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## Rural environmental planning in a family farm: education, extension and sustainability

### Planejamento ambiental rural em uma propriedade familiar: ensino, extensão e sustentabilidade

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#### ABSTRACT

*Developing research, teaching and extension in university programs is fundamental to capacitate professionals for the challenging endeavors. Considering the importance of these three university functions as relevant learning practices, the objective of this study was to analyze qualitatively the development of teaching project proposals associated with extension activities, directed to the rural environmental planning in an Agricultural Production Unit, in order to identify the issues and their degree of applicability. Twenty project proposals were developed in the "Rural Environmental Planning" course to plan an Agricultural Production Unit, which were subsequently evaluated by the farmer. This discipline is part of the Bachelor's degree course in Environmental Management and Analysis of the Universidade Federal de São Carlos. The projects followed qualitative research methods using the systemic and participatory approach. At the end of the process the farmer answered an evaluation matrix of the projects. Development of the projects was particularly important for the students and for their knowledge on the various topics covered, which also resulted in factual improvement perspectives in the Agricultural Production Unit. Construction of knowledge was participatory and integrated between the students and farmer.*

**Key words:** family farm, university extension, environmental management and planning.

#### RESUMO

*O desenvolvimento das ações universitárias de ensino, pesquisa e extensão é fundamental para a formação de profissionais capacitados para os desafios existentes na sociedade. Considerando a importância dessas três funções da universidade como prática relevante de aprendizagem, o objetivo do presente trabalho foi analisar qualitativamente o desenvolvimento de propostas de projetos de ensino ligados às atividades de extensão,*

*voltados para o planejamento ambiental rural em uma Unidade de Produção Agrícola, identificando as temáticas e o grau de aplicabilidade dos mesmos. Foram desenvolvidas vinte propostas de projetos voltados para o planejamento de uma Unidade de Produção Agrícola, sendo posteriormente avaliadas pelo agricultor na disciplina de "Planejamento Ambiental Rural", do curso de Bacharelado em Gestão e Análise Ambiental da Universidade Federal de São Carlos. Os projetos seguiram métodos de pesquisa qualitativa, utilizando abordagem sistêmica e participativa. Ao final do processo, foi aplicada ao agricultor uma matriz de avaliação dos projetos. O desenvolvimento dos projetos foi de suma importância para a aprendizagem dos acadêmicos sobre os diversos temas abordados, assim como resultou em perspectivas reais de melhoria na Unidade de Produção Agrícola. A construção do conhecimento foi participativa e integrada entre os acadêmicos e o agricultor.*

**Palavras-chave:** agricultura familiar; extensão universitária, gestão e planejamento ambiental.

#### INTRODUCTION

University initiatives of teaching, research and extension programs are fundamental to capacitate professionals for the challenging endeavors in today's society, which establish a reciprocal relationship (society and university) (BRASIL, 2001). The integration of these three functions, as prescribed in the Brazilian Constitution (BRASIL, 1988), can elucidate the students in order to understand the reality they are part of and which they can participate in (UFSC,

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2010). However, reconciling the development of these activities is challenging and therefore, often not executed. MAGALHÃES (2007), discussing about the relevant challenges in the inseparability of these three functions, draws attention to the need for developing research and extension initiatives as teaching strategies.

Among the areas of knowledge, the agricultural and environmental sciences provide an appropriate environment to carry out activities that can accomplish the integration of the three aforementioned functions. Traditionally, scientific research in the agricultural sciences has been under pressure from the socio-economic challenges of the rural environment (GAUNAND, 2015). It is crucial to associate the teaching activities with this research and extension interaction already in place. In this sense, in Brazil, family farming faces many challenges, among them environmental ones as well as finding the right production strategies. Several authors (GRISA & SCHNEIDER, 2014; TOMEI & LIMA, 2014) have reported that small family farms remained at the fringe of public policies well into the 1990s. The situation has improved in recent years, as reported in the context of university extension by CALLOU et al. (2008). These authors analyzed the state of the art of education in the rural extension in Brazil and found that family farming was the most recurring theme (20.40%) in the research projects about agricultural extension.

Considering the importance of these three university functions as relevant learning practices, the objective of this study was to analyze qualitatively the development of teaching project proposals associated with extension activities, directed to the rural environmental planning in an Agricultural Production Unit (APU), in order to identify the theme and their degree of applicability.

## MATERIALS AND METHODS

São João farm is an APU characterized as a small family farm, occupying 14.1ha. It is located in the Ribeirão Feijão Basin, which is an important water source for the city of São Carlos, as it provides approximately 40% of the total volume of surface water collected for public water supply. The largest portion of the basin is inserted in rural areas occupied by small and medium-size farms. There are also areas covered by forest and cerrado native vegetation remnants (MACHADO, 2013).

Since the 1970s, the production at São João farm has included horticulture and currently pisciculture, tended by four family members and two employees. Their environmental compliance concern began in 1998 after the Bolivia/Brazil gas pipeline was installed along the farm. This resulted in farmers' greater involvement in the implementation of projects and environmental conservation actions, such as: implementation of a biodigester septic tank and sewage treatment system through a filter garden; restoration of permanent preservation areas and degraded areas; water and energy saving measures through investments in technology and irrigation equipment; and also proper care in the handling and storage of pesticides during and after use. Environmental recovery actions developed were responsible for creating environmental education projects on the farm. Through educational and monitored visits of schools and various groups, projects included topics to convey the importance of riparian forest, of rivers and water, recycling and composting, soil conservation, nature trails, and other subjects.

The study was conducted within the rural environmental planning discipline in 2013 and 2014, and it involved a total of 72 students, divided into small groups. This course is taught in the 4<sup>th</sup> year of the bachelor's degree course in environmental management and analysis from the Universidade Federal de São Carlos. The educational proposal of this undergraduate course is based on an interdisciplinary approach with a strong reference in ecological theory, as well as extensive practical and technical education. Therefore, the main goal in this discipline was to approximate a teaching experience with university research and extension in an integrated manner with the farmer. The objective of the activity was to propose new projects aimed at the environmental planning of an APU, leading the environmental manager to reflect on and operate the entire rural property, proposing viable alternatives in order to assist in improved production conditions and also assist in the environmental aspects.

Following the qualitative research methods, the project used two approaches. The first was the systemic approach (MIGUEL, 2010), to acknowledge and understand the diversity and interrelationships between elements of the study object and the external environment. Systemic approach helped to incorporate the notion that the APU can provide, besides the agricultural production function, other combined functions such as conservation (MIGUEL, 2010).

The second one was the participatory approach (BRANDÃO, 2005) which involved one of the farmers in all stages of the work developed. This farmer represented the link with the family and with the reality of the APU. The origin point of participatory research is based on a perspective of social reality, taken as a whole in its structure and its dynamics. Therefore, the concrete reality of everyday life of the participants in the process was considered in its different dimensions and interactions (BRANDÃO, 2005). According to GAJARDO (1986), participatory perspective of social and educational research considers that the production of knowledge can/should happen at the same time, with the dissemination of knowledge produced and reinterpreted by integrating researcher/researched and teacher/student, in a collective learning process that takes into consideration beliefs, ideologies, desires, and world views of the participants.

In order to integrate these two approaches a five-stage participatory diagnosis was performed, which included the farmers' joint participation in all stages. The first step consisted in understanding the geographical area in question and the elements that influence the rural reality and their regional viewpoints. This required determining the abiotic, biotic, social, political and cultural characteristics encompassing the APU on a watershed level, with the support of the farmer. Each group performed a regional diagnosis, which was then transformed into a single collective diagnosis for the class.

The second stage was an *in loco* visit, together with the farmer, for the physical diagnosis on the operation and management of the APU. In order to understand such aspects, the characteristics and skills of the farm and of the farmer were determined. The third stage consisted of conversations with the farmer, which took into account issues such as planning, production systems, environmental actions, social and economic aspects, their past and present decisions and their demands and desires for the future of the farm.

The fourth step was to identify the strengths and vulnerabilities that would serve as the guiding principles for the projects. Issues such as implementation of new technologies, environmental concerns in production and complementing the family income came to light as important subjects. Based on this previous diagnosis, the fifth stage was performed, which resulted in a class discussion about the priority issues to be addressed in the projects. This stage also included the participation of the farmer, who gave

suggestions and explanations of the specific topics raised by the student groups.

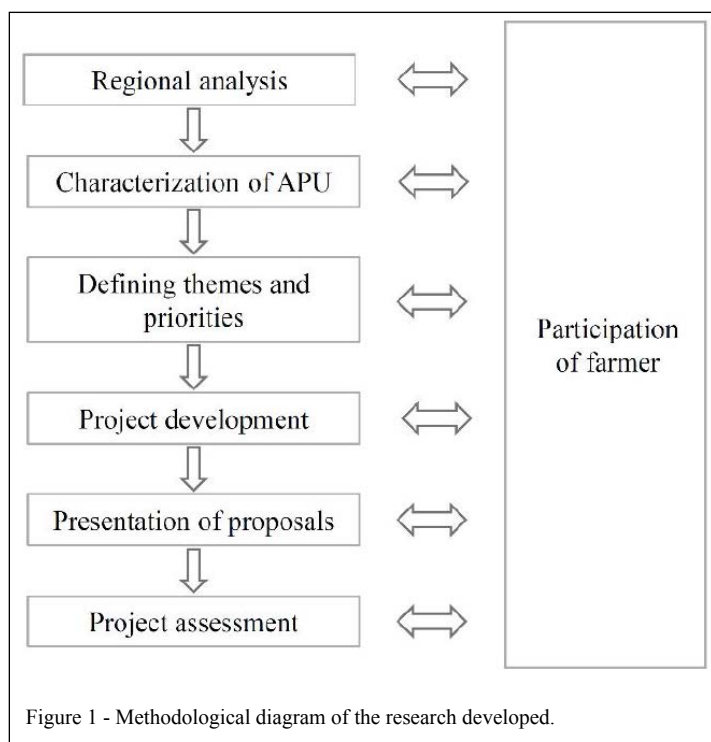
After the issues were defined and with the support of the diagnosis of the APU, the groups went on to develop the projects, with the support of academic expertise and local knowledge. The process was elaborated and conducted within a period of three months. This was initially based on defining the objectives and methods, followed by a theoretical and conceptual research on the topic selected, and finalized with the discussion of the expected results. During this period the groups had to present the partial results to the farmer so that he could follow and suggest changes in the process. On completion of the course, the projects were again presented to the farmer and his family for the subsequent discussions. The final and printed versions were handed to the farmer, after the suggested additions in the final presentation. To close this cycle, the farmer answered an evaluation matrix of the project proposals. Seven aspects were asked to be analyzed: 1) Applicability of the proposal; 2) Applicability period (if applicable); 3) Innovative project (this strategy had already been considered for the farm); 4) What was the major limitation that prevented implementing this strategy earlier?; 5) Is there a need for integration with other farmers/partners?; 6) Can this study be associated with other projects presented in the course?; 7) In terms of rural environmental planning, enumerate the projects in implementation priority order (0 to 10). Figure 1 shows the methodological sequence of the research developed.

## RESULTS AND DISCUSSION

### Analysis of the developed projects

Based on the observation of skills, capabilities and vulnerabilities of the APU, which included the farmer's demands, twenty projects were developed for the APU. The guiding theme was rural environmental planning; however, the broader concept of sustainability, addressed by SACHS (2002), permeated all sets of work groups and also covered the social and economic aspects. Within the broad theme of "rural environmental planning" the works were grouped into four subthemes: tools and public policies, technological innovation, value added and regional development (as shown in Figure 2). Some studies addressed two or more subtopics.

The research involving public management and policy instruments guided the farmer in the new environmental compliance processes of the farm (such as the Rural Environmental Registry – CAR),



or provided assistance to the legal framework of recently implemented policies and laws. The study of NEUMANN & LOCH (2002) points out that the policies and environmental management tools should consider the fact that rural areas have new requirements and must adapt to these changes.

The proposals of the research group that proposed some kind of technological innovation investigated the production systems already developed in the Farm and researched technical improvement measures and better process efficiency opportunities, such as improvement in irrigation systems and implementation of rainwater catchment systems. These proposals included equipment or production organization changes, or a combination of these changes.

The thematic of added value was addressed in the projects to couple economic development with environmental conservation, focusing on the generation of by-products from the APU's production. These projects strived to indicate strategies to the farmer in order to increase his profitability and reach new markets, such as organic certification or production of jams and jellies.

The regional development subtheme assembled proposals that presented a landscape-scale analysis and which had, besides delimitations

of the APU, territorial delineations in the study areas. In a larger spatial scale this scope is a differential in rural extension approaches. In a study on the frequency of topics in the syllabus of the rural extension disciplines, it is observed that only 1.89% address local development and 3.41% address regional development (CALLOU et al., 2008). It stands out in this sub-theme that all of the proposals included tourism-related approaches. In this context, CANDIOTTO (2011) reports on the importance of tourism in family farming establishments, stressing the need for planning and management for a better management of natural resources. Another factor should be highlighted in this theme is that the students published a paper in a Brazilian Planning and Development Seminar (FAUSTINO et al., 2014).

#### Evaluation matrix of the project proposals

Of the seven aspects evaluated, 70% of the projects presented were classified as having broad applicability, only 15% with partial applicability and 15% with no applicability. Analyzing the projects classified as "not applicable", it was observed that these projects were not viable in terms of incompatibility with the neighboring farms (*Environmental Readjustment Project*). Another aspect in this regard refers to the issue of

Rural Environmental Planning			
Public policies and instruments	Technological innovations	Value added	Regional development
<ul style="list-style-type: none"> <li>- Environmental Zoning</li> <li>- Registry Rural Environmental – CAR</li> <li>- Plan ABC</li> <li>- Environmental readaptation</li> <li>- Environmental Fragility</li> </ul>	<ul style="list-style-type: none"> <li>- Water use management</li> <li>- Solid waste management</li> <li>- Rainwater Catchment</li> <li>- Pisciculture</li> </ul>	<ul style="list-style-type: none"> <li>- Manufactured Products</li> <li>- Green Tracks Agroforestry</li> <li>- Agroforestry System</li> <li>- Herbs house</li> <li>- Organic Certification</li> <li>- Organic Production</li> <li>- Vivarium Revitalization</li> </ul>	<ul style="list-style-type: none"> <li>- Ecotourism</li> <li>- Rural tourism</li> <li>- Educational Tourism</li> <li>- Bird watching</li> </ul>

Figure 2 - Themes included in projects for the APU.

the agreement between the farmer and his family, related to the type of production system adopted on the farm (*Organic Certification Project*); some family members did not believe the conversion was viable at that time. ZUIN et al. (2011) analyzed the dialogic communication in rural training, emphasizing the importance of respecting the senses, meanings and relationships that family farmers have with their surroundings.

Based on the projects that were classified as applicable (14 projects), the “Applicable period” was evaluated, of which 10 projects were defined as short-term applicability. These projects were characterized primarily as planning projects, among which stood out those in which the farmers showed a desire to progress, but did not have the methodology, such as the project proposal to create a manufactured product with the raw materials from São João farm, as well as several projects that could help rearrange the activities already undertaken by the farm (*Vivarium Revitalization Project*). Proposals that involved some form of technological gain were the ones that resulted in more research development and scientific papers that were published in national and international journals, bringing research into the farm. GAUNAND et al. (2015) highlighted the high applicability from research conducted in the rural environment. In the more specific case of family farming, NIEDERLE et al. (2014) complement this reasoning, highlighting how the academic public has increased on this issue over the past 15 years. As for project innovation, 60% of projects were considered as innovative. Regarding projects that were not innovative, the question asked was

with regard to the main limitation which did not enable this strategy to be implemented. Of the factors mentioned, what stands out is the lack of manpower, lack of knowledge on the subject and financial matters.

On the integration with other farmers/partners for the projects implementation, 60% of projects were classified as independent of any partnership. Overall, the farmer reported that projects that depend on these interactions tend not to be implemented, as the relationship with neighboring farmers is a delicate matter, since São João farm has a differentiated production system.

As for the association with other projects presented in the course, only three projects were not considered to be applicable. Overall, these three projects were not well classified in the other issues in terms of the farmer’s evaluation.

The last question asked the farmer to assess the rural environmental planning by numbering the projects in order of priority (0 for the least priority to 10 for the highest priority). Excluding the projects that were not classified as applicable, the projects that required interaction with other farmers and/or that showed a broader landscape scale scope obtained the lowest score. The projects that scored best were those contributing to remedy a need already identified by the farmer and his family, and the projects with a potential to generate new financial income and also viable projects in terms of manpower and financial issues.

Analyzing all the projects elaborated enabled to perceive that there was a connection

between education and extension activities. This situation sets a differential, since in Brazil, in general, there is a disconnection in the teaching, research and extension activities carried out by Brazilian universities, according to CALLOU et al. (2008).

## CONCLUSION

It was concluded that the activity developed resulted in real improvement perspectives for the APU, as the proposals developed encompassed integrated environmental conservation, social responsibility and economic returns, each one with its specificity.

Based on the progress analysis of the proposals developed, it was observed that among the students and farmers the construction of knowledge was participatory and integrated, stressing the importance of university extension initiatives as a democratization activity, respecting the farmers' know how in building a new and broad knowledge-base to be developed.

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## BIOETHICS AND BIOSSECURITY COMMITTEE APPROVAL

We, authors of the article "Rural environmental planning in a family farm: education, extension and sustainability" declared, for all due purposes, that the project that gave rise to the present data has not been submitted for evaluation of the Ethics Committee of the Universidade Federal de São Carlos, but we are aware of contents of resolution No. 466, of December 12, 2012 of the Brazilian National Health Council <<http://conselho.saude.gov.br/resolucoes/2012/Reso466.pdf>> if it involves human>.

Thus, the authors assume full responsibility for the presented data and are available for possible questions, if they be required by competent authorities.

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