

Original Articles

The Use of Action Research in the Management of Environmental Problems

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Abstract

The aim of the article is to present and discuss the possibilities for using participatory methodologies and action research in studies with a socioenvironmental focus, particularly in the rural context. Special emphasis is given to problems which occur as a result of interactions between researchers and communities and ways of building a shared vision are suggested. Finally, the article presents some results from a participatory project involving communities in a microbasin in the north-west region of Rio de Janeiro state, relating in particular to the health problems resulting from the use of pesticides. The procedures used to deal with the organization of the communities are also highlighted.

Keywords

Methodology, action research, agriculture, environment, communities

Introduction

In the face of the current social and environmental challenges in agricultural development, it is necessary to research, design and evaluate new models for agroenvironmental management. New theoretical and methodological approaches are needed to surmount the predominant economic visions which have proved restrictive for understanding socioenvironmental and cultural complexities and led to the worsening of problems of environmental deterioration and social exclusion. Directly and indirectly, this comes to be reflected in health conditions.

With this purpose, this article will present some theoretical and methodological possibilities associated

with the use of participatory methodologies, and in particular action research. Emphasis will be given to the intercultural relations which are established between researchers, agricultural producers and other participants. Finally, a case study of a hydrographic microbasin will be presented to illustrate some aspects of the proposed methodology.

Methodological approach

The planning, management and evaluation of agroenvironmental projects increasingly include consideration of elements of the biological, ecological or socioenvironmental dynamic, principles of

environmental, economic and social sustainability, and the criteria of participation by the social groups involved. Sometimes these demands remain on the drawing board, but in various research and funding institutions, both international and national, sustainability and participation criteria are becoming obligatory. In terms of methodology, these requirements manifest themselves in the adoption of a systemic framework of reference and one based on participatory methods, which include the idea of action research. For a broad overview of the full range of participatory methods, see BROSE (2001).

The sustainability of the technical solutions which result from a project concerns the possibility of predicting and guaranteeing the conditions necessary for its continuity, with the replenishment of natural resources and long-term economic and social viability within the ecosystem in question. In concrete terms, this means an attempt to fit the productive solutions to the characteristics of the soil, the water resources, the energy sources and labor patterns, minimizing the harmful effects in social, environmental and health terms.

Contrary to the immediatist economic logic, which can be reduced to cost variables and profit for economic agents, the new approach requires a range of criteria for socioenvironmental decision-making and evaluation. According to this perspective, biological and environmental knowledge is connected to socioeconomic knowledge. Environmental science is intimately inserted into social process (NORGAARD, 1991). In contrast to economic reasoning restricted to the calculation of the profits of a self-interested agent (*homo economicus*) Enrique Leff proposed the construction of an environmental reasoning, a complex process which integrates new forms of theoretical production, technological development, institutional changes, social transformation and participatory decision-making (LEFF, 1994; 2001a; 2001b).

This socioenvironmental perspective requires a systemic approach, not limited to the analysis of isolated variables, but instead undertaken in a way capable of understanding the whole and the parts in their relations with the whole and seeing the complexity that results from the interaction between the parts. In addition, the idea of sustainability means taking into account a vision of the future. The systemic approach is not limited to the structural, processual and functional aspects of the reality observed in the present. It must also consider the historical dimension, including evolution, an account of the past and a projection of the future, which is obviously subject to conflicts, but which makes it possible to define what is desirable or not.

It is within this same socioenvironmental perspective that participatory methodology has found a new and advantageous field of application. This methodology covers a wide range of methods and techniques for research, teaching, extension, evaluation, management, planning and so on, whose common denominator is the principle of participation, in different

forms and degrees of intensity, of all the actors involved in the problems which are to be solved.

The research is carried out in a space of interlocution where the actors involved participate in the identification and resolution of problems, based on different kinds of knowledge. Participatory methodology is not simply an instrument. It is based on a criticism of the unilateral methodology, on a social criticism of conventional scientific practice and its tendency to dominate, to ignore, to exploit or to extract by force popular or native knowledge.

The adaptation of these methods takes place in practical terms (adaptation and effectiveness of the solutions found), in theoretical terms (comparison of theory and practice, with enrichment of knowledge) and in ethical terms (acceptance, legitimacy of the proposals and solutions in a dialogic and negotiated way).

Participatory methods are applicable in all social areas, in education, in collective health and increasingly in technical activities (organization, ergonomics, engineering, architecture, etc.) and are particularly suitable for agricultural research. In the Pronapa 2005 program (the National Program for Agricultural Research and Development of Embrapa, the Brazilian Agricultural Research Corporation), the development of participatory research appears as a strategic objective, set out as follows: "Develop and adapt participatory research methods, adapting the research activities to the reality of small-scale producers, contributing to the resolution of national social and economic problems and reducing regional imbalances." (Embrapa, 2005).

In the agrarian sciences, action research has been under discussion for a long time, and has sometimes been used in rural extension, technological diffusion (THIOLENT, 1984) and creation of appropriate technology. The methodology has been used for the preparation of projects for associations and cooperatives and the solidarity economy (THIOLENT, 2005b).

Although the relationship between action research and the problem of appropriate technology, or more recently, social technology, has not always been explicit, there are similarities and overlaps in the spirit, in the procedures and in the ways of interacting with rural communities.

Participatory methodology and particularly action research lie at the heart of debates about environmental education (ZART, 2001), the dissemination of information to strengthen participation and sustainability (FURNIVAL et al., 2005) and can, without a doubt, contribute a great deal to preparatory studies for agroenvironmental management.

In projects where microbasins are considered the systemic unit of analysis of agricultural activities, participatory methods are generally recommended especially in relation to family-based agriculture and the organization of communities of small-scale producers.

From the epistemological point of view, the foundations of participatory methodology and action

research have support from critical theory, from some lines of phenomenology and, more recently and increasingly, from new forms of *constructivism* or *social constructionism* (JIGGINS, 1997; GERGEN, 2001).

The prolonged interaction between researchers and actors produces new formulations of knowledge focused on practice. Starting with mapping and systematization, these formulations become knowledge which is appropriated by the users and at the same time, validated on a scientific level by researchers and professionals.

Action research occupies a key position within participatory methods. Its history dates back to the beginning of the 1940s and it is constantly being renewed (MORIN, 2004). It is based on a range of psychosociological, communicational, educational and critical thinking (EL ANDALOUSSI, 2004).

As a research methodology, action research must not be confused with other participatory methods which have different characteristics and aims, such as planning, monitoring and evaluation techniques. It is worth remembering that the main vocation of action research is research, within a process of interaction between researchers and the relevant population, to generate potential solutions to the problems detected. According to LIU (1997) action research is not restricted to the resolution of the practical problems of its users, and must not be misunderstood as just a consultation technique, since its goals also include advancing the underlying knowledge. This entire process takes place in the context of “joint work which consists of mutual learning between researchers and users” (the educational function is developed in detail in certain environmental projects) and within an “ethical framework negotiated and accepted by all” (LIU, 1996).

The results of action research are corroborated in the “modes of resolution of concrete problems encountered during the execution of the project”. The knowledge which is produced is “validated by experimentation”. There is “the formation of a qualified community, with individual and collective competencies” and also “new questions for future research and study” (idem).

The “participation” dimension is fundamental in action research and in all the methods which make up participatory methodologies. Nonetheless, there is always controversy about the scope and effectiveness of participation. As Guivant and Jacobi observe in a text about the management of hydrographic basins:

“Over the last decade the term “participatory approaches” has become part of the discourse of governments, NGOs and the different international development agencies. But the concept of participation can have different meanings, which are not always made explicit. Questioning of an undifferentiated use of the concept of participatory approach has increased, particularly in the literature about sustainable development. One of the points raised is that generally the people formulating policies, development plans and

legislation forget to state explicitly who will participate. In other words, community participation does not always benefit or reach all members of a community in the same way (...). Another problem relates to a tendency to presuppose that the goodwill of experts/technicians can magically dissolve the power relations which they establish with laypeople. These power relations do not disappear but must rather be worked through and negotiated jointly by laypeople and experts.” (GUIVANT, 2003).

Each project or case requires a clear analysis of the participation of the actors and its different effects. The conditions, modalities and the intensity of the participation and the relations between specialists and communities must be monitored. In many projects the participation of the interested parties proves to be rather limited. But in any case, the question of participation must not be reduced to a dichotomy of the “all or nothing” kind. It is necessary to distinguish between the different modalities and levels of intensity. According to the classic lens of Henri Desroche, who developed theories in this area over a long period, there is a range of types of participation, from the incipient to the integral, going via intermediary levels, dependent on the emphasis in the search for explanations, in the application or in the implications (DESROCHE, 2006).

In more practical terms, according to STRINGER (1999, p.35), participation is more effective when it (a) makes possible a significant level of involvement; (b) trains people to carry out tasks; (c) supports people in learning to act autonomously; (d) strengthens plans and activities which people are capable of carrying out on their own; and (e) deals with people more directly, rather than resorting to representatives or agents as intermediaries.

Increasingly, projects are conceived and carried out with multidisciplinary groups working in partnership. The various actors come to an arrangement which will make the implementation of the project possible. In this context, action research must be adapted to maintain an interaction between the actors or partners which results in the production of knowledge (EL ANDALOUSSI, 2004).

The inter-relation between researchers and actors in the action research process, associated with a space of interlocution, results in the construction of knowledge for which it is necessary to understand the cultural dimension and the differences in language, social positions, perceptions and interpretations.

Relations between researchers and communities

In action research projects, it is common for there to be interaction between groups which are socially and culturally different. The actors, the communities or their representatives involved in the research project, and particularly in the interpretation of results and definition of the possible actions to be taken, may encounter misunderstandings or even behave in a way that causes conflict.

In the face-to-face activities of these groups, it is important to observe the symbolic aspects of the language they use and the way they behave and, if possible, map the knowledge and facilitate verbal expression of the different views of the problems being researched and other cognitive aspects which are specific to the actors. In addition, it is necessary to make clear the criteria, norms and values which the different actors accept, respect or reject.

Even in research which is apparently operational or technical in nature, problems associated with differences and relationships arise. One only has to remember the difficulties encountered by agronomists in their contact with producers, where this exists, or between any engineer and the users of the equipment or techniques he or she designs.

To make progress in the practical resolution of this kind of problem, one strategy is choosing to work with professionals who are already aware of and sensitive to the cultural aspects of their role. The technician with a "square" mentality who wants to impose his or her vision, which is a priori rational and supposedly superior to that of other actors, will be of little value. Worse still, a large part of the problem will be worsened by this kind of attitude.

Another aspect of the proposed methodology consists in producing a kind of cognitive mapping of the problems encountered in the situation being researched. This mapping would cover both the representations of non-experts (members of the situation) and that of the specialists and researchers. It is important to show everyone how each of the groups represents the problems, for example, associated with the adoption of a specific kind of planting technique in communities of rural producers. There will not always be overlap in the representations of the different groups. Aspects emphasized by some may be absent from the representation of others. Even if there is not the possibility of complete agreement, an attempt must be made to establish at least which are the areas of possible understanding. In parallel, the areas of disagreement must be made evident as well as the underlying justification. In this way, without a priori about who is right and who is wrong, the points of view and representations of each group are compared. Sometimes the dialogue is difficult: one group is not aware of or does not have access to the knowledge of certain aspects raised by another group. The aim is to move in the direction of consensus, or at least the certification of the areas of compatibility or incompatibility. The solutions imagined by the non-experts are often more appropriate to the context than the solutions proposed by the external experts. The professionals must accept questions and suggestions, which requires humility and capacity for reflection on their part. On the other hand, they must describe in an unbiased way how the actor can accept some aspect of the representation, explanation or solution proposed by the professional. This question must be tabled and solved in practice. The appropriate starting point is

the recognition of the two universes (that of the specialists and that of the non-specialists) based on mapping and the elucidation of the steps to be taken jointly by the interlocutors.

As well as the question of participation, the cultural perception of the meaning of the proposed change is sometimes a delicate issue. The researchers cannot postulate a change without the consent of the interested parties. The ideal situation is when the change is conceived and consciously put into practice by them. On an ethical level, it is no longer possible to impose modernizing changes which do not make sense in the culture of specific social groups. Contrary to common practice in the 1960s and 1970s, modernity must not be imposed without the consent of groups. Resistance to modernity, in the name of tradition, has proved to be a cautious attitude which often corresponds to the preservation of the groups' cultural identity.

An action research project does not impose a predefined transformative action on groups. This transformation only takes place if it is of interest to the groups and is elaborated and put into practice by them. The role of the researchers is limited: they are there only to accompany and encourage certain aspects of the change decided on by the interested parties. If these groups are not in a position to set in motion the actions, the researchers cannot take their place; they will only attempt to understand why that situation arises. In general, the idea that it is possible to unilaterally change the behavior of others must be abandoned. It is the actors themselves who decide if they want to change or not. On an ethical level, the researcher-actor is allowed to help and facilitate a change only if there is consent from the actors directly affected.

A participatory project experience in a microbasin in the north-west of Rio de Janeiro state

Some aspects of the methodology for agroenvironmental management projects can be illustrated through a concrete experience: the Project for the Participatory Management of the São Domingos River Sub-Basin (GEPAR-MBH in the Portuguese acronym), developed in response to the CT-Hidro 02/2002-Finep request for proposals. It involved the participation of research teams from EMBRAPA-Soils, the State University of Rio de Janeiro (Uerj) and the Work and Training Laboratory of the Coordination of Postgraduate Programs in Engineering at the Federal University of Rio de Janeiro (COPPE/UFRJ) and took place in the municipality of São José de Ubá in the north-west region of Rio de Janeiro state in 2003/2004.

Alongside research which took place into the soil and the hydrographic elements, another piece of research was carried out looking at the socioeconomic aspects and the forms of community organization of tomato producers in São José de Ubá.

The aim of this research was to generate information which could be shared and discussed with

the stakeholders in order to, at a later stage, formulate proposed solutions to the socioenvironmental problems faced by the communities, setting in motion a process of shared management of the production of knowledge.

Like many other municipalities in the region, São José de Ubá has signed up to the “technological package” with emphasis on tomato monoculture and the intensive use of chemical fertilizer, without consideration of the climatic specificities of the region, which is characterized by heavy rains in the summer and prolonged dry spells in the other seasons of the year. As a result, many areas fell into decadence since the rains provoke erosion in the summer and off season crops, such as corn, cannot stand the prolonged hot sunshine associated with the dry season. The adoption of this planting system, badly adapted to the climate, soil and vegetation conditions of the north-west region of the state caused serious damage to the environment and to the health of the workers. Environmental and health problems associated with the use of pesticides in the cultivation of tomatoes are long-standing and have already been the subject of studies in the largest production centers of the state of Rio de Janeiro, such as São José de Ubá (CEZAR, 2004) and Paty de Alferes (DELGADO, 2004).

In the communities of São José de Ubá, the field researchers interviewed tomato producers and heard accounts of the inappropriate use of pesticides. According to Costa et al. (2007, p.9): “the most common problems reported were: headache and dizziness, 31%; diarrhoea and vomiting, 19%; allergic reactions, 12%; anorexia and vomiting, 3%; neurological disturbances, also 6.3%; and others, adding up to 25%” (multiple answers, with sum above 100%). It was also found that the pesticides are often applied up to the last few days before harvest, which suggests possible contamination of the products destined for consumers.

Using the participatory methodology developed by the Work and Training Laboratory, action research and participatory management work was carried out, resulting in a gradual process of environmental awareness-raising focusing on the recovery of the São

Domingos river through experimentation with environmental management, the emergence of new local interlocutors (the Management Committee) and the establishment of experimental units. All this work was developed with the participation and consultation of farmers and local leaders, who were “trained” by the team to monitor and discuss the project and carry out management in relation to the project’s own activities and those of the public authorities.

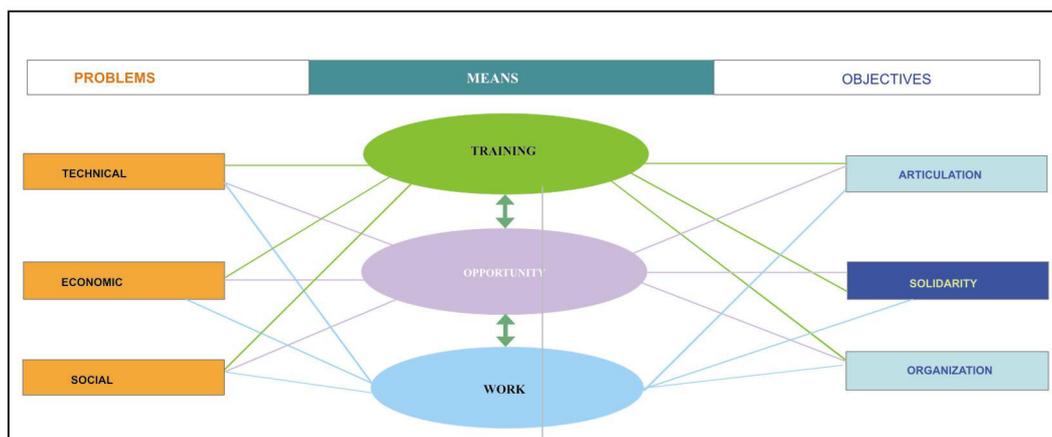
Applied methodology

The outline presented by Fabio Zamberlan (the coordinator of the Work and Training Laboratory) is based on an understanding of the concrete *problems* of the local population – in their technical, economic and social dimensions – aiming to create new forms of community *organization* based on the values of technical strengthening and citizenship. It is worth stating that the case under consideration favors *solidarity* and respect for life and the environment. For this purpose, a new *articulation* between social actors is sought which will be authentic and can be institutionalized in the future, and which is self-organizing (see Figure 1).

The means used for this initiative were: (a) studies of the technical, economic and social viability of the communities’ agricultural production; (b) the resulting generation of contextualized and, if possible, lasting *opportunities*; and finally, (c) *training activities* as part of an ongoing process focused on citizenship.

Given the low participation of local actors in successful community initiatives, a decision was made to begin the project by focusing on the attribute which was most scarce in the local structures: organization. The activities proposed were aimed at mobilizing the local communities and designed to create a basic organizational structure, autonomous from the outset, which would empower those involved to undertake effective fieldwork and circumstantial research. The project therefore began by dedicating a large amount of effort to the creation and consolidation of the Management Committee.

Figure 1 - Problems, means and objectives



Source: COSTA et al, 2007

The Management Committee was seen as a space where the farmers would play an important role in the process of elaborating and implanting the work to be developed in the communities. The confidence of the farmers also serves simultaneously as an indicator of their participation and can be seen in: (a) confidence in themselves (self-confidence), a fundamental condition for gaining autonomy and indicative of this autonomy; and (b) confidence in others, as a basis for building cooperation and synergies, and an indicator of autonomy.

In practice, the “participation” happened on very different levels: consultation about the proposal offering appropriate information and based on prior awareness of the means which would enable the stakeholders to give their opinion; involvement of local actors in the different phases of the proposal, through participation in discussions and decision-making; and attention given to other problems raised by the communities which were not included in the project’s initial objectives.

Activities carried out

The activities carried out for social management and local organization by the social and economic team were: (a) mobilization of the community, culminating in the election of community representatives to serve on the Management Committee and the development of its logo; (b) the implementation of a socioeconomic and environmental census through the application of questionnaires by representatives of the Management Committee; (c) identification of the existing production systems in the area under study; (d) organization of events (field days and technical seminars) with the participation of the project institutions and the producers and local actors, as well as capacity-building courses (integrated pest management); (e) identification of priority themes for project intervention, as follows: poisoning by pesticides, transport, health, roads and means of transportation, medical attention, communication, education and leisure, adjusted to the need to protect the environment; (f) training of technicians from the mayor’s office and the University of Nova Iguaçu to collect blood samples to test for poisoning by pesticides through analysis of alterations in cholinesterase levels; (g) regular monthly meetings with the Management Committee; and finally, (h) production of four information bulletins distributed in the project region.

The development of these activities depended on an understanding of the concrete problems of the local population – in the technical, economic and social dimensions. Visits were therefore made to all the communities in the municipality to find out about them and decide which ones best matched the project objectives.

The first census research carried out by the members of the Management Committee made it possible to organize the information, and it was later necessary to negotiate with them in order to deepen

the research. For this purpose, 17 farmers were trained and took part in the research, and 118 families were identified in 5 communities. The data made it possible to collect the range of information necessary for the knowledge of the local reality which would form the basis of the discussions with the selected communities about solutions to local problems.

In line with the action research strategy, a feedback session was organized with the families who had been interviewed, in which each community could discuss the results of the research and give priority to its areas of interest. Of the 77 questions in the questionnaire, the communities chose eight. The following items were identified as priorities for the Management Committee: (a) the use of pesticides; (b) water usage; (c) health and environment; (d) sales and marketing; (e) professional training; and (f) conservation of the roads.

The research into accidents related to the use of pesticides indicates that 30.5% of the interviewees had already had accidents themselves or had relatives who had had accidents. This percentage is considered high in relation to the number of interviewees. For this reason, this issue was given the highest priority by the communities.

Despite the fact that the majority of the population considered the water to be of good quality (clear and good for cooking), the research found that there were problems with salinity, and that the water was considered bad by 6.8% and average by 4.3% of interviewees. This makes it clear that the fact that the majority of the communities get their water from a spring (88.9%) is not a synonym for good quality water.

As well as the problems identified through the participatory research, the hydrology team identified others, such as: springs without vegetation cover; dry springs; treated animals below the tomato plantation; streams without riparian forest and silt build-up; construction of dams along the São Domingos river; and sewage flowing directly into the river.

Results and ramifications in the communities

Among the project’s consequences or ramifications in the communities, it has been observed that it has had a mobilizing effect with gains in self-esteem and collective capacity-building.

At the beginning of the intervention, the majority of the members of the communities did not feel able to change the situation in relation to several aspects of the social conditions.

An example of this was the Santo Antônio do Colosso community, where the school had been closed for a year. The children had to get up at the crack of dawn and travel by minibus, which took about two hours to get to the town, stopping in all the communities on the way. These difficulties helped to explain the levels of truancy. As a result of the social

and economic actions of the CT-Hidro project, the Santo Antônio do Colosso community reorganized itself and reopened the school.

On their own initiative, the farmers began to carry out wider actions, for example, they: (a) presented their demands to the technicians involved in the project; (b) established the Association of Pesticide Resellers of the North-West Region of Rio de Janeiro State, or ARDANF in the Portuguese acronym, responsible for the construction of a warehouse for receiving empty pesticide containers in the municipality; (c) carried out two collections of blood samples for cholinesterase testing, gathering samples from 60 people of which 50 were rural tomato producers and ten were non-producers.

Based on the positive results obtained in the pilot units, discussions were begun about the proposal to reorient the tomato production so that it would be environmentally friendly. In the specific case of the Barro Branco village, the kitchen-school was reopened for the production of environmentally friendly tomato sweets using fruit discarded due to not being of commercial quality.

Despite its limitations, the São José de Ubá project showed that it is possible to carry out participatory and interdisciplinary research, including the mobilization aspects which are unique to action research, and that this is capable of setting in motion a series of positive outcomes for the organization of producer communities. The procedures adopted revealed the real problems faced by the communities and allowed them to be solved by the team in a more appropriate way than if conventional research methods had been used.

Conclusion

Participatory methodologies and action research have a long history and their fields of application are increasing. In light of the urgent need for solutions to the health, social and environmental problems resulting from the dominant development model, new approaches to agroenvironmental management are emerging which require the participation of stakeholders in different ways and with different levels of intensity, ranging from the direct participation of the producer in the experience to more complex relationships with environmental groups, trade unions, social movements and other public or private bodies in the pursuit of partnership.

The use of participatory methodologies and action research in this context represents a flexible method for a project involving interdisciplinary teams and direct contact with population groups or the affected communities in the resolution of the problems detected. This methodology is subject to experimentation on the level of knowledge and social practice. To avoid the imposition of culturally inappropriate models, projects which are steered by the action research method must be subject to a

rigorous ethical control (both internal and external) before, during and after their implementation (THIOLENT, 2005a, Postface).

The experience of the microbasin project in São José de Ubá confirmed the viability of the application of participatory methodologies and principles of action research within an interdisciplinary undertaking, bringing together elements of hydrology, soil analysis and dealing with the socioeconomic aspects of the organization of the rural communities involved.

With the effective participation of the members of these communities, there was real involvement in the identification and prioritization of the problems and the search for the solutions most appropriate to the context. The interlocution between the actors directly or indirectly involved was organized through a forum and discussion groups. The participation focused on the collective management and decision-making was made possible by the establishment of a locally-implemented management committee. This was the beginning of an empowerment process, promoted by the participatory project, through which the communities got used to the idea of taking responsibility for the management of their productive activities, guaranteeing their sustainability by considering and minimizing the environmental risks, making the production technically and economically viable and transforming their surroundings through improvements in education and transport.

To summarize, participatory methodologies and action research offer promising possibilities for research and activities in the area of agroenvironmental management. However, it is clear that the elaboration and adoption of this methodology still require further development and systematization to guarantee effective results. It is also necessary to strengthen the ethical functioning of projects, to evaluate existing participatory experiences and to find appropriate channels for sharing the results more widely.

Bibliographic references

- BROSE, M. **Metodologia participativa**. Uma introdução a 29 instrumentos. Porto Alegre: Tomo Editoral, 2001. 312p.
- CEZAR, L.H.S. Horticultura do tomate. Questão ambiental e territorialidades em São José de Ubá, Noroeste Fluminense. Rede acadêmica de meio ambiente e desenvolvimento, 2004. Available at: <www.ebape.fgv.br/radma/doc/SMA/SMA-012.pdf>. Accessed: 29 Mar. 2007.
- COSTA, J.R.P.F. et al. **O desenvolvimento social e econômico sustentável**: o caso de cinco comunidades do Município de São José de Ubá. Available at: <http://ich.ufpel.edu.br/economia/professores/xavier/desen_sust_econ_RJ.pdf>. Accessed: 29 Mar. 2007.
- DESROCHE, H. Pesquisa-ação: dos projetos de autores aos projetos de atores e reciprocamente. In: THIOLENT, M. (Org.). **Pesquisa-ação e projeto cooperativo na perspectiva de Henri Desroche**. São

Carlos: EdUFSCAR, 2006 (in print).

DELGADO, I. F.; PAUMGARTTEN, F. J. R. Intoxicações e uso de pesticidas por agricultores do Município de Paty do Alferes, Rio de Janeiro, Brasil. **Cadernos de Saúde Pública**, v.20, n.1, 2004. Available at: <www.scielo.br/pdf/csp/v20n1/34.pdf>. Accessed: 29 Mar. 2007.

EL ANDALOUSSI, K. **Pesquisas-ações**. Ciência, desenvolvimento, democracia. São Carlos: Edufscar, 2004, 192p.

EMBRAPA. Superintendência de Pesquisa e Desenvolvimento. Pronapa 2005. **Programa Nacional de Pesquisa e Desenvolvimento da Agropecuária**. Pronapa, Brasília, v.31, p.1-146, 2005.

FURNIVAL, A.C.; OKI, C.S.; COSTA, L.S.F. Desvelando as práticas culturais na comunicação de informação ambiental para a sustentabilidade. In: FURNIVAL, A.C.; COSTA, L.S.F. (Orgs.) **Informação e conhecimento**. Aproximando áreas de saber. São Carlos: EdUFSCAR, 2005, p.181-211.

GERGEN, K.G. **Le constructionnisme social**. Une introduction. Paris; Lonay (Suíça): Delachaux et Niestlé, 2001.

GUIVANT, J.S.; JACOBI, P. Da hidro-técnica à hidropolítica: Novos rumos para a regulação e gestão dos riscos ambientais no Brasil. **Cadernos de Pesquisa Interdisciplinar em Ciência Humanas**, Florianópolis, n.43, jun, 2003. Available at: <www.cfh.ufsc.br/~dich/TextoCaderno43.pdf>. Accessed: 28 Apr. 2006.

JIGGINS, J.; RÖLING, N. Action reserach in natural resource management. In: ALBALADEJO, C., CASABIANCA, F. (Eds.). **La recherche-action**. Ambitions, pratiques, débats. Etudes et Recherches sur les Systèmes Agraires et le Développement, Paris: INRA, v.30, 1997.

LEFF, E. (Org.). **Ciencias sociales y formación ambiental**. Madri: Gedisa. 1994.

LEFF, E. **Epistemologia ambiental**. São Paulo: Cortez, 2001a.

LEFF, E. **Saber ambiental**. Sustentabilidade, racionalidade, complexidade, poder. Petrópolis: Vozes, 2001b.

LIU, M. **Fondements et pratiques de la recherche-action**. Paris: L'Harmattan, 1997.

MORIN, A. **Pesquisa-ação integral e sistêmica**. Uma antropopedagogia renovada. Rio de Janeiro: DP&A, 2004. 232p.

NORGAARD, R.B. **A ciência ambiental como processo social**. Rio de Janeiro: PTA/FASE, 1991. 19p. (Textos para debate, 35)

STRINGER, E. **Action research**. 2. ed. Thousand Oaks; Londres: Sage, 1999.

THIOLENT, M. Anotações críticas sobre difusão de tecnologia e ideologia da modernização. **Caderno de Difusão de Tecnologia**, Brasília, v.1, n.1, p.43-51, Jan.-Apr. 1984.

THIOLENT, M. **Metodologia da pesquisa-ação**. 14.ed. aumentada. São Paulo: Cortez, 2005a.

THIOLENT, M. Perspectivas da metodologia de pesquisa participativa e de pesquisa-ação na elaboração de projetos sociais e solidários. In: LIANZA, S.; ADDOR, F. (Orgs.). **Tecnologia e desenvolvimento social e solidário**. Porto Alegre: Editora UFRGS, 2005b. p.172-189.

ZART, L.L. A educação ambiental como proposta de superação da instrumentalização do desenvolvimento. **InformaLista**, n.9, 28 Jan. 2001. Available at: <www.apoema.com.br/Informalista9c.htm>. Accessed: 28 Abr. 2006. 

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