



Knowledge networks for innovation in the forestry sector: Multinational companies in Uruguay[☆]

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ABSTRACT

In this paper, we analyse the role that inter-agency and inter-business linkages have in the process of technological innovations in the forestry sector in Uruguay. We focus on what types of interaction prevail in the process of creating new knowledge and diffusing existing ones and what role different types of organizations have during this process. This paper offers new insights into the role that innovation in multinational firms has on knowledge creation and diffusion in developing countries as they interact with and reinforce weak sectoral innovation systems. Our findings indicate that multinational companies follow three main strategies to cope with the limitations of the local innovation system: cooperate among them, establish links with international research centres and, have a network of suppliers of technology. The spillovers to local agents are greater in case of networks established with the purpose of generate new knowledge.

1. Introduction

Although different definitions for innovation have been put forward in the literature, probably, the most accepted is the one provided by the Oslo Manual (OECD and Statistical Office of the European Communities, 2005). According to this manual, innovations can be classified in four types: product, process, marketing and organizational. Product innovation implies a good or service that is new or significantly improved. There is process innovation when a new or significantly improved production or delivery method is introduced. Marketing innovation exists when a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing is introduced. Finally, organizational innovation implies a new organizational method in business practices, workplace organization or external relations.

The literature in the last decades has shown that the process of introduction of innovations has a non-linear nature. It is an iterative process that involves various actors (entrepreneurs, public organizations, academic institutions, firms, clients, etc.) that interact through formal and informal networks (Caraca et al., 2009).

To understand this complex process, the innovation system (IS) approach was developed as a policy concept in the 1980s (e.g. Freeman,

1987; Nelson and Rosenberg, 1993). Since then, it has gained relevance in the innovation literature (Lundvall et al., 2002; Edquist, 2001). Lundvall (1992) defines an innovation system as “the elements and relationships, which interact in the production, diffusion and use of new, and economically-useful, knowledge”. Focusing on the IS at a sectoral level, it provides a framework to study how agents interact through networks to introduce novelties (e.g. Breschi and Malerba, 1997).

Despite the growing interest in the innovation process as a system, there is no agreement about the role of different actors in these systems and the type of relationships (training, technical assistance, exchange of information, financial, etc.) that lead to different types of innovation (Tödtling et al., 2009). Within the same country, sectoral differences affect access to resources required for innovation and thus firms' networking strategies (Salavisa et al., 2012).

Some recent studies have analysed the configuration of networks for innovation in high-tech manufacturing: optics and electronics (Quimet et al., 2004); chemicals, biotechnology, telecommunications, and semiconductors (Hagedoorn et al., 2006) and knowledge-intensive business services (Tödtling, 2009). However, only a few studies focus on agro-based sectors that capture a big share of public R&D expenditure in many developing countries. In these studies, network

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analysis has been applied mainly to explain the role of social and inter-agency networks for the diffusion of innovations rather than innovation creation (Perez and Hartwich, 2008; Boahene et al., 1999; Nyblom et al., 2003, and Bandiera and Rasul, 2006).

Kubeczko et al. (2006) and Rametsteiner and Weiss, 2006 study the forest innovation systems in several European countries finding that forestry institutional systems are limited to diffusion programs in selected topics rather than to provide systematic innovation support. Jarský (2015) evaluates the forestry IS in the Czech Republic and concludes that it provides sufficient innovation support but only partially fulfilling its information function. Giurca and Späth (2017) applies an IS approach to study how actors from different sectors interact in an emerging innovation system in Germany. However, these studies do not address in detail the question of how firms develop strategies to generate or incorporate new knowledge in these settings of incomplete IS.

The literature on innovation systems in developing countries converges on the high influence of foreign sources of technology, knowledge and innovation (Pietrobelli and Rabelotti, 2012). However, only a few studies highlight the role that innovation in multinational firms has in knowledge creation in developing countries as they interact with and reinforce the existing sectoral innovation systems (e.g., Niosi and Bellon (1994, 1996) and more recently Carlsson (2006), Fromhold-Eisebith (2007), Spencer (2008), Quan (2010)).

Our work contributes to this literature by considering the international dimension of innovation networks in the forestry sector in developing countries with incomplete IS and analysing the potential of knowledge exchange and collaboration for innovation. In particular, we are interested in the role that inter-agency and inter-business linkages have in the process of innovations. We aim to understand what types of interaction prevail during the creation and diffusion of knowledge and how they favor or not knowledge spillovers. More generally, we expect to contribute to an open question on what is the role that MNC can play for the technological dynamisms of developing countries (Marin and Arza, 2009).

We focus on innovations performed in the primary stage of the forestry value chain. A particular element of the forestry sector in Uruguay is that since the beginning of forestry policies in the country, 40 years ago, the sector has attracted leading international companies with a long history of R&D in their home countries.¹ This peculiarity puts forestry in a different context with respect to the more traditional natural resources activities in which the rule has been that public research organizations and universities have had (or shared) the leadership in knowledge creation and innovation. We understand that this feature represents a challenge for innovation policies, and it could apply to other developing countries.

Uruguay has a production structure that is intensive on natural resources; consequently, it is in these sectors that the greatest public and private R&D efforts are made (Aboal et al., 2017). Forestry in Uruguay is characterized by its recent and increasing production and export dynamism, further propitiating investments in innovation activities.

Our empirical analysis has two parts. First, using micro data from the official Uruguayan Forestry Innovation Survey for the period 2007–2009, we analyse which are the characteristics of the more innovative enterprises in the sector and whether they engage with other actors from the IS to carry out innovation activities (section 4.1). Our objective here is to understand, at a macro-sectoral level, the type of agents and cooperation that help introducing innovations in the forestry sector.

¹ Before 1967 there was no promotion or regulation of forestry activities. In that year, the first forestry law was approved; but it was operative only in 1975. However, it was with the 1988 Forestry Law that the activity was actually promoted with a set of tax incentives. A greater detail of the evolution of the forestry policy in Uruguay can be found in Soust (2012).

Second, in Section 4.2 we provide evidence regarding the inter-organizational interactions in an innovation program carried out by a leading multinational company (MNC), and its implications for the sectoral IS. The program seeks to adapt an imported species to the national climatic conditions to improve forest productivity in cold zones. This case study will allow us to explore how innovation happens in this type of firms, emphasizing the way in which inter-institutional networks develop around an innovation project. We also use this case study to understand whether the relationships between actors are different according to the type of knowledge created or diffused. We apply descriptive network analysis techniques to characterize the network generated by the MNC with national and international actors.

The paper is structured as follows. Section 2 provides a brief overview of the forestry industry in Uruguay. Section 3 presents the methodology. Section 4 discusses the main findings. Conclusions are presented in Section 5.

2. Uruguayan forestry sector

In the past 25 years, the Uruguayan forestry sector has grown steadily. According to official information, the planting surface increased by 30 in that period.² The main use of round wood is in the production of wood pulp (64% of the volume in 2009), but also chips, sawn timber, and pulpwood logs. Exports of forest-based products have grown significantly in the last 10 years. In 2017, the exports of cellulose pulp reached 1.3 billion dollars. Cellulose pulp ranked as the second most exported product in Uruguay, only behind beef-related products. In 2016, Uruguay was the 8th largest exporter of pulp for paper in the world.³ In this context, the sector has gained productive and export dynamics, defining an auspicious setting for augmenting global investments in this activity, particularly for increasing innovation efforts.

Multinational firms account for a big share of wood-related production and exports in the country. As a general feature, these firms have industrial plants and subsidiaries in the primary stage of production. This means they have fully integrated production, starting with locally based tree breeding programs up to pulp production or warehouse.

During the 90s, some global players built plants in the country. Subsidiaries of multinational companies (Shell, Ence, UPM-Kymmene, StoraEnso, Weyerhaeuser) were attracted by Uruguayan tax incentive policies and availability of raw material. By the end of the decade, their plantations dominated most of the forested areas (Durán, 2003). Multinational companies introduced new technologies from abroad and new species and carried on genetic improvement programs that resulted in productivity increases. Innovation efforts were largely concentrated in the adaptation to local conditions of species brought from abroad.

Besides MNCs, > 700 micro, small and medium-size forest producers are part of the forest sector in Uruguay. Many of these firms have little or no capacities to carry out their own breeding development programs. They use mainly those developed by public research institutes or multinational companies.

Three main public R&D institutions are active in forest research: the National Institute of Agricultural Research (INIA), the Technological Laboratory of Uruguay (LATU) and the University of the Republic of Uruguay.

3. Methodology

Although the importance of innovation networks has been emphasized in the literature for a long time, only recent studies have

² Report on Investment opportunities in the forest sector. Uruguay XXI (2013, 2017).

³ Food and Agriculture Organization (FAO) statistics (accessed 08/04/2018): <http://www.fao.org/forestry/statistics/80938@180724/en/>

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