometer's 2022 estimate of the 798.13 billion people worldwide, 82.14 billion are undernourished, 73 billion are living in extreme poverty, 201.38 billion have moderate food insecurity, and 704.3 million have severe food insecurity. While extreme poverty decreased globally from 54% in 1990 to 41% in 2015, it increased in some parts of Africa from 277 to 413 million people (FAO et al., 2019). Worldwide, according to the Body Mass Index (BIM), 860.4 million people are undernourished, 808.1 million are with obese, 1.726 million are overweight, and 13,000 people per day die from famine (Worldometer, 2022).

Colombia has 60 million acres of forested land (González, 2021), 39,7 million acres are in the Amazonian region (Restrepo et al., 2020), and 1.5 million acres

are in the Amazonian piedmont (Arévalo et al., 2020). However, such wealth is impacted by deforestation: 219,973 acres in 2017, 197,159 in 2018, 158,894 in 2019, and 171,685 in 2020; of these, respectively, 65.5%, 70.1%, 70%, and 70% occurred in the Amazonia (Paz, 2018; IDEAM, 2019; González, 2020; MinAmbiente, 2021; González, 2021).

Famine affected 59.7 million Latin Americans and 7.3 million Colombians (United Nations, 2022); thus, Colombia has 14.6% of the total population suffering from famine, 54.2% from food security (Aristizábal, 2022), 36.3% from poverty (Nieto & Altamiranda, 2022), 46.5% from rural poverty, and 19.5% from extreme poverty. In Florencia, Caquetá, rural poverty reaches 50.1% of the population, although extreme rural poverty is lower, 12.9% of the people. (DANE, 2022).

After several years of implementation as a strategy for SD, EE does not show good results. Caquetá with food dependence of 87.51%, has land suitable for cultivation, food security and sustainable agricultural production which can be transversal EE topics that foster activities, skills, and environmental, cultural, social, and economic values in particularities of each community.

The National Survey for Situational Nutrition (2017) reveals economic and social inequalities in households, ethnic groups, social classes, regions, departments, municipalities, and various areas of Colombia. According to the figures, more than 54% of Colombian households live in food insecurity; 321 people die each year for malnutrition (Castro, 2018); monetary poverty in 2018 reached 24.4% in urban sectors and 36.1% in rural sectors; and multidimensional poverty in the city reached 13.8%, while in the countryside it reached 39.9%, with extreme poverty in 4.9% in the city and 15.4% in the countryside. For children, 62.5% between six and 11 months old suffer from anemia, 13.3% under five years old. Ten percent of Colombians between five and 17 years old are in a chronic malnutrition condition (ENSIN, 2017).

Data reveals the state of abandonment of our farmers. Regarding agricultural producers, 85.6% in Colombia have an average monthly income of $296,000, 72% are in a subsidized health system, 91% have no employment risk affiliation and 88.3% do not have a pension affiliation (Osorio et al., 2019). Food in rural communities when there are no planned strategies from research, experiments, technological developments and innovations that facilitate models of sustainable production is a reason for concern (Asprilla-Perea & Díaz-Puente, 2020).

Colombia is an unequal country in land possession and low in peasant labor force. There are no opportunities for youth, and has endangered the existence of peasants thus food security. Agriculture imports grew from 1992 to 2015 by 9.1 times; from $637 million to $578.6 billion of dollars annually, with exports of minimal agricultural participation and ineffective agricultural laws regarding land ownership. (Villamizar, 2020).

The Amazon region in Caquetá —with its geostrategic position, biodiversity, water abundance and natural wealth— raises concerns about the environmental situation. In 2017, Caquetá had 6,442,745 hectares of stable forest surfaces, which corresponds to 11% of Colombia (58,341,095 hectares of stable forest area). However, Caquetá has unfavorable rates of deforestation with 60,373 hectares, 27.5% of the total of 219,973 hectares in Colombia. (IDEAM, 2018).

The agricultural sector in Caquetá and its capital imports the necessary food for the basic diet of its inhabitants. This complex situation does not allow for eradicating hunder or poverty. Although there are government programs, poor people are 26.9% of the total population; 24.2% in municipal headquarters and 36% in the rural sector (De Castro, 2017). In Caquetá, poverty in terms of unsatisfied basic needs (NBN) corresponds to 33.48% in urban areas and 59.20% in rural areas (OCHA, 2021).

In Colombia, sustainable agricultural production should be worked in agricultural systems for food alternatives in economic, social, cultural, and environmental contexts. (Pitta & Acevedo 2019). To prioritize educational and productive food needs in peasant families, from their environment and particularities, supporting family gardens is recommendable. They are essential reservoirs of agricultural variety and promote food security and nutrition of rural population (Villa & García, 2017).

Recognizing peasant wisdom becomes very strategic, since sustainable food development allows the farmer, as an actor in his own territory, to identify man-nature relationships and become a potential change in conservation and the protection of ecosystems, along with agricultural production techniques for rural development (Vásquez, 2018). Popular rural agriculture keeps its culture, networks and firmness alive in the values of the farmer, collector, craftsman, fisherman, etc., as an unceasing activity. Good agricultural practices are recognized in activities such as crop rotation, organic waste benefit, pest elimination, creating native food and tree seedings to preserve water sources and protect ecosystems (Vergara-Buitrago, 2018).

Also, in Colombia the food industry is described as a productive gamble with worldwide projection, but some aspects of competitiveness must be known and immediate improvements must be made. (Melo et al., 2019). Land distribution that has left several peasants without support demands agricultural and livestock activities (Villamizar, 2020). Thus, agriculture historically was a good space for peasant development, but has since lost its dynamic. The government does not create employment opportunities in the fields; it does not support transitional crops and does not drive the family economy, but rather creates supportive policies for a permanent use of technology in crops farming that generate less employment.

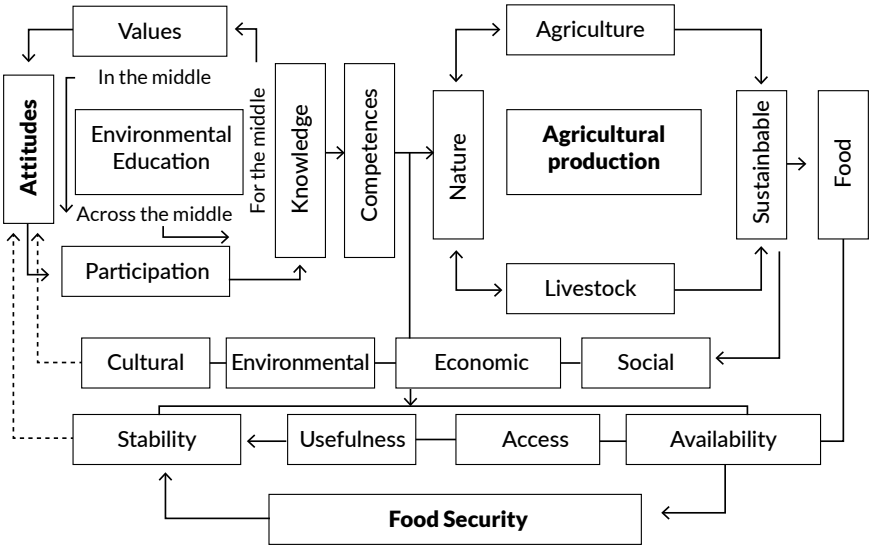
Discussion

From the findings, it is important to comprehensively consider environmental education, sustainable agricultural production, and food safety, to be systematically analyzed as a set of interrelated elements in which there is coherence and purpose, unity in searching for efficient results in food production, human quality of life and the protection of the environment.

Environmental education can be determined to be a major strategy with the ability to create knowledge, values, attitudes, participation, and competencies in and for the environment. It provides the input for sustainable agricultural production that, by making rational use of natural resources, generates agricultural, livestock, and forestry production systems to obtain food. With a sustainable vision, these elements must equitably balance social, environmental, economic, and cultural aspects, so that, harmoniously, EE does not alter the environment or food security in its dimensions of availability, access, use, and stability.

Integrated environmental education, sustainable agricultural production, and food security, as a systemic process, must be continuous and applied in every dimension to deal with environmental problems, such as deforestation, global warming, pollution, social problems such as hunder, and malnutrition, economic issues such as poverty, and housing, and cultural problems, like education and eradication. Figure 3 illustrates this interrelationship.

Figure 3. Integrated Environmental Education, Agricultural Production and Food Security System.



In today's society, the data described in Figure 3 is not comprehensively solving existing problems and it is one of the main reasons why poverty, hunger, food insecurity, global warming, malnutrition, etc. are increasing every day, even with all the advances and developments of modernity. These problems of the world in figures have a similar trend in Colombia. The Amazonía, Caquetá and Florencia relate in different ways, they share the same problems and failures in issues of environmental education, sustainable agricultural production and food security.

In this way, poor environmental education favors environmental problems, since it is not taught from practical and natural contexts. Nor are age, cultural or individual differences in interest undermined in people; it is not promoted to protect the environment from sustainable agriculture and other activities, or integrates all the participants in environmental Education (Rodriguez & Bezerra, 2016). Educating everyone about the environment is mandatory, but also teaching them how to care for their health, natural resources, and environment while growing crops and producing foods that serve as a means of practical environmental education and a source of local development is equally important (Rodriguez & Bezerra, 2016).

The universe of the integrated system (Figure 1) involves a variety of elements and phenomena that become cyclical and create the possibility of being

a good alternative solution, although, the data reveals the ability to meet the sustainable development goals in reducing poverty and hunger to zero (Herrero et al., 2018); as in Florencia rural poverty exceeds 50% (DANE, 2022). In EE, the topic for environmental training should be based on crops cultivated and managed environmentally, with agroecological knowledge that seeks balance between established production systems and performance environment, something that is not happening because it is being assigned, without any distinction, as a subject at primary education levels. (Marrugo et al., 2015).

As stated, EE and the SD are shown as a priority and a key connection to achieving a respectful investigation and a change of mindset on how to conceive of the environment and natural resources. However, several inhabitants of poverty and misery go unnoticed by political leaders who claim privileges and special forces with little or no sense of what really should be their representation in the State, to such an extent that the inequality of income or wealth measured in the Gini index exceeds 0.530 (DANE, 2022). Likewise, environmental degradation and alteration is a cause and consequence of poverty (Rodríguez, 2022).

Literature on EE, agricultural production and food security —related in figures and indicators associated with environmental problems, poverty, food insecurity, hunder, etc. is very broad and varied, but shows little encouraging results. This happens year after year; individuals have been talking about EE, SD, agrarian reform, security, and food sovereignty for decades, but the problems associated with these persist *(Jurado-Mejía* et al., 2020). Several years ago, SD was considered to provide humanity with the needed solutions for education, food, and equality, because it was thought to be able to achieve environmental, social, and economic balance. By the given concept of SD, everything seemed to face innovation capable of transforming humanity and creating environmentally healthy and socially more equitable communities.

Since then, the SD thesis has involved a variety of viewpoints, analyses and publications arguing about the SD conceptual appropriateness or inappropriateness and raising concerns such as sustainability (greater emphasis on environmental pillars), green economy (sustainability management), community eco-development (basic needs satisfaction and promotion of peoples' autonomy) and good living (living in harmony with the community and with the nature), among other perspectives widely discussed and systematized by scholars.

Nevertheless, these findings show that the discussions result in being more semantic than pragmatic. Regardless of the term or viewpoint, there is an evident lack of solution to the related problems, and to date, the political vision of SD education as a food security strategy has not caused the expected outcomes from the environmental, social, and economic components to achieve the desired equity

and social justice. SD is assumed to be isolated rather than aggregated with no participation from all members, despite age or gender (García et al., 2021).

Environmental summits, meetings and events have resulted in a plethora of publications that highlight the SD principles as a fundamental theory used to analyze how to advance at different performance levels. Despite the fact that SD seems to be widely discussed in intervention strategies, the Colombian reality has no significant implications for agricultural production systems in terms of food security.

Additionally, the current agricultural production model may be responsible for the lack of food, as the crisis in the sector is evident. The presence of intermediaries in the sales process, the large income gap, Colombia's high transportation costs and the disparity in productive capacities between small and medium producers are all factors to consider (Vanegas & Gaitán, 2020).

As a fundamental human right, food security must be ensured in all respects. However, statistics show a high correlation between food insecurity and extreme poverty with the inequity and social inequality being the source of the problem that several households face in overcoming obstacles, especially given that humidity is seen as the greatest threat to survival due to the damage caused to the planet (Sanchez, 2019).

According to the previous issues, EE makes sense because of its relevance in influencing significant changes in people's behavior, in the human-nature relationship, and the pursuit of optimal performance in sustainable agricultural production as an alternative solution to environmental, social, and economic problems. These are included in the dynamics of agricultural production and coexistence required for food security as a fundamental right.

Thus, the importance of EE becomes obvious in light of the decade's technological boom which has resulted in remarkable growth and profits at the expense of an increasingly deteriorating environment. This entails everyone on the planet becoming aware of the scope of the environmental damage, and taking the necessary actions to provide solutions from both individual and collective perspectives, thus, overcoming the greatest threat to survival (Sánchez, 2019).

In Caquetá, a developing region, the lack of technological capacity for the agricultural sector, the low productivity, and the short-sightedness of the long-term primary economy are the factors causing serious damage for the regional agricultural sector. This creates a structural transformation and a vision based on what a society needs to do with its farming communities, with its agro-industrial manufacturing, and with the rural sector to improve growth and maintain the populations' food security. In agricultural production systems, all of these factors are inextricably linked.

Perhaps the problems of the countryside rely on EE as an opportunity for creating alternative solutions for the Colombian agricultural sector and the department of Caquetá, not as a desire for perfection in the agricultural processes, but as a requirement for today's society's survival. Because it is critical to use appropriate language and a shared logic of thinking when it comes to sustainable agricultural production, the authors aim at understanding and seeking for a consensus to changing the country's focus which is collapsing into violence, opposition, power of ego, corruption, despair, and loneliness of a population that has dreams and still lives with the illusion of having a better world for their children.

Sustainable development emerges as a response to the growing concern of environmentally destructive actions, but its focus is lost when, from the capitalist's view, industrial and economic progress is achieved at the expense of the environmental damage without a balance among social, environmental, and economic dimensions. Because productivity and economic growth were prioritized in actions toward natural resource depletion, hindering agricultural production, creating environmental problems, and therefore, human famine and poverty.

Finally, the best strategy is to work on sustainable development, environmental education and agricultural production all at the same time. These are critical factors for achieving human food security, environmental protection, the reduction of social inequality, eradication of hunger, and poverty reduction, in other words, meeting the Sustainable Development Goals (SDG). These structural factors do not work independently; they would perform well if implemented as intended and in a simultaneous and integrated manner in achieving effective outcomes. These could become a system with elements such as sustainable development, environmental and agricultural production, which are integrated and interact coherently in order to achieve food security. However, if any of them underperforms, the system as a whole fails to function properly and fails to meet the expected SDGs.

Conclusions

Environmental Education (EE) must be based on the communities' own worldview which must be developed through a conscious and directed search for new knowledge in their own environment and reality. Thus, freedom and autonomy as well as competitiveness are generated. This process cannot be based on external values alien to the social structure of agricultural production without reasons of

state, religious mandates, or salvation discourses regarding unreal prosperities that are never realized but create increasingly difficult survival conditions for local communities.

EE architecture and sustainable agricultural production must begin with rethinking, redoing, believing, and reflecting on citizenship as a society, as well as recovering the agricultural communities' shared values and distancing itself from easy money, selfish, and deceptive attitudes toward fellow citizens. Because a way of life and a social construction are reclaiming beliefs in the capacity and vocation of the countryside, as well as rediscovering those values of bygone times rather than an aspect of right-wing or left-wing fundamentalisms that are forged as saving and excluding idolatries.

Real-world scenarios of food insecurity and low agricultural production prompt individuals to consider human nutrition in relation to the productive, cultural, environmental, cognitive, political, economic, and social contexts into which agricultural production dynamics are inserted and expanded to aid in the search for solutions to the structural problems of hunger, poverty, and human malnutrition. Agricultural output is therefore essential and critical to the world economy. In Colombia, agriculture is the backbone of its economic system, because it produces raw materials and food, as well as serves as a major opportunity for generating employment, income, trade, and forage, among other benefits.

Food security, as a human welfare issue, requires examining, analyzing and resolving the detrimental disparities in access to food, as well as understanding and emphasizing with the poor community's situation by recognizing and looking into the economic, social, and environmental issues brought on by the unequal distribution of wealth and the means of production. Similarly, food insecurity should be viewed as an opportunity for agricultural production based on environmental education and sustainability and as a social and environmental strategy to meet desired outcomes.

Food as a basic human need is a necessary condition for the quality of life, regardless of whether a country is underdeveloped or developed. The agricultural sector is critical for food production and ensuring people's food security.

Despite the fact that access to food is a fundamental human right and a governmental obligation, there is a remarkable disregard of this mandate and a lack of training support to strengthen it. The majority of global decisions have promised food as a right, with the goal of hunger elimination, inequality reduction, and food security assurance. There is, however, no coercive or effective system for monitoring and evaluating the level of compliance and commitment among the States. As a result, the first barrier to achieving food security —based on EE, and having sustainable agricultural production— is and will remain the

lack of work and genuine commitment required to materialize the aforementioned promises.

The success of a community's food security is dependent on the performance of a food production system as well as on SD, EE, and agricultural production. The implemented sustainable development must be socially, environmentally, and economically equitable to function coherently and guarantee resources for the present and the future of humanity. At the same time, it is founded on environmental education for people to recognize their environment and their values as well as to acquire the necessary skills, abilities, and attitudes to appreciate and comprehend the interrelationships between man, culture and environment. Similarly, if people work from a position of food autonomy returning to their culture and traditions, with native seeds and less reliance on agrochemicals in search of a healthy diet, that would be preferable to achieving food security in the dimensions of availability, access, utilization, and stability. If this process followed the implementation of the concepts, sustainable development goals would certainly be accomplished.

The integrated SD, EE, and agricultural production system achieves favorable outcomes if the government eliminates rural economic aid programs, improves infrastructure, regulates agrochemical costs and land tenure (maintains a reserve of 30% of the size of the land for environmental protection, requires cultivating 35% of the land owned and leaves the remaining 35% for other activities), fixes prices and guarantees purchase of primary production directly from small producers. This would eradicate logging, insufficient soil use, land accumulation, reliance on imported food, unemployment, poverty, famine, and other associated issues, such as the revision of free trade agreements with export production.

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