

## **Participatory knowledge building as an agricultural extension approach to sustainability**

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### **Abstract**

Agricultural extension has a relevant role in facing the challenges of rural development. New agricultural extension approaches are required to promote a sustainable rural development. Participatory knowledge building is a novel agricultural extension approach proposed by Agroecology Science. The article presents a conceptual review of this approach. Literature review and analysis are conducted as related to knowledge building, agricultural extension, Agroecology and participatory approaches. Moreover, a Brazilian project focused on a participatory approach, called participatory experimentation, is presented. From this review and the Brazilian case, it is possible to affirm that participatory knowledge building is a necessary feature to promote sustainable rural development, if both technical-scientific and traditional knowledge are considered valuable for sustainability.

**keywords:** sustainable rural development; family farming; Agroecology; participation; experimentation; Brazil.

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### **Introduction**

Agricultural extension has a relevant role in facing the challenges of rural development, since it is the main policy associated to farmers' training.

However, the main types of agricultural extension are based on the transfer of modern science knowledge to farmers, in most cases neglecting the farmers' own knowledge.

Farmers' traditional knowledge is mostly based on environmental observation and reproduction of its patterns, as biodiversity usage, soil cover (mulching), water harvest, integrated crop-livestock and others. Moreover, family farming multi-functionality assigns relevant functions to a sustainable rural development, among which we can mention food security, biodiversity preservation, agro-diversity promotion, social reproduction, local development, cultural heritage and others.

Due to these features, the design of new agricultural extension approaches is required: approaches that do not seek to transfer scientific knowledge, but that

pursue novel and appropriate knowledge originating from the dialogue between the technical-scientific knowledge and the traditional one.

Agroecology is one of the sciences engaged in developing this kind of approach, as it is a science that provides a basis to support a process of transition from conventional agriculture models to agriculture styles with ecological or sustainable basis, as well as from a conventional model of development to sustainable rural development (Caporal and Costabeber, 2002).

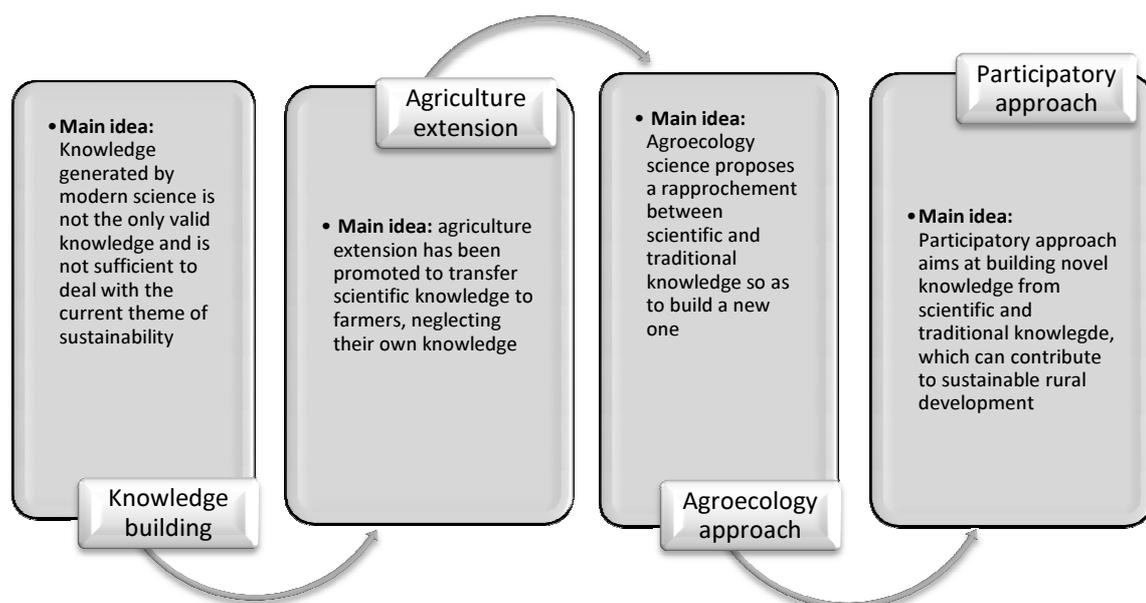
This paper's purpose is to present a concept review on participatory knowledge building and a practical Brazilian case, in order to contribute to the current international discussion on agricultural extension approaches and, potentially, to inspire the formulation and use of agricultural extension new approaches in the public and private sectors as well as in the civil society sphere.

The fundamental research question addressed by this article is the following: Is participatory knowledge building an effective approach for agricultural extension services to promote sustainable rural development?

## Methodology

Our review of literature starts from the main relevant ideas related to the following issues: knowledge building, agricultural extension, Agroecology and participatory approach. A framework (Fig.1) representing the logical sequence of concepts is useful for guiding the literature review.

**Figure 1. A framework of logical sequence of concepts**



After the identification of some key ideas, the literature review was carried out. Based on this review, critical analysis was carried out linking the authors' ideas and producing new ones.

To add a practical perspective, a Brazilian project approach is presented, based on the project reports and field observation.

### **Knowledge building: the gaps among silos**

What legitimized scientific knowledge were its promises: promises of peace, rationality, freedom, equality, progress and sharing the results of this progress. However, these promises have not been kept, and moreover it has turned into an ideology that legitimizes subordination to colonial imperialism (Santos, 2002).

In the name of modern science, alternative knowledge and sciences were destroyed. Thus, many groups were stripped of their resistance mechanisms (Santos, 2002).

Knowledge building in agronomy has also been a result of modern science's historical process. For this reason, to discuss this kind of knowledge it is crucial to describe the pillars on which it is based.

Positivism (Löwy, 2000; Andrey *et al.*, 1988) is modern science's main pillar, which in natural sciences is well represented by Cartesianism as research method. Its concepts - as universal laws, scientific objectivity and neutrality (Japiassu, 1975) - guide modern science. It was developed in the context of the Industrial Revolution, seeking to create technologies aimed at increasing labor productivity and promoting capital accumulation (Japiassu, 1991).

This goal was achieved through knowledge building in a segmented manner, with "specialization" as the key ingredient to productivity building. However, knowledge segmentation promotes a distance between these technologies and the reality to which they are applied. For this reason, there have been several gaps among the knowledge boxes or silos, that is separate compartments, created by modern science.

This logic has been adopted in agricultural sciences, too. Knowledge building moves away from reality, especially from the family farmers' one. The dissemination of this knowledge was put in place by a "classical" agricultural extension.

As noted by Fonseca (1985), this "classical" agricultural extension has aimed at the reproduction of the urban and industrial development historical model, structuring a process of subordination of the countryside to the city, changing habits and practices on behalf of productivity and modernity.

### **“Classical” agricultural extension: a one-way bridge**

Historically in the 1940s, with the beginning of the agricultural extension debate in Brazil, the main goal was the transformation of agriculture through innovation (Queda, 1987). The agricultural extension mission was to approximate agriculture to industrial productivity, which occurred by modernizing the means of production.

In the agricultural modernization context, especially since 1950, agricultural extension was considered the way to educate farmers and get them to overcome their delay (Caporal and Costabeber, 2004), through a vertical process of knowledge generation and transfer, as a one-way bridge.

Agricultural extension sought to spread the Euro-American model of agriculture that offered two different styles of modernization: the European, aimed primarily at increasing the land yield, and the U.S. model, focused on increasing labor productivity through mechanization (Romeiro, 1998).

According to Romeiro (1998), there were two possible ways to adopt these styles of modernization: the purchase of existing technologies and the establishment of research institutions for technological adaptation and creation of solutions appropriate to the country's reality. Notwithstanding the presence of some structured institutions, Brazil opted for importing 'turnkey' technologies, thus demonstrating a lack of commitment to construct a non "excludable" development project (Romeiro, 1998).

According to Caporal and Costabeber (2004), in addition to farmers' education it was also necessary to accelerate intermediate consumption in agriculture, and it favored medium and large producers (while working with small farmers did not produce the expected results). It contributed to environmental damage aggravation and to accelerated social differentiation in agriculture.

With time such negative results of modernization have become more apparent, with farmers' and workers' poisoning, rivers pollution, pests of resistant varieties, useful species' disappearance and transformation of harmless species in pests, inappropriate land management (with no adaptation to tropics and excessive use of mechanization technologies), erosion, compaction and rivers siltation (Romeiro, 1998).

Solidarity between generations of farmers was replaced by the quest for quick individual enrichment and land tenancy. Land fertility was not interpreted as a result of previous generations's work, but an intrinsic feature of nature, ready to be "consumed". The environmental consequences of certain practices were taken into account only when their losses became economic damage, as Romeiro noted (1998).

Beside all the environmental damages observed over the past decades, this agricultural mode of production was also caused the loss of traditional knowledge in terms of ecosystem management capacity and the autonomy of rural populations correlated to this knowledge.

In recent years, the importance of restoring and ensuring the autonomy of these populations has been discussed, firstly because this is their right and secondly because this autonomy generates benefits for the whole society, since these populations can find many of the solutions they need thanks to autonomy. Also meaningful is the importance of traditional knowledge in the search for solutions to current environmental issues, as these populations have been sustaining themselves for countless generations by producing and defending natural resources.

In this sense, "classical" agricultural extension began to be questioned, and today there are efforts to develop collective knowledge building methodologies (Furtado and Furtado, 2000), which seek to regain the autonomy and traditional knowledge of rural population.

### **Agroecology and traditional knowledge**

Agroecology is the science that provides the scientific basis to support the process of transition from a conventional agriculture model to styles of ecological agriculture, as well as from a conventional model of development to a sustainable rural development (Caporal and Costabeber, 2002).

Based on the work of a number of researchers in this area - Altieri, Gliessman, Noorgard, Sevilla Guzmán, Toledo, Leff - Agroecology has been reaffirmed as a multidisciplinary approach that presents a set of principles, concepts and methodologies that allow us to study, analyze, manage, design and assess agroecosystems, the latter being considered as fundamental units for the study of human interventions and planning for sustainable rural development (Caporal and Costabeber, 2002).

The implementation of sustainable agricultural systems depends on profound changes of the current development paradigm of contemporary society. In agriculture, a focus on the local dimension combined with the implementation of agroecological principles ensures the maintenance of local varieties and crops, agricultural biodiversity increase and the reduction of negative effects. It also allows the recovery of local knowledge of traditional management practices, enhancing and revitalizing existing ethno-sciences. Agroecological production systems, by integrating ecological, agronomic and socioeconomic principles, emerge as a concrete possibility of implementing a democratic process of sustainable rural development from local actions, wherein farmers are able to play the role of main actors (Assis, 2006).

According to Moreira (2004), from the Agroecology perspective strategies for a sustainable rural development should be defined on the basis of the participation and identity of each locality.

Over time some participatory methods aimed at addressing issues of sustainable rural development and agroecology were created. These methods seek to foster the participation of individuals in rural areas in decision-making that affects them directly or indirectly.

### **The participatory approach**

Participatory methods have been created with the goal of re-examining the family farmers' importance in the knowledge supply chain, thus lifting them out of the last link of these chains, as occurs within the "classical" agricultural extension (Chambers, 1983). According to Barbier (1996), this type of methodology allows technicians and farmers to seek the causes and solutions to problems reflecting their own experiences.

In recent decades, in reaction to the "top-down" standardized approach, the search for reconciling sustainability urgency and the need to recover and enhance traditional knowledge has expanded and gained increasing consensus in social and agricultural sciences, as well as within entities involved in rural development (Guivant, 1997).

According to Caporal and Costabeber (2004), an agriculture extension focused on sustainable rural development should be guided by the search for strategies that respect and enhance the value of the socio-cultural, historical diversity of social groups, focusing on their co-evolution with the ecosystems where they live.

Traditional knowledge must be respected by technicians, scientists and government officials, because it involves many skills of analysis, such as experimentation, adaptation and innovation of technologies and a set of knowledge in many cases more appropriate to their realities than scientific knowledge (Chambers, 1997).

According to Guivant (1997), the ways wherein farmers organize their properties show an enormous diversity of practices, knowledge, strategies and interests that shape different farming styles behind an apparent uniformity. New technologies are adopted by producers, but in their implementation they are adapted to the productive and family features and natural resources strategies, according to preference values and available knowledge (Guivant, 1997).

However, it is important not to confuse respect and appreciation with a blind faith in traditional knowledge. According to Guivant (2008), to put in place effective participatory methods which allow the real empowerment of local

people, it must be considered that neither technical knowledge as experts nor traditional knowledge are unquestionable. Both have distinct and complementary skills and knowledge that can generate, once in dialogue, more appropriate responses to environmental issues than they can alone.

When participatory methodologies seek to highlight the different types of knowledge and establish a dialogue between them, they enable the rescue of traditional knowledge and can generate new knowledge, one that is better suited to each local reality.

### **Participatory experimentation**

Participatory experimentation is a participatory approach of agricultural extension. This methodology seeks the development of a participatory agriculture through participatory development of agricultural technologies. It can be considered a guidance to strengthen local capacity for experimentation and innovation by farmers (Sevilla Guzmán, 2001).

According to Canuto (2005), participatory experimentation enables the appropriation of knowledge, as it generates results in real conditions and because the experimental areas become places of observation, awareness and exchange in the daily practice of agriculture and host various training events, such as field days, workshops, courses and seminars.

According to Canuto (2005), the areas of participatory experimentation favor the construction of a knowledge embedded within the systems so that it can build bridges between local and scientific knowledge.

The units of participatory experimentation enable triggering processes of agroecological transition, from the gradual construction of a new array of knowledge oriented to sustainability that can become a beacon for local and regional irradiation of knowledge (Canuto, 2005, p.14).

The approach of participatory experimentation was used in the project "Experimentation in Agroforestry and Social Participation", developed in the city of Joanópolis/São Paulo.

### **Experimentation in Agroforestry and Social Participation**

The project "Experimentation in Agroforestry and Social Participation" was developed in the city of Joanópolis, São Paulo State, Brazil, between 2005 and 2010.

**Figure 2. Joanópolis location**

Source: [http://commons.wikimedia.org/wiki/File:SaoPaulo\\_Municip\\_Joanopolis.svg](http://commons.wikimedia.org/wiki/File:SaoPaulo_Municip_Joanopolis.svg) and IBGE/SIDRA *apud* Guyot (2006).

It was developed by the Center for Culture and Extension Education and Environmental Conservation (NACE/PTECA), São Paulo University (USP), College of Agriculture "Luiz de Queiroz" (ESALQ).

The project was aimed at creating sustainable production systems through participatory processes of agricultural extension (NACE/PTECA, 2009).

The approach adopted by the project was based on two fundamental pillars: participation and Agroecology. Its methodological approach was the "participatory experimentation".

This approach was based on the construction of knowledge through dialogue between family farmers and technicians/researchers, and experimentation was chosen, adapted and implemented in the context of participatory agricultural and/or livestock practices.

The project was developed through the following steps: local reality recognition, training process with stakeholders, definition of the group of experimenters' farmers, planning and implementation of experimental areas, monitoring and use of experimental and demonstration areas.

Local reality recognition aimed to obtain a mapping of the region, focusing on the role of agricultural, livestock and forestry activities in the socio-economic dynamics of the city. From the development of a socio-economic and environmental analysis of macro-level and micro-level data on economic aspects the following points emerged:

- the economic activities of the municipality and the importance of the agricultural and forestry sectors, their history and evolution;

- social aspects, in terms of understanding of social groups and institutions that articulate their interests in the municipality;
- environmental aspects, through the survey of natural resources and environmental problems in the region.

This diagnostic lasted about one year.

After the diagnosis, the project proposal was consolidated and a process of farmers' training began. In this phase themes and issues related to the project were explored in order to define discussion and stimulate the exchange of experiences among participants. The phase took the form of modules and workshops, visits to other experiences and addressed the following issues: social skills for group work, reflections on the theme "Environment and Society", specific contents in environment and agriculture.

This training process was carried out with several farmers of the city. Among the latter a group of farmers interested in establishing experimental practices on their properties was selected. The group was composed by thirteen farmers (eight families) who met the project criteria. The criteria were: 1) to have experience with local production systems; 2) to live in rural property and develop some agricultural activity; and 3) willingness to participate in the project, sharing its goals.

**Figure 3. Training process**



Source: Project "Experimentation in Agroforestry and Social Participation" images.

After that, workshops and technical visits were organized so as to facilitate the planning process and the preparation of projects for the implementation of experimental practices.

**Figure 4. Workshop planning and design of the experimental areas**



Source: Project "Experimentation in Agroforestry and Social Participation" images.

Experimental practices were implemented with the aim of turning them into educational tools creating a period and room for reflection among involved farmers on their farming practices, on how to manage the property as a whole and to discuss broader issues of rural development. The idea was also to use these areas as demonstration areas for technicians and farmers from different regions.

The tested practices were grounded on Agroecology basis, including among others: diversification of productive systems and of activities undertaken by farmers, reduction of the use of chemical inputs, use of organic inputs, soil cover with use of green manures, organic matter management.

In the project eight families were directly involved in testing agricultural practices. These families implemented experimental practices in twelve focus areas related to coffee, fruit culture, dairy farming, eucalyptus and restoration of riparian vegetation.

**Figure 5. One of experimental areas of coffee production**



Marking the contour (photo 1), farmers coffee seedlings (photo 2), farmer and coffee in development with other species (photo 3), coffee area seen from afar (photo 4), green manure between the coffee lines (foto5), coffee in development with other species (photo 6).

Source: Project "Experimentation in Agroforestry and Social Participation" images.

**Figure 6. Experimental area of fruit culture**



Source: Project "Experimentation in Agroforestry and Social Participation" images.

**Figure 7. One of the experimental areas of dairy farming**



Farmer planted green manure (photo 1), cattle grazing in the area (photo 2), legume species inserted in the pasture (photo 3).

Source: Project "Experimentation in Agroforestry and Social Participation" images.

**Figure 8. One of the experimental areas of eucalyptus**



Farmers, interns and eucalyptus seedlings (photo 2), 2 years-development eucalyptus (photo 3), view of a eucalyptus (photo 3).

Source: Project "Experimentation in Agroforestry and Social Participation" images.

**Figure 9. One of the experimental areas of restoration of riparian vegetation**



Planting (photo 1), riparian vegetation and native sunflower species - (photo 2), riparian vegetation and native legumes species(photo 3).

Source: Project "Experimentation in Agroforestry and Social Participation" images.

Monitoring of the experimental areas was performed by technical visits; the areas were used as demonstration to other farmers, technicians and other stakeholders by conducting various field days, where farmers and technicians presented and exchanged knowledge related to the experimental areas and rural development as a whole with visitors.

**Figure 10. Technical visits**



Source: Project "Experimentation in Agroforestry and Social Participation" images.

The main outcomes of this project were:

- Changing habits of production to more sustainable practices of agriculture;
- Development of an integrated view of land property management;
- Boosting local relationships;
- Increased importance of producers in relation to rural development;
- Construction of a knowledge better suited to local reality;
- Development of a new form of knowledge building among producers and technicians.

## **Conclusions**

Tackling the current challenges that mankind is facing is not just a question of technical alternatives, but of an alternative thought (Meneses and Santos, 2010).

With regard to rural development, an alternative thought includes alternative knowledge, which goes beyond the scientific knowledge boundaries. Part of this alternative knowledge is already available: the traditional one which however has been depleted, as over the course of time its value was not recognized. Scientific knowledge should maintain its value, but it should also include and respect the traditional one.

Agricultural extension has been the bridge between modern science and farmers. However, this has been a one-way bridge, wherein the scientific knowledge is presented as the only truth.

Participatory approaches for a positive agricultural extension must be developed, applied, evaluated, systematized, and improved with the aim to build a two-way bridge, where different kinds of knowledge can meet each other and build up a new and more proper knowledge.

Some participatory methodologies are already in place, as the Brazilian project presented here. These experiences represent an important progress for sustainability. This is why researches are required to investigate and improve these methodologies.

Agricultural extension policies and technical training must include participation as the heart of knowledge building for a sustainable agriculture and development.

Promoting participation and considering alternative knowledge will not be an easy task for our society, mainly because our behavior regarding knowledge has deep roots in the modern scientific logic, which foresees neutrality and universal laws.

To change this logic, it will be necessary an effort as strong as these same roots.

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