


CHAPTER 67

Fishery agroecology and sustainability in the drylands of Pernambuco, Brazil

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ABSTRACT

Artisanal fishing is a traditional activity and has been experiencing several losses of recognition and rights. Respect for artisanal fishermen and fisherman is fundamental, and they must be recognized for what they develop in their fishing territory and for how they reproduce as social subjects. In turn, Agroecology as an emerging science that studies agroecosystems integrating knowledge of agronomy, ecology, economics, and sociology, supports, from its beginnings, the correct management of natural

resources through forms of collective social action. An approach between artisanal fishing and agroecology based on food sovereignty makes this recognition possible, strengthening fishing agroecology. In this way, this chapter results from a small section of the results of a Technological Extension Network (PET), approved in Public Edict No. 04/2022 of the Pernambuco State Science and Technology Foundation (FACEPE), having as a collaborating institution the Federal Institute of the Sertão Pernambucano (IFSertãoPE – Petrolina Campus) and as a participating entity the Fishermen's Colony Z21 (CPZ21) in the village of Pedrinhas, in the city of Petrolina/PE. It is qualitative research with an exploratory nature and field procedures based on the dialectical method. This chapter demonstrates the main results of the implementation of the PET since the project contributed to the training of students, artisanal fishermen, and the community in general in the acquisition of knowledge on fishing agroecology, food sovereignty, integral use of fish, good production practices, and food preservation. The findings indicated the need for HEIs to provide opportunities for practical and systematized knowledge to fulfill their socio-educational function and to promote the socioeconomic and environmental sustainability of traditional peoples and communities through extension projects.

Keywords: PET; Fisheries agroecology; Sustainable fishing.

1 INTRODUCTORY

One of the traditional activities that, over time, has undergone different losses of recognition and rights is artisanal fishing. Respect for fisherwomen and artisanal fishermen is imperative since they must be recognized for the activities they carry out in their fishing territory, and for the configuration they produce and reproduce as social subjects. An approximation between artisanal fisheries and agroecology based on food sovereignty allows this recognition to be possible, strengthening both artisanal fishermen and agroecological science (SOUZA; GALLAR, 2018).

In Brazil, fisherwomen and artisanal fishermen won rights and access to various policies from 2003 to 2014, but, with the maintenance of the development model, which despite generating jobs, and reducing

poverty and inequalities, maintained the privileges of the agro-export sector and financial capital, resulting in losses for artisanal fisheries (AZEVEDO, 2017).

The normative definition of “artisanal fisherman” was given by Decree-law n° 221/67, in its Art. 26, which defines that this citizen is “one who, registered in the competent department according to the laws and regulations in force, makes fishing his profession or main way of life”. Furthermore, “[...] any act aimed at capturing or extracting animal or plant elements that have their normal or most frequent way of life in water” (BRASIL, 1967, *sp*).

Based on this prerogative, it is possible to affirm that the fishermen are capable of forming arrangements of organizations such as associations, colonies and cooperatives, however, the experiences and the presence of the basic elements must be considered. Each group, in its history, in its social reproduction strategies, its techniques and even in its fishing spaces, has a certain level and organizational design. The arrangement must be adequate to the level of these elements present, without trying to implement models worked on in other activities and with different groups. Always valuing the local culture is fundamental for the strengthening and guarantee of its fishing identity.

In this sense, both artisanal fishermen and family farmers (who practice agroecology and use agroecosystems) have their workplace in nature and daily extract the conditions and guarantees of their social reproduction from it, that is, fishermen also characterized by a “family organization based on not strictly economic criteria”, maintaining a strong relationship with the actors involved and partially with the market, which indicates a certain flexibility in relationships, from which it can withdraw without compromising its social reproduction (ABRAMOVAY , 1998, p. 101 *apud* RIBEIRO, 2005). Therefore, it is relevant to consider that artisanal fishing is an activity of the family, in which it occupies a central role (COTRIM, 2008), being organized in Community Associations, Fishermen's Colonies, Cooperatives, or in other social movements.

According to Guzmán *apud* Caporal (1998), agroecological sustainability is closely linked to the ability of an agroecosystem to maintain its production over time, overcoming ecological tensions, conserving its level of resilience and socioeconomic pressures. Therefore, a sustainable agroecosystem must meet the characteristics of being ecologically correct, economically viable, socially just, culturally adapted and socioculturally humanized.

In the case of food sovereignty, it is based on the principle of respect for the sovereignty of different nations in the formulation of their socioeconomic policies for the production, distribution and consumption of food, in which the participation of traditional peoples and communities is imperative. Food sovereignty postulates the collective attribute of land, water sources and knowledge associated with food production, promoting access to technology through social policies. It also legitimizes autonomy in land and biodiversity management by proposing community control of natural resources (HOYOS; D'AGOSTINI).

Therefore, the research was classified as qualitative, with an exploratory character and with field procedures, based on the dialectical method. This chapter demonstrates the main results of the

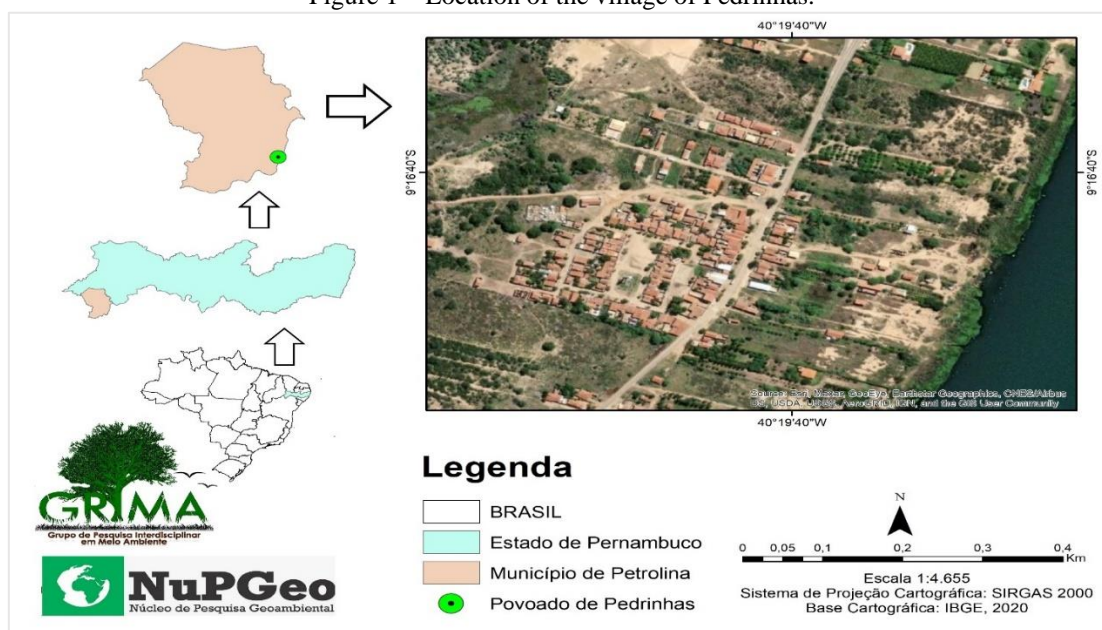
implementation of the PET, since the project contributed significantly to the qualification of students, artisanal fishermen and the community in general in the acquisition of knowledge about fisheries agroecology, food sovereignty, full use of fish and good fishing practices. food production and conservation. The findings indicated the need for HEIs to provide communities with the opportunity to acquire practical and systematized knowledge in order to fulfill their socio-educational role in promoting the socioeconomic and environmental sustainability of traditional peoples and communities, through the implementation of extension projects.

2 METHODOLOGICAL PROCEDURES

2.1 GEOGRAPHIC LOCATION OF RESEARCH

The PET was developed in the village of Pedrinhas, located in the municipality of Petrolina/PE (figure 1). The target audience served were fishermen and artisanal fisherwomen who are members of the Z21 Fishermen's Colony. The village is 30 km from the center of Petrolina, located on the banks of the São Francisco River, and has a spa that is very popular with tourists on weekends and holidays. The town is an old fishing village, where the name has its genesis associated with the small smooth stones that are scattered on the banks of Velho Chico.

Figure 1 – Location of the village of Pedrinhas.



Source: Pacheco, 2022.

CPZ21de Pedrinhas, started its activities in 1998, having a group of partners who fight tirelessly to maintain their livelihood. It also has a massive participation of women, who even not going to the field (in the river to fish), they contribute in a direct and significant way to the processing and sale of the fish product, being artisanal fishing the means of subsistence of the most riverine families.

2.2 RESEARCH TYPOLOGY

The study developed has a qualitative approach, being exploratory, bibliographic and field. The choice of the object of study, the *locus* of the research and the target audience was due to intentionality and accessibility (BARDIN, 2016). In order for the research results to have greater credibility, it was based on the dialectical method, widely used in qualitative research because it assesses that facts cannot be considered distant from a social context.

In this follow-up, dialectics provides grounds for a dynamic and totalizing interpretation of reality, establishing that social events should not be understood independently, absorbed from their political, economic, social and cultural influences (GIL, 2019). According to this author, when a researcher employs dialectical materialism, it is because he emphasizes the historical dimension of social processes, based on the identification of the mode of production in a given society and its interrelations, deciphering the observed facts.

In addition, the study was classified according to its nature as applied, since it aimed to generate new knowledge for the advancement of science with expected practical application, where the findings will be disseminated to the entire community, thus enabling the transmission and debate of the constructed knowledge (*Ibidem*).

Regarding the qualitative approach, it takes into account that there is a relationship between the world and the subject that cannot be quantified. For Gil (2019), the use of this procedure provides a deeper investigation of the issues related to the phenomenon under study and its relationships, through the maximum appreciation of direct contact with the situation studied, seeking what was common, but remaining, however, open to perceive individuality and multiple meanings.

To be in line with the objective, the study was considered exploratory because it intends to be closer to a problem, involves a bibliographic survey, because the subject is little studied and because the approach described here is innovative. Its purpose was to develop, clarify and modify concepts and ideals, substantiating to obtain an overview of the chosen theme, which is generally little explored, constituting a far-fetched literature review. Prodanov and Freitas (2013, p. 51 and 52), argue that exploratory research "has flexible planning, which allows the study of the theme from different angles and aspects [...]" includes bibliographic survey, direct contact with people who they had practical experiences with the researched problem and analysis of examples that stimulate understanding.

From the point of view of technical procedures, it refers to a bibliographic research, where the methodological strategies for this are associated with readings of classic works and articles published in scientific journals and of consistent impact that address the following descriptors: "agroecology", "sustainability", "artisanal fishing", "integral use of fish", "good practices in food production", "fish waste management", in addition to other published theoretical contributions that address the discussed theme.

Bibliographic research, according to Gil (2019), generally has the advantage of allowing the researcher to cover a range of facts from the chosen sources, which must be rigorous in their choice, aiming

at a better approach and discussion of the problem and the theme listed, trying to discover possible inconsistencies or contradictions. On the other hand, field research is characterized by investigating the problem raised associated with the bibliography, in addition to being designed to perform data collection with the target audience.

The practical execution of the project took place in four stages:

- **Stage I** : Initially, the project was elaborated and the idea was presented to the Fishermen's Colony Z21 of Pedrinhas, in order to seek to establish a partnership. After acceptance, the Letter of Consent was signed, in which the entity declared that it was interested in being an integral part of the PET to receive training and be a *locus* of immersion. The project was also presented to the management of IFSertãoPE - Petrolina campus, and then consent was received to participate as a partner entity and the guarantee of full support in carrying out the activities provided for in the PET. In addition, it received the consent of the institution to participate both for the coordination of the project and for the students.
- **Stage II**: In this stage, a training course was held, from June 1 to 15, 2022, lasting 15 (fifteen) days, in the distance learning format *with* synchronous and asynchronous classes and activities, for an audience of 100 (one hundred) people, being students from 05 (five) HEIs at undergraduate and graduate levels (master's and doctorate), from 03 (three) high schools, in addition to the fishing community *locus* of research.
- **Stage III** : The second stage consisted of the selection and monitoring of 10 scholarship students in the immersion and execution of practical extension activities *in loco* at the Food Laboratory (LEA) and CPZ21, lasting 3 (three) months. There was also the certification of the participants of the Training Course and the presentation of the previous results for the Locus of Innovation “ *Sertão Renovável* ” and for the FACEPE team.
- **Stage IV** : In this stage, more fisherwomen were trained in the LEA and a workshop entitled “ *Business Modeling: developing women entrepreneurs* ” was offered. After participating in the workshop, in the practical activities developing (in the laboratory) products derived from fish, the course and workshop certificates were handed over (figure 9). The next step was the production, publishing and submissions for publication of an *E-Book* entitled “ *Integral Utilization of Artisanal Fish Derivatives* ” containing authorial and adapted recipes, valuing the full use of the fish product and by-product .

In this way, at the end of the activities, reports were prepared containing all the results and impacts of the PET, and they were delivered to FACEPE, the institution that promoted the research, and, to IFSertãoPE, the institution that made it possible to carry out, from the logistical support with transport and laboratory structure during the development of practical PET activities.

3 RESULTS AND DISCUSSION

3.1 RESULTS OF STAGE I

At first, the Technological Extension Project entitled “ *Agroecology, Sustainability and Artisanal Fisheries* ” was elaborated and the idea was presented to the Fishermen's Colony Z21 of Pedrinhas, in order to seek to establish a partnership (figure 2). After acceptance, the Letter of Consent was signed, in which the entity declared that it was interested in being an integral part of the PET to receive training and be a locus of immersion.

Figure 2 – Presentation of the project to the locus of immersion entity.



Source: Research Data, 2022.

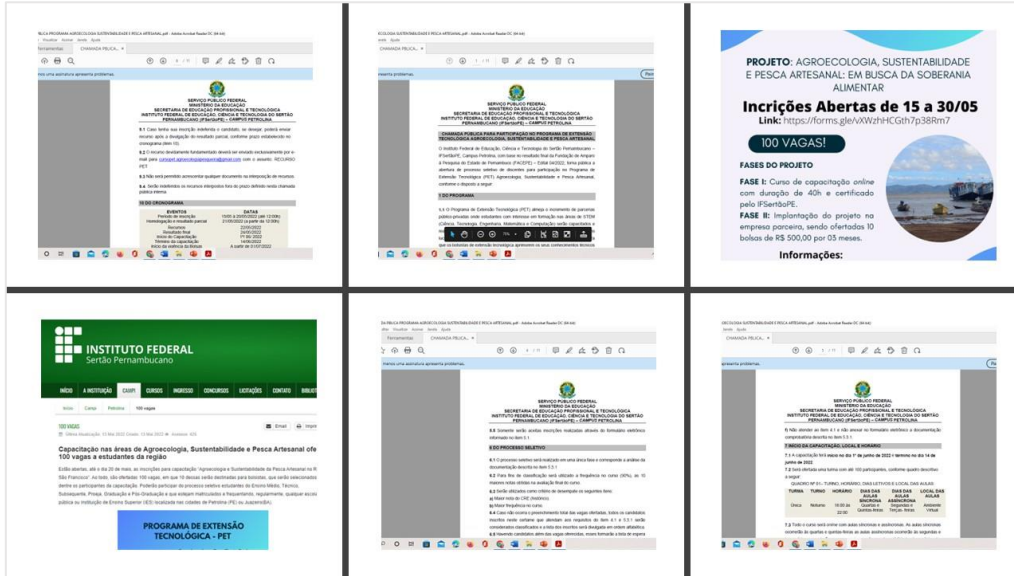
The project was also presented to the management of IFSertãoPE - Petrolina campus, and then consent was received to participate as a partner entity and the guarantee of full support in carrying out the activities provided for in the PET. In addition, it received the consent of the institution to participate both for the coordination of the project and for the students.

3.2 RESULTS OF STAGE II

After the submission of the PET to Public Notice No. 04/2022 of the Fundação de Amparo à Ciência e Tecnologia do Estado de Pernambuco and its respective approval, the project stages began. Seeking to strive for ethics, transparency and social justice, an Internal Public Call was opened for the opening of registrations for the target audience to participate in the training course.

This course was one of the prerequisites for students who were interested in becoming a fellow of the respective project. Therefore, the internal call (figure 3) detailed the project, its objectives and implementation methodology, in addition to discussing the registration process for participation in the course, the number of vacancies available, the target audience, necessary documentation, the requirements to be selected as a scholarship holder, the commitments of the selected scholarship holders, the duration of the project and the value of the scholarships of the scholarship holders to be paid by the funding institution – FACEPE.

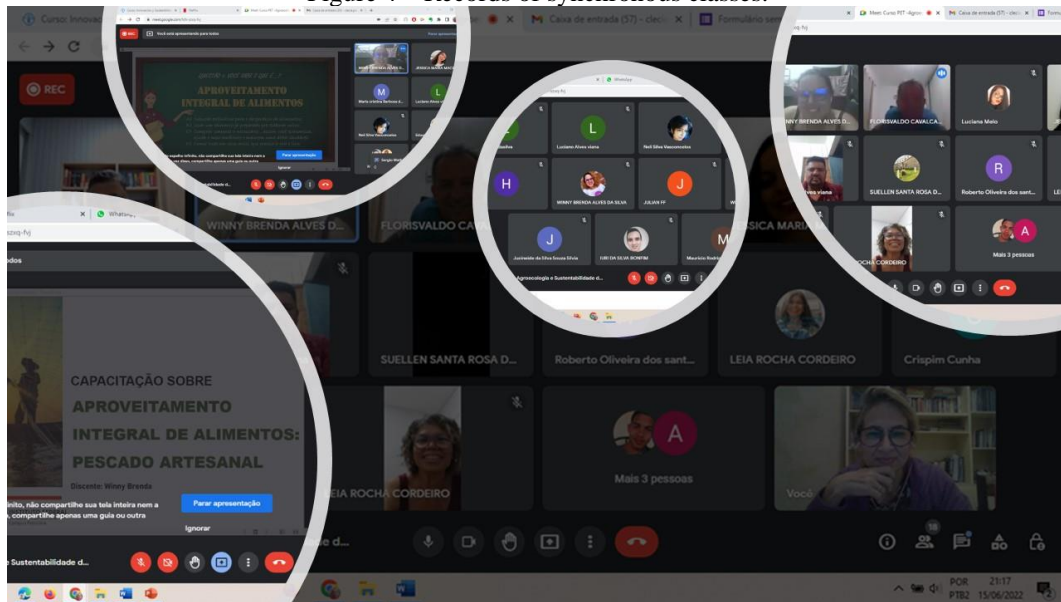
Figure 3 – Internal public call for participation in the first stage of the PET.



Source: Research Data, 2022.

The Training Course took place between June 01 and 15, 2022, in the distance learning format, where the *Google Meet platform* was used to carry out synchronous and asynchronous classes and activities. About 100 (one hundred) people participated in the course, being undergraduate and graduate students (master's and doctorate) from 05 (five) Higher Education Institutions (IES). High school students from 03 (three) public schools in the São Francisco Valley also participated, in addition to fishermen and fisherwomen, members of CPZ21 (as shown in Figure 4).

Figure 4 – Records of synchronous classes.



Source: Research Data, 2022.

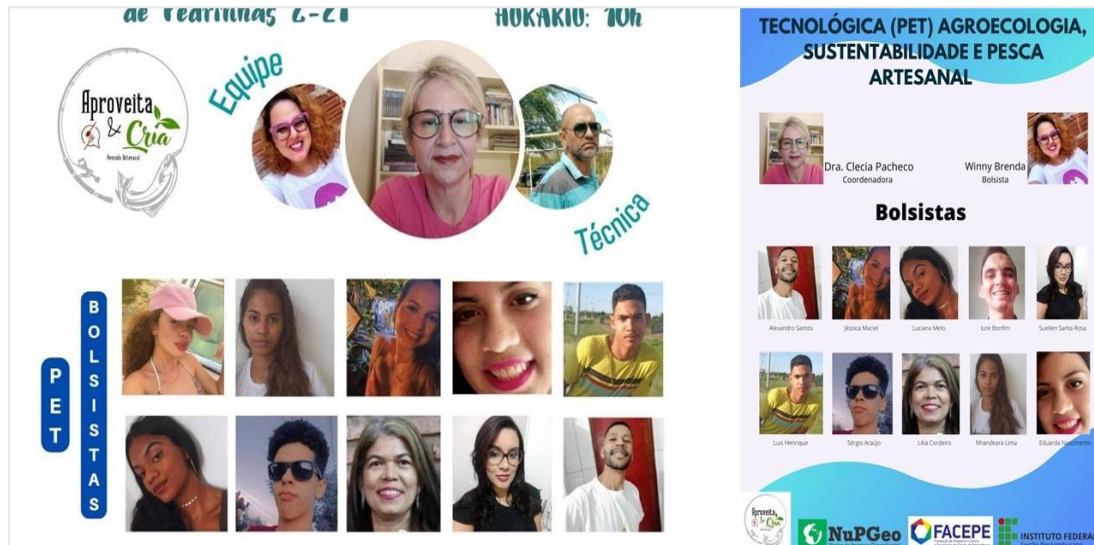
Once the activities of Stage II were successfully completed, the planning and execution of the activities of the next stage began, following the project schedule.

3.3 RESULTS OF STAGE III

The third stage consisted of the selection and monitoring of 10 scholarship students (figure 5) in the immersion and execution of practical extension activities *in loco* at the Food Laboratory (LEA) and CPZ21, lasting 3 (three) months.

The selection of fellows took place in accordance with what was foreseen in the Internal Public Call, where the selection process was carried out in a single phase and corresponded to the analysis of the documentation. For the classification of the student, the following was used: a) the frequency in the course (90%); b) the 10 highest scores obtained in the final evaluation of the course. The following items were used as tie-breaking criteria: a) Highest CRE score (historical); b) Higher frequency in the course.

Figure 5 - Selected Scholars
(PET scholars) (Agroecology, sustainability and artisanal fishery)



Source: Research Data, 2022.

The practical extension activities took place in two moments. In the first moment, culinary practices of full use of fish were carried out at the Food Laboratory (LEA) in IFSertãoPE (figure 6).

For the elaboration of the products in the laboratory, the scholarship holders, under the guidance of the coordinator, prepared the environment and purchased the raw material necessary for the production, as well as the necessary accessories to guarantee a healthy, nutritious diet, without high costs, prioritizing hygiene, good practices, minimal waste generation and significant reduction of environmental impacts.

Figure 6 – Practices developed by scholarship holders at LEA.



Source: Research Data, 2022.

After carrying out the laboratory practices, a demonstration was made for the fishermen and fisherwomen of the CPZ21 in the village of Pedrinhas, through the tasting of the products produced in the LEA (figure 7).

Figure 6 – Tasting of food produced in LEA at CPZ21.



Source: Research Data, 2022.

Finally, the certificates of the training course that took place between June 01 and 15, 2022 were delivered to the participants who are part of CPZ1 (figure 7).

Figure 7 – Certification of the participant in the training course.



Source: Research Data, 2022.

In addition to the activities described, in this stage, the presentation of previous results was also carried out for the Locus of Innovation “Sertão Renovável” and for FACEPE, with the culmination of the stage being the delivery of certificates to fellows who are members of the PET (figure 8) .

Figure 8 – Presentation of previous PET results.



Source: Research Data, 2022.

Therefore, it was possible, once again, to complete another stage of the PET, which among all was the longest and with the greatest amount of practical activities, and it can then be said that another stage was carried out with the success that the project proposed from the beginning.

3.4 RESULTS OF STAGE IV

At this stage, new training was carried out for fisherwomen at the LEA and a workshop entitled “*Business Modeling: developing women entrepreneurs*” was offered. After participating in the workshop, in the practical activities developing (in the laboratory) products derived from fish, the course and workshop certificates were handed over (figure 9).

Figure 9 – Workshop registration, laboratory practices and certification. (Tecnological Extension Network [PET] Agroecologia, Sustentabilidade and Artesanal Fishery Workshop Business modeling Entrepreneurs Development)



Source: Research Data, 2022.

The next step was the production, publishing and submissions for publication of an *E-Book* entitled “*Integral Utilization of Artisanal Fish Derivatives*” containing authorial and adapted recipes, valuing the full use of the fish product and by-product.

Therefore, the PET was completed in the foreseen period and with all the activities, contained in the planning, executed successfully. In all, 100 participants were trained (among them students, fishermen and fisherwomen) through the training course, and later, another 20 fisherwomen received bakery courses based on the use of artisanal fish, in addition to receiving the entrepreneurship workshop, seeking to improve their knowledge. of them to undertake from the base activity of economic support of origin.

4 FINAL CONSIDERATIONS

Agroecology is in continuous evolution, constituting an area of science that defends the ecological management of natural resources, in order, through collective social actions of a participatory nature, with a holistic approach and systemic strategies, to return the modified course of socio-ecological co-evolution. Sustainability, on the other hand, is invariably based on a social organization that has concern and orientation in the protection of natural resources and seeks, over time, to expand the harmony of the society-nature relationship.

Thus, fishing is a human activity characterized by a large number of interconnections with many variables in the society-nature relationship, where this relationship has become a social construction, which over time has accumulated knowledge and become complex. for understanding. Thus, addressing the fisheries agroecology is something new and still little known. It is to adapt the principles of agroecological science to fisheries management practices, striving for sustainability.

In this sense, fishermen are a social group of economic and cultural importance in Brazilian society, where, in their fishing activity, they are influenced by environmental externalities promoted by countless social actors that occupy the same system. Furthermore, the production system in artisanal fishing does not only cover technical-economic relationships, but also emphasizes the social and environmental relationships that condition it, being relevant to consider among the types of fishing carried out, the complementarity of resources and the internal coherence and complexity. of the system.

Therefore, the artisanal fishing system is understood by the interactions between social, cultural, economic and environmental dynamics that represent a set of production systems in fishing, and that need attention, high impact public policies, income generation from incentives public-private and, above all, continuing education so that they can understand the relevance of their socioeconomic role, as traditional peoples and communities, in their locus of experiences.

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