

Innovation in Traditional Food Networks

Xavier Gellynck and Bianka Kühne

Faculty of Bioscience Engineering, Department of Agricultural Economics
Division Agro-Food Marketing, Coupure Links 653, Ghent University
B-9000 Gent, Belgium

Bianka.Kuhne@UGent.be; Xavier.Gellynck@rug.ac.be



**Paper prepared for presentation at the 110th EAAE Seminar ‘System Dynamics and
Innovation in Food Networks’ Innsbruck-Igls, Austria
February 18-22, 2008**

Copyright 2008 by [Gellynck, Kühne]. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Innovation in Traditional Food Networks

Xavier Gellynck and Bianka Kühne

Faculty of Bioscience Engineering, Department of Agricultural Economics

Division Agro-Food Marketing, Coupure Links 653, Ghent University

B-9000 Gent, Belgium

Bianka.Kuhne@UGent.be; Xavier.Gellynck@rug.ac.be

Introduction

In an increasingly globalising market, innovation is an important strategic tool for micro, small, and medium sized enterprises (SMEs) to achieve competitive advantage (Avermaete et al., 2004a; Gellynck et al., 2007; Murphy, 2002). Innovation can be defined as an ongoing process of learning, searching and exploring resulting in new products, new techniques, new forms of organization and new markets (Lundvall, 1995). Innovation is a continuous process characterised by three steps: efforts, activities and results. Efforts are all resources, such as human and financial resources, a firm is investing in activities for the development of innovations. Results are the effects of these innovation activities on tangible (e.g. growth of market share, profit) as well as less tangible aspects (e.g. firm stability, efficiency) (Gellynck et al., 2006). Consequently, the measurement of innovation competences captures also the progress in developing an innovation and not only the result, such as the successful implementation of innovation (Gellynck et al., 2007).

SMEs mainly focus on innovation that improves products and processes and which reduces costs (Scozzi et al., 2005), but seldom on organisational innovation (Humphreys et al., 2005). Although, the implementation of organisational innovation facilitates innovation processes in a firm (Ussman et al., 1999) and contributes to the performance and effectiveness of SMEs as well as their networks (Gellynck et al., 2006; Murphy, 2002). Organisational innovation is widely understood as ‘innovation in organisations’ and is used to understand how organisations are able to successfully promote and develop innovations (Read, 2000). Subsequently, many scholars define organisational innovation as an initiator for new products, services, processes, structures, or policies that are new to the organization (e.g. Damanpour, 1991; Hage, 1999; Read, 2000; Yamin et al., 1997). However, in this paper organisational innovation is not investigated in its role as initiator for further innovations. Instead, the focus is on actual organisational innovations, which are understood as an incremental and continuous process of generating, adopting and implementing an idea or behaviour being new to the organisation resulting in a new system, policy, management practice, or external relation (Alasoini, 2001; Hage, 1999; Murphy, 2002; Read, 2000). Other examples of organisational innovation are changes in staff policy, new management practices for R&D, as well as vertical networking (Alasoini, 2001; Avermaete et al., 2003).

The innovation competence of a firm is dependent on its internal and external resources (Avermaete et al., 2004b). Internal resources contain a large number of firm characteristics, such as the R&D structure, qualified staff, experience of the manager, the openness toward new ideas, financial structure, and firm’s size (Diederer et al., 2000; Fey and Birkinshaw, 2005; Grünert et al., 1997). External resources belong to the firm’s strategic environment and include the potential of business-to-business relationships, available infrastructure for collaboration and net-

working, and access to support from research providers and government (Avermaete and Viaene, 2002; Scozzi et al., 2005; Ussman et al., 1999).

Further, recent studies indicate that the network, a firm is embedded in, is increasingly becoming more important for the development and implementation of innovation than the firm itself (Omta, 2002; Pittaway et al., 2004). Networks increase the flow of information and thus play an important role for the diffusion and adoption of innovations (Pittaway et al., 2004). Hence, a network is the place where actors within one or between several related industrial sectors interact and collaborate to add value for the customer (Omta, 2004). Two different forms for networks can be distinguished. Horizontal networks relate to collaboration among firms which are primarily competitors. Meanwhile, vertical networks refer to collaboration of partners belonging to the same supply chain network (Omta, 2004). The supply chain network includes all the organizations (suppliers, focal companies, customers, and third parties) involved in all the upstream and downstream flows of products, services, finances, and information (Van der Vorst, 2000). The focal company is hereby the food manufacturer. Third parties embrace institutions such as research organisations, governmental institutions, and financial providers all related to one supply chain network. In consequence, a network is the place where the internal and external resources of a firm are combined and transformed into innovation (Gellynck et al., 2006). Through the optimal use of both internal and external resources in the network, a firm can become innovative and able to achieve competitive advantage (Cassiman and Veugelers, 2002; Lengnick-Hall, 1992).

However, most SMEs face numerous problems regarding the introduction of innovations. SMEs are mainly not aware of the importance of being innovative and face limited organizational capabilities, due to a lack of managerial competencies and experiences, and lack of strategic vision (Avermaete et al., 2003; Scozzi et al., 2005). Further difficulties for the development and implementation of innovation appear if the firm has problems with the allocation and coordination of resources, collection of relevant information and knowledge, and when learning is not included in the innovation process (Scozzi et al., 2005). These obstacles can be overcome through collaboration between the partners of a network.

The value of collaboration for innovation is the fast building of a complex knowledge base and diffusion system of innovations through streamlining information flows (Pittaway et al., 2004; Sawhney et al., 2006). Ideas for innovations can be derived from exchange and alliances with suppliers and customers, participation at fairs and exhibitions, and R&D activities (Scozzi et al., 2005). Collaboration is the way how network partners work actively together to achieve common objectives by sharing information, knowledge, profits, and risks and benefits (Gruat La Forme et al., 2007; Omta, 2002). Collaboration in the network offers opportunities for new relationships, links or markets and allow access to new or complementary competencies and technologies (Lazzarini et al., 2001; Lowndes and Skelcher, 1998; Pittaway et al., 2004). Thus, SMEs are more innovative when they are able to join and manage network activities (Avermaete and Viaene, 2002; Gellynck et al., 2006). Successful collaboration is based on sharing information with all partners of the network, cooperative behaviour among network members, and clear communication of well defined goals and expectations. But also the share of risks and benefits along the network are reasons for successful collaboration, because it improves the teamwork and focuses on common goals among all network members (Elmuti, 2002; Fearne and Hughes, 1999). In the opposite, collaboration can fail due to lack of trust between network members, lack of understanding the benefits of collaboration, and lack of strategic vision (Elmuti, 2002; Fearne and Hughes, 1999; Scozzi et al., 2005).

In the frame of this paper the focus is on traditional food networks, which contain a large majority of SMEs. Within the EU an increasing interest is noticed in preserving its cultural heritage characterising the different European regions (EC, 2006a; EC, 2006b). An important element of the cultural heritage is the production of traditional food products. Only few studies about traditional food products are published (Jordana, 2000; Trichopoulou et al., 2006). Even less studies are in reference to innovation in this specific food sector. The increasing demand for traditional food products in combination with the importance of organisational innovation to gain competitive advantage, underlines the great interest to carry out research in this field (Edwards et al., 2005; Humphreys et al., 2005). Studying the traditional food sector requires a clear definition. In the context of our study, we define traditional food according to four criteria: (1) the key production steps of a traditional food product must be performed in a certain area, which can be national, regional or local. (2) The traditional food product must be authentic in its recipe (mix of ingredients), origin of raw material, and/or production process. Further, (3) the traditional food product must be commercially available for at least 50 years and (4) it must be part of the gastronomic heritage.

Thus, the present paper aims to investigate how SMEs achieve organisational innovation through collaboration with their partners in the traditional food network. Subsequent three research questions occur: (1) What kind of networks exists in the traditional food sector?, (2) Which innovations are implemented by traditional food producers? – with particular focus on organisational innovation, and (3) What are the main barriers for innovation in traditional food networks?

This paper is structured as follow: In the subsequent section the methodology of our research is described followed by a discussion of the research results. Finally conclusions are drawn.

1. Methodology

Based on a literature review on bottlenecks and success factors of SMEs in relation to innovation, a focus group discussion guide (FG-DG) was set up to explore determinants of these bottlenecks and success factors. The guide contains items related to innovation and network management. The present paper discusses results from these parts, particularly related to networking and collaboration.

A pilot test was conducted in one chain to test the FG-DG, which led to adaptations, particularly regarding the length of the session. In addition the compilation of the groups needed to be modified. Originally, the focus group was compiled of 8-10 participants from the same sector of which 60% were managers from focal companies (traditional food producers), 20% were raw material suppliers and 20% were distributors. This composition was not delivering satisfying outcomes during the pilot test, due to disagreements between raw material suppliers and distributors based on their firm size and power position in the chain. Therefore it was decided not to invite these two groups of respondents to the same focus group, but separately. It means that focal companies were put together with raw material suppliers on the one hand and focal companies with distributors on the other.

The qualitative explorative research was conducted in three European countries, which represent different cultural heritages – Northern Europe (Belgium), Southern Europe (Italy) and Central Europe (Hungary). The research was conducted between March and May 2007. In each

country, data were collected from food manufacturers, distributors, and raw material suppliers belonging to the traditional beer, cheese, ham, sausage or white paprika supply chain network. Food manufacturers were selected based on our definition for traditional food products and based on the characteristics for SMEs (EC, 2003). In case the requirements were not fulfilled the respondent could not be considered as traditional food producer. The other chain members were selected based on their importance for the focal companies in producing traditional food. In each country two traditional food products are chosen as case studies. Per product type, two focus group sessions were organised. In two countries focus groups were conducted, compiling focal companies with raw materials suppliers in the one focus group and focal companies with distributors in the other focus group (50%-50%). Furthermore, in each focus group it was aimed to assemble firms of the same size. The participants of the focus groups were first contacted by phone to introduce the aim of the focus groups. In Belgium, in-depth interviews are conducted instead of focus groups because of high respondent refusal to participate in focus group discussions (see Table 1. Sample description of focus groups and in-depth interviews 1).

Table 1. Sample description of focus groups and in-depth interviews

Region / Method	Product type	Participants ^a
HUNGARY		
Focus group 1	White pepper	4 medium sized white pepper processing companies 5 retailers/distributors (small shop owners)
Focus group 2	White pepper	2 medium sized white pepper processing companies 6 white pepper growers
Focus group 3	Dry sausage	2 medium sized dry sausage manufacturer 7 animal breeders
Focus group 4	Dry sausage	2 small sized dry sausage manufacturer 1 medium sized dry sausage manufacturer 6 retailers (2 supermarket chains, 4 small shop owners)
ITALY		
Focus group 1	Dry ham	4 small sized ham producers 4 suppliers
Focus group 2	Dry ham	4 medium sized ham producers 4 distributors
Focus group 3	Cheese	4 small sized cheese plants 4 suppliers
Focus group 4	Cheese	4 medium sized cheese plants 4 distributors
BELGIUM		
In-depth interviews	Cheese	4 micro sized cheese plants 1 medium sized cheese plant 2 milk supplier 2 distributors/retailers (small shop owners)
In-depth interviews	Beer	2 micro sized breweries 2 small sized breweries 1 medium sized brewery 1 supplier of malt 2 distributors/retailers (retail and wholesale)
TOTAL	6 Product types	84 participants

- a. Micro sized enterprise: < 10 employees, maximum EUR 2 million annual turnover
 Small sized enterprise: < 50 employees, maximum EUR 10 million annual turnover
 Medium sized enterprise: < 250 employees, maximum EUR 50 million annual turnover

2. Results

In this section the results from the qualitative research are presented. First, it is presented what kind of networks exists in the traditional food sector and what there success factors and bottlenecks are. Secondly it is described which innovations are considered in the traditional food sectors.

2.1 Networks in the traditional food sector

In the investigated countries both vertical and horizontal networks exist. However, the intensity of using the network differs.

Horizontal networks between firms which are primarily competitors are well developed when a consortium is involved setting the manufacturing rules of the product and guaranteeing the quality towards third parties. Besides, collaboration of small group of producers exists for the achievement of national and European protection of geographical indications. These relationships are mainly based on acquaintance and mutual trust. However, mainly there is no collaboration between competitors in horizontal networks in the traditional food sector, due to conflict of interests, strong competition, no understanding of benefits of collaboration, and too conservative attitudes of the traditional food SMEs.

In addition, traditional food manufacturers collaborate with research institutions, food federations, governmental institutions, communication agencies, and international initiatives to achieve certain aims. Collaboration between focal companies and research institutions, such as universities and vocational schools, and food federations focus on the improvement of product and process innovations the traditional food products. These networking activities are mainly based on the common objective to improve quality assurance schemes and achieve traceability. Collaboration with food federations, governmental institutions, and communication agencies is mainly aiming at the improvement of the image of the traditional food product on national and international level. One respondent mentioned that he is participating in an international initiative, which is promoting the regional cuisine and cultural heritage.

Vertical networks exist between the focal company and the direct supply chain members, means the supplier and the customers of the food manufacturer. Vertical networks are hampered by a high lack of trust, lack of potential partners and lack of understanding the benefits of collaboration along the chain and with third-parties.

2.2 Innovation in traditional food networks

Members of traditional food networks mainly focus on innovations related to product characteristics, such as new size or new product composition, and less on organisational innovation (see Table 2. Innovations in the traditional food sector (per country)²). However, the raw materials as well as the production process may not be changed too much through innovation to maintain the traditional character of the product. In general, innovation in traditional products is only acceptable when it ensures the maintenance and/or supports the improvement of the image of the traditional food product.

Product innovations include also packaging innovation and new combinations of products packed together. For packaging innovation the respondents state that the design of the package should be changed carefully because of the long adaptation time of the consumer to a new designed package containing the same product. Another product innovation is to consider new

ways of usage of the traditional product in further processed products, such as the use as an ingredient for (industrial) food preparations of ready-to-eat or ready-to-cook meals. Process innovation is considered in only one country in order to improve the quality assurance and traceability along the network. In the other countries process innovation is not considered as feasible for traditional products or even as a deviation from master's rule established by a producer consortium. In all countries, the use of alternative distribution channels, such as small specialised shops, are mentioned in relation to market innovation. Furthermore, a small shop owner stated that market innovation would be to search for not widely known traditional food products and to increase their marketability.

Since the focus of this paper is on organisational innovation it is notable that the respondents did not mention organisational innovation in the first place. When they were asked how they could improve innovation activities together with other players of the chain, they mentioned joint product development and formation of joint research organisations or networks. The implementation of innovation by traditional food SMEs is mainly hampered by lack of human and financial resources and the lack of knowledge of appropriate methods.

Table 2. Innovations in the traditional food sector (per country)

Type of innovation	Hungary	Italy	Belgium
Product innovation	Changes in product composition Package innovation without changing the design too much	New feeding stuff Package innovation New product combinations packed together New ways of usage of the traditional product	New product size and/or form New product composition New use of product in food preparations
Process innovation	-	- (change in process would be deviation from master's rule)	New technical solutions to improve quality assurance and traceability along the SC
Market innovation	Use of alternative distribution channels (e.g. specialised small shops)	Use of alternative distribution channels (e.g. specialised small shops)	Use of alternative distribution channels (e.g. specialised small shops) Search for not widely known traditional food products and supporting their marketability
Organisational innovation	Formation of membership based research organisations	-	Joint product development activities Formation of innovation networks supported by the government

Source: own data

3. Conclusions and future research steps

Our paper explores the kind of networks existing in the traditional food sector and the innovation implemented by traditional food SMEs. Both, horizontal and vertical networks exist in the traditional food sector. The SMEs use these networks to achieve in particular product innovations. Only few SMEs use the networks to achieve other forms of innovations. Our particular focus is on organisational innovation in SMEs. However, it is hardly the focus of the traditional food network members. They limit it to joint research activities. Implementation of new management tools or changes in staff policy, purchases and sales are not considered by them.

Input and ideas for innovation are mainly received from collaboration with research institutions and food federations. However, the main barriers for innovation in the traditional food networks are the lack of understanding the benefits of networking activities for innovation, the lack of trust, the lack of knowledge of appropriate methods and skills, and the lack of financial and physical resources.

Successful SMEs use their network to overcome lacks of knowledge, lack of information and for creating possibilities of joint use of resources, such as access to information, new technologies, financial and human resources. The most important success factor is the ability of a firm to join and manage participation in collaborations with its chain members, because this offers the easiest and fastest access to new information and complementary resources. If a firm lacks this ability, it limits its knowledge base and reduces its chance to enter collaborations in the future (Pittaway et al., 2004). The reason for lacking collaboration capabilities lies not exclusively in the firm itself, lacking trust among network members and inappropriate or no knowledge of feasible network management techniques to assure the confidentiality of exchanged information are hampering the development of innovation as well.

In future quantitative research, different forms of networks, such as regional, local or sector specific networks, should be explored in relation to their input on the innovation process and their efficiency and sustainability.

Acknowledgments

We would like to thank our partners of work package 5 in the - TRUEFOOD- "Traditional United Europe Food", Integrated Project financed by the European Commission under the 6th Framework Programme for RTD, Contract n. FOOD-CT-2006-016264. The information in this document reflects only the author's views and the Community is not liable for any use that may be made of the information contained therein.

References

- Alasoini, T. (2001). Promoting network-based organizational innovations: a new approach in Finnish labour and technology policies. *International Journal of Technology Management*, Vol. 22(1/2/3), p 174-188.
- Avermaete, T. and J. Viaene (2002). On Innovation and Meeting Regulation - the Case of the Belgian Food Industry. DRUID Summer Conference on "Industrial Dynamics of the New and Old Economy - who is embracing whom?" Copenhagen/Elsinore, 6-8 June 2002.
- Avermaete, T., J. Viaene, E. J. Morgan and N. Crawford. (2003). Determinants of innovation in small food firms. *European Journal of Innovation Management*, Vol. 6(1), p 8-17.
- Avermaete, T., J. Viaene, E. J. Morgan and N. Crawford (2004a). The impact of firm characteristics and macroeconomic performance on innovation in small food firms: Case study from Belgium, Ireland and UK. IN: *Innovation in Small Firms and Dynamics of Local Development*. Eds: T. de Noronha Vaz, J. Viaene and M. Wigier. Warsaw: Scholar Publishing House, p 79-95.
- Avermaete, T., J. Viaene, E. J. Morgan, E. Pitts, N. Crawford and D. Mahon. (2004b). Determinants of product and process innovation in small food manufacturing firms. *Trends in Food Science & Technology*, Vol. 15(10), p 474-483.
- Cassiman, B. and R. Veugelers. (2002). Complementarity in the innovation strategy: internal R&D, external technology acquisition, and cooperation in R&D. IESR Research Division, p 1-32.
- Damanpour, F. (1991). Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators. *Academy of Management Journal*, Vol. 34(3), p 555-590.
- Diederer, P., H. Van Meijl and A. Wolters. (2000). Eureka! Innovatieprocessen en innovatiebeleid in de land- en tuinbouw. LEI. Den Haag. p 89.
- EC (2003). Commission of the European Communities, Commission Recommendation (EC) No 361/2003 of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. Brussels.
- EC (2006a). Commission of the European Communities, Council Regulation (EC) No 509/2006 of 20 March 2006 on agricultural products and foodstuffs as traditional specialties guaranteed. Brussels.
- EC (2006b). Commission of the European Communities, Council Regulation (EC) No 510/2006 of 20 March 2006 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs. Brussels.
- Edwards, T., R. Delbridge and M. Munday. (2005). Understanding innovation in small and medium-sized enterprises: a process manifest. *Technovation*, Vol. 25, p 1119-1127.
- Elmuti, D. (2002). The Perceived Impact of Supply Chain Management on Organizational Effectiveness. *The Journal of Supply Chain Management: A Global Review of Purchasing and Supply*, Vol. 38(3), p 49-57.
- Fearne, A. and D. Hughes. (1999). Success factors in the fresh produce supply chain: insights from the UK. *Supply Chain Management*, Vol. 4(3), p 120-128.
- Fey, C. F. and J. Birkinshaw. (2005). External Sources of Knowledge, Governance Mode, and R&D Performance. *Journal of Management*, Vol. 31(4), p 597-621.
- Gellynck, X., B. Vermeire and J. Viaene. (2006). Innovation in the Food Sector: Regional Networks and Internationalisation. *Journal on Chain and Network Science*, Vol. 6(1), p 21-30.

- Gellynck, X., B. Vermeire and J. Viaene. (2007). Innovation in food firms: contribution of regional networks within the international business context. *Entrepreneurship & Regional Development*, Vol. 19(3), p 209-226.
- Gruat La Forme, F.-A., V. Botta Genoulaz and J.-P. Campagne. (2007). A framework to analyse collaborative performance. *Computers in Industry*, Vol. 58, p 687-697.
- Grünert, K., H. Harmsen, M. Meulenberg, E. Kuiper, T. Ottowitz, F. Declerck, B. Traill and G. Göransson (1997). A framework for analysing innovation in the food sector. IN: *Product and process innovation in the food sector*. Eds: B. Traill and K. G. Grünert. Suffolk: Chapman & Hall, p 1-33.
- Hage, J. T. (1999). Organizational Innovation and Organizational Change. *Annual Review of Sociology*, Vol. 25, p 597-622.
- Humphreys, P., R. McAdam and J. Leckey. (2005). Longitudinal evaluation of innovation implementation in SMEs. *European Journal of Innovation Management*, Vol. 8(3), p 283-304.
- Jordana, J. (2000). Traditional foods: challenges facing the European food industry. *Food Research International*, Vol. 33, p 147-152.
- Lazzarini, S. G., F. R. Chaddad and M. L. Cook. (2001). Integrating supply chain and network analyses: The study of netchains. *Chain and network science*, Vol. 1(1), p 7-22.
- Lengnick-Hall, C. A. (1992). Innovation and Competitive Advantage: What we know and what we need to learn. *Journal of Management*, Vol. 18(2), p 399-429.
- Lowndes, V. and C. Skelcher. (1998). The dynamics of multi-organisational partnerships: An analysis of changing modes of governance. *Public Administration*, Vol. 76(2), p 313-333.
- Lundvall, B. (1995). *National systems of innovation: towards a theory of innovation and interactive learning*. London, Biddles Ltd.
- Murphy, M. (2002). *Organisational Change and Firm Performance*. OECD Science - Technology and Industry Working Papers, Vol. 2002(14), p doi:10.1787/615168153531.
- Omta, O. (2004). *Management of Innovation in Chains and Networks*. IN: *The Emerging World of Chains and Networks*. Eds: T. Camps, P. Diederer, G. J. Hofstede and B. Vos. 's-Gravenhage: Elsevier Juridisch (Reed Business Information bv).
- Omta, O. S. W. F. (2002). Innovation in chains and networks. *Journal on Chain and Network Science*, Vol. 2(2), p 73-80.
- Pittaway, L., M. Robertson, K. Munir, D. Denyer and A. Neely. (2004). Networking and innovation: a systematic review of the evidence. *International Journal of Management Reviews*, Vol. 5-6(3-4), p 137-168.
- Read, A. (2000). Determinants of Successful Organisational Innovation: A Review of Current Research. *Journal of Management Practice*, Vol. 3(1), p 95-119.
- Sawhney, M., R. Wolcott and I. Arroniz. (2006). The 12 different ways for companies to innovate. *MIT Sloan Management Review*, Vol. 47(3), p 75-81.
- Scozzi, B., C. Garavelli and K. Crowston. (2005). Methods for modeling and supporting innovation processes in SMEs. *European Journal of Innovation Management*, Vol. 8(1), p 120-137.
- Trichopoulou, A., E. Vasilopoulou, K. Georga, S. Soukara and V. Dilis. (2006). Traditional foods: Why and how to sustain them. *Trends in Food Science & Technology*, Vol. 17, p 498-504.
- Ussman, A., M. Franco, L. Mendes and A. Almeida (1999). Are SMEs Really Innovative? A Study Regarding the Main Difficulties in Portuguese SMEs. Conference Paper No. 78, Conference of the International Council for Small Business (ICSB), Small Business Advancement National Center, Naples / Italy.

- Van der Vorst, J. G. A. J. (2000). Effective food supply chains: generating, modelling and evaluating supply chain scenarios. Wageningen University. Doctor Thesis. Advisor: Ir. A. Beulens and Dr. P. Van Beek. Wageningen. p 325
- Yamin, S., F. Mavondo, A. Gunasekaran and J. C. Sarros. (1997). A Study of Competitive Strategy, Organisational Innovation and Organisational Performance among Australian manufacturing companies. *International Journal of Production Economics*, Vol. 52, p 161-172.