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CONSTRUCTION OF AGRO-ECOLOGICAL KNOWLEDGE THROUGH THE DIALOGUE OF KNOWLEDGE IN SOCIOTECHNICAL NETWORKS OF TERRITORIES IN THE NORTHEAST OF BRAZIL

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Abstract: The construction of knowledge used in the agroecological approach enables the appreciation of local products, allows the dialogue of knowledge and recognizes the traditional methods of productive management, strengthening the rural identity of the territory. This work presents the Experience of building knowledge, through dialogues of knowledge and technical knowledge, with the formation of sociotechnical networks for the socio-productive inclusion of farming families benefiting from the public policy called Plano Brasil Sem Miséria (PBSM), in territories of northeastern Brazil. The methodologies used by Embrapa in the technology transfer process do not foresee the participation of farmers and extensionists. The experience took place from 2012 to 2016, in partnership with a public institution and a non-governmental organization of ATER, involving Interest Groups, consisting of farming families, technicians and extension agents. Environments of Learning Units were built, adopting the principles of Agroecological Education. It was verified that the creation of a space for dialogue promoted the construction of knowledge in a sociotechnical environment of agroecological innovation, articulation and social management.
Keywords: Public Policy, Family Farming, Food Security, Learning Unit, Technology Transfer.

INTRODUCTION AND CONTEXTUALIZATION OF THE EXPERIENCE

The problem of poverty and hunger continues to be one of the biggest and most serious problems in Brazil and the world. According to reports from the Zero Hunger Institute (IFZ), in Brazil 2/3 of the population is at some level of food insecurity (2022), mainly due to the absence, fragility and interruption

of social inclusion policies focused on fight against hunger in recent years. The problem of extreme poverty in Brazil has already been faced for many years, whether with specific or sectoral initiatives. The great change in the focus of social programs occurred in 2003, when the federal government defined social inclusion as a priority by creating several programs for this purpose, such as Bolsa Família, Minha Casa Minha Vida and Território da Cidadania (BAUER; LOTTA; GALVÃO, 2012).

The analysis of policies for social inclusion and the fight against hunger makes it possible to reflect on principles and guidelines for the formulation of effective public policies. One of the bases for formulating a food security policy is to understand that this concept goes beyond production and access to food (SILVA; BELIK; TAKAGI, 2010).

The Brasil Sem Miséria Plan (PBSM) was a redistributive public policy launched in 2011, with the objective of overcoming the condition of extreme poverty that affected part of the Brazilian population, creating opportunities to increase income and access to public services for the population in poverty and extreme poverty. The PBSM was organized around three axes: guaranteed income, access to services and rural and urban productive inclusion. The Plan articulated different programs and actions by different ministries and public bodies, aiming to promote local development and socio-productive inclusion of beneficiaries. This plan was aimed at Brazilians with a family income of up to R$75.00 (seventy-five reais) per person. According to the 2010 Census of the Brazilian Institute of Geography and Statistics (IBGE), 16.2 million Brazilians were in this situation.

The promotion of public policies for populations living in rural areas, in order to be effective, must always involve different actors, to think about the development process focusing on the place in its various dimensions and contexts. PBSM would tackle two interrelated but distinct problems: poverty and food insecurity.

In 2012, Embrapa, in partnership with the Ministry of Social Development and Fight against Hunger (MDS) and the Ministry of Agrarian Development (MDA), which was extinguished during the Bolsonaro government, initiated several actions in the PBSM to support the productive inclusion of approximately 93 thousand families in 14 Territories of Citizenship in the Brazilian Semiarid Region (BELTRÃO, 2013).

Embrapa Tabuleiros Costeiros was responsible for the actions of the PBSM in the states of Alagoas and Sergipe, with two rural territories being defined as priorities for the development of forms of intervention with communities and groups of family farmers, in Alagoas it was the Território Agreste Alagoano and in Sergipe the Alto Sertão Territory.

The Território Agreste Alagoano was composed of 19 municipalities with a population of 676,407 inhabitants. The population in extreme poverty corresponded to 27% of the territory's total population. The Territory of Alto Sertão Sergipano had 6 linked municipalities with a population of 119,300 inhabitants, 57.3% residing in the rural area, with agriculture contributing with 32% of the Gross Domestic Product (GDP).

In that context of PBSM adopted in the Territories of Alto Sertão de Sergipe and Agreste Alagoano, it became an opportunity for the development of new technology transfer methodologies that, in an approach to the principles and guidelines of Education in Agroecology (ABA, 2013), inspired in Agroecological Extension (CAPORAL, 1998), they valued and imprinted a participatory character with their target audience of beneficiaries and extension agents involved.

The methodologies traditionally used by

Embrapa in its Technology Transfer (TT) actions do not foresee the participation of technicians and extension agents and farmers in the construction, monitoring and evaluation of the content of what is "transferred". They are marked by the traditional view of rural extension, with the family farmer being perceived as a mere repository of knowledge and technologies. The change in TT paradigms requires the internalization of new methodological principles that carry mechanisms and tools that allow the establishment of different forms of knowledge dialogue (OLIVEIRA et al., 2016).

Agroecology, a multidisciplinary science, which incorporates the analysis of social, ecological, cultural, political and ethical variables, uses concepts from communication, anthropology, sociology, ecology, agronomy and ecological economics, allowing the transformation of production systems conventional or the "green revolution" for production systems in a context of sustainable rural development (CAPORAL; COSTABEBER, 2002). In this context, all knowledge is important and needs to be considered in the construction of new knowledge, agroecological knowledge.

The construction process of agroecological knowledge results from the strengthening of local innovation processes, improved by the experience of families and rural communities that can organize themselves in local networks of experimentation, sharing, exchange of experiences and social organization.

For Guzmán (2001) it is the participatory development of agricultural technologies that will allow, by strengthening the local capacity for experimentation, adaptation and innovation of the farmers themselves, to articulate local knowledge and external knowledge, expanding the cultural heritage of knowledge according to the specific values of each community. On the other hand, Freire (1981), education is communication and dialogue insofar as it is not the transfer of knowledge, but a meeting of subjects and interlocutors who seek the meaning of meanings, and which requires the co-participation of subjects in the act of knowing. Thus, one must not speak of Education with an Agroecological approach if it does not present a pedagogical methodology that has a strong relationship with Rural Education, Popular Education, Contextualized Education, Rural Family Schools, in accordance with the principles and guidelines of the I National Seminar on Education in Agroecology (ABA, 2013).

The objective of this work is to present the experience of building knowledge through sociotechnical networks formed in spaces for dialogue that promote the integration of knowledge between education-research-extension with the farming families benefited by the Public Policy of the Brasil Sem Miséria Plan (PBSM), in territories of the states of Sergipe and Alagoas.

METHODOLOGY

The work was carried out in a territory of the Citizenship of the Brazilian Northeast, called Território do Alto Sertão Sergipano and Agreste Alagoano. Farming families in Sergipe were selected by the Rural Development and Extension Company (EMDAGRO), in communities in the Sergipe municipalities of Canindé de São Francisco, Gararu, Monte Alegre de Sergipe, Nossa Senhora da Glória, Poço Redondo and Porto da Folha. In Alagoas, they were carried out in the municipalities of Arapiraca, Campo Grande, Craíbas, Estrela de Alagoas, Feira Grande, Girau do Ponciano, Igaci, Lagoa da Canoa, Olho D`água Grande, Palmeira dos Índios, São Sebastião and Traipu. The Participatory-Action-Research methodology for building the Learning Unit (UA) was applied in 18 municipalities of

farming families involving approximately 40 communities, from 2012 to 2016.

The actions began in 2012 and were monitored until 2016. The project's stages were: Articulation of institutions operating in the Territory to present demands and expectations of actions in partnerships, Seminar for the presentation of projects/ actions/activities being carried out in the territory at the time they were presented by the Territorial Collegiate. Based on the analysis of this information, working groups were formed to elaborate the main lines of the Project to be presented to the Ministry of Agrarian Development (MDA)/Ministry of Social Development (MDS)/Department of Technology Transfer of Embrapa (DTT); establishment of an Inter-institutional Management Committee to manage and monitor the Project; holding follow-up meetings with a calendar constructed and validated with the team; construction and definition of execution strategies and analysis and proposal of the Project; characterization of the Local Reality through Participatory Rapid Diagnosis techniques (CHAMBERS, 2001); Return and Forwarding Workshops; Pedagogical Training Workshops on topics of interest and prioritized by families; Formation of Interest Groups (IG) constituted with farming families, technicians, extensionists and researchers; Participatory Planning to prepare the (re)designs of family agroecosystems; Construction of Learning Units (LU), using the themes prioritized by the GIs; Meetings and Visits for the Follow-up phase of the Units and the Evaluation of the process and the Learning obtained by the subjects participating in the Experience.

The Knowledge of Local Reality Workshops and the Return and Forwarding Workshop, in the municipalities of Sergipe and Alagoas, had the participation of male and female farmers, technicians and extension agents. The ethnographic methodological approaches used referred to dialogue, interviews, self-presentations, testimonials, exchange of experiences, drawings and maps of local productive systems and reflections on their realities and expectations of male and female farmers, PBSM's target audience, technicians and extensionists.

Participatory Planning was carried out in the municipalities for the construction of Learning Units (UA), using the construction of maps of local production systems, from the collage of figures that represented the productive arrangements; cross walk to observe the landscape and production systems; recognition and choice of the location of the UAs; and finally, the identification of possibilities of productive arrangements for the UAs, according to the interest of male and female farmers.

The implantations took place in the months of May to August 2012 and 2013, with the participation of two teams of technicians, extension workers with the local Interest Groups (IG). From the initial planning, some adjustments were made, due to local specificities and characteristics of each of the GI of each community. All the work was carried out in a "Big group of people" format. The selection of places where the UAs were built was voluntary manifestations of the families, validated by the GI of each location. The Interest Groups (IGs) were made up of farming families, technicians, extension agents and the project team.

The sociotechnical environments were formed based on a multidimensional pedagogical process that integrates education-research-extension combined with participatory action, where theory, practice and experience of farming families, the project team and the rural extension team are combined and integrated. Farming families took on the main role of the Experience and

researchers, technicians and extensionists assume the role of facilitators and animators, both assume the role of educators, hours of students, depending on of the situation, experience of the topic to be addressed and the accumulated knowledge around the identified problem and its causes and consequences.

Participatory techniques and tools were used in all Workshops, such as: self-introductions, testimonials, interviews, conversation circles, transversal walks, maps of production systems, visits and exchanges. All activities were followed by a collective reflection on the work carried out on the day, their individual and collective meanings and their (re)meanings after discussion in plenary with the participation of the collective.

The definition of the calendar for the collective assembly of the UAs and the definition of the productive arrangements was carried out with diversified and integrated arrangements of food production with the raising of animals, predominantly small animals. External inputs were only used in a complementary way to the inputs already available on the properties and the systems were planned to promote the recycling of materials and the minimum of production costs. Seeds of varieties with greater rusticity and adaptation to local climatic conditions were used. Each Interest Group (IG) was constituted, on average, by fifteen families of farmers in each municipality.

DISCUSSION OF THE RESULTS

The principles and guidelines of agroecological education lead the diagnosis of the environmental and socioeconomic reality of families and rural communities to be made by valuing traditional knowledge, culture and previous experiences of farmers, their families and technicians involved in the project.

In the initial stage, the strategies used to articulate and mobilize the institutions for the Seminar for the construction of the project proposal in support of the Public Policy of the ''Brasil Sem Miséria' Plan for the Territory of Alto Sertão Sergipano and the project for the Territory of Agreste Alagoano" enabled the conception, articulation and construction of projects, as well as the active participation and integration of institutions that already had a history of acting in these territories and with the target public, resulting in the formation of inter-institutional management committees, the involvement of a team of researchers and analysts from Embrapa, the organizations involved, as well as the sectors linked to the Head of Technology Transfer (TT) of the Unit of Embrapa Tabuleiros Costeiros and the Department of Technology Transfer (DTT), of Embrapa in Brasília.

Figure 1. Training Course in Agroecology. I Module: Arapiraca-Alagoas.2012.

The way of building and meeting the TT demand and the construction of the Projects constituted an innovation at Embrapa Tabuleiros Costeiros and, perhaps, at Embrapa itself, concerning the formation and involvement of the teams; the participatory methodology tools employed, the participatory-action-research methodology based on the TT approaches developed during the construction, development and execution of the projects; the experimentation and the productive arrangement (re)designed in the agroecosystems of the farming families, being

planned and built in each place, according to the interests and objectives of the families, from an integrated perspective of the families, technicians and extension workers; the main role of farming families; the collegiate management of the project taking place in practice; the agroecological approach as a principle for the execution of the Projects and of the tried practices; the multidisciplinary and multivariate vision of the principles and guidelines of Agroecological Education being built and matured with the teams; the construction of learning environments in areas of agricultural families; the creation of spaces for innovation, based on the construction, analysis, collective monitoring and conformation of partner technical spaces for innovation (OLIVEIRA, 2015).

The Management Committee was formed by the institutions: Embrapa Tabuleiros Costeiros, Agricultural Development Company of Sergipe (EMDAGRO), Minha Terra Movement (MMT), ‘’Universidade Federal de Sergipe” (UFS), Development Company of the São Francisco and Parnaíba Valleys (CODEVASF), Dom Helder Câmara Project (PDHC) and Dom José Brandão de Castro Center (CDJBC), all active in the Agreste Alagoas Territory and/or in the Alto Sertão Sergipe Territory.

The sociotechnical environments were characterized and assumed as spaces created to stimulate and promote agroecological innovation through the dialogical process of Teaching-Learning, which recognizes and values the different knowledge in order to integrate them in the perspective of building innovative solutions adapted to the realities of the PBSM beneficiary farming families, based on the Principles of Life, Diversity, Complexity and Transformation, bringing the “School” as the locus for transforming reflection and action on social and ecological problems (ABA, 2013), in contexts and realities of family agroecosystems, communities and territories.

The Visits and Meetings for Sensitization and Methodological Leveling, with Technicians from the regional and local offices of Emdagro and MMT, made it possible to approach, gain knowledge and validate the project, as well as the elaboration of agendas and the planning of the Participatory Rural Diagnosis of the Agroecosystems (DRPAs), prior knowledge of the selected PBSM farming families and strategies for executing the actions/activities foreseen in the project.

Figure 2. DRPA Workshop - Map of Family Agroecosystems in the Community of Baixa das Coxas, in Monte Alegre de Sergipe, Sergipe, 2013.

Figure 3. Rapid Participatory Diagnosis in Agroecosystems (DRPA). Arapiraca-Alagoas. 2013.

In the testimonies and in the rounds of conversations, integration, socialization

and involvement between the teams from Emdagro, MMT and Embrapa and the guidelines and approach of Agroecological Extension (CAPORAL, 1998) of the methodology used in the construction of the Units of Learning (UAs).

Figure 4. Construction Workshops of the Learning Unit (UA) of the Community of Caqueiro I, in Canindé do São Francisco, Sergipe, 2013.

Figure 5. Exchange of Agroecological Experiences in the municipality of Monte Alegre, Sergipe, 2015.

The focus and agroecological guidelines used in the process of Participatory Planning, Construction and implementation of the UAs were: valuing local resources, in order to enhance the multifunctionality and diversity of family farming; recognition, revitalization and appreciation of the know-how of farming families; use of participatory tools and techniques to ensure the effectiveness of the participation and role of agricultural families in decisions and management of the agroecosystem, based on their expectations and interests; experimentation with practices that promote the minimization of the use of inputs external to family agroecosystems and preserve the biological and cultural diversity of farming families; conformation of environments that favor the dialogue of knowledge between farming families, technicians and extension workers; promotion of practices that promote soil recovery, coverage and enrichment with regenerating plants for fixation and recycling of nutrients, mainly nitrogen, carbon (organic matter); use of natural and biological products to control pests and diseases and the appreciation of the use of native seeds or varieties of interest and knowledge (OLIVEIRA, 2015). The political-institutional approximation and articulation involving Embrapa, technicians and extension workers from Emdagro and MMT, Administration and Management of EMDAGRO and MMT, Municipal Secretariats, Rural Workers Unions and Associations of Family Farmers in the municipalities were strongly highlighted in the execution of this Project where the UAs were implemented.

The Learning Units (UAs) enabled the integration, the horizontal participation of the subjects involved and the participatory techniques and tools promoted the educational process through the dialogue of knowledge, making possible the effective participation and involvement of all and the rescue, revitalization and appreciation of collective work. At each stage of project execution and at each workshop held, an individual and collective reflection was developed and through different ways of looking at the different types of subjects involved, which were the farming families, technicians and extension workers, researchers and trained GIs.

Figure 6. Participatory Planning Workshop in the Community of Pías, in Gararu, Sergipe, 2013.

Figure 7. Participatory Planning Workshop for the construction of the Learning Unit (UA), Igaci, Alagoas, 2013.

It was observed that the integration between the technician's formal knowledge and the families' know-how enabled the construction of an adequate solution to the main problems and difficulties that were food production and lack of autonomy. The families diversified and expanded the production of food integrated with the raising of animals and reduced the purchase of external inputs, with this, they obtained greater autonomy, rescued and revitalized the work in "big group of people" and became references for other communities.

Distribution of technological themes of the Learning Units (UAs), in the Agreste Territory of Alagoas		
City	**Region**	**Main topics (subsystem integration)**
Estrela de Alagoas	Lagoa do Mourão	Sheep farming, formation of pastures and planting of corn and beans
Palmeira dos Índios	Amaro	Horticultura and poultry farming
Igaci	Colônia	Sheep farming, planting corn and beans
São Sebastião	Nascença	Poultry farming
Lagoa da Canoa	Antonica	Sheep farming
Traipu	Bom Carandá	Poultry farming
Girau do Ponciano	Alto do Umbuzeiro	Sheep farming
Campo Grande	Poço da Lagoa	Poultry farming
Olho D'agua Grande	Malícia	Poultry farming (priority) and pig farming
Feira Grande	Olho D'agua do Meio	Sheep farming
Arapiraca	Lagoa D'agua	Poultry farming
Craíbas	Cabaceiro	Sheep farming (priority) and pig farming

Table 1. Priority themes, defined in the Participatory Planning Stage for the construction of the (re)design of agroecosystems, in the PAs selected by the farming families. Alagoas. 2012.

Participatory methodological strategies, used in conforming socio-technical environments, allowed the identification of production systems and producers' routines, the recognition of agroecological experiences, the participation of women and young people, as well as knowledge of the main demands and needs of families and also the interest of each one in participating in the construction of the Learning Units (UA) and in being part of the Interest Groups (IGs).

Below is the transcription of some excerpts from the testimonies about the learning spaces, the formation of GIs and the way of

carrying out the work in "big group of people".

> Learning place, a school where everyone learns and teaches (Farmer B from Canindé do São Francisco).

> Embrapa, Emdagro and farmers working together (...) research and extension working together and integrated (Farmer D de Canidé do São Francisco).

> Place of learning, this work is like a study (Farmer A from Gararu).

In the Planning for the construction of the PSUs, reference topics were prioritized for the construction of integrated production systems and volunteers were identified to compose the Interest Groups. A visit was also made to the volunteers' properties to systematize information on the local reality. During all the meetings held between the project team, the technicians and the farmers, moments of exchange of experiences and knowledge were experienced, strengthening and valuing know-how and local culture from a collective teaching-learning environment where everyone learns and everyone teach.

As Paulo Freire (1983) teaches us, this has to be the attitude of technicians who intend, through dialogue, to support the peasants' decisions. For it is necessary to understand that there is no absolute ignorance as there is no absolute knowledge. Nobody knows everything, just as nobody ignores everything. Knowledge begins with the awareness of knowing little. For knowing that he knows little is how a person prepares to know more (FREIRE, 1983).

FINAL CONSIDERATIONS

The approach advocated in agroecological education allowed the construction of an environment of coexistence between education-research-extension that valued the knowledge of farmers and from the contribution of technicians it was possible to (re)design agroecosystems, integrating animal production with different vegetable crops.

The Learning Units (LUs) were recognized as sociotechnical spaces for the construction of knowledge that involve teaching-research-extension. Including, based on the successful result of this experience, the UAs were formally recognized and used by Embrapa, being used in other projects aimed at family and peasant agriculture by Embrapa Tabuleiros Costeiros and the UA was recognized as one of Embrapa's TT tools called Technical Reference Unit (URT).

The AUs implemented in the territories of Sergipe and Alagoas, effectively collaborated with the constitution of a network of experimental farmers and for the exchange of experiences that serve as a basis for (re)designs and adjustments in sustainable production systems.

The results achieved made it possible to increase the socio-productive inclusion of farming families benefiting from the public policy, promoting greater use of local inputs, greater autonomy and sustainability of agroecosystems, with a view to enhancing endogenous development based on agroecological principles.

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