Chapter 3

Agri-environmental education for valorization of life in the countryside and in the city

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Introduction

The targets of Sustainable Development Goal 4 (SDG 4) addressed in this chapter refer to meaningful learning that determines the improvement of social, economic and environmental relations, giving the subjects the ability to act in the protection of the landscape for sustainable development.

These being:

> [Target] 4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.
>
> [...]
>
> [Target] 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development. [...] (United Nations, 2017).

Contributions of Embrapa to the aforementioned targets refer to formal and non-formal educational actions developed in the regions of the country that contribute to the valorization of life.

Cultural sustainability

The cultural identity of peoples must be recognized and respected by all. Culture is today identified as an instrument that promotes development and is recognized as an essential factor to the balance of society.

The United Nations Educational, Scientific and Cultural Organization (Unesco, 2002) has proposed that education, in addition to propagating teaching and learning about the cultural diversity of the human being, reinforces the recognition that all are equal and interdependent. This union is presupposed for the attainment of world citizenship.

The Brazilian Agricultural Research Corporation (Embrapa) operates in all Brazilian regions and recognizes that cultural development and cooperation must be based on the recognition of differences of identities, understanding that each has its value. Cultural diversity and the participation of the population are crucial for conscious transformation towards sustainable development.

Since the Environmental Education Treaty for Sustainable Societies and Global Responsibility, at the *United Nations Conference on Environment and Development* (*Eco 92*), Embrapa has developed several solutions for agri-environmental awareness with the purpose of inserting environmental issues into the processes of technological solutions developed. Some practices aim to work on conceptual models and, consequently, paradigm changes.

Macroeducation

Macroeducation is a set of techniques, methods and materials developed by Embrapa Environment with the objective of systematizing a process of awareness that results in the change of attitude of family farmers, students of rural schools and agricultural technicians through the training of rural extension multiplier agents and public education networks (Brasil, 2012).

It is a participatory planning method to guide the formation of sustainable community. The moderator conducts the process of developing collective

perception about the territory or organization so that, in an agile way, the community delineates its own methodology of socio-environmental interaction of management and governance aiming at sustainable development. The main strategy is the formation of present and future development agents with the purpose of influencing the transition from the present to the sustainable future, starting from the building of relationships that result in local quality of life.

Macroeducation is applicable to all Brazilian regions and biomes, involving diverse publics and the interrelation between adults, youngsters and children of the education networks, from kindergarten to undergraduate education, also permeating agricultural and non-agricultural vocational education. In this last area, the integrated production of strawberry (PIMo) and the technical-agricultural schools in organic production and integrated production stand out. The results were certifications won by family farmers and schools, as well as the recognition of macroeducation as a good practice in environmental education in family farming by the Ministry of Environment (Brasil, 2012).

Environmental Education collection for sustainable development

The main result regarding macroeducation is the launch of the Environmental Education Collection for Sustainable Development, with seven volumes (today in the third edition). This kind of material serves primary and secondary education and is used for the training of moderators, community leaders and public and private organizations, making them able to jointly develop their own socio-environmental responsibility methodologies. The method was awarded by the Ação pela Água do Consórcio Intermunicipal das Bacias dos Rios Piracicaba, Capivari e Jundiaí (Water Action from the Piracicaba, Capivari and Jundiaí Rivers Basin Intermunicipal Consortium) for the work done with 110 schools in 30 municipalities of São Paulo state.

Education of sustainable development agents

Sustainable development is one that seeks to meet the needs of the present generation without compromising the ability of future generations to meet their own needs (Comissão Mundial sobre Meio Ambiente e Desenvolvimento, 1991). In accordance with this concept and with the aim of promoting the sustainability of Brazilian agriculture, Embrapa develops educational practices appropriate

to public and private organizations and civil society organizations, such as rural communities and publics that directly or indirectly influence the living conditions. Embrapa also carries out actions directed to the education networks (from kindergarten through graduation) aiming to contribute to its improvement through the awareness of students, potential development agents.

Agricultural research by nature requires continuous interaction with the productive sector to develop knowledge and provide technological solutions. Technicians, farmers, cattle breeders and rural communities are distinct publics, which require different forms of communication; these forms are presented below.

Field day

Embrapa organizes events and programs called "field days" and implements spaces, either in the institution itself or in strategic locations, with the purpose of demonstrating its technologies, services and products, through direct contact, in a consolidated manner, with action practices and knowledge exchange between technicians and farmers.

One of the formats of the field days is the program Field Day on TV, which allows greater visibility to Embrapa's research because it is broadcasted in a language appropriate to the target audience by broadcasters of national reach and by satellite dish.

Education experience of multiplying agents

Among many experiences of training of multiplier agents, it is important to highlight the one led by researchers from Embrapa Western Amazon, in Manaus, AM, in 2016.

Researchers trained 18 mid-level technicians and three agronomists to act as multiplier agents on the Production Systems of cassava, cowpea and corn. The training was aimed at increasing the productivity of these crops and increasing the supply of food, food security and quality of life of the population. After the participation of the technicians in the training courses, 90 Demonstration Units were installed and 2,788 farmers were trained in 22 municipalities, distributed in 236 rural communities. It was verified that the average agricultural productivity of the Demonstration Units was superior to the average of the state of Amazonas. This reveals the importance of using technology and technical training, especially

in a state with one of the lowest levels of education in the country (Oliveira; Pereira, 2017).

This experience is an example of how the implementation of Demonstration Units has contributed to the training of professionals and students aligned with the technologies offered by Embrapa and enabling farmers to produce in a sustainable way.

Community communication for strengthening local development

Embrapa Technological Information has built a communication method based on the premises of community communication and popular education. The method arose in the context of a public policy, the Plano Brasil Sem Miséria (Brazil Without Poverty Plan), in which Embrapa worked with farmers and rural extension workers in 14 Territories of Citizenship in the Northeast region. The objective is to encourage the continuous formation of community leaders to exercise the communicative role, in order to contribute to a new perspective of rural development, with an agroecological approach and based on the premises of sustainability.

The tools used in the communication process are:

- Training in community communication for territorial leaderships – farmers, communicators, educators, rural youngsters and rural extension technicians – through workshops on agroecology and systematization of experiences (concepts and practices).
- Communication tools (techniques for producing audios, videos, photographs and bulletins).
- Dialogue groups articulating elements of participatory rapid diagnosis of the Territory and analysis of narratives from the theme "traditional versus alternative media".
- Experiences in agroecological spaces for recording images, interviews and photo production and use of social media in the formation of networks.

Embrapa partners in this work were the Department of Transfer of Technology, Embrapa Coastal Tablelands, Embrapa Tropical Agroindustry, Embrapa Goats & Sheep, Embrapa Semiarid Agriculture, Embrapa Cassava & Fruits, Embrapa Maize & Sorghum, Embrapa Cocais, Embrapa Cotton e Embrapa Mid-North, besides

Articulação Semiárido Brasileiro (Brazilian Semiarid Articulation – ASA) and its state organizations.

In 2017, Banco do Brasil Foundation (FBB) certified the methodology as social technology reapplicable under the 9th edition of Prêmio Fundação Banco do Brasil de Tecnologia Social (Banco do Brasil Social Technology Foundation Award).

Agricultural property management

The method developed by Embrapa Western Amazon, applied in Manaus, AM, is addressed to family farmers (individual, family or community) and aims to develop the capacity and autonomy of the management of agricultural property as a strategy to improve the quality of life and search for the sustainable local development.

The methodology consists in the elaboration of a schedule of courses, workshops, lectures, talk groups, technical visits and field days, according to the interest of the families and the needs observed. At the same time, practical actions are taken to recover degraded areas, rehabilitate Permanent Preservation Areas (APPs) and Legal Reserve areas, in accordance with Brazilian law.

The goal is to emphasize participation, the expansion of environmental knowledge and its interface with health, critical reflection, experiential learning and the democratic ownership of the processes of change. In these meetings, there are exchanges of experiences, observations and discussions on techniques and procedures that can be adapted by farmers.

Building skills are important to promote sustainable management of farms. Environmental education is considered to be an effective tool for raising awareness and training on environmental, social and economic issues.

The method was recognized as a good practice of environmental education in family farming by the ministry of the environment. In addition, the linked project was considered a reference in the Amazon biome (Brasil, 2012).

In 2011, the project's partner association was selected as a finalist of Banco do Brasil Social Technology Foundation Award, which is sponsored by Petrobras and by a partnership of the Ministry of Science and Technology, Unesco and KPMG Auditores Independentes.

Fish for schools

Researchers from Embrapa Fisheries & Aquaculture, in partnership with other institutions, have been undertaking, since 2016, in Tocantins, actions to train fishermen, women who prepare meals, students and teachers to meet the prerequisites of the Programa Nacional de Alimentação Escolar (National School Feeding Program – PNAE).

The actions seek to make the schools accessible to fishermen, enabling the producer with correct forms of creation, slaughter and distribution, so that the product is consumed by the school units. The training and guidance of fishermen in good practice present excellent results. Of the 36 participants, 15 fishermen are included in PNAE, which has resulted in a significant increase in their income.

It also carries out the training of the women preparing the meals, who learn about fish cleaning, preparation of recipes, ways of serving and tests of acceptance.

Students and teachers are also trained in fish farming as part of the partnership between Embrapa and the school. The work that addressed training and guidance to fishermen (Sousa et al., 2016) was awarded by the International Fund for Agricultural Development (IFAD), an agency of the United Nations (UN). The experience report with public schools and fishermen from Brejinho de Nazaré, TO, was one of the five selected for publication on the page of FIDA Mercosul and it received award in cash.

Pedagogical Bank of Família Agrícola School of Sobradinho

The spaces created for teaching and learning in some units of Embrapa are well diversified having as background the rural landscape and the creation of trails to instrumentalize the technological and ecological learning.

There are also spaces in schools, such as the work developed at Escola Família Agrícola (Rural Family School), located in the municipality of Sobradinho, BA.

These schools are community-based institutions run by an association of families, ex-students, people and related entities, with the mission of promoting the integral formation of family farmers' and rural workers' children, aiming at sustainable development through alternative education. The pedagogy of alternation is an educational concept that seeks to promote the dialogue between empirical,

traditional and scientific knowledge from a formation that alternates school time and community time. The school of Sobradinho, although located in this municipality, has as students the children of family farmers from different other municipalities of the region.

The work developed was the creation, in 2016, of the Banco Pedagógico da Agrobiodiversidade (Pedagogical Bank of Agrobiodiversity – BPA), with seeds of creole varieties coming from different municipalities of Bahia. The registration of the information of the creole varieties kept in the seed bank was carried out with the participation of the students. Currently, BPA conserves 65 semiarid creole varieties, of which 38 were brought from their communities by school students during community activity. Twenty-six seed guardians were identified in the 15 communities where the collections were made.

Community seed banks are important because they are a privileged space for learning, development of management capacity, articulation of families for agro-ecological innovation processes and exchanges of knowledge, strengthening of cooperation and solidarity relations, seed recovery and of lost knowledge.

BPA is therefore an interesting and innovative strategy not only for the conservation and use of creole varieties, but also for the awareness of both teachers and students, farmers, technicians and other professionals in related areas on the importance of these varieties for family farming. In this work, Embrapa Semiarid Agriculture is a partner of the Instituto Regional da Pequena Agropecuária Apropriada (Regional Institute of Small Appropriate Agriculture – Irpaa) and the Federal University of Vale de São Francisco (Univasf). This experience will also be established in 11 other agricultural family schools in the state of Bahia that are part of the Rede das Escolas Famílias Agrícolas Integradas do Semi-Árido (Network of Integrated Agricultural Family Schools of the SemiArid Region – Refaisa).

Sisteminha (little system) Embrapa at school

Sisteminha Embrapa is a technological solution for integrated food production developed by Embrapa Mid-North in Teresina, PI, which consists of a rotation involving the integrated production of fruits, vegetables, poultry, small animals (guinea pig) and fish, with recirculation of nutrients from fish farming. The solution has turned into public policy, with projects to install more than 3 thousand systems in different Brazilian locations.

The Cristóvão Colombo de Queiroz State School, located in the municipality of Doutor Severiano, RN, together with Embrapa Tropical Agroindustry, implemented

a unit demonstrating *Sisteminha* Embrapa. *Sisteminha* has become a teaching-learning practice adopted in chemistry and biology, besides providing food that is consumed by teachers, assistants and students. Also benefiting families that survive at social risk. Students of the mentioned school received awards for researches related to the *Sisteminha*, in the *6ª Feira de Ciências do Semiárido Potiguar* (*6th Science Fair of the Potiguar Semiarid Region*).

Environmental Education Space

Embrapa Soybean revitalized in 2010 the old headquarters of its farm, an area of environmental and historical importance buit when the farm used to grow coffee. The Espaço de Educação Ambiental (Environmental Education Space – EEA) includes an APP, water sources, dam and a Legal Reserve area. EEA is used as a learning space and a culture of respect for the environment. The visit to the place includes an ecological trail and the visit to an old coffee barn, which now houses a museum that tells the history of the farm and the north of Paraná. EEA serves the community of Londrina, PR, and region, especially to elementary and middle school students and undergraduates.

Interpretative trail for environmental education

Several Embrapa units use the interpretive trail (Figure 1) as a pedagogical communication tool for environmental education in order to train multiplier agents on the technological solutions developed by Embrapa and to support discussions about environmental problems.

Embrapa Western Agriculture, headquartered in Dourados, MS, stands out with the trails integrated to the thematic and training workshops, campaigns and communication pieces (booklets, laboratory journal, photography, educational video), among others.

Green Room

The Green Room is a dynamic environment in which the citizen has access to information and experiences related to environmental education through workshops on handicrafts, theater and music, research in books, lectures, video presentations and walks on monitored trails. The activities aim to promote

Photo: Clarice Zanoni Fontes

Figure 1. Interpretive trail receives students for learning about environmental issues, in Dourados, MS.

reflection for changes, allowing the recognition of the factors that lead to socio-environmental degradation.

The Green Room is coordinated by Embrapa Environment, located in Jaguariúna, SP, in partnership with the Ministry of Environment, the Municipal Environmental Education Center Dr. Darcy Machado de Souza de Jaguariúna and the Secretariat of Education of the Municipality of Jaguariúna.

Practices of agrienvironmental education-learning

Embrapa develops materials, dynamics and constructivist interaction practices that lead to meaningful learning about natural, rural, or urban landscapes. These tools help to incorporate principles and create harmonious conditions between the parts necessary to develop a particular action. Among them, the following are highlighted: Educommunication Practices; Integrated Environmental Education; Environmental Pictorial Model of Situation-Reflection-Solution Analysis; Ecoliteracy; Campaign Environment and the School; and Systematized Experience of Environmental Education.

Educommunicative practices

The set of initiatives developed by Embrapa Rondônia, under the name of Práticas Educomunicativas Socioambientais (Socio-Environmental Educommunication Practices) (Figure 2), in Porto Velho, RO, Brazil, is a social technology through which dialogue between social actors is promoted and, collectively, produce content (intended for formal education as well as media dissemination) related to the enhancement of renewable natural resources and the protection of natural ecosystems.

Photo: Vânia Beatriz Vasconcelos Oliveira

Figure 2. Students in the 4th to 6th grade of elementary education in *Educommunication* Workshop, in Porto Velho, RO.

Integrated Environmental Education – The Six Elements

Integrated Environmental Education – The Six Elements (Rachwal; Souza, 2003) is a multiplier training method developed by Embrapa Forestry. The method emphasizes the interdependence between the six natural elements (air, water, soil, flora, fauna, and human being). The human being (the sixth element), although being part of the fauna, is given special prominence because it is the

only one capable of reversing the process of current degradation by recovering and conserving the planet.

Therefore, during the presentation of the contents, awareness activities are inserted with the objective of working the positive side of the human being, showing that they are also part of nature, builders and agents of change. The method uses thematic kits (air, water, soil, flora, fauna) containing natural materials that deal with training, use (correct and incorrect) and ways of recovery and conservation of the elements.

Environmental Pictorial Model of Situation-Reflection-Solution Analysis

The Pictorial Model was developed by Embrapa Southeast Livestock. It allows the visualization, in three figures, of the basic elements for environmental education: current situation, reflection on the situation and proposition of solutions to the current situation.

The model allows dialogue on the key points of environmental degradation. It is used in environmental education actions with the objective of educating and recovering the perception of ecological fundamentals that support good practices in the management of efficient and sustainable production systems (Primavesi; Arzabe, 2006).

Ecoliteracy

The Ecoliteracy Tatu-Bolinha (armadillo) or Ecoliteracy is an instrument developed by Embrapa Maize & Sorghum that aims to strengthen students' link with ecology. The armadillo was the animal chosen as the main character of this tool because it is a common animal in backyards and the knowledge of most people since childhood. A survey was conducted online directly with teachers to characterize the interviewees' perception about the armadillo.

A storytelling on the ecological role of the armadillo was elaborated, which was then adapted to comic book format and published by Embrapa and other institutions (Matrangolo; Lima, 2014). A video (Matrangolo, 2016) was also produced, with resources from the National Council for Scientific and Technological Development (CNPq), demonstrating the steps for the creation of a terrarium for the creation of small animals as a potential ecological literacy tool in schools. The terrarium

supported environmental education actions promoted by the Subcommittee of Ribeirão Jequitibá Basin and by the Embrapa & School Program with the school community. The proposal inspired activities in other schools, which produced publications, plays and dance presentations.

Environment and School Campaign

From the application of Macroeducation, the Environment and School Campaign was developed by Embrapa Environment, in partnership with the company Motorola, with state boards of education and city halls of the region of Campinas, SP. The objective of the campaign was to train multiplier agents among the educators of the state or municipal education networks (from 17 municipalities in the state of São Paulo) to develop projects, programs and policies of transversal and interdisciplinary environmental education.

The campaign highlights the interdependence between urban and rural areas experienced in different environments: classroom, school, school neighborhood, city and planet. The action contributes to promoting citizenship through the exercise of education-learning actions that are agreed with the school community and the neighborhood on the themes: Water and energy; Natural resources; Citizenship and health; Agriculture and food; and Trash. This set is part of the rescue of social function of schools, aimed at transforming the local reality through quality education (Hammes; Rachwal, 2012).

Systematized Experience on Environmental Education

Embrapa Instrumentation carried out social technology transfer actions (septic tank, biodigester, Embrapa chlorinator and filtering garden) in a traditional family farming unit (Sítio São João) located in the municipality of São Carlos, SP. The farm area is about 13 ha, where the family survives from horticulture, fish farming and native seedling production. The family became a transformative agent, in an interactive and participative way, from agroenvironmental practices and the installation of technologies, together with forest restoration.

The accumulated knowledge, the protagonism of the farmer, the mastery of the concepts of rural basic sanitation and its direct and indirect impacts on farming were fundamental. This vision led to effective actions of environmental education,

reconciled to production activities, which annually address about 3,700 students (kindergarten, elementary and high school). In the period, there was the spontaneous creation of a language suitable for children from 4 to 6 years old. In addition, concern was expressed about the transmission of this knowledge to neighboring farmers. It was also observed that the adoption of social technologies can be a means of raising awareness and empowering farmers, who can become protagonists of socio-environmental transformations (Arruda; Silva, 2014).

Distance education

Embrapa has been building its contribution in the area of distance education in order to increase the access of its public to the knowledge generated. Through distance educational projects, people in different parts of the world have access to quality technical content (Gorga; Silva, 2015; Torres et al., 2016).

For Embrapa, distance education, besides an educational action and "[...] a multiple and two-way learning instrument [...]" (Gorga; Silva, 2015, p. 5, our translation), is also a communication strategy to meet the demands of information and knowledge coming from society (Torres et al., 2016). In this sense, when adopting distance education, Embrapa considers the specificities and constraints of the objective reality of the current society, which is known to be moving toward virtuality, interactivity and dialogicity, aiming to broaden spaces, channels and means of participation and critical reflection (Torres et al., 2016).

Institutional Arrangement of Ceffas Network

Through the Arranjo Rede de Centros Familiares de Formação por Alternância (Network Arrangement of Family Centers of Training by Alternation – Ceffas), Embrapa brings together, in a single scope, all research and technology transfer, exchange and knowledge building initiatives of the Embrapa units together with the schools that work with the pedagogy of alternation. Therefore, it was established axes that allow, regardless of the location of Embrapa's Decentralized Unit (UD) or its focus product, to promote this transfer, exchange and collective construction of knowledge based on local demands and products.

Through integration with other arrangements, the following become possible:

- Prospecting regional technological demands with the Ceffas public.

- Creation of science, technology and innovation observatories aimed at young people and children to generate booklets at the end of learning.
- Training and technological updating of farmers, students, teachers and other multipliers.
- Establishment of technology reference centers in schools serving as education-learning units of locally appropriate technologies.
- Validation and technological adaptation, collective construction of knowledge, conservation and dissemination of locally adapted animal and plant genetic resources.
- Opportunity for students to carry out internships as a way of complementing their technical training.
- Establishment of a consistent network of knowledge and innovative technologies multiplier agents.

Activities are also encouraged in the community, such as the establishment of pre-incubators with the incentive to local activities, incentive courses in rural property planning and administration, and marketing practices, among others.

For training, in addition to the traditional research and technology transfer, exchange and knowledge building strategies (field days, courses, lectures, etc.), actions and instruments of distance education and Embrapa Mini Library are aggregated. Another instrument adopted in Ceffas is the professional project, in which each student must develop, in the place where they live, during the 3 years of the course, an activity in which they can put into practice the acquired knowledge. This didactic resource guides young people to work in segments according to the biodiversity of the biome in which they are inserted and allows them to seek, through cooperatives, groups of exchanges and associations to access previously unreachable markets.

Final considerations

One of the most urgent needs of Brazil is to qualify education at all levels. The improvement of the educational standard is essential for the country's development.

All actions developed by Embrapa and presented in this chapter are aimed at the development of capacities aimed at socio-environmental transformation.

Embrapa uses a number of facilitating instruments to promote the participation of local actors, awareness and social and environmental awareness, dissemination of information and technological solutions, and the formation of partnerships with different institutions (including municipal and state education secretariats) seeking to consolidate initiatives to change rural and urban areas. The role of research centers in the implementation of these actions stands out, showing good application effectiveness in different regional contexts.

These opportunities amplify the work of Embrapa and are important strategies to contribute to the search for a more impartial education.

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