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Full Length Research Paper

Examining the New Roles of Intermediaries in Agricultural Extension Education, such as Facilitation and Brokerage

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This work's goal is to examine the function of intermediaries in agricultural and rural development by conducting a literature review. First, a broad overview of the functions of intermediaries is given, with an emphasis on the two primary categories of intermediates—brokers and facilitators—as they are portrayed in the literature. According to the shift from reductionist to systemic science and from the expert syndrome to participatory development, the rise of facilitators and brokers in agricultural literature is then examined. Such shifts allow for the emergence of a facilitation model and provide a significant challenge to the prevalent Transfer of Technology extension paradigm; this is further supported by the discourse and practice of sustainability. Consequently, the concept of "intermediation" needs to change from exploitation to exploration, that is, from disseminating information to facilitating co-learning or from old to new KIBS. Such an argument is illustrated with several instances from agriculture-related literature (and practice). According to this research, intermediates as co-learning facilitators represent relatively novel professions needing specialized and, for the most part, untested skills, at least from the perspective of agriculture-related theory and practice. Given that a number of problems still threaten the effectiveness of intermediaries (brokers and facilitators), it is argued that better definitions, operational definitions, and evaluations of facilitation and brokerage are urgently needed in order to improve practice interpretation and guidance.

Key words: Aagricultural extension, advisory services, intermediaries, facilitators, innovation brokers, KIBS.

INTRODUCTION

The current, difficult landscape for agricultural/rural extension and education is illustrated by changes in the following areas: a) how innovation is thought of (i.e., innovation systems approaches replace the linear view of innovation; innovations encompass not only technological but also social and organizational issues); b) how the agricultural knowledge infrastructure is developed (i.e., commercialization and privatization of extension services; sustainability of production systems; multifunctionality; specialization, globalization, and the change of markets); and c) how the supply and demand sides of the agricultural knowledge infrastructure (i.e., traditional providers of knowledge and technology face the challenge of becoming more client-oriented as well as a new, pluralistic organizational landscape). This suggests that, in terms of acquiring knowledge and technology, agriculture is becoming more and more like non-agricultural sectors.

For instance, the changes pertaining to innovative thinking are the most noticeable of the aforementioned modifications. In fact, a variety of new systems of innovations (Sol) approaches have surfaced in the non-agricultural literature in recent decades. These include the sociotechnical systems approach (e.g. Bijker, 1995; Geels 2004), the technological systems approaches (e.g. Hughes, 1987; Carlsson and Stankiewicz, 1995), and the national systems of innovation approach (e.g. Edquist and Johnson, 1997; Lundvall, 1992; Nelson, 1992). These methods view

innovation as systemic and interactive, meaning that it arises from networks of players as a technical, nonlinear, social, and institutional process that involves interactive learning. At the same time, new ideas and methods are becoming more significant. Evidence-based practice, which "integrates best available research evidence with practitioner expertise and the client/population's needs, characteristics, values, and preferences," Knowledge Translation, Knowledge Transfer and Exchange (KTE), or the "interactive interchange of knowledge between research users and researcher producers," to "increase the likelihood that research evidence will be used in policy and practice decisions and to enable researchers to identify practice and policy-relevant research questions," and Knowledge Management (KM), which "encompassing any processes and practices concerned with the creation, acquisition, capture, sharing, and use of knowledge, skills, and expertise" (Swan et al., 1999; see also Hinton, 2003).

The term "implementation research" (Shea, 2011) refers to "the exchange, synthesis, and ethically sound application of knowledge within a complex system of interactions among researchers and users" (Mitchell et al., 2010).

These and other pertinent ideas and methods build upon networks as social processes that promote information sharing (interrelating and sense creating; Weick, 1990) and, more significantly, as prerequisites for creativity. People participating in a process of collective learning in a common area of interest are referred to as Communities of Practice (CoPs) (Wenger et al., 2002). Because knowledge is regarded as being generated through social interaction—that is, not unproblematically communicated but rather continuously formed and recreated—such notions and approaches place more emphasis on processes than on structures. As a result, networking and (social) coordination receive special focus. Furthermore, several kinds of (process) "intermediaries/facilitators" are receiving more attention in an effort to prevent or close gaps (cognitive, information, management, or system) that lead to network and institutional failures (for a review, see: Klerkx and Leeuwis, 2009). For instance, Davenport and Prusak (1998) assert that neutral facilitation is one of the hallmarks of successful knowledge networks; Van Lente et al. (2003) distinguish "systemic intermediaries" as actors who primarily operate at the system or network level to facilitate actor interactions; Haga (2009) makes the case for the necessity of coordinating networking enablers and, consequently, for "mediators" or "brokers" as "independent players" in networks with the following goals: a) serving as entry points for external actors outside the network, bringing in experience and expertise; and, b) creating internal network resources and network structure, which are essential for network governance and processes (see also: Dhanaraj and Parkhe, 2006); and Shea (2011) cite Gagnon, who asserts that "...knowledge brokers, networks, and communities of practice are innovative ways to disse and facilitate the application of knowledge." Particular potential exists in integrated exchange, which entails active cooperation between knowledge users and researchers and is based on regular interactions and trust.

According to Wells (2006), these "intermediaries" are becoming more prevalent, especially in industrial literature, where they are referred to as third parties, (knowledge/technology) brokers, bridging organizations, intermediaries, boundary organizations, and so on. For instance, in their analysis of the functions of facilitation in small high-tech enterprises' internationalization, Juho and Mainela (2009) proposed the following functions: diagnosing, diagnosing, architecting, brokering, coaching, knowledge transfer, and experience sharing. When it comes to specialized knowledge bridging, these intermediary actors have been referred to as knowledge intensive business services, or KIBS (Muller and Zenker, 2001).

The field is still theoretically fragmented, poorly grounded, and primarily practice oriented, according to extensive reviews on the topic of various types of "intermediaries," which are primarily found in the industrial sector (industrial dynamics, technology policy, and firm strategy) and increasingly in the healthcare literature. According to the working definition, "an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties," Howells (2006: 720) prefers to use the more general term "innovation intermediary." Providing information about possible collaborators, facilitating a transaction between two or more parties, serving as a mediator or go-between for bodies or organizations that are already working together, and assisting in locating guidance, capital, and support for the innovative results of such collaborations are examples of these intermediary activities.

Thus, it is evident that these "intermediaries" have a separate systemic role in process facilitation as opposed to innovation production (i.e., source) or diffusion (i.e., carrier) (Van Lente et al., 2003). Alternatively, they participate in "indirect" innovation processes (i.e., enabling people and businesses) as opposed to direct ones (i.e., actual innovation projects), according to Haga (2005).

The following functions of intermediaries are also identified by Howells (2006), who distinguishes between intermediaries as processes and intermediaries as organizations: diagnostics and foresight; scanning and information processing; knowledge processing and combination/recombination; gatekeeping and brokering; testing and validation; accreditation; validation and regulation; safeguarding the results; commercialization; and outcome evaluation. According to the author, these functions also depend on the innovation system's aggregate levels, the innovation network's composition and development stage, and the context.

AIM AND METHODOLOGY

Despite Although the importance of "intermediaries" in knowledge sharing and the larger innovation system is becoming more widely acknowledged, agricultural literature has not yet addressed this novel subject in great detail (Klerkx and Leeuwis, 2008a). In order to fill that gap, this work makes an initial effort to investigate the definition and

application of "intermediaries," notably "facilitators" and "brokers," especially in agricultural literature. The ideas of brokerage and facilitation, as well as the associated roles, are first examined in order to complete such a work. The (need for the) introduction of such concepts in agricultural literature and practice is examined and demonstrated through several examples in the following session. The potential and some of the primary issues with the "intermediation" function are discussed in the paper's conclusion, along with some suggestive implications for higher agricultural education.

Regarding "Intermediaries," definitions of the many kinds of "intermediaries" have not yet been broadly agreed upon and are frequently used interchangeably due to the previously noted lack of conceptual groundedness. The two main categories of "intermediaries" that will be discussed are "brokers" and "facilitators."

In the case of "facilitation," Auvine et al. (2002) state that "a facilitator's job is to focus on how well people work together" and that "facilitation is designed to help make groups perform more effectively." While a facilitator "can fulfill different kinds of needs in working with a group," the facilitator's actual role is determined by "the group's purpose for coming together and by what is expected … of the facilitator." A facilitator influences a group's orientation and relationships; their intervention impacts both internal (direct and indirect) and external (inward and outward) group processes, according to Savage and Hilton (2001), who also distinguish between facilitation, mediation, and persuasion. The main function of facilitators is "to assist (individuals or groups) through the process of implementing a change in practice," according to Thompson et al. (2006), who compare "opinion leaders, facilitators, champions, linking agents, and change agents." Their unique function is to use "the dynamics of a group and their skills to assist persons to move towards change." According to Murray and Blackman (2006), the goal of facilitation is to "assist various teams in solving primarily complex problems and in developing decision solutions." Ultimately, Leeuwis (2004) summarizes the facilitator's responsibilities as follows: a) to guide the group process, b) to teach, and c) to be an expert on technical elements of farming. The idea is that facilitators enable learners to encounter various forms of engagement. In the sense that "a facilitator tries to create an ideal speech situation and through the appropriate intervention strategies helps the participants to engage in a communicative dialogue that results in consensual decision-making," these facilitation techniques are related to Habermas' (1984) perspective (Savage and Hilton, 2001).

(b) Brokerage and brokers: According to the literature on "Knowledge Management," brokering in the form of "knowledge brokers" has become popular as a way to promote innovation by facilitating the transfer of knowledge both within and between organizations (Roth, 2003). Dobbins et al. (2009) emphasize the value of Knowledge Brokers as a "emerging human resource" in the health sector in their thorough literature analysis. Their goals are to enhance and facilitate knowledge exchange across stakeholders, promote learning, and develop local competence. Knowledge brokers, whether individuals, organizations, or structures, play a significant role in "Knowledge Translation" (Kitson, 2009; Jones et al., 2009), where their goal is "to manipulate contextual factors and support experiential learning … in managing the new knowledge." In a similar vein, Melkas and Harmaakorpi (2009), in their investigation of regional innovation systems, advocate for intermediary organizations that act as information brokers in order to balance out the disparity in knowledge interests among network parties. However, when the focus is specifically on the genesis of innovation, a "innovation broker" is described as "an organization acting as a member of a network … that is focused neither on the organization nor the implementation of innovations, but on enabling other organizations to innovate" (Winch and Courtney, 2007: 751) or "a type of boundary organization that specializes in brokering or facilitating innovation processes involving several other parties, but does not itself engage in the innovation process" (Devaux et al., 2010). Kolodny et al. (2001) have established design requirements for innovation brokers that offer services to SMEs. These requirements include: (1) being visible and accessible to SMEs; (2) being trustworthy by SMEs; (3) having access to relevant knowledge and information sources for the innovation process; (4) being credible with these sources; (5) responding quickly to SMEs' requests; and (6) complementarity to the weaknesses of the SMEs it serves.

By bridging systemic gaps and serving as animators or catalysts, innovation brokers are generally regarded as advantageous to the innovation process. Through their study of the literature, Klerkx and Leeuwis (2008a, 2008b, 2009) identify three key roles of an innovation broker: a) articulating demand, b) forming networks, and c) managing the innovation process (for a more detailed explanation, see Kileluet al., 2011; see also Juho and Mainela, 2009).

The topic of "intermediaries" in agricultural theory (and practice) is one that is well-known in agricultural literature. These are state- or government-funded organizations that work to close the gap between agronomy-science and farming practice, also known as mainstream or "conventional" extension. Technology or knowledge transfer (ToT/TOK), another name for the linear (diffusion of innovations) model, asserts that scientists create innovations, which are then disseminated by extension agents (sometimes referred to as "intermediaries") and adopted or used by farmers (Rogers, 2004). "A person who influences clients' innovation decisions in a direction deemed desirable by a change agency" is what Rogers (2004: 28) defines as a change (extension) agent. The shift from reductionist to systemic science (and practice) and from the expert syndrome (top-down approach) to participatory (bottom-up) processes (i.e., "passing the stick" to participants) has, however, led to a new understanding of "intermediaries" in the agricultural sciences. Until recently, instrumental rationalist knowledge predominated over other ways of knowing (Habermas, 1984). According to Packham and Sriskandarajah (2005), this (dominant) paradigm of experimental, reductionist science has led to a "culture of technical control" (Bawden, 2005), which suggests that scientific testing is used to develop a "fix" for agricultural issues (Nerbonne and Lentz, 2003). Despite the paradigm's

impressive accomplishments, alternative ideas have been thriving since the 1970s due to the recognition that linear and mechanistic thinking is inadequate for comprehending the causes of issues and their remedies (Hjorth and Bagheri, 2006). Because of this, modern ideas of agriculture increasingly emphasize systems approaches (see Ison, 2010; Mingers, 2011), which examine a potential system holistically and concentrate on the vital causal connections or couplings between its components as well as system dynamics, rather than the components themselves. A growing body of literature has identified the social, cultural, and political perspectives involved in natural resources management (Pound et al., 2002), particularly since Dahlberg's (1979) claim that most intellectual maps of agriculture fail to perceive it as "the basic interface between people and their environment." This suggests that social and ecological systems must be treated as a single coupled and dynamically complex system (Allison and Hobbs, 2004; Griffin, 1979).

According to Chambers and Jiggins (1986), Nitch (1982), Röling (1988), and Jiggins (1998), the "diffusion of innovations" paradigm has also been widely criticized for failing to adapt to complicated issues and quickly changing contexts, such as the move toward sustainable development. The advent of Farming Systems Research/Extension (FSR/E) methodologies has been significant in this regard. With theoretical foundations in ecology and general systems theory (Schiere et al., 1999), their introduction as a collection of methodologies to better understand and apply technical interventions marked a theoretical and practical leap in agricultural development (Byerlee et al., 1982; Simmonds, 1986). A great deal of experience has been gained through FSR/E in terms of comprehending farmers, encouraging involvement, creating tools and techniques, and creating social and agricultural networks. FSR/E made a significant contribution to the identification of various development actors and raised awareness of the need for innovative approaches to research and extension that take relationships and context into consideration (Collinson, 2000).

The shift from Rapid/RRA to Participatory Rural Appraisal/PRA (Chambers, 1992, 1994; Webber, 1995) within the FSR/E tradition has been a significant advancement in this regard. This shift "tends to favor facilitation of a non-interventionist variety" (Robinson, 2002). Thus, a variety of participatory techniques and procedures have been created in relation to agricultural and rural development, such as Participatory Action Research, Farmer Participatory Research, Participatory Rural Appraisal, and Participatory Technology Development (see Pretty, 1995). The realization that communication and exchange flows between various actors are crucial for the reinforcement, transformation, and deconstruction of existing knowledge, which in turn leads to the emergence of new forms and a "fusion of horizons" (Leeuwis et al., 1990), is what led to the forceful emergence of the need for interaction and dialogue between various actors and networks (the interpenetration of actors' life-worlds and projects; Long, 1992) (Chambers, 1993; Scoones and Thompson, 1994).

For instance, GTZ (Hess, 2007) asserts that Technical Cooperation projects should focus on enhancing and facilitating communication between the two parties because "experts" and farmers have different knowledge systems and messages created in one system might not make sense in another. "Experts, researchers, and farmers together: build up mutual trust and respect; develop a common language; create a shared knowledge basis; welcome and appreciate the other's knowledge (system); show a learning attitude; spend time together for exchanging ideas; [and,] spend time together working and investigating," Hess says, citing a number of prerequisites for knowledge growth based on a Knowledge Management approach.

Such issues have been further increased in agricultural literature and practice as a result of the "sustainability era's" general preference for multi-stakeholder processes (MSPs) thinking (see: Dalal-Clayton and Bass, 2002; Hemmati, 2002; UNCED, 1992). This is predicated on the idea that sustainable agriculture techniques, in particular, are complex, knowledge-intensive, and non-prescriptive, in addition to the ecological, agronomic, and socioeconomic complexity of farming systems. Therefore, collaborative problem-solving techniques with extensionists that promote discovery learning are necessary, according to Somers (1998). The transition to sustainable agriculture is important because, according to Röling and Jiggins (1998), it involves a systemic change that calls for "double loop" learning, which is a significant shift in the assumptions and strategies that underpin subsequent actions (Argyris and Schon, 1974) or a shift from traditional, first-order practice to second-order change, which is a change in perspective or level (Ison and Russell, 2000). As a result, the present emphasis on experiential learning's tenets (Kolb, 1984) and its developments, such action research and participatory learning (King et al., 2001), emphasizes the value of reflection and discussion, among other things.

Furthermore, Röling and Jiggins (1998) contend that the shift from a praxeology of "transfer of knowledge" (i.e., theory informing practice, and practices feeding new theory) to one of "facilitating knowledge" (Box 1) that focuses "on enhancing the farmers' capacity to observe, experiment, discuss, evaluate and plan ahead" (Deugd et al., 1998) is necessary in order to move towards a "ecological knowledge system" as opposed to a "conventional knowledge system." Accordingly, this new approach necessitates a different extension pedagogy that involves stakeholders in knowledge sharing and practical learning (Woodhill and Röling, 1998).

The core of these multi-stakeholder procedures is social learning (SL). As stakeholders strive toward a mutually agreeable resolution to an issue concerning the management of human and environmental interrelationships, it refers to the collaborative action and reflection that takes place among them (Keen et al., 2005) (see also: Wals, 2007). Furthermore, "critical self-reflection; the development of participatory multi-layered democratic processes; the reflexive capabilities of human individuals and societies; and, the capacity for social movements to

change political and economic frameworks for the better" are the tenets upon which Woodhill and Röling (1988) based SL.

Accordingly, extension for sustainable agriculture suggests a (social) framework for supporting SL (Allahyariet al., 2009), or participatory processes of social change, through cooperation, shared learning, and the formation of consensus over the course of action. Thus, a new extension strategy is needed that focuses on networking and group and participatory learning, with extension agents serving as facilitators (Röling, 1994) (see, for instance, Box 2).

Furthermore, the TOT model has been conceptually replaced by network and systems approaches, such as agricultural knowledge and information systems (AKIS; see Röling and Engel 1991; Rivera and Zijp, 2002), and, more recently, agricultural innovation systems (AIS; see Klerkx and Leeuwis 2008a; Klerkx et al. 2010; Leeuwis, 2004), in agricultural literature based on SoI approaches. Contrary to Rogers (2004), these methods assert that innovation is a messy and complex process, with individuals working in networks to generate and execute new ideas and making modifications to attain desired results (see Van de Ven et al., 1999). These days, learning itself is the subject of innovation studies more and more, with a focus on facilitation and the human interaction processes that give rise to learning (LEARN Group, 2000; Röling and Wagemakers, 1988). Accordingly, Leeuwis views extension as "communication for innovation" (Leeuwis, 2004; Leeuwis and Aarts, 2011).

These factors have made it necessary to bridge the gaps between scientists and stakeholders as well as between various scientific disciplines. The field of sustainable natural resources management has thus seen the advancement of a wide range of collaborative-participatory approaches, including adaptive management, social learning/learning for sustainability, social/public ecology, and the emphasis on indigenous science and local knowledge (see Koutsouris, 2008). As a result, new arrangements in agriculture also appear, such as farmer-field schools, study circles, learning partnerships, communities of practice, farmer networks, and group extension.

All things considered, these modifications suggest that extension needs to be changed. "Conventional" extension, which is associated with the linear model of innovation, is related to "exploitation," which is the gathering, sharing, and application of knowledge in other comparable contexts. As such, it falls under the category of traditional KIBS. Conversely, new KIBS are emerging today that focus on "exploration," or the sharing and synthesis of new knowledge, and operate from a systems perspective. They aim to improve the interaction between a variety of actors (see: Levinthal and March, 1993; Murray and Blackman, 2006). The co-learning facilitator, who is typically referred to in literature as "facilitators" or "brokers," plays a significant role in the new KIBS. Their goal is to help discussion partners build a common language and meaning in order to promote change, generate solutions, and foster innovation. In order to achieve critical self-inquiry and collaboration, stakeholders must engage in dialogue, despite its challenges and time-consuming nature (since (social) learning and change are slow). Furthermore, Sriskandarajah et al. (2006) state that "learning processes in open networks will be the future challenge, and less so in well-defined and frequently familiar groups." One of the most important concerns nowadays is learning across diverse stakeholder groups and epistemologies.

(a) Typical Illustrations of "Facilitation" in the Field of Agriculture: For instance, Long (1984), Box (1988), and Long and Long (1992) have addressed the problem of knowledge networks and the necessity of transforming local knowledge through the creation of interfaces between farmers, researchers, and Extensionists.

In their 1991 description of the six main components (animation, structure, facilitation, intermediate, connection, and withdrawal) in encouraging rural people's engagement, Oakley et al. made a well-known and early reference to facilitation. They claim that facilitation is the process of helping rural residents take steps to increase their involvement by giving them access to resources, helping them develop technical skills, or helping them turn their own ideas into projects.

However, Ingram (2008) distinguishes between the roles of different agronomists in knowledge exchange encounters (KEE) in connection with best management practices (BMPs) for a more sustainable and responsible agriculture. According to her research, there are four different types of agronomists who identify as facilitators and take on the role of facilitator. By empowering farmers "in terms of raising general awareness about problems as well as teaching [explaining] certain principles and practices," these agronomists assist "farmers to understand the problems and opportunities within their own farming systems" and "provide the basis for facilitation of use of BMPs." Thus, as stated by Garforth et al. (2003) and Moriss et al. (2006), facilitative KEEs "are built on dialogue, mutual respect, and shared expectations and this provides the right context for joint learning." For Ingram facilitators, agronomists must "have good communication skills, the ability to empathize and listen, impartial, technically capable, and they value farmers' insights" in order to collaborate with farmers, help and empower farmers to learn and adapt, or establish a trustworthy and credible relationship with farmers. Her findings highlight the importance of developing advisers' "interactional expertise" or interpersonal skills in addition to their technical training (see also: Cerf et al., 2011; Ison and Russell 2000; Leeuwis 2000; Sheath and Webby 2000).

The Australian Landcare movement and Farmer Field Schools (FFS) are two of the most well-known examples supporting facilitation. "Landcare group facilitation is about fomenting group synergy, about helping groups make the best use of the human resources available, about helping to develop a shared sense of direction among the relevant actors (within and outside the Landcare group)," according to Campbell (1997) on page 146. It also involves skills like skilled listening, asking the right questions of the right people at the right time, providing occasions, organizing

encounters, and stimulating interaction among target stakeholders.

Regarding Australia once more, Coutts and Roberts (2003) identify a particular extension model that they refer to as "The Group Facilitation/Empowerment Model," among others, and they explain it as follows: The main goal of this model is to help participants become more capable of planning, making decisions, and determining their own educational and training needs according to their circumstances. Groups are free to do independent study. In order to help groups identify their own objectives and learning requirements and to help them achieve these, the initiative frequently funds or provides a facilitator. A key component of their "Capacity Building Ladder" is this facilitation model.

Regarding FFS, it was first created using the principles of adult learning to help farmers comprehend and implement IPM through social learning, learning-by-doing, or discovery learning (Röling and van de Fliert, 1994, 1998; van de Fliert et al., 1995; Tipp et al., 2005). Currently, 78 nations have launched FFS programs (Braun et al., 2006). According to Braun et al. (2000), FFS and CIALS (local agricultural research committees) are "participatory platforms for stimulating local innovation for sustainable agriculture and improving decision-making capacity." The authors claim that both platforms "... treat farmers as experts, emphasize respect for local knowledge and values, and develop capacity based on real-world experience." possess systems to guarantee risk sharing... [while] incentive plays a comparable role to facilitation approaches. In this setting, teaching becomes facilitation, or a process that helps farmers explore and discover; extension agents or farmers with training lead the learning process, guiding farmers to learn important agro-ecological concepts and cultivate IPM skills through self-discovery exercises conducted in the field (Ooi, 1996). Accordingly, Van den Berg and Jiggins (2007), through an international review, conclude that “the FFS has triggered further development beyond IPM, in the field of experimentation, collective action, leadership, planning, and organization.” Friis-Hensen and Duveskog (2011) emphasize the connection between FFS participation (based on high-quality facilitation) and empowerment.Another intriguing example of an alternative approach to innovation service delivery is the Participatory Extension Approach (PEA), which GTZ implemented in Zimbabwe in the 1990s and later modified and expanded in other nations (Hagman et al., 1997; Hagman et al., 2003; Moyo and Hagman, 2000; Ngweya and Hagman, 2007). PEA is a learning-oriented, participatory, people-centered program that blends "social extension" with "technical advisory services" to help individuals become more flexible and create a shared platform for trying new things. Facilitation for Change (F4C), which is based on action learning and systemic theories, is one such strategy that seeks to encourage people's "creative orientation" on both an individual and organizational level. F4C may be examined from several angles and has been instrumental in starting the process of community liberation and creativity (see Box 3).

Among other things, PEA emphasizes the extension facilitators' cognitive, behavioral/attitude, and emotional competencies, all of which are closely related and have a significant impact on one another. The specific facilitation skills are also outlined in terms of: a) process-related skills and b) facilitation strategies. The first consists of components such as process documentation, adaptive capacity, and process observation (including monitoring and assessment). The second encompasses the competence of asking insightful questions, controlling instruments for facilitation, visualizing ideas, providing and receiving feedback, and managing group dynamics and team-building methods. Lastly, PEA offers the following recommendations for the improvement of facilitation skills: Over the course of 18 months, a sequence of five learning workshops introduces students to various ideas and offers a forum for reflection on the fieldwork experiences. A field practice period of two to four months follows each workshop, allowing for the integration of theory and practice as well as simultaneous community and extension level involvement (see also Box 4).

(a) Facilitation and the European Farming Systems Community:

The topic of "facilitation" has received more attention in the European Farming Systems community, especially since 2000. This has happened both explicitly in papers in workshops dedicated to learning and SL and implicitly, such as in papers discussing systemic and participatory approaches, multi-stakeholder and interactive processes, sustainable (especially organic) farming, education for sustainability, inter- and trans-disciplinarily, etc. Notably, at the most recent FS Symposium in Vienna (2010), a workshop was dedicated exclusively to facilitation. Box 5 contains indicative passages from papers delivered during the European Farming Symposia.(b) Typical Agricultural "Brokerage" Examples: With the notable exception of the Dutch agricultural sector (e.g. Hermans et al. 2013; Klerkx and Leeuwis 2008b, 2009a, 2009b; Klerkx and Nettle 2013; Klerkx et al. 2010; Wielinga and Vrolijk 2009), the topic has not been widely adopted by the agricultural academic and research community, despite Hekkert et al. (2007)'s contention that innovation brokers contribute to several of the innovation systems functions. Three primary roles of an innovation broker are identified by Klerkx and Leeuwis (op. cit.) as follows: a) demand articulation, b) network development, and c)

This is consistent with findings in the literature on the development of SMEs that show that, despite the expectation that they will eventually become self-sufficient, pure innovation intermediaries are frequently funded and induced by policy due to market failure or social economy arguments (see also: Klerkx and Leeuwis, 2008b). Klerkx and Leeuwis (2008a) contend that because it is challenging "to perform a wide array of innovation intermediation functions within one organization," there should be a distinction made between "animateurs" who carry out tasks like foresight, problem diagnosing and needs articulation,

scoping and filtering (selection of collaborative partners), and network brokerage roles during the early pre-competitive stages of the innovation process and intermediaries who carry out tasks like gate keeping and knowledge brokering; knowledge testing and validation; knowledge commercialization; accreditation, validation and regulation, and standards work; independent advice and mentoring on protecting intellectual property; and evaluation of the results of innovation collaboration. Additionally, according to Klerkx and Leeuwis (2009), more research is required in two areas: the role of innovation brokers in relation to the various stages of the innovation process, as well as the particular competencies they need to perform their tasks successfully; and the emergent types (typology) of brokers and how well they fit into the innovation system.

Heemsesrk et al. (2011) identify and discuss a number of brokering functions within the framework of innovation platforms, including advocacy, capacity building, technical backstopping, facilitation, linking and strategic networking, documentation of learning, and championing. Nederlof et al. (2011) also provide several examples of innovation brokering. Therefore, brokers offer three lines of support: innovation process management; scoping, scanning, filtering, and strategic networking; and creating a shared vision and communicating associated demands. The authors emphasize that a good broker goes beyond training and that it takes time and interaction for brokers to develop their skills, even though they have identified several instances of broker training. They also emphasize that brokering is a time-consuming and expensive job, leading them to conclude that brokering is "[E]asier said than done" (p. 52). In addition, Klerkx and Gildemacher (2012) offer a typology of innovation brokers, highlight important policy concerns, and offer some suggestions for practitioners, decision-makers, and project managers. However, it is evident that the broker position is still relatively young.

Conclusions

New roles for extension arise as a result of changes in innovation thinking, knowledge infrastructure, and knowledge supply and demand in agriculture (and rural development). A change from a "transfer of knowledge" to a "facilitation of knowledge" approach is indicated by these new "intermediating" or/and "enabling" roles, i.e., co-learning facilitation roles like "facilitation" and "brokerage." Although the case of facilitation is not new in agricultural literature and practice, as demonstrated in the preceding sections, it is evident that an extension is necessary to transition from a "old" to a "new KIBS" role. However, as the subject of brokerage in agricultural innovation is relatively young, a great deal of theoretical and research effort is required.

However, some issues also surface in spite of the generally beneficial "intermediation" roles that brokers and facilitators play in the spread of knowledge and the creation of interactive innovation. The experience of Landcare groups, for instance, has demonstrated that (Campbell, 1997): a) "Landcare facilitation often looks anything but strategic, and its puprose is often lost"; b) despite the fundamental assumption that facilitators (and brokers) have an independent, impartial stance, "there is no such thing as a neutral, detached, value-free facilitator" (see also: Drennon and Cervero, 2002; Devaux et al. 2010; Klerkx and Leeuwis, 2009). Additionally, a facilitator should possess both the necessary technical expertise and facilitation skills (see also the call for the training of "social agronomists"; Leeuwis 2000, 2004). Additionally, the sustainability issue is also quite important. As demonstrated by Ljung and Emmelin (2000) and Cristóvão et al. (2008), the withdrawal of "external," or project-supported, facilitators leads to the end of such work in the localities in question, despite Oakley et al.'s (1991) contention that the "withdrawal" dimension implies a conscious move on the part of the facilitator/change agent along with the empowerment of local actors to undertake his/her role.

Lastly, it is important to highlight the conflict between the "top-down" and "bottom-up" functions of an intermediate. When discussing the barriers to involvement, particularly the "expert syndrome," this issue is covered in great detail in the literature on participation (see, for instance, Botes and van Rensburg, 2000; Cooke and Kothari, 2001; Leal, 2007; Quaghebeur et al., 2004). Savage and Hilton (2001) further note that in the particular instance of process facilitators, there is occasionally a need for facilitators to guide processes toward consensus, which the authors believe is a desirable outcome. Similar to this, Stetler et al. (2006) contend that depending on the projects, particular sites, related progress, and individuals involved, the flexible facilitator may adopt either a directive or a non-directive style. Harvey et al. (2002), while advocating for the "enabling" approach, also contend that in some situations, the task-oriented, practical approach is also effective.

As previously noted, intermediation (brokerage and facilitation) has not yet been fully defined, operationalized, or evaluated (Stetler et al., 2006). The current plethora of terminology and the employment of the same terms but with distinct meanings complicate the situation, thus conceptual clarity is necessary on the one hand. Therefore, it is imperative that theoretical advancements receive explicit attention. Without a thorough understanding of the concepts, terminology, and disputes, study findings will be challenging to interpret, and recommendations for practice change may become unworkable. However, despite the inherent challenges, Klerkx and Leeuwis (2008b) emphasize the necessity of developing the ability to quantify the added value of intermediaries. In this manner, their work would be acknowledged in the knowledge infrastructure and made clear. An agenda like this will aid in identifying more knowledge gaps and ways to fill them, resulting in the development of a strong body of information that will be useful to practitioners, scholars, policymakers, and researchers.

Last but not least, it should be noted that the aforementioned factors, which alter perceptions of how research and extension activities are conducted, particularly with regard to sustainability, also (tentatively) affect education, particularly Higher Education Institutions (HEIs).

The following should be emphasized: a) the rejection of reductionist and monodisciplinary science in favor of trans-disciplinarily (i.e., the combining of different worldviews, including the crossing of disciplinary boundaries and the involvement of stakeholders) in order to create new boundaries for exploration and understanding; b) the shift from transmissive learning to transformative learning, i.e., to constructive and participative learning, particularly through the interaction and examination of complex, contentious issues and the use of complex teaching/learning methods (see: Bawden and Packham, 1993; Bawden et al., 2007; Packham and Sriskandaraja, 2005; Valentine, 2005). Curricula must also expose students to "intermediation" concepts, skills, and tools related to "the creation of circumstances in non-deterministic ways for dialogue to emerge and to trust in emergence, such as reflexivity, mediation, brokering, and networking for learning among stakeholders" (Koutsouris, 2008a) in light of the new roles that have emerged as discussed in this paper. This is to ensure that graduates who work in the field of sustainable agricultural/rural development as academics/researchers, policymakers, or practitioners are prepared to take on relevant roles in their field of endeavor. Tertiary institutions, particularly agricultural universities, will have to deal with the aforementioned changes/challenges pertaining to agricultural (and rural) development theory and practice, even though change in HEIs is particularly slow due to the numerous risks (both cognitive and social) and obstacles for both students and academics/researchers (see also: Koutsouris, 2008b, 2009).

REFERENCES

Allahyari, M.S., M. Chizari and S.M. Mirdamadi.(2009). Extension-Education Methods to Facilitate Learning in Sustainable Agriculture. Journal of Agriculture & Social Sciences 5: 27-30.

Allison, H.E. and R.J. Hobbs. (2004.) Resilience, adaptive capacity, and the “Lock-in Trap” of the Western Australian agricultural region. Ecology and Society

9. [online] URL: http://www.ecologyandsociety.org/vol9/iss1/a rt3/.

Argyris, C. and D. Schon, D. (1974). Theory in Practice: Increasing Professional Effectiveness. San Francisco: Josey-Bass.

Auvine, B, B. Densmore, M. Extrom, S. Poole and M. Shanklin. (2002). What do we mean by facilitation. Group Facilitation: A Research & Applications Journal 4: 53-55.

Bawden, R. (2005). Systemic development at Hawkesbury: Some personal lessons from experience. Systems Research and Behavioral Science 22: 151-164

Bawden, R. and R. Packham.(1993). Systemic praxis in the education of the agricultural systems practitioner. Systems Practice 6: 7-19.

Bawden, R., B. McKenzie and R. Packham. (2007). Moving beyond the academy: A commentary on extra-mural initiatives in systemic development. Systems Research and Behavioral Science 24: 129-141.

Bijker, W.E. (1995). Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change. Cambridge, MA: The MIT Press.

Botes, L.and D. van Rensburg. (2000). Community participation in development: nine plagues and twelve commandments. Community Development Journal 35: 41-58.

Box, L. (1988). Experimenting cultivators: A method for adaptive agricultural research. SociologiaRuralis 28: 62-75.

Braun, A.R., G. Thiele and M. Fernandez. (2000). Farmer field schools and local agricultural research committees: complementary platforms for integrated decision-making in sustainable agriculture. AgREN Network Paper 105. London: Overseas Development Institute.

Braun, A., J. Jiggins, N. Röling, H. van den Berg and P. Snijders.(2006). A global survey and review of farmer field school experiences.Wageningen: Endelea.

Byerlee, D., L. Harrington and D.L. Winkelmann. (1982). Farming systems research: issues in research strategy and technology design. American Journal of Agricultural Economics 64: 897-904.

Campbell, A. (1997). Facilitating Landcare: conceptual and practical dilemmas. In: S. Lockie, & F. Vanclay (Eds.), Critical Landcare (pp. 143-152). WaggaWagga, Australia: Centre for Rural Social Research, Charles Stuart University.

Carlsson, B. and R. Stankiewicz. (1995). On the nature, function and composition of technological systems. In: B. Carlsson (Ed.), Technological Systems and Economic Performance: The Case of Factory Automation (pp. 21-56). Dordrecht: Kluwer Academic Publishers.

Carr, A. (1997). Innovation of diffusion: Landcare and information exchange. In: S. Lockie, & F. Vanclay (Eds.), Critical Landcare (pp. 201-216). WaggaWagga, Australia: Centre for Rural Social Research, Charles Stuart University.

Cerf, M., M.N. Guillot and P. Olry. (2011). Acting as a change agent in supporting sustainable agriculture: How to cope with new professional situations? The Journal of Agricultural Education & Extension 17: 7-19.

Chambers, R. (1992). Rural Appraisal: Rapid, Relaxed and Participatory. IDS Discussion Paper 311. Brighton: IDS, University of Sussex.

Chambers, R. (1993). Challenging the Professions: Frontiers for Rural Development. London: Intermediate Technology Publications.

Chambers, R. (1994). The origins and practice of participatory rural appraisal. World Development. 22: 953-969.

Chambers, R. and J. Jiggins.(1986). Agricultural Research for Resource Poor Farmers.IDS Discussion Paper 220. Brighton: IDS, University of Sussex.

Collinson, M. (Ed.) (2000).A History of Farming Systems Research. Wallingford: CABI & FAO.

Cooke, B. and U. Kothari (Eds.) (2001). Participation: The

New Tyranny? London: Zed-Books.

Coutts, J. and K. Roberts. (2003). Models and Best Practice in Extension'. Paper in the 2003 APEN National Forum, Hobart,

Australia.http://www.regional.org.au/au/apen/2003/invited/ p-08.htm#TopOfPage.

Cristóvão, A., P. Ferrao, R. Madeira, M.L. Tibério, M.J. Rainho and M.S. Teixeira. (2008). Circles and communities, sharing practices and learning: Looking at old and new extension education approaches. In: B. Didieu, & S. Zasser-Bedoya (Eds.), Empowerment of Rural Actors: A Renewal of Farming Systems Perspectives (pp. 797-807). Montpellier: INRA-SAD.

Critchley, W., M. Verburg and L. van Veldhuizen (Eds.) (2006).Facilitating multi-stakeholder partnerships: lessons from PROLINNOVA.Silang, Cavite, Philippines: PROLINNOVA International Secretariat - ETC EcoCulture.

Dahlberg, K.A. (1979). Beyond the Green Revolution. New York: Plenum Press.

Dalal-Clayton, B. and S. Bass. 2002. Sustainable Development Strategies. London: Earthscan (OECD & UNDP).

Davenport, D. (1997). A view from the ground: Farmers, sustainability and change. In: S. Lockie, & F. Vanclay (Eds.), Critical Landcare (pp. 153-164). WaggaWagga, Australia: Centre for Rural Social Research, Charles Stuart University.

Davenport, T.H. and L. Prusak. (1998). Working Knowledge: How Organizations Manage What They Know. Cambridge, MA.: Harvard Business School Press,

Den Hertog, P. (2000). Knowledge-intensive business services as co-producers of innovation. International Journal of Innovation Management 4: 491–528.

Devaux, A., J. Andrade-Piedra, D. Horton, M. Ordinola, G. Thiele, A. Thomann and C. Velasco. (2010). Brokering Innovation for Sustainable Development: The Papa Andina Case. ILAC Working Paper 12. Rome: Institutional Learning and Change (ILAC) Initiative.

Deugd, M., N. Röling and E.M.A. Smaling.(1998). A new praxeology for integrated nutrient management, facilitating innovation with and by farmers. Agriculture, Ecosystems and Environment 71: 269-283.

Dhanaraj, C. and A. Parkhe. (2006). Orchestrating innovation networks. The Academy of Management Review 31: 659-669.

Dobbins, M., P. Robeson, D. Ciliska, S. Hanna, R. Cameron,

L. O'Mara, K. DeCorby and S. Mercer.(2009). A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies.Implementation Science.doi:10.1186/1748-5908-4-23.

Edquist, C. and B. Johnson.(1997). Institutions and Organizations in Systems of Innovation. In: C. Edquist (Ed.), Systems of Innovation: Technologies, Institutions and Organizations (pp. 41-63). London: Pinter Publishers.

Friis-Hansen, E. and D. Duveskog. (2011). The empowerment route to well-being: An analysis of Farmer Field Schools in East Africa. World Development doi:10.1016/j.worlddev.2011.05.005 Garforth, C. and A. Lawrence. (1997). Supporting sustainable agriculture through extension in Asia.

Natural Resources Perspectives 21. London: Overseas Development Institute.

Garforth, C., B. Angell, J. Archer and K. Green.(2003). Fragmentation or creative diversity?Options in the provision of land management advisory services. Land Use Policy, 20: 323–333

Geels, F.W. (2004). From sectoral systems of innovation to socio-technical systems.Insights about dynamics and change from sociology and institutional theory. Research Policy 33: 897-920.

Griffin, K. (1979). Political Economy of Agrarian Change: an Essay on the Green Revolution. London: Macmillan.

Habermas, J. (1984). The Theory of Communicative Action: Reason and the Rationalization of Society. Cambridge: Polity Press.

Haga, T. (2009). Orchestration of network instruments: a way to de-emphasize the partition between incremental change and innovation? Artificial Intelligence & Society 23: 17–31

Hagmann, J., E. Chuma, M. Connolly and K. Murwira. (1997). Propelling change from the bottom-up: institutional reform in Zimbabwe. Gatekeeper Series 71. London: IIED.

Hagmann, J., E. Moyo, E. Chuma, K. Murwira, J. Ramaru and P. Ficarelli.. (2003). Learning about developing competence to facilitate rural extension processes. In: C. Wettasinha, L. van Veldhuizen, & A. Waters- Bayer (Eds.), Advancing Participatory Technology Development: Case studies on Integration into Agricultural Research, Extension and Education (pp 21-38). Silang, Cavite, Philippines: IIRR / ETC Ecoculture / CTA.

Harvey, G., A. Loftus-Hills, J. Rycroft-Malone, A. Titchen, A. Kitson, B. McCormack and K. Seers. (2002). Getting evidence into practice: The role and function of facilitation. Journal of Advanced Nursing 37: 577– 588.

Heemskerk, W., L. Klerkx and J. Sitima. (2011). Brokering innovation. In Nederlof, S., Wongtschowksi, M. & van der Lee, F. (eds.) Putting heads together: Agricultural innovation platforms in practice. Amsterdam, KIT Publishers: 43-54.

Hekkert, M.P., R.A.A. Suurs, S.O. Negro, S. Kuhlmann and

R.E.H.M. Smits. (2007). Functions of innovation systems: a new approach for analysing technological change. Technological Forecast & Social Change 74: 413–432.

Hemmati, M. (2002). Multi-stakeholder Processes for Governance and Sustainability - Beyond Deadlock and Conflict. London: Earthscan.

Hermans, F., M. Stuiver, P.J. Beers and K. Kok. (2013). The distribution of roles and functions for upscaling and outscaling innovations in agricultural innovation systems.

Agricultural Systems 115: 117-128

Hess, C.G. (2007). Reader: Knowledge Management and Knowledge Systems for Rural Development. http://www.gtz.de/de/dokumente/en- Knowledge-Management-Reader-2007.pdf.

Hinton, B. (2003). Knowledge Management and Communities of Practice: an experience from Rabobank Australia and New Zealand. International Food and Agribusiness ManagementReview,5(3). http://ageconsearch.umn.edu/bitstream/34328/1/0503hi01.pdf.

Hjorth, P. and A. Bagheri. (2006). Navigating towards sustainable development: A system dynamics approach. Futures 38: 74-92.

Howells, J. (2006). Intermediation and the role of intermediaries in innovation. Research Policy 35: 715–728.

Hughes, T.P. (1987). The Evolution of Large Technological Systems. In: W. E. Bijker, T. P. Hughes, & T. J. Pinch (Eds.), The Social construction of Technological Systems: New Directions in the Sociology and History of Technology (pp. 51-82). Cambridge, MA.: The MIT Press.

Ingram, J. (2008). Agronomist–farmer knowledge encounters: an analysis of knowledge exchange in the context of best management practices in England. Agriculture & Human Values 25: 405–418.

Ison, R. (2010). Systems Practice: How to Act in a Climate- Change World. London: Springer in association with The Open University.

Ison, R. and D. Russel (Eds.) 2000. Agricultural extension and rural development: Breaking out of traditions. Cambridge: Cambridge University Press.

Juho, A. and T. Mainela.(2009). External facilitation in the interorganization of high-tech firms.Research on Knowledge, Innovation and Internationalization Progress in International Business Research.doi:10.1108/S1745- 8862(2009)0000004013

Jones, N., A. Datta and H Jones with ebpdn partners. (2009). Knowledge, policy and power: Six dimensions of the knowledge–development policy interface. London: RAPID/ODI.

Keen, M., V.A. Brown and R. Dyball. (2005). Social learning: A new approach to environmental management. In: M. Keen, V. A. Brown, & R. Dyball (Eds.), Social Learning in Environmental Management – Towards a Sustainable Future (pp. 3-21). London: Earthscan Publ. Ltd.

Kilelu, K., L. Klerkx, C. Leeuwis and A. Hall. (2011). Beyond knowledge brokerage: An exploratory study of innovation intermediaries in an evolving smallholder agricultural system in Kenya. RIU Discussion Paper 13. London: DFID.

King, C., J. Gaffney and J. Gunton. (2001). Does participatory action learning make a difference? The Journal of Agricultural Education and Extension 7: 133-146.

Kitson, A. (2009). The need for systems change: reflections on knowledge translation and organizational change. Journal of Advanced Nursing 65, 217–228.

Klerkx, L., K. de Grip and C. Leeuwis. (2006). Hands off but strings attached: The contradictions of policy- induced demand-driven agricultural extension. Agriculture and Human Values 23, 189–204.

Klerkx, L. and P. Gildemacher. (2012). The role of innovation brokers in agricultural innovation systems. In Agricultural Innovation systems: An investment sourcebook (pp. 221-230). Washington: The World Bank.

Klerkx, L. and C Leeuwis. (2008a). Balancing multiple interests: Embedding innovation intermediation in the agricultural knowledge infrastructure. Technovation 28: 364-378.

Klerkx, L. and C Leeuwis. (2008b). Matching demand and supply in the agricultural knowledge infrastructure: Experiences with innovation intermediaries. Food Policy 33" 260-276.

Klerkx, L. and C Leeuwis. (2009a). Establishment and embedding of innovation brokers at different innovation system levels: Insights from the Dutch agricultural sector. Technological Forecasting and Social Change 76: 849-860.

Klerkx, L. and C Leeuwis. (2009b). Shaping Collective Functions in Privatized Agricultural Knowledge and Information Systems: The Positioning and Embedding of a Network Broker in the Dutch Dairy Sector. The Journal of Agricultural Education and Extension 15: 81-105.

Klerkx, L. and R. Nettle. (2013). Achievements and challenges of innovation co-production support initiatives in the Australian and Dutch dairy sectors: A comparative study. Food Policy, 40: 74– 89.

Klerkx, L., N. Aarts and C. Leeuwis. (2010). Adaptive management in agricultural innovation systems: The interactions between innovation networks and their environment. Agricultural Systems 103: 390–

400.

Kolb, D.A. (1984). Experiential Learning: Experience as the Source of Learning and Development. N. Jersey: Prentice-Hall.

Kolodny, H., B. Stymne, R. Shani, J.R. Figuera and P. Lillrank.(2001). Design and policy choices for technology extension organizations, Research Policy, 30: 201–225.

Koutsouris, A. (2008a). Innovating towards sustainable agriculture: A Greek case study. The Journal of Agricultural Education & Extension, 14: 203-215.

Koutsouris, A. (2008b). Higher Education Facing Sustainability: The Case of Agronomy. International Journal of Learning 15: 269-276.

Koutsouris, A. (2009). Sustainability, crossdisciplinarity and Higher Education – From an agronomic point of view. Journal of US-China Education Review 6: 13-27.

Leal, P.A. (2007). Participation: the ascendancy of a buzzword in the neo-liberal era. Development in Practice 17:

539 – 548.

LEARN Group (2000). Cow up a Tree: Learning and Knowing Processes for Change in Agriculture; Case Studies from Industrialised Countries. Paris: INRA Editions.

Leeuwis, C. (2000). Learning to be sustainable. The Journal of Agricultural Education & Extension 7: 79-92.

Leeuwis, C. (2004). Communication for Rural Innovation: Rethinking Agricultural Extension. Oxford: Blackwell Science.

Leeuwis, C. and N. Aarts. (2011). Rethinking communication in inovvation process: creating space for change in complex systems. The Journal of Agricultural Extension & Education 17: 21-36.

Leeuwis, C., N. Long and M. Villareal. (1990). Equivocations on knowledge systems theory: An actor-oriented critique. Knowledge in Society: The International Journal of Knowledge Transfer 3: 19- 27.

Levinthal, D. and J. March. (1993). The myopia of learning. Strategic Management Journal 14: 95-112.

Ljung, M. and A. Emmelin. (2000). The development of farmers; dialogue: The decision making process behind a facilitated learning process in Swedish agriculture. In: A. Koutsouris, & L. OmodeiZorini (Eds.) European Farming and Rural Systems Research and Extension into the Next Millennium: Environmental, Agricultural and Socio-economic Issues (pp. 336-357). Athens: Papazisis Ed.

Long, N. (1984).Creating space for change: a perspective on the sociology of development.SociologiaRuralis 24: 168-184.

Long, N. (1992).Conclusion. In: Long, N., Long, A. (Eds.), Battlefields of knowledge (pp. 268-277). London: Routledge.

Long, N. and A. Long (Eds.) (1992).Battlefields of knowledge. London: Routledge.

Lundvall, B.-Å. 1992. Introduction. In: B.-Å. Lundvall (Ed.), National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning (pp. 1-19). London: Pinter Publishers.

Melkas, H. and V. Harmaakorpi. (2008). Data, information and knowledge in regional innovation networks: Quality considerations and brokerage functions. European Journal of Innovation Management 11: 103-124.

Mingers, J. (2011). The contribution of systemic thought to Critical Realism. Journal of Critical Realism 10: 303-330.

Mitchell, S., C. Fisher, C. Hastings, L. Silverman and G. Wallen. (2010). A thematic analysis of theoretical models for translational science in nursing: Mapping the field. Nursing Outlook 58: 287-300.

Mitton, C., C. Adair, E. McKenzie, S. Patten and B.W. Perry. (2007). Knowledge Transfer and Exchange: Review and synthesis of the literature. The Milbank Quarterly 85: 729–768.

Morriss, S., C. Massey, R. Flett, F. Alpass and F. Sligo. (2006). Mediating technological learning in agricultural innovation systems. Agricultural Systems 89: 26–46.

Moyo, E. and J. Hagmann. (2000). Facilitating competence development to put learning process approaches into practice in rural extension. In: SDRE-FAO (Eds.), Human resources agricultural and rural development (pp. 143-157). Rome: FAO.

Muller, E. and A. Zenker. (2001). Business services as actors of knowledge transformation: The role of KIBS in regional and national innovation systems. Research Policy 30: 1501–1516.

Murray, P. and D. Blackman. 2006. Managing innovation through social architecture, learning, and competencies: A new conceptual approach. Knowledge and Process Management, 13: 132-

143.

Nederlof, S., M. Wongtschowksi and F. van der Lee (Eds.) (2011). Putting heads together: Agricultural innovation platforms in practice. Amsterdam, KIT Publishers.

Nelson, R.R. 1992. National Innovation Systems: A Retrospective on a Study. Industrial and Corporate Change, 2: 347-374.

Nerbonne, J.F. and R. Lentz. (2003). Rooted in grass: Challenging patterns of knowledge exchange as a means of fostering social change in a southeast Minnesota farm community. Agriculture and Human Values, 20: 65-78.

Ngwenya, H. and J. Hagmann. (2007). Facilitation for Change: Triggering emancipation and innovation in rural communities in South Africa. Paper in the Conference: Farmer First revisited: Farmer participatory research and development twenty years on. IDS http://www.future-agricultures.org/farmerfirst/files/T2b_Ngweny a.pdf.

Nitch, U. (1982). Farmer's Perceptions of and Preferences Concerning Agricultural Extension Programmes. Uppsala: Dept. of Economics & Statistics, Swedish University of Agricultural Sciences.

Oakley, P. (1991). Projects with People: The Practice of Participation in Rural Development. Geneva: ILO.

Ooi, P.A.C. (1996). Experiences in educating rice farmers to understand biological control. Entomophaga 41: 375–385.

Packham, R. and N. Sriskandaraja (2005).Systemic Action Research for Postgraduate Education in Agriculture and Rural Development. Systems Research and Behavioral Science 22: 119-130.

Pound, B., S. Snapp, C. McDougall and A. Braun (Eds.) (2002).Managing Natural Resources for Sustainable Livelihoods.http://www.idrc.ca/ev_en.php?ID= 43428_201&ID2=DO_TOPIC.

Pretty, J. (1995). Regenerating Agriculture: Policies and Practice for Sustainability and Self-reliance. London: Earthscan Publications Ltd.

Quaghebeur, K., J. Masschelein and H. Huong Nguyen. (2004). Paradox of participation: Giving or taking part? Journal of Community & Applied Social Psychology 14, 154–165.

Rivera, W. and W. Zijp. (2002). Contracting for agricultural extension. International case studies and emerging practices. Washington D.C.: CABI Publishing.

Robinson, L. (2002). Participatory Rural Appraisal: A brief introduction. Group Facilitation: A Research & Applications Journal 4: 45-52.

Rogers, E.M. (2004). Diffusion of Innovations. New York: Free Press.

Röling, N. (1988). Extension Science. Cambridge: Cambridge University Press.

Röling, N. and P. Engel. (1991). The development of the concept of agricultural knowledge and information systems (AKIS): implications for extension. In: W. Rivera, & D. Gustafson (Eds.), Agricultural Extension: Worldwide Institutional Evolution and Forces for Change (pp. 125-139). Amsterdam: Elsevier.

Röling, N. and J. Jiggins. (1998). The ecological knowledge system. In: N. Röling, & M. A. E. Wagemakers (Eds.), Facilitating Sustainable Agriculture: Participatory learning and adaptive management in times of environmental uncertainty (pp. 283-311). Cambridge: Cambridge University Press.

Röling, N. and M.A.E. Wagemakers (Eds.) (1998).Facilitating Sustainable Agriculture: Participatory learning and adaptive management in times of environmental uncertainty. Cambridge University Press, Cambridge.

Röling, N. and E. van de Fliert. (1994). Transforming extension for sustainable agriculture: the case of integrated pest management in rice in Indonesia. Agriculture & Human Values 11: 96–108.

Röling, N. and E. van de Fliert. (1998). Introducing integrated pest management in rice in Indonesia: a pioneering attempt to facilitate large-scale change. In: N. Röling, & M. A. E. Wagemakers (Eds.), Facilitating Sustainable Agriculture: Participatory learning and adaptive management in times of environmental uncertainty (pp. 153-171). Cambridge: Cambridge University Press.

Roth, J. (2003). Enabling knowledge creation: Learning from an R&D organization. Journal of Knowledge Management 7: 32-48.

Savage, G. and C. Hilton.(2001). A critical view of facilitating labor-management collaboration. Group Facilitation: A Research & Applications Journal 3: 47-55.

Scoones, I. and J. Thompson (Eds.) (1994).Beyond Farmer First. London: Intermediate Technology Publications.

Shea, B. (2011). A decade of knowledge translation research - what has changed? Journal of Clinical Epidemiology 64: 3-5.

Sheath, G.W. and R.W. Webby. (2000). The results and success factors of a farm monitoring and study group approach to collective learning. In: LEARN Group (Eds.), Knowing and learning for change in agriculture. Case studies from industrialised countries (pp. 111–120). Paris: INRA.

Simmonds, N.W. (1986). A short review of farming systems research in the tropics. Experimental Agriculture 22: 1-13.

Somers, N. (1998). Learning about sustainable agriculture: the case of Dutch arable farmers. In: N. Röling, & M. A. E. Wagemakers (Eds.), Facilitating Sustainable Agriculture: Participatory learning and adaptive management in times of environmental uncertainty (pp 125–134). Cambridge: Cambridge University Press.

Sriskandarajah, N., M. Cerf and E. Noe. (2006). Introduction to Section 1 – Learning as a process: understanding one's role in the new learning demands of multifunctional land use systems, working with different actors, tools and scales. In:

H. Langeveld, & N. Röling (Eds.), Changing European Farming Systems for a Better Future: new visions for rural areas (pp. 27-28). Wageningen: Wageningen Academic Press.

Stetler, C.B., M.W. Legro, J. Rycroft-Malone, C. Bowman, G. Curran, M. Guihan, H. Hagedorn, S. Pineros and C.M. Wallace. (2006). Role of "external facilitation" in implementation of research findings: A qualitative evaluation of facilitation experiences in the Veterans Health Administration. Implementation Science 1.doi:10.1186/1748-5908-1-23.

Swan, J., S. Newell, H. Scarbrough and D. Hislop. (1999). Knowledge management and innovation: networks and networking. Journal of Knowledge Management, 3: 262-275.

Thompson, G.N., C.A. Estabrooks and L.F. Degner. (2006). Clarifying the concepts in knowledge transfer: a literature review. Journal of Advanced Nursing 53: 691–701.

Tripp, R., M. Wijeratne and V. HiroshiniPiyadasa. (2005). What should we expect from Farmer Field Schools? A Sri Lanka case study. World Development 33: 1705–1720.

Valentine, I. (2005). An emerging model of a systems agriculturalist. Systems Research and Behavioral Science 22: 109-118.

Van de Fliert, E., J. Pontius and N. Röling. (1995). Searching for strategies to replicate a successful extension approach: training of IPM trainers in Indonesia. European Journal of Agricultural Education and Extension, 1: 41–63.

Van den Berg, H. and J. Jiggins. (2007). Investing in farmers - The impacts of Farmer Field Schools in relation to Integrated Pest Management. World Development 35: 663–686.

Van de Ven, A.H., D.E. Polley, R. Garud and S. Venkataraman. (1999). The Innovation Journey. Oxford: Oxford University Press.

Van Lente, H., M. Hekkert, R. Smits and B. Van Waveren.(2003). Roles of systemic intermediaries in transition processes. International Journal of Innovation Management, 7: 1-33.

UNCED (1992).Earth Summit 1992 – The United Nations Conference on Environment and Development. London: Regency Press.

Wals, A. (Ed.) (2007). Social Learning towards a Sustainable World.Wageningen: Wageningen Academic Publishers.

Webber, L. (1995). Participatory rural appraisal design: Conceptual and process issues. Agricultural Systems 17: 107-131.

Weick, K.E. (1990). Technology as equivoque: sensemaking in new technologies. In: P. S. Goodman, & L. Sproull (Eds.), Technology and Organisations (pp. 1-44). San Francisco: Jossey- Bass.

Wenger, E., R. McDermott and W. Snyder. (2002). Cultivating Communities of Practice. Cambridge, MA.: Harvard Business School Press.

Wielinga, E. and M. Vrolijk.(2009). Language and tools for networkers. Journal of Agricultural Education & Extension, 15: 205–217.

Winch, G. and R. Courtney. (2007). The organisation of innovation brokers: An international review. Technology Analysis and Strategic Management, 19: 747–763.

Woodhill, J. and N. Röling. (1998). The second wing of the eagle: The human dimension in learning our way to more sustainable futures. In: N. Röling, & M. A. E. Wagemakers (Eds.), Facilitating Sustainable Agriculture: Participatory learning and adaptive management in times of environmental uncertainty (pp. 46-71). Cambridge: Cambridge University Press.