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Metodologias de extensão rural aplicadas à aquicultura: um paralelo entre teoria e prática

Rural extension methodologies applied to aquaculture: a parallel between theory and practice

Metodologías de extensión rural aplicadas a la acuicultura: un paralelismo entre teoría y práctica

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Resumo

O trabalho é resultado do projeto de extensão "Transferência de tecnologia através da capacitação e assistência técnica para criadores de tambaqui, *Colossoma macropomum*, no arquipélago do Marajó/PA". O artigo discute a utilização de metodologias de extensão rural aplicadas à piscicultura familiar, traçando um paralelo entre teoria e prática a partir de conceitos e vivências. As práticas metodológicas foram executadas por estudantes e professores do Instituto Federal de Educação, Ciência e Tecnologia do Pará (IFPA) *Campus* Breves, na cidade de Curralinho (Marajó - Brasil). A duração do projeto foi de agosto de 2019 a março de 2020. Este estudo é do tipo descritivo, com abordagem qualitativa, configura-se como um relato de experiência. Nesse sentido, apresentam-se algumas, estratégias metodológicas que podem auxiliar nas coletas de dados para aquicultura, tais como: reunião; contato; visita; caminhada transversal; cartaz; folder; rádio; seminário; curso; palestra; entrevistas; oficina; maquete; árvore de problemas; realidade/desejo; análise FOFA/SWOT (Forças, Oportunidades, Fraquezas e Ameaças); fluxos de produção e comercialização. Constatou-se que as estratégias metodológicas utilizadas neste projeto se apresentaram como ferramentas úteis no processo de assistência técnica e extensão rural na aquicultura do Marajó.

Palavras-chave: Comunidades rurais; Desenvolvimento; Educação extensionista; Tambaqui; Impacto social.

Abstract

The work is the result of the extension project "Transfer of technology through training and technical assistance for creators of tambaqui, *Colossoma macropomum*, in the Marajó archipelago/PA". This article discusses the use of rural extension methodologies applied to family fish farming, drawing a parallel between theory and practice based on concepts and experiences. The methodological practices were carried out by students and teachers from the

Federal Institute of Education, Science and Technology of Pará (IFPA) *Campus* Breves, in the city of Curralinho (Marajó - Brazil). The duration of the project was from August 2019 to March 2020. This descriptive study, with a qualitative approach, is configured as an experience report. In this sense, here are presented some, among many, methodologies that can assist in data collection for aquaculture, such as: meeting; contact; visit; cross walk; poster; folder; radio; seminar; course; lecture; interviews; workshop; model; problem tree; reality/desire; SWOT analysis (Strengths, Opportunities, Weaknesses and Threats); production and commercialization flows. In conclusion, the methodologies used in this project were presented as excellent tools in the technical assistance and rural extension process in Marajó aquaculture.
Keywords: Rural communities; Development; Extension education; Tambaqui; Social impact.

Resumen

El trabajo es el resultado del proyecto de extensión "Transferencia de tecnología a través de capacitación y asistencia técnica para criadores de tambaqui, *Colossoma macropomum*, en el archipiélago de Marajó/PA". Este artículo analiza el uso de metodologías de extensión rural aplicadas a la piscicultura familiar, trazando un paralelo entre la teoría y la práctica basadas en conceptos y experiencias. Las prácticas metodológicas fueron realizadas por estudiantes y docentes del Instituto Federal de Educación, Ciencia y Tecnología de Pará (IFPA) *Campus* Breves, en la ciudad de Curralinho (Marajó - Brasil). La duración del proyecto fue de agosto de 2019 a marzo de 2020. Este estudio descriptivo, con un enfoque cualitativo, se configura como un informe de experiencia. En este sentido, aquí se presentan, entre otras, metodologías que pueden ayudar en la recopilación de datos para la acuicultura, tales como: reuniones; contactos; visitas; caminatas; posters; carpeta; radio; seminario; cursos; conferencias; entrevista; talleres; modelos; arbol problema; realidad/deseo; analisis FODA (Fortalezas, Oportunidades, Debilidades y Amenazas); flujos de producción y comercialización. En conclusión, las metodologías utilizadas en este proyecto se presentaron como excelentes herramientas en el proceso de asistencia técnica y extensión rural en acuicultura de Marajó.
Palabras clave: Comunidades rurales; Desarrollo; Educación de extensión; Tambaqui; Impacto social.

1. Introduction

Aquaculture is a science that proposes to produce organisms with predominantly aquatic habitat (Mmanda et al., 2020; Lameira-Silva et al., 2020). This activity works in

restricted environments, in any of its development stages (eggs, larvae, post-larvae, juveniles or adults) (Valenti, 2002). In Brazil, several organisms are already created in this system, mainly fish (Sousa et al., 2019). An important activity from the social and economic point of view, being responsible for supplying fish to the population in the Marajó archipelago (state of Pará - Brazil).

However, among its characteristics, the extensive hydrographic network stands out, composed of basins, channels, meanders, lakes and streams, among which the Amazon, Pará, Anapu, Jacundá and Anajás rivers stand out (Crispim et al., 2016). The archipelago has numerous affluents, which encourage the practice of fish farming in rural communities. The lack of credit, low training of labor, abusive charging for the use of water, deficient sanitary legislation, management of the enterprise, high price and low quality of feed, scarcity of technical assistance and rural extension, have been affecting the local fish farming value chain. Thus, the use of rural extension methodologies is extremely important to ease these barriers and leverage the activity (Sousa et al., 2017; Aranha & Lobão, 2018; Albuquerque et al., 2019).

Rural extension can be an important tool in the construction of this dialogue between extension workers and rural producers (Verdejo, 2006; Oliveira, 2015; Marinho & Freitas, 2015; Caporal & Dambros, 2017). It is understood as a set of procedures through which the subjects (internal or external to the University/Institute) involved in the project are interconnected in consultation, diagnosis, teaching, research, training, communication devices, effectively designed to achieve common goals (Freire , 1983; Demo, 2006; Thiollent, 2011; Ramos et al., 2013; Oliveira et al., 2017).

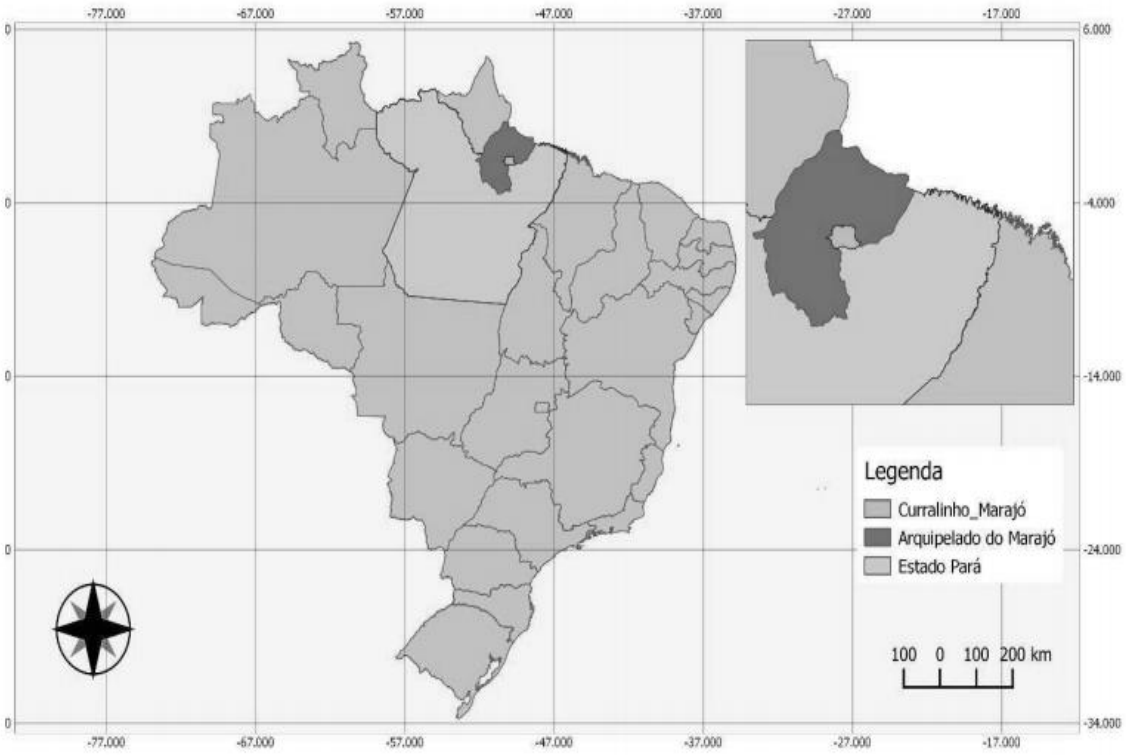
Despite the advances in rural extension approaches in Brazil, so far, there is a lack of extension work in aquaculture in Marajó. Thus, this article discusses the use of rural extension methodologies applied to family fish farming, drawing a parallel between theory and practice based on concepts and experiences. Such methodologies will allow an overview of future extension projects. It will also assist in the development of strategies and promote the integration of aquaculture. It is worth mentioning that this information is of paramount importance, as it favors dialogue between the school environment and the community. Therefore, it provides students with a life experience that strengthens their academic education and as engaged citizens in the world of work.

2. Metodology

2.1 Study area

The study was carried out in the municipality of Curralinho, archipelago of Marajó, state of Pará, Northern Brazil (Figure 1).

Figure 1. Location of the municipality of Curralinho, Marajó, Pará, Brazil.



Source: adapted from Aranha & Lobão (2018).

Marajó is located on the Amazon coast (Amaral et al., 2012). Region comprising 16 municipalities, which comprise the micro-regions of Arari (Cachoeira do Arari, Chaves, Muaná, Ponta de Pedras, Salvaterra, Santa Cruz do Arari and Soure), Furos de Breves (Afuá, Anajás, Breves, Curralinho and São Sebastião da Boa Vista) and Portel (Bagre, Gurupá, Melgaço and Portel). These municipalities are among the lowest Human Development Indexes (HDI) in Brazil (UNDP, IPEA, 2013).

Curralinho has a territorial extension of 3,620,279 km^2, its population is estimated at 33,893 people for 2018 (IBGE, 2010). The region has rural populations living on plant extraction, fishing and agriculture for subsistence, with low technological level, and fish

farming is an important alternative in this context.

2.2 The extension project

The project "Transfer of technology through training and technical assistance for creators of tambaqui, Colossoma macropomum in the archipelago of Marajó/PA" was funded by the Dean of Extension and External Relations (PROEX) of the Federal Institute of Education, Science and Technology of the Pará (IFPA), under notice number 03/2019. The project was called "Piscicultura Marajoara", being conducted by students and teachers at IFPA *Campus* Breves.

A total of 13 fish farmers participated in the project. The methodological tools used in sequence in the execution of the project were: meeting; contact; visit; cross walk; poster; folder; radio; seminar; course; lecture; interview; workshop; model; problem tree; reality/desire; Strengths, Opportunity, Weakness and Threat (FOFA/SWOT); production and marketing flows (Table 1). The duration of the extension project was from August 2019 to March 2020.

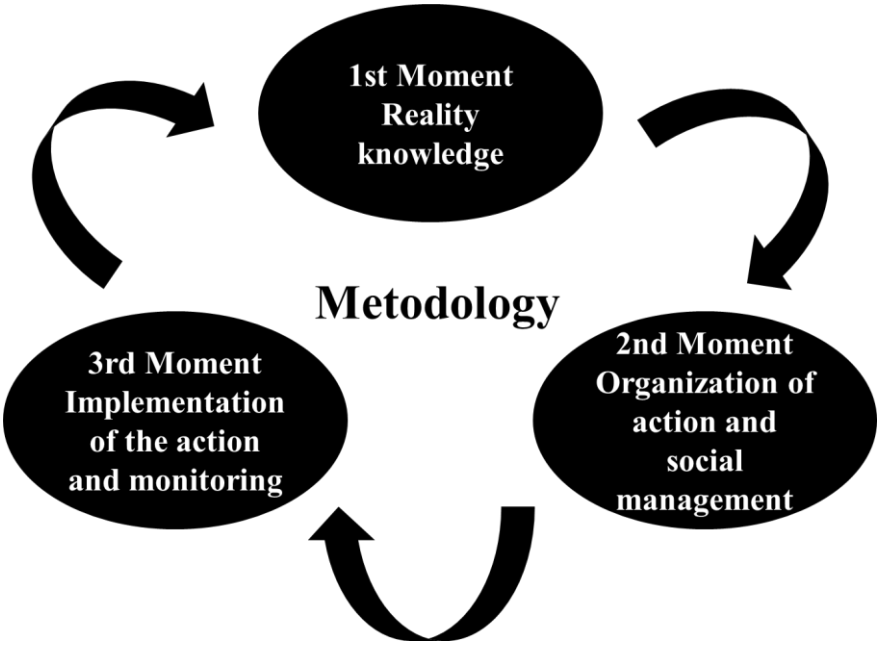
Table 1. Methodologies and respective references used in the fish farming extension project, in the municipality of Curralinho, Marajó, Pará, Brazil.

Metodology	Reference
Meeting	Aranha & Lobão (2018)
Contact	Sousa et al. (2017)
Visit	Silva et al. (2017); Ituassú & Aragão (2018)
Cross walk	Santos et al. (2014) e Silva et al. (2017)
Poster	Horonato (2019)
Folder	Horonato (2019) e Oliveira et al. (2020)
Radio	Medeiros Junior et al. (2016)
Seminar	Lima et al. (2015) e Kato et al. (2017)
Course	Abreu et al. (2015) e Kato et al. (2017)
Lecture	Silva et al. (2014); Santos-Filho & Aguiar (2016)
Interview	Sousa et al. (2019); Trombeta et al. (2020)
Workshop	Barbosa et al. (2014)
Model	Felcher et al. (2015)
Problem Tree	Kummer (2007); Silva et al. (2013)
Reality/desire	Silva et al. (2013); Marinho & Freitas, (2015)
FOFA/SWOT	Marinho & Freitas, (2015); Valle et al. (2017)
Production and marketing flow	Silva et al. (2011); Aranha; Lobão (2018)
Hornbook	Corrêa et al. (2018); Silva et al. (2018)

Prepared by the authors.

The planning method presented by the project is structured in three didactic moments (Figure 2). The extension project experienced methodologies, involving mediators (teachers and students) and social actors (aquaculture farmers). The use of methods and techniques used contributed positively to the realization of extension activities with a view to planning interventions, as described by Ruas (2006):

Figure 2. Method of participatory planning and social management used for rural extension in fish farming in the municipality of Curralinho, Marajó, Pará, Brazil.



Source: adapted from Ruas (2006).

a) First moment

It is essentially a moment of rapprochement, of establishing emotional relationships and of exchanging personal and environmental information. It is important that, at that moment, conditions are created for the collective elaboration of the social-historical rescue of the community. If for the technician it is essential to know the reality of the field and its subjects, for producers it is also essential to know the technician and Institution to which he is linked. The knowledge of reality includes: prior information about the local reality; the approach and awareness of the community (exchange of information about the reality of producers, the community and extension workers); and conducting participatory diagnosis by development field.

b) Second moment

It is the collective exercise of planning and is a sequence of the process of reflection on the issues surrounding the community's life project. It has as its starting point the information retrieved in the elaboration of the field work. It is when the action is organized that the identification of interest groups and partners takes place. These groups are structured around common projects. The organization of the action comprises: the identification and organization of interest groups (by theme); and the negotiation and elaboration of sustainable development projects and programs.

c) ***Third moment***

It constitutes the stage of carrying out the planned actions. The interest groups, together with the partners, take control of the process of execution, monitoring, evaluation and social management of the projects. The execution and monitoring includes: the execution of the project; the training/qualification of social actors; and the monitoring and evaluation of projects and programs.

This descriptive study with a qualitative approach is configured as an experience report. Experience reports originate from an “action research”, while conceived and carried out in close association with an action and in which researchers and participants representing the situation are involved in a cooperative or participatory way (Gil, 2008). The following discussions refer only to a stratum of the amount of data systematized by the project team and reflect, in particular, our view of extension practices as a teaching-learning tool.

3. Results and Discussion

Below are the methodologies used in the extension action, respectively.

3.1 Meeting

Initially, the coordination of the project met with the team of students to present it and the bibliographic references available so that students could level their knowledge about fish farming. Then, the students underwent training offered by the coordination, in the form of a

short course, on communication and rural extension and to associate them with the proposed practical activities.

The extension project meeting was planned, held with an audience that has common interests and objectives. It aims to introduce or improve techniques; transmit information to many people at the same time; plan the work; provide exchange of knowledge and experiences; promote community organization; and/or motivate the public to be worked on (Pereira et al., 2009; Aranha & Lobão, 2018). The extension worker seeks to stimulate the creativity of a group of people to identify problems and needs, seeking solutions and making decisions for action, including, necessarily, the exchange of information and debates.

3.2 Contact

The students communicated with the following institutions: Technical Assistance and Rural Extension Company (EMATER), Curralinho City Hall, Z-37 fishing colony and thirteen local fish farmers. There was an exchange of information and experiences in fish farming. Contact is the moment when the technician exchanges information and clarifications with the public related to the technical assistance and rural extension work. The public reached in the contacts must be quite diversified, being able to be formed of people directly or indirectly linked to the work plan (Pereira et al., 2009; Sousa et al., 2017).

3.3 Visit

A total of thirteen properties were visited to assess their productive potential and the conditions of Good Management Practices (BPM) in fish farming. The checks were carried out by students, with the aquaculture farmers. Tambaqui breeders in the region were identified, but in their life trajectory they never received technical information. For Pereira et al. (2009), this is a method that provides a means of personal communication between the rural family and the extension worker, in an environment where they can discuss matters and exchange information in privacy, without distractions and interruptions. Therefore, in fish farming, the visit involves a planned action, aimed at executing the technical assistance and rural extension work schedule (Ituassú & Aragão, 2018).

3.4 Cross walk

The cross walk tooks place in family farms, in the communities: Boa Esperança, Cafezal, Ilha das Araras, Perpétuo Socorro, Piriá Miri, Rio Açú and Santa Izabel. This technique aims to explore the spatial characteristics of the study area (Santos et al., 2014; Silva et al., 2017). We took walks with fish farmers, observing and asking about different areas, local technologies, introduced technologies, history and tradition of the activity. The meanings given to locals considered important by them were also raised, as Silva et al. (2013).

3.5 Poster

In this project, a poster was produced to publicize the actions (training in BPM) in rural communities. The poster is one of the best known and preferred visual aids used by communicators in their mission to transmit ideas and experiences (Pereira et al., 2009). The poster on the activity in fish farming reached individuals in isolation, groups of people, and the mass, in constant and insistent communication, whenever anyone faces it.

3.6 Folder

A folder was produced to publicize the schedule of training courses in BPM for fish breeders. It was a printed communication vehicle, of a single sheet, with three folds, printed in color, with illustrations. The content of the folder message can be technical or merely informative, such as the schedule for a field day, for example, and the message must be simple and clear (Pereira et al., 2009; Horonato 2019; Oliveira et al., 2020).

3.7 Radio

The training course was also disseminated to the internal communities through local radio (Rádio São João FM 97.1), by the students of the project. It is a massive method that reaches all recipients, even those with low education, reaching the most distant places, where other means of extension cannot reach (Pereira et al., 2009; Medeiros Junior et al., 2016). Radio was less expensive, both for fish farmers and for those doing extension programs, and is more susceptible for producers to capture and assimilate information.

3.8 Seminar

A seminar was held to enable further discussions, before the training course for fish farmers. Before the seminar, students prepared presentations (slides), according to the proposed theme. We seek to share the theme of the seminar among students: water quality; indicated species; fish transport management; quarantine and fish stocks; fish biometry management; liming and fertilizing nurseries; management of fish nutrition, food and health; and fishing and slaughtering of fish and teachers took on the role of mediators. Seminar is a planned method of active learning, in which a group of people get together in previously programmed sessions, to study a topic of common interest, in search of problem solving, under the direction of a coordinator (Pereira et al., 2009 ; Lima et al., 2015; Kato et al., 2017).

3.9 Course

A technical training course in BPM in fish farming was offered to local producers. This included important themes in the tambaqui production chain (mentioned above). It is worth noting that, during the course, rounds of conversations were held for discussions on the issues in question. The project reached an audience from several locations, with a certification at the end of the training. It is an extension method that employs a set of technical activities, with specific programming, aiming to train a group of people with common interests (Pereira et al., 2009; Abreu et al., 2015; Kato et al., 2017).

3.10 Lecture

After consolidating the visual materials, students were allowed to give eight lectures (themes) on BPM of approximately 60 minutes (each theme) to fish farmers. Each student was responsible for the presentation of topics within the activity, including practical exposure to the most important aspects of fish farming. The lectures contributed both to students, who improved public exposure and mastery of the subject, and to aquaculture farmers, who had no knowledge of BPM in fish farming, in addition to increasing the interaction between those involved in the extension project. It is a method in which the speaker talks about a carefully elaborated and previously determined subject, before a group of people. The lecture is used to present information, in order to clarify points of controversy, inform and analyze facts, explore facets of a problem (Pereira et al., 2009; Silva et al., 2014; Santos-Filho & Aguiar, 2016).

3.11 Interview

Thirteen interviews were conducted with fish farmers. On the first day of the course, before the start of activities, a questionnaire was applied consisting of structured questions (initial interview). At that time, basic information about fish farming and BPM adoption was collected. On the last day of the course, another questionnaire about the training course (final interview) was applied. The interview can be conducted with people (leaders) or with groups (Verdejo, 2006). The use of this tool is a meeting between people, so that one of them obtains information about a certain subject, through a conversation of a professional nature (Marconi & Lakatos, 2010). It is a method performed to find out situations and facts, identify problems, and evaluate work (Pereira et al., 2009; Sousa et al., 2019; Trombeta et al., 2020). In fish farming, it must be carefully planned and well conducted.

3.12 Workshop

Social technologies for tambaqui fish farming were built. For this, teachers, students and producers participated in the construction workshop. Simple language was used to build the technologies, in order to provide a better understanding by fish farmers. For making, alternative and low-cost materials were used, taking into account the reality of local fish farming. Secchi's disk, ictiometer, liftnet and tank-net were the social technologies built during the BPM course.

3.13 Model

Three models were produced, with the prospect of deploying tambaqui fish farming in different environments, for the region: lowland, firm ground and field area. The models showed the details of the productive system and infrastructure of the properties. The physical model can be used as a teaching tool at any level of education, benefiting teachers and students (Felcher, 2015). This strategy is used mainly as a facilitator of spatial understanding and as a tool to go through different areas of knowledge.

3.14 Problem Tree

It is a methodology used to deepen the understanding of a particular problem identified during discussions and diagnostic activities carried out previously with a certain group (Silva et al., 2013). Thus, a specific problem identified as a key is chosen and the causes and effects arising from this problem are discussed. In Curralinho, the problem tree detected some causes (scarcity of public policies; lack of communication and rural extension; and little knowledge of fish farming), which generated problems (training of aquaculture farmers and fish feed), which ended up affecting fish farming in the region (decreased fish production; reduced area of cultivation; lack of technical knowledge; fish have little management; and families return to predatory fishing). The awareness of cause and effect relationships allows for a more adequate planning to solve the problems of the group involved in the intervention (Kummer, 2007).

3.15 Reality/Desire

It is a methodology used to guide the planning process in order to deepen the aspects that interfere in the lives of people in the group involved in the intervention, whether positive or negative (Marinho & Freitas, 2015). Based on the characterization of reality, the group's desire is discussed, that is, where it is intended to arrive with respect to a certain aspect of the life / dynamics of that group. Thus, it is necessary to detail the process, that is, actions, assignments of responsibilities, deadlines and resources necessary for the group's wish to materialize (Silva et al., 2013). In Curralinho, the reality technique (aquaculture farmers does not have a vessel to transport production; rural extension is not carried out in all communities; lack of information on fish farming and no guidance; high input costs, such as: fry, feed, and others; lack of financial support and public institutions) and desire (river transport to drain production; rural extension, information and training courses; better remuneration and reduction of operating costs; credit and valorization of work in the field) were the bottlenecks detected in fish farming place.

3.16 FOFA/SWOT

From this methodology it is possible to identify what interferes in the dynamics of the group involved in the diagnosis / intervention process. From the debates, it is possible to evaluate and plan strategies that enhance the actions and objectives and goals determined by

that group, the focus of the intervention (Marinho & Freitas, 2015). Through the technique (FOFA): Forces (family participation; unity and self-esteem; association and farmers' cooperatives; availability of electricity), Opportunities (partnerships between producers and institutions; training of aquaculture farmers; public policies for activity; marketing of fish)), Weaknesses (transport (boat); diseases in fish; low education of producers) and Threats (investment in fish farming; political dispute; availability of inputs), were the local problems reported, and justified by the lack of social organizations in aquaculture (associations and cooperatives).

3.17 Production and commercialization flows

Diagrams make it possible to analyze in an accessible manner all complex and interrelated aspects (Verdejo, 2006). Both cause-effect relationships and the intensity and importance of institutional, commercial or production relationships (trade and production flowcharts) can be visualized (Silva et al., 2011; Aranha & Lobão, 2018).

In Curralinho, it still does not have a fish breeding farm. Through the production flow, fish farmers also acquire aqua from other municipalities in Pará, such as Castanhal, Igarapé-Açu and Peixe-Boi, for breeding. In addition to buying the fish, the producers transport the fish to Marajó, clean the excavated ponds, use organic fertilizer. After that, the fish stock, fattening, slaughter/slaughter and commercialization. In the present study, through the marketing flow technique, the tambaqui trade occurs throughout the entire year on the properties themselves for the final consumer or for middlemen.

3.18 Hornbook

Hornbooks are instruments widely used in technology transfer in technical assistance to fish farmers, due to the ease of understanding (mainly by complete or functional illiterates) and playfulness (Alcântara et al., 2017; Corrêa et al., 2018; Silva et al. , 2018). A card accelerates the transfer of knowledge through practicality and allows the fish farmer to always have this knowledge, and may even include it with other members of the community. Thus, a hornbook was prepared to consolidate the necessary knowledge for the fish farmer in Marajoara, with information on the respect of the production system, fry, feed, fish, commercialization, among others.

Finally, it is worth noting that, when working with methodologies in an aquaculture context, some premises must be considered. These assumptions are suggested by Soares and Carvalho (2016): a) Meet social requirements: preserving and qualifying the relationships between the subjects and seeking better living and well-being conditions; b) Consider cultural aspects: rescuing and respecting knowledge, knowledge and values of the different social groups that will be analyzed, understood and used as a starting point for local development; c) Caring for the environment: preserving natural resources over time, maintaining or expanding biodiversity, improving the recycling of materials and energy within agro-ecosystems; d) Support the strengthening of associative forms and collective action: promoting effective participation, enabling greater empowerment of social actors, encouraging self-management; e) Contribute to obtaining economic results: observing the balance between production and preservation of the natural resource base; and f) Meet ethical requirements: commitment to a more just society, guided by egalitarian and fraternal relationships, noting that the search for sustainability implies a necessary solidarity between current and future generations.

4. Conclusion

The use of different rural extension methodologies (meeting; contact; visit; cross walk; poster; folder; radio; seminar; course; lecture; interviews; workshop; model; problem tree; reality/desire; FOFA/SWOT analysis; flows production and commercialization) produced important results for marajoara fish farming. In addition, the integrated application reported in this study demonstrated that it is possible to work on aquaculture issues in projects outside the school environment. Such methodologies contributed positively to a greater interaction between students, teachers and local fish farmers so that they could reflect on the creation of tambaqui in Marajó, as well as facilitating the understanding of knowledge through teaching-learning.

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