Proceedings of the 13th North American Agroforestry Conference
June 19-21, 2013
Charlottetown, Prince Edward Island, Canada

Laura Poppy, John Kort, Bill Schroeder, Tricia Pollock and Raju Soolanayakanahally, Editors

PROMOTING TREE-BASED INTERCROPPING SYSTEMS IN THE POLITICAL ARENA: A COGNITIVE ANALYSIS OF PUBLIC POLICIES IN AGRICULTURE, NATURAL RESOURCES AND RURAL DEVELOPMENT IN QUEBEC

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ABSTRACT

In Quebec, tree-based intercropping (TBI) systems are considered as potential contributors to climate change adaptation as well as ecological goods and services providers. TBI systems are consequently promoted by stakeholders as complex systems accurately addressing issues related to environmental deterioration, landscape degradation and rural devitalization. However, financing the implementation of these systems on farms remains a challenge. In fact, no clear policy on agroforestry or TBI systems has been developed and implemented yet in the province, complicating the work of both receptive farmers and experts. Thus, we could wonder how the arguments put forward by TBI systems promoters are or can be integrated at all in the mainstream ideas now driving three specific public policies (agriculture, natural resources and rural development).

Our research uses qualitative methods and a content analysis based on Muller's notion of referentials to understand how TBI systems can be integrated in the pre-existing referentials of actors in the agriculture, natural resources and rural development public policies. Based on the analysis of formal publications and semi-directed interviews, our preliminary results show that the referentials driving agriculture, natural resources and rural development policies are slowly shifting from strict economic development to multifunctionality and sustainable development. TBI systems may then have the opportunity to be integrated in these policies' referentials, especially when they are promoted as multifunctional and sustainable systems. Nonetheless, the integration of TBI systems is insufficient to produce large-scale policies given the present policies referentials, but may lead to small-scale initiatives support.

Keywords: tree-based intercropping systems, public policies, cognitive referentials.

INTRODUCTION

A promising system…
Tree-based intercropping systems (TBI) associate annual or perennial crops to widely spaced rows of trees (CRAAQ, 2011). In a context where agriculture faces simultaneously crucial environmental, economic and social issues, TBI systems may be an alternative to conventional land-use systems worth considering (Anel 2007; Tessier *et al.* 2009). Providing many ecological goods and services, these systems have proven to be particularly well-suited to help the

agricultural sector face many challenges related to environmental, economic and social sustainability. On the one hand, their environmental benefits are numerous: they reduce soil erosion, limit water contamination by nitrates (Bergeron *et al*. 2011), improve soil quality (Chifflot *et al*. 2009, Rivest *et al*. 2010) and protect biodiversity and wildlife habitats (Desrochers *et al*. 2010). Moreover, these systems sequester carbon in the tree biomass (both below and above ground) and the soil (Bambrick *et al*. 2010) and may help create a site-scale microclimate regulating humidity and temperature, thus contributing to climate change mitigation and adaptation. On the other hand, these benefits may be obtained while a relatively high crop productivity is maintained and tree growth rate is enhanced, leading to good high-quality timber market opportunities (Rivest *et al*. 2009; 2010). The implementation of paiement mechanism for ecosystem services provision may also be an opportunity to assure the economic sustainability of TBI systems (EcoRessources 2009). Last but least, TBI systems can significantly contribute to create new dynamism in rural collectivities facing landscape degradation problems related to farmland abandonment or agricultural intensification (Anel 2007; Tessier *et al.* 2009; Domon 2011).

… awaiting public support
Although integrated in almost every agricultural context in the tropics, these agroforestry systems are quite rare in Quebec's agricultural landscape, as in most North American landscapes (Garrett, 2011). In Quebec, TBI systems are estimated to cover approximately only 150 hectares (Rivest, 2013, pers. comm.) of the 3,5 M hectares of cultivated land (Government of Quebec, 2013). Indeed, integrating so closely crops and trees in a productive system is nothing but something like a "UAO" (unidentified agricultural object) in the contemporary agricultural landscape. The concept of planting trees and crops in the same field contrasts with the broadly shared assumption among farmers and specialists that trees and crops grow better separately. Moreover, implementing such a practice in Quebec's agricultural context is clearly going against the historical, political and social driving forces that have led to a clear-cut separation between forested and cultivated land in Quebec's landscape (Paquette and Domon, 1993). It is then not surprising that TBI systems adoption rates stay very low in that specific context. In order to tackle this issue, many specialists have pointed out the importance of implementing coherent public policies to make TBI systems truly attractive to farmers (Marchand et Masse 2008, Place *et al*. 2012, Tartera *et al*. 2012). In fact, studies have shown that current policies, in Quebec as in many others developed countries, are still inadequate and maladapted to bring efficient support to these systems (Place *et al.* 2012, Tartera *et al.* 2012).

This situation calls for tremendous efforts to make TBI systems an alternative to conventional land-use systems, and to promote them in every policy sector having a chance to consider these systems as valuable, such as agricultural, natural resources and rural development policies. The success of such an undertaking will depend, as it has already been demonstrated in other fields, on the capacity of TBI systems promoters to understand the major trends and ideas influencing these policy sectors and to adapt their discursive resources to these trends (Fouilleux 2004, Schmidt and Radaelli 2004, Schmidt 2008). In that context, it may be useful, on the first hand, to answer this preliminary question: what policy sector, if any among agriculture, natural resources and rural development, is the most receptive to TBI systems, and therefore the best positioned to integrate these land-use systems in its policies?

This study shades light on the actors and ideas having an influence on the integration of TBI systems in public policies. Using a conceptual framework based on the "cognitive referentials" in public policies developed by Muller (2008), it aims at 1) identifying the cognitive referential in which TBI systems are situated 2) comparing this referential to the referentials currently driving policies in agriculture, natural resources and rural development and 3) analyse the relationships between these referentials and the TBI systems referential in order to determine the policy sector sharing the ideas closest to the ideas put forward by TBI systems promoters. We hypothesize that policy sectors using referentials close to the referential used to promote TBI systems are the best suited to foster TBI systems support. On the contrary, policy sectors using a referential highly contrasting with TBI systems' referential are unable to integrate these land-use systems in their policies.

METHODOLOGY

Public policy referentials as a conceptual framework
Our study uses a conceptual framework slightly derived from the public policy referential framework designed first by Jobert and Muller (1987). Muller defines the policy referential as a shared conception of the place and role of a specific policy sector in the society (Muller 2008: 60). This referential is nothing but a cognitive structure which dictates and justifies the scope and nature of its actions. The referential is made of various levels of perceptions: values, images, norms and algorithms (Muller, 2008). The policy referential may be decomposed in two interrelated parts: the global referential and the specific referential related to the policy sector. The global referential is composed of a hierarchized set of values and norms influencing the society. If conflicting values and norms may coexist in this global referential, some are indubitably, at one given time, more influent than others on policies. In the same way, the sectorial referential is composed of a plurality of hierarchized values, norms, images and algorithms defining the frontiers of the policy sector and justifying its place and roles in the global system of public policies. The sectorial values, norms, images and algorithms that appear to be the most coherent with the global referential will necessarily be the most influent in the sectorial referential.

Consequently, public policies may be seen as means taken by stakeholders to maintain coherence between pregnant values and norms at the global and the sectorial levels, and at the meantime to construct their own vision of the world. When new land-use practices such as TBI systems are presented by stakeholders (in Quebec, mostly scientists and professionals) as potential solutions to public problems, their integration in different policies depends, among many other factors, on their compatibility with the different sectorial referentials used by policymakers in agriculture, natural resources (recovering forestry) and rural development, these referentials all being modulated by the global referential. The core of this system is made by the relations between the sectorial (or policy) referentials and the TBI system referential. This system is schematized in figure 1.
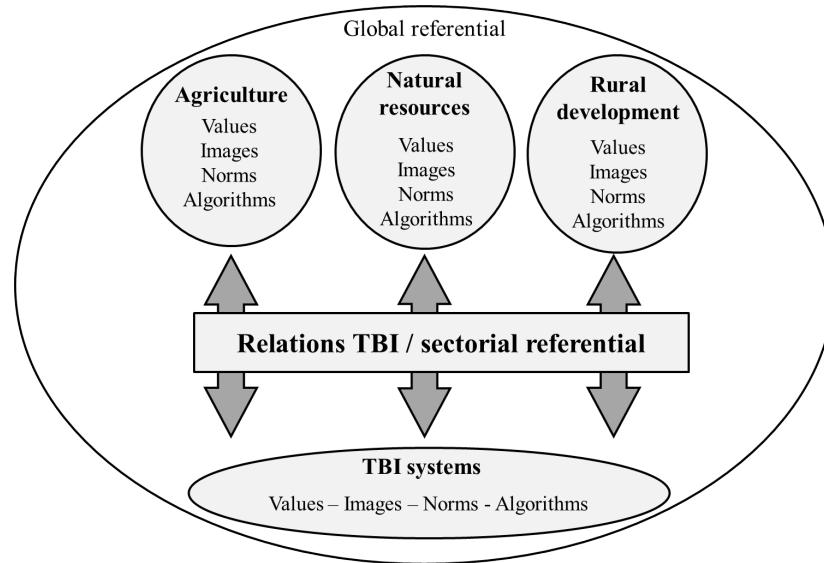
Figure 1. Schematic representation of the relations between referentials.

Data collection and analysis

For the purpose of this preliminary study, data was collected exclusively from written sources. A total of 22 information sources of different kinds (mostly brochures, memoirs presented in parliamentary commissions, web pages and online presentations) produced by scientists, professionals and policymakers to inform or present TBI systems. The documents were codified and analyzed following the content analysis method. QDA Minor (v. 4.0.13) software was used in order to reveal the main values, norms, algorithms and images composing the TBI systems' referential, in order to compare it to the sectorial referentials currently driving policies. Policies in agriculture, natural resources (including forestry) and rural development at the federal, provincial and municipal level were scrutinized and the elements (programs, special funds strategies, etc.) making the integration of TBI systems possible identified, in order to understand the ideas involved in TBI systems' policy integration.

RESULTS AND DISCUSSION

Description and comparison of the referentials

TBI systems' referential is depicted in table 1. TBI systems are promoted as integrated and multifunctional land-use systems in 84,7 % of the documents consulted. They are also presented as land-use systems integrating (or re-integrating) trees in agricultural systems for both productive and environmental purposes, as titles a publication: " hardwood intercropping systems: combining wood and agricultural production while delivering environmental services " (AAFC, 2010). This combination of characteristics creates the image of a complex system fulfilling the need for sustainability and productivity in both agriculture and forestry. TBI systems are also depicted as modern systems (table 1). In more than a third of the documents consulted, promoters underline that TBI systems are not only a reminiscence from the past, but that they have been developed and optimised in the present prevailing conditions, with a strong concern for productivity. TBI systems are therefore presented as systems not only suited for marginalized lands and extensive agricultural management, but also for productive lands.

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Table 1: Images, values, norms and algorithms related to TBI systems' referential

Category	Description	% of documents consulted containing this item
Images	Multifunctional/Integrated	84,7
	New/modern	38,5
	Productive	38,5
	Sustainable agroecosystems	38,5
Values	Environment protection	84,7
	Productivity	66,3
	Rural vitality	46,2
Norms (we have to…)	… integrate trees in the agroecosystem	23,1
	… improve agricultural sustainability	15,2
	… intensify hardwood production	7,7
Algorithms (TBI =…)	Environmental goods and services	46,2
	… better crop productivity	30,8
	… social benefits	30,8
	… economic benefits	23,1

Despite the emphasis put on productivity and environmental advantages, promoters make efforts to describe TBI systems as multifunctional. This conclusion can be drawn by taking a look at the algorithms and norms evocated by TBI promoters. The environmental goods and services (EGS) provided by these systems compose the main algorithms, which are coherent with the norm "land-use systems have to improve agricultural sustainability". Social benefits provided by TBI systems are the second most frequent algorithms presented, equal to algorithms related to productivity (table 1). This clearly shows that it is desirable for TBI systems promoters to manage agricultural land for multiple purposes. It consequently explains why TBI systems are presented as multifunctional systems, even if data on social or economic benefits are not as numerous as environmental evidences. The values driving the necessity of promoting TBI systems are mainly environmental protection, productivity and rural vitality, confirming that TBI systems are situated in a referential of "multifunctional land-use systems". The choice to present TBI systems as multifunctional is coherent with the broader context of agroforestry promotion, which emphases on the multiple functions of the systems combining trees and crops for foresters, farmers and rural communities.

Sectorial and global referentials in agriculture, forestry and rural development
On the other hand, driven by economic profitability, scientific advancements, productivity needs, mechanisation and the expansion of a global market that would put local producers in competition with the rest of the world, policies in agriculture, forestry and rural development have supported the specialisation and the separation of land uses and economic activities, in order to lead to a better economic and social development (Morisset 2010; Coulombe *et al.* 2004). Therefore, modern and coherent agricultural and forestry practices excluded each other, and the images, norms and algorithms used in these sectors were coherent with this dichotomous

evolution. Even in rural policies, the separation between agriculture and forestry was evident (Jean, 2003). This common sectorial referential of "land use specificity" was expressed differently in the three policy sectors, especially through their specific algorithms, but was driven by the same values, images and norms of productivity, intensification and profitability.

In recent years, sectorial crisis in agriculture, forestry and rural development, along with the emergence of concepts such as sustainable development, multifunctionality, ecosystem management and landscape planning, have slightly shaken this global referential separating agriculture and forestry, thus conducting to new sets of small policies and programs dedicated to experiment new ways to manage our resources and occupy our land (MAMROT 2012; MAPAQ 2012, MRN 2012). Despite the emergence of new concepts, the description of the referentials used in the policy sectors and the promotion of TBI systems indicates that multifunctionality is not the mainstream idea currently driving policies in agriculture and forestry. It leads to conclude that multifunctional land-use system can't be fully supported by the current policy frameworks in these sectors, and will probably stay marginally supported until multifunctionality becomes a real driving force in the global or a sectorial referential.

Multifunctionality: the key for TBI systems policy integration?
Although no policy directly supports agroforestry or TBI systems more specifically in Quebec, TBI systems find support in a few policies or strategies in agriculture, forestry and rural development. Rural policies and agricultural policies are currently the most supportive for TBI systems. Two major programs of the rurality policy offer opportunity and funding for TBI systems. All these programs have in common to promote rural vitality, diversification, land-use innovation and imply a collective approach. The agricultural policies integrate TBI systems in four programs, but only three offer direct funding for TBI systems implementation. Moreover, two of these programs are dedicated to specific regions, thus limiting the support. Nonetheless, the agricultural programs integrating TBI systems share common objectives: diversification, concerted agricultural development, landscape improvement and agricultural multifunctionality. The results demonstrate that for rural and agricultural policies, TBI systems are supported on the basis of their potential to combine the effects of many attributes in order to tackle complex land-use problems and provide a broad range of opportunities for rural and agricultural communities. The place given to multifunctionality in these two policy sectors explains the support given to TBI systems.

The situation is quite different for forestry policies. In fact, only one program of tree distribution gives a real support to TBI systems implementation under some conditions. The strategic plan for the hardwood forest and the recent new forest policy contain a few elements related to intensification and productivity that may lead to a better recognition and support for TBI systems. Interestingly, the main objectives of these policy elements are not related to multifunctionality, but to environment protection or wood production intensification. Public policies that do not consider TBI systems as multifunctional land-use systems are not the most supportive, but they can provide support to these systems on the basis of other characteristics.

CONCLUSION

TBI systems are presented in Quebec as multifunctional land-use systems with a good productivity potential and efficiently providing environmental services. From the partial analysis made of the policy context modulating TBI systems recognition and support, evidence arises that TBI systems are best supported through policies tackling land-use issues using multifunctionality as a key concept such as rural and agricultural policies. The analysis also shows that in absence of this multifunctionality concept in a sectorial policy, TBI systems are not adequately supported, but other characteristics may be used as support drivers. Although partial, these results lead to conclude that integrated land-use systems such as TBI systems may receive a marginal support in the current policies referentials, but can't expect large-scale support given the global cognitive referential still clearly separating trees and crops both in minds and landscapes.

AKNOWLEDGEMEN**TS**

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