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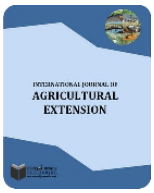

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EXPLORING THEEMERGING INTERMEDIATION ROLES (FACILITATION AND BROKERAGE) IN AGRICULTURAL EXTENSION EDUCATION

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A B S T R A C T

The purpose of this piece of work is to investigate, through a literature review, the role of intermediaries in agricultural and rural development. In the first place, a general view of the roles of intermediaries, (focusing on the two main types of intermediaries, i.e. facilitators and brokers), as depicted in literature, is provided. Following, the emergence of facilitators and brokers in agricultural literature is explored based on the turn from reductionist to systemic science as well as from the expert syndrome to participatory development. Such changes pose a major challenge to the dominant Transfer of Technology extension model and allow for the rise of a facilitation model; this is further reinforced by the sustainability rhetoric and practice. As a consequence the understanding of 'intermediation' has to be transformed from exploitation to exploration, i.e. from information dissemination to co-learning facilitation or from old to new KIBS. A number of examples from agriculture-related literature (and practice) illustrate such an argument. This review points to the fact that, at least as far as agriculture-related theory and practice are concerned, intermediaries as co-learning facilitators signify rather new roles requiring specific and, to a large degree, unexplored skills. Given that that there is still a number of issues threatening the efficacy of intermediaries (facilitators and brokers), it is argued that there is an urgent need for facilitation and brokerage to be better described, operationally defined and well-evaluated so as to allow for both a better interpretation and guidance of practice..

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

INTRODUCTION

Changes a) in thinking about innovation (i.e. the replacement of the linear view of innovation by innovation systems approaches; innovations as encompassing not only technological but social and organisational issues as well); b) in the agricultural knowledge infrastructure (i.e. commercialisation and privatisation of extension services; sustainability of production systems; multi functionality; specialisation, globalisation and the change of markets); and, c) on the demand and supply side (i.e. on the one hand, agricultural entrepreneurs actively seeking knowledge and information and, on the other hand, traditional providers of knowledge and technology facing the challenge to become more client-oriented as well as anew, pluralistic organisational landscape) illustrate the current, challenging scene for agricultural/rural extension and education (Klerkx and Leeuwis, 2008a, 2008b, 2009; Klerkx*et al*., 2006). This, in turn, implies that agriculture increasingly resembles non-agricultural sectors in terms of knowledge and technology acquisition.

For example, prominent among the abovementioned changes are the ones concerning innovation thinking. Indeed, during the last decades, a number of new, systems of innovations (SoI) approaches have emerged in the non-agricultural literature including the national systems of innovation approach (e.g. Edquist and Johnson, 1997; Lundvall, 1992; Nelson, 1992), the technological systems approaches (e.g. Hughes, 1987; Carlsson and Stankiewicz, 1995) and the sociotechnical systems approach (e.g. Bijker, 1995; Geels 2004). Such approaches see innovation in a systemic and interactive way, i.e. that innovation emerges from networks of actors as a social (and institutional) as well as a technical process, a nonlinear process, and a process of

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interactive learning. At the same time new concepts/approaches are gaining in importance. Such examples include Knowledge Management (KM), "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); Knowledge Transfer and Exchange (KTE), i.e., the "*interactive interchange of knowledge between research users and researcher producers" in order 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*" (Mitton *et al*., 2007); Evidence-based practice which "integrates best available research evidence with practitioner expertise and the client/population's needs, characteristics, values, and preferences" and Knowledge Translation, i.e. "The exchange, synthesis, and ethically sound application of knowledge within a complex system of interactions among researchers and users" (Mitchell *et al*., 2010) also known as 'implementation research' (Shea, 2011).

These and other relevant concepts/approaches build on networks, as social processes encouraging the sharing of knowledge (i.e., interrelating and sense making; Weick, 1990), and notably as preconditions for innovation. Communities of Practice (CoPs), for instance, are described as people engaged in a process of collective learning in a shared domain of interest (Wenger *et al*., 2002). Such concepts/approaches, therefore, focus on processes (instead of the emphasis on structures) with knowledge conceived as being constructed through social interaction – i.e., not unproblematically transferred but instead continuously created and recreated. Thus particular attention is given to (social) co-ordination and networking. Moreover, in order to avoid or overcome gaps (cognitive, information, managerial or system) resulting in network and institutional failures (for a review see: Klerkx and Leeuwis, 2009) growing attention is given to various types of (process) 'intermediaries/facilitators'. For example, Davenport and Prusak (1998) claim that one of the characteristics of successful knowledge networks is neutral facilitation; Van Lente *et al.* (2003) distinguish 'systemic intermediaries' as actors working mainly at the system or network level to facilitate actor interactions; Haga (2009) argues for the need to orchestrate networking enablers and thus for 'mediators' or 'brokers' as 'independent players' in networks aiming at: a) acting as points of passage to external actors outside the network, bringing in experience and expertise; and, b) building internal network resources and network structure - upon which network governance and processes depend (see also: Dhanaraj and Parkhe, 2006); and Shea (2011), cites Gagnon according to whom "...knowledge brokers, networks, and communities of practice are innovative ways to disseminate and facilitate the application of knowledge. Integrated exchange, involving active collaboration between researchers and knowledge users, built on trust and frequent interactions, holds particular promise."

Such 'intermediaries' are increasingly found particularly in industrial literature as third parties, (knowledge/technology) brokers, bridging organizations, intermediaries, boundary organizations and so on (Howells, 2006). For example, Juho and Mainela (2009) in their examination of the roles of facilitation in the internationalisation of small high-tech firms put forward the following roles: knowledge transfer, experience sharing, diagnosing, architecting, brokering, and coaching. Such intermediating actors have, in case of specific knowledge bridging, been named as KIBS, that is, knowledge intensive business services (Muller and Zenker, 2001).

Extensive reviews on the topic of various types of 'intermediaries', mainly found in the industrial sector (industrial dynamics, technology policy and firm strategy) and increasingly in the healthcare literature, however show that the field is still theoretically fragmented, not well-grounded and largely practice oriented. Therefore, Howells (2006: 720) prefers to employ the broad term 'innovation intermediary' according to the following 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. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations."*

It is thus quite clear that such 'intermediaries' are involved, taking an independent systemic role, in

process facilitation rather than in the production (i.e., source) or dissemination (i.e., carrier) of innovation (Van Lente *et al*., 2003). Or, according to Haga (2005) they are involved in 'indirect' inovation processes (i.e. in enabling individuals and enterprises) rather than in direct ones (i.e. on actual innovation projects).

Furthermore, Howells (2006) discriminates between intermediaries as organizations and intermediaries as processes and identifies the following functions of intermediaries: foresight and diagnostics; scanning and information processing; knowledge processing and combination/recombination; gatekeeping and brokering; testing and validation; accreditation; validation and regulation; protecting the results; commercialization; evaluation of outcomes. The author also states that such functions are dependent on the context, the development stage and the composition of the innovation network, and the system aggregate levels of the innovation system.

AIM AND METHODOLOGY

Despite the fact that 'intermediaries' are increasingly recognised as playing a significant role in knowledge exchange and the wider innovation system, this new topic has not been extensively dealt with in agricultural literature (Klerkx and Leeuwis, 2008a). This piece of work aims at addressing such a lack; a first attempt to explore the meaning and use of 'intermediaries', especially of 'facilitators' and 'brokers', particularly in agricultural literature, is thus undertaken. To fulfill such a task, first, the concepts of facilitation and brokerage and the relevant roles are explored. In the next session, the (need for the) emergence of such concepts in agricultural literature and practice is discussed and illustrated by a number of examples. The paper concludes with reference to the potential as well as some of the main problems identified with the 'intermediation' function while also including indicative implications for higher agricultural education.

On 'Intermediaries': In general, due to the aforementioned lack of conceptual groundedness, definitions of various types of 'intermediaries', on the one hand, have not yet been widely agreed and, on the other hand, are often used interchangeably. Following two major types of 'intermediaries' will be dealt with: 'facilitators' and 'brokers'.

(**a) Facilitation and facilitators:** In the case of 'facilitation', Auvine *et al*. (2002) note that facilitation "is designed to help make groups perform more effectively" and that "a facilitator's job is to focus on how well people work together"; although a facilitator "can fulfil different kinds of needs in working with a group" his/her actual role depends on "the group's purpose for coming together and by what is expected … of the facilitator". Savage and Hilton (2001) distinguish between facilitation, mediation and persuasion and note that a facilitator affects the orientation of a group and its relationships; they add that a facilitator's intervention affects both internal (direct and indirect) and external (inward and outward) group processes. Thompson *et al*. (2006) in their comparison between 'opinion leaders, facilitators, champions, linking agents and change agents' point out that facilitators' overarching role is "to assist (individuals or groups) through the process of implementing a change in practice"; their distinctive role relates to the use of "the dynamics of a group and their skills to assist persons to move towards change". For Murray and Blackman (2006) facilitation aims at *"supporting the work of different types of teams in solving mostly complex problems and in developing decision solutions. The point is that facilitation enablers allow learners to be confronted with different kinds of participation."* Finally, Leeuwis (2004) summarises the facilitator's tasks as a) to facilitate the group process, b) to teach and c) to be an expert on technical aspects of farming. Such approaches to facilitation relate to Habermas' (1984) perspective, 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*" (Savage and Hilton, 2001)

(b) Brokerage and brokers: Brokerage in the form of 'knowledge brokers' has emerged, within the 'Knowledge Management' literature, as the facilitation of the spread of knowledge within and between organisations and thus as a means to stimulate innovation (Roth, 2003). In their extensive literature review, in the health sector, Dobbins *et al.* (2009) stress the importance of Knowledge Brokers as an 'emerging human resource' with the aim to facilitate and improve knowledge sharing between stakeholders, facilitate learning and build local capacity. Brokers' roles are prominent in 'Knowledge Translation' (Kitson, 2009; Jones et al., 2009) where knowledge brokers - either individuals, organisations or structures, work-intervene with the aim "to manipulate contextual factors and support experiential learning … in managing the new knowledge." (Kitson, 2009). Similarly, Melkas and

Harmaakorpi (2009) in their exploration of regional innovation systems call for information brokering intermediate organisations to compensate for the difference in knowledge interests among networks' partners. But when attention shifts particularly to innovation genesis, an 'innovation broker' is defined 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), i.e. a 'facilitator of innovation' (see: Den Hertog, 2000; Winch and Courtney, 2007; Van Lente et al., 2003). In this respect, Kolodny *et al*.'s (2001) design requirements for innovation brokers providing services to SMEs are as follows: (1) visibility and accessibility to SMEs, (2) trustworthiness to SMEs, (3) access to appropriate sources of knowledge and information relevant to the innovation process, (4) credibility of the intermediary organization with these sources, (5) quick response to the requests of SMEs, and (6) complementarity to the weaknesses of the SMEs it serves.

Innovation brokers are in general seen as beneficial to the innovation process by closing system gaps and acting as animators or catalysts. Klerkx and Leeuwis (2008a, 2008b, 2009), through their literature review, identify three major functions of an innovation broker: a) demand articulation, b) network formation and c) innovation process management (for a more elaborated account see Kilelu*et al*., 2011; see also Juho and Mainela, 2009).

The turn to 'Intermediaries' in agricultural theory (and practice): Agricultural literature is rather familiar with the topic of 'intermediaries' in the sense of state/public funded bodies aiming at bridging the gap between agronomy-science and farming practice, i.e. mainstream or 'conventional' extension. The linear (diffusion of innovations) model, also known as technology or knowledge transfer (ToT/TOK), claims that innovations originate from scientists, are transferred by extension agents ('intermediaries') and are adopted/applied by farmers (Rogers, 2004). For Rogers (2004: 28) a change (extension) agents "an individual who influences clients' innovation decisions in a direction deemed desirable by a change agency". However, nowadays, a new understanding of 'intermediaries' is emerging since the turn a) from reductionist to systemic science (and practice) and b) from the expert syndrome (top-down approach) towards participatory (bottom-up) processes (i.e., 'passing the stick' to participants).Agrarian sciences have until recently been dominated by instrumental rationalist knowledge over others ways of knowing (Habermas, 1984). Such a (dominant) paradigm of experimental, reductionist science (Packham and Sriskandarajah, 2005) has resulted in a 'culture of technical control' (Bawden, 2005) implying reliance upon scientific experimentation to create a 'fix' for agricultural problems (Nerbonne and Lentz, 2003). Despite the paradigm's dazzling achievements, alternative proposals have nevertheless flourished, since the 1970s, based on the realization of the inadequacy of linear and mechanistic thinking in understanding the source and the solutions of problems (Hjorth and Bagheri, 2006). As a result, contemporary conceptions of agriculture focus increasingly on systems approaches (see: Ison, 2010; Mingers, 2011) looking at a potential system as a whole (holistically) and focusing on the relationships (important causal inter-linkages or couplings) among a system's parts and on system dynamics, rather than the parts themselves. Especially since Dahlberg's (1979) contention that most intellectual maps of agriculture fail to perceive it as 'the basic interface between people and their environment', a growing body of literature has identified the social, cultural and political perspectives involved in natural resources management (Pound *et al*., 2002), implying that social and ecological systems have to be treated as a single coupled and dynamically complex system (Allison and Hobbs, 2004; Griffin, 1979).

In parallel, the 'diffusion of innovations' model has been heavily criticised, as it fails to respond to complex challenges and rapidly changing contexts, including the shift to sustainable development (see: Chambers and Jiggins, 1986; Nitch, 1982; Röling, 1988; Röling and Jiggins 1998). Important in this respect has been the emergence of Farming Systems Research/Extension (FSR/E) approaches. Their introduction as a set of methodologies to better understand and apply technical interventions, with its theoretical roots based on ecology and general systems theory (Schiere, *et al*., 1999), was a leap in terms of agricultural development on both theoretical and practical terms (Byerlee, *et al.,* 1982; Simmonds, 1986). Through FSR/E vast experience hasbeen accumulated in terms of understanding farmers, eliciting participation, developing tools and methods, and

building agricultural and social networks. FSR/E contributed substantially to the recognition of different actors in development and helped to create awareness about the need for new ways to conduct research and extension, taking into account context and relations (Collinson, 2000).

An important evolution in this respect has been, within the FSR/E tradition, the turn from Rapid/RRA to Participatory Rural Appraisal/PRA (Chambers, 1992, 1994; Webber, 1995) which "tends to favour facilitation of a non-interventionist variety" (Robinson, 2002). A suite of participatory approaches and methods, relating to agricultural and rural development, has thus been developed including Farmer Participatory Research, Participatory Action Research, Participatory Rural Appraisal, Participatory Technology Development, etc. (see: Pretty, 1995). Consequently, the need for interaction and dialogue between different actors and networks (the interpenetration of actors' life-worlds and projects; Long, 1992) forcefully emerged (Chambers, 1993; Scoones and Thompson, 1994), based on the realisation that flows of communication and exchange between different actors are extremely important for existing knowledge to be either reinforced or somehow transformed or deconstructed, thus leading to the emergence of new forms and a 'fusion of horizons' (Leeuwis *et al.,* 1990).

For example, based on the realisation that 'experts' and farmers come from different knowledge systems and thus the messages generated within one system may not make sense in another one, GTZ (Hess, 2007) claim that Technical Cooperation projects should aim at facilitating and improving the communication between the two parties. Based on a Knowledge Management approach Hess posits a number of prerequisites for the growth of knowledge as follows: "*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*".

With the 'sustainability era' having, in general, favoured multi-stakeholder processes (MSPs) thinking (see: Dalal-Clayton and Bass, 2002; Hemmati, 2002; UNCED, 1992) such considerations have been further enhanced in agricultural literature and practice. This is based on the understanding that, in addition to the ecologically, agronomically and socio-economically complex nature of farming systems, sustainable agricultural practices in particular are also complex as well as knowledge intensive and non-prescriptive ones. Thus, for Somers (1998) collaborative problem-solving methods with extensionists fostering discovery learning are required. Crucially, according to Röling and Jiggins (1998) the shift to sustainable agriculture concerns a systemic change thus requiring 'double loop' learning, i.e. a profound change in assumptions and strategies underlying subsequent actions (Argyris and Schon, 1974) or a move from traditional, first-order practice to second-order change, i.e. change in perspective or level (Ison and Russel, 2000). Thus the emphasis currently given on the principles of experiential learning (Kolb, 1984) and its advances such as participatory learning and action research (King *et al*., 2001) stressing, among others, the importance of reflection and dialogue.

Moreover, Röling and Jiggins (1998) argue that the move towards an 'ecological knowledge system' (vs. the 'conventional knowledge system') means the need to move from a praxeology (i.e., theory informing practice, and practices feeding new theory) of 'transfer of knowledge' to a 'facilitating knowledge' one (Box 1) focusing "on enhancing the farmers' capacity to observe, experiment, discuss, evaluate and plan ahead" (Deugd *et al*., 1998). This new praxeology thus calls for an alternative extension pedagogy entailing stakeholders' participation in experiential learning and knowledge exchange (Woodhill and Röling, 1998).

BOX 1: Dimensions of the ecological knowledge system

1. Effective research on ecologically-sound practices.
2. Social learning.
3. Facilitation (extension).
4. Supportive institutions and networks (including research).
5. Conducive market and policy contexts.

Source: Röling and Jiggins (1998: 286)

Social learning (SL) lies at the heart of such multi-stakeholder processes. It refers to the collective action and reflection that occurs among stakeholders as they work towards mutually acceptable solution to a problem pertaining to the management of human and environmental interrelationships (Keen *et al*., 2005) (see also: Wals, 2007). Additionally, SL according to Woodhill and Röling (1988) is based on the following premises: "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 andeconomic frameworks for the better".

Extension for sustainable agriculture therefore implies a (social) mechanism for facilitating SL (Allahyari*et al*., 2009) i.e. participatory processes of social change, through shared learning, collaboration, and the development of consensus about the action to be taken. Consequently, a new extension approach aiming at participatory and group learning and networking with extension agents acting as facilitators is required (Röling, 1994) (see, for example, Box 2).

BOX 2. Extension approaches to support sustainable agriculture

Extension approaches should:

Embody a whole farm or farming system orientation with individual clients, and an interdisciplinary orientation when supporting collective RNR management.

Use collaborative problem-solving as the dominant mode of influence on clients' behaviour.

Use extension resources to support the development of independent client organisations.

Work increasingly to influence and facilitate planning, decisions and action at group and community levels.

Incorporate bottom-up and interactive processes for extension planning and technology development.

Encourage learning which will enable clients to manage with minimal extension support in the future and to identify critical points at which support is needed.

Source: Garforth and Lawrence (1997)

Additionally, based on SoI approaches there has been a conceptual shift in agricultural literature from the TOT model to network and systems approaches such as the agricultural knowledge and information systems (AKIS; see: Röling and Engel 1991; Rivera and Zijp, 2002) and, more recently, towards agricultural innovation systems (AIS; see: Klerkx and Leeuwis 2008a; Klerkx *et al*. 2010; Leeuwis, 2004). Contra Rogers (2004), these approaches claim that the process of innovation is messy and complex; new ideas are developed and implemented by people who engage in networks and make adjustments in order to achieve desired outcomes (see: Van de Ven *et al*., 1999). Nowadays, innovation studies increasingly focus on learning itself, with emphasis on facilitation and the processes of human interaction from which learning emerges (LEARN Group, 2000; Röling and Wagemakers, 1988). Thus Leeuwis's view of extension as 'communication for innovation' (Leeuwis, 2004; Leeuwis and Aarts, 2011).

Such considerations have led to the requirement to move across the boundaries of different scientific branches as well as between scientists and stakeholders. As a result, a wide variety of approaches on collaborative-participatory efforts has been advanced in the field the sustainable natural resources management, such as adaptive management, social learning/ learning for sustainability, social/public ecology as well as the attention paid to local knowledge and indigenous science (see, Koutsouris, 2008). Consequently, new configurations also emerge in agriculture including learning partnerships, group extension, farmer-field schools, communities of practice, study circles, farmer networks, etc.

Overall, such changes imply that extension has to be transformed. 'Conventional' extension, identified with the linear model of innovation, has to do with 'exploitation', i.e. with the capturing, transfer and deployment of knowledge in other similar situations, and thus belongs to the old type of KIBS. On the contrary, nowadays new KIBS operating on the systems perspective and aiming at enhancing the interaction between a variety of actors, focusing on 'exploration', i.e. with the sharing and synthesising thus with the creation of new knowledge (see: Levinthal and March, 1993; Murray and Blackman, 2006), are emerging. A major role of the new KIBS is that of the co-learning facilitator (usually found in literature as 'facilitators' or 'brokers') aiming at the development of shared meaning and language between dialogue partners in order to stimulate change and develop solutions and innovation. The engagement of stakeholders in dialogue, despite its difficulties and its time consuming nature (since (social) learning and change are gradual), is necessary so that critical self-inquiry and collaboration will be achieved. What is more, according to Sriskandarajah *et al*. (2006): "*The future challenge will be about learning processes in open networks and less so in well-defined and often familiar groups. Learning among heterogeneous groups of stakeholders, and among different epistemologies has become one of the most central issues".*

(a) Indicative Examples of 'Facilitation' in agriculture: The issue of knowledge networks and the

need for the transformation of local knowledge through the construction of interfaces between farmers, researchers and Extensionists has been dealt with by, for example, Long (1984), Box (1988) and Long and Long (1992).

A well-known, early reference to facilitation is found in Oakley et al's (1991) account of the six major dimensions (animation, structuring, facilitation, intermediary, linking and withdrawal) in promoting rural people's participation. According to them facilitation concerns the provision of assistance to rural people (such as the acquisition of technical skills, gaining access to available resources or translation of their own ideas into projects) in order to undertake actions aiming at strengthening their participation.

On the other hand, in a recent paper, Ingram (2008), discriminates between various agronomists' roles in knowledge exchange encounters (KEE) in relation to best management practices (BMPs) for a more responsible and sustainable agriculture. Her research points to the existence of one, among four, distinct type of agronomists who see themselves and act as facilitators. These agronomists help "farmers to understand the problems and opportunities within their own farming systems" through farmers' empowerment "in terms of raising general awareness about problems as well as teaching [explaining] certain principles and practices" which "provides the basis for facilitation of use of BMPs." Therefore, facilitative KEEs "are built on dialogue, mutual respect and shared expectations and this provides the right context for joint learning" (see also: Garforth *et al*. 2003; Moriss *et al*. 2006). For Ingram facilitators-agronomists in order to be able to work collaboratively, assist and empower farmers to learn and adapt (or, to build a trusting and credible relationship with farmers) have "to have good communication skills, the ability to empathize and listen, impartial, technically capable, and they value farmers' insights". Her findings, stress especially the need for the development, in parallel with technical training, of the 'interactional expertise'/ interpersonal skills of advisors (see also: Cerf *et al*., 2011; Ison and Russell 2000; Leeuwis 2000; Sheath and Webby 2000).

Among the most well known cases advocating facilitation are the Australian Landcare movement and Farmer Field Schools (FFS). In the Lancare case, "*Landcare group facilitation is about fomenting group synergy, about helping groups to make best use of the human resources available, about helping to develop a shared sense of direction among the relevant actors (within and beyond the Landcare group), about skilled listening, asking the right questions of the right people at the right time, providing occasions, organising encounters and stimulating interaction among target stakeholders*" (Campbell, 1997: p. 146).

With reference to Australia again, Coutts and Roberts (2003) identify one specific, among others, extension model which they call 'The Group Facilitation/Empowerment Model' which they describe as follows: "*This model focuses on participants increasing their own capacity in planning and decision-making and in seeking their own education/training needs based on their situation. Groups may undertake their own research. The project will often provide or fund a facilitator to assist groups to define their own goals and learning needs and to help them realize these.*" This facilitation model is central to their 'Capacity Building Ladder'.

As far as FFS is concerned, it was initially developed based on adult learning principles in order to facilitate farmer understanding and application of IPM through learning-by-doing and social learning (Röling and van de Fliert, 1994, 1998; van de Fliert *et al.,* 1995) or discovery learning (Tripp *et al*., 2005). Nowadays, FFS programmes have been initiated in 78 countries (Braun et al., 2006). For Braun *et al*. (2000) FFS - as well as CIALS (local agricultural research committees) - sum up to "participatory platforms for improving decision-making capacity and stimulating local innovation for sustainable agriculture". According to the authors both platforms "… consider farmers as experts, stress respect for local values and knowledge, and build capacity based on practical experience … have mechanisms to ensure that the risk is shared ... [while] facilitation styles and the role of motivation are similar." Within such a context teaching is transformed into facilitation i.e. a process assisting farmers to explore and discover; extension workers or trained farmers facilitate the learning process, encouraging farmers to discover key agro ecological concepts and develop IPM skills through self-discovery activities practised in the field (Ooi, 1996). Thus Friis-Hansen and Duveskog (2011) stress the link between FFS participation (based on high-quality facilitation) and empowerment, while 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."The Participatory Extension Approach (PEA) practiced by GTZ in Zimbabwe in the 1990's and thereafter, further adapted and developed, in other countries as well, is another interesting example of an alternative approach to innovation service delivery (Hagman *et al*., 1997; Hagman *et al*., 2003; Moyo and Hagman, 2000; Ngweya and Hagman, 2007). PEA is people-centred, learning oriented and participatory; it combines 'social extension' and 'technical advisory services' in an effort to enhance people's adaptive capacities and establish a common platform for trying out new things. Within such an approach, facilitation for change (F4C), built on action learning and systemic theories, aims at stimulating people's 'creative orientation' both at individual and organisation levels. F4C has played a significant role in triggering the process of community emancipation and innovation and it can be analysed in a number of dimensions (see: Box 3)

Box 3: Some of the fundamental factors underpinning F4C

Facilitation for trust building.
Facilitation for creating discomfort.
Facilitation for creating a joint vision for development.
Facilitate for making people analyse their situation critically.
Facilitation for creating ownership of the process and self-reliance.
Facilitation for self-discovery of behavioural patterns and hidden potentials.
Facilitation for making people see the systemic nature of the developmental challenges.
Facilitation for local organisational development.
Facilitation for re-discovering and creating norms and values.
Facilitation for creating linkages and stakeholder collaboration.
Facilitation for stimulating creativity, solution-orientation and an entrepreneurial spirit.
Facilitation for establishing a culture of feedback and reflection.
Facilitation for information sharing.
Facilitation for making people see facts instead of politics.

Source: Ngweya and Hagman (2007)

PEA, among others, puts emphasis on the competencies of the extension facilitators at the cognitive, behavioural/attitudinal level and the emotional level which are integrally linked and strongly influence one another. Furthermore, it delineates the specific facilitation skills in terms of: a) process related skills and b) facilitation techniques. The first comprise elements like process observation (including monitoring and evaluation), process documentation and the adaptive capacity. The second include the art of questioning and probing; managing facilitation tools; visualisation skills; giving and receiving feedback; and, managing group dynamics, team building techniques. Finally, PEA provides the guidelines for the development of facilitation skills as follows: a series of 5 learning workshops spread over a period of 18 months expose learners to different concepts and provide a platform for reflection on the fieldpractice experiences. Each workshop is followed by a period of 2-4 months field practice, allowing for the blending of theory with practice and, concurrently, intervention at both extension and community level (see also: Box 4).

(b) Facilitation and the European Farming Systems Community: The issue of 'facilitation' has been given increasing attention particularly since 2000 within the European Farming Systems community both implicitly (e.g., in papers dealing with systemic and participatory approaches; multi-stakeholder and interactive processes; sustainable (particularly organic) farming; education for sustainability; inter- and trans-disciplinarily, etc.) and more explicitly in papers in Workshops devoted to learning/SL. Notably, a Workshop was specifically devoted to Facilitation in the last FS Symposium in Vienna (2010). Indicative excerpts from paper presented in the European Farming Symposia are provided in Box 5.(**b) Indicative Examples of 'Brokerage' in agriculture:** Despite Hekkert *et al.* (2007) argument that innovation brokers contribute to several of the innovation systems functions the topic has not been extensively embraced by the agricultural academic and research community 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). Klerkx and Leeuwis (op. cit.) identify three major functions of an innovation broker: a) demand articulation, b) network formation and c)

Box 4: Extension worker training for sustainable agriculture: areas for action

Learning objectives should include:

Specific technical knowledge and competence in respect of sustainable technologies - at the level of principles underlying categories of technology and the range of possible adaptations and permutations of components which may be appropriate to farmers' varying circumstances.

Competence in using, and selecting from, a range of extension methods.

Ability to comprehend farmers' practices in terms of systems and ecological processes.

Attitudes and interpersonal skills which will facilitate farmer experimentation and farmer-to-farmer extension.

Training (teaching and learning) methods help trainees to internalise particular strategies and patterns of learning which they will use in their professional practice. They also influence the methods extension personnel use in their interaction with clients. Extension workers who are expected to encourage farmers to adapt technologies to their own farm and local environment should be encouraged to learn about sustainable technologies through direct observation and experimentation. If sustainable agricultural development requires extension workers to engage farmers in dialogue, respect farmers' knowledge and recognise the social and economic dimensions of technology, their own training should incorporate methods which embody these principles.

Management practices to support future professional development include supervision, appraisal (linked to reward systems and career development) and the use of short-term project teams.

Source: Garforth and Lawrence (1997)

Further useful hints about facilitation can also be found in PROLINNOVA's work (www.prolinnova.net/publications/publications) documenting their experieces with on Participatory Innovation Development (PID) (see, for example, Critchley *et al.*, 2006).

Box 5: indicative EXAMPLES OF 'Facilitation' THINKING in European FS Symposia Proceedings

Kaltoft, P., 2000 (WS5). "extension as facilitation of collective action among different stakeholders and involving social learning (Röling and Jong 1998, p. 152) and creating room for mutual learning (Nitsch 1994)."

Röling, N., 2002 (WS5). "More especially, we must begin to develop the skills and insights required effectively to facilitate and govern interaction so that it yields desirable states."

Ison, R., 2002 (WS5). "to move towards a facilitated model of behaviour change which is local and contextualised"

Nagel, *et al.*, 2002 (WS5). "it became absolutely clear that networking requires facilitation and organisation, both of which have to be managed and funded."

Langeveld, H.,Proost, J., 2004 (WS4). "The network thus facilitated links between farmers and researchers, allowing more effective feedback and interaction, and, hence, reflection on the way of thinking and working that existed in either group before they were linked."

Knickel, K., Peter, S., 2004 (WS4). "Ideally, the support programme and the agency implementing it play the role of facilitators."

Roberts, K., Paine, M., 2004 (WS4) Facilitation requires "a comprehensive understanding of the process, and competence with tools that help participants to *give it a go* in their own situation".

Marquandt, K., 2004 (WS4) research strives to "facilitate farmers' reflection on land management in a broader context that includes farmer knowledge and farmer worldview"

Klerkx, L., Leeuwis, C., 2008 (WS6). "a role of facilitators who match demand and supply for innovation support services"

Compagnone, *et al.* 2008 (WS6). "the role of mediation is different from technical transmission traditionally provided by agricultural development structures"

Knickel, *et al.*.,2008 (WS6). "the role of organisations facilitating innovation as well as public innovation policies are critically important research questions"

van de Fliert *et al.*., 2010 (WS1.6) "From being the "know-it-alls", researchers and service providers are learning to identify needs and opportunities from a farmer perspective and becoming facilitators of a change process in which farmers are considered the experts of their own farms"

Source: http://ifsa.boku.ac.at/cms/index.php?id=30

This is in line with findings in the SMEs development literature showing that due to market failure or social economy arguments pure innovation intermediaries are often policy induced and funded although on the medium/long-run they are expected to become self-sufficient (see also: Klerkx and Leeuwis, 2008b). Given the difficulty "to perform a wide array of innovation intermediation functions within one organisation", Klerkx and Leeuwis (2008a) argue that the differentiation between 'animateurs' involved in the early pre-

competitive stages of the innovation process (fulfilling tasks such as foresight, problem diagnosing and needs articulation, scoping and filtering (selection of collaborative partners), and network brokerage roles) and intermediaries involved in the process in a later stage (fulfilling tasks such as gate keeping and knowledge brokering; knowledge testing and validation; knowledge commercialisation; accreditation, validation and regulation, and standards work; independent advice and mentoring on protecting intellectual property; and evaluation of the outcomes of innovation collaboration).

Furthermore, Klerkx and Leeuwis (2009) state that further research is needed along two lines: the position of innovation brokers in relation to the (different stages of) innovation process (including their specific competencies needed to successfully carry out their taks), and the emergent types (typology) of brokers and their fit in the innovation system.

A number of examples of innovation brokering is also found in Nederlof *et al*. (2011) in which, within the framework of innovation platforms, Heemsesrk *et al*. (2011) identify and discuss a number of brokering functions: facilitation, linking and strategic networking, technical backstopping, mediation, advocacy, capacity building, management, documenting learning, championing. Brokers thus provide three lines of support, i.e. developing a common vision and articulating related demands; scoping, scanning, filtering and strategic networking; and innovation process management. The authors notwithstanding the identification of a number of training instances for brokers stress that a good broker goes beyond training as well as that it takes time and interaction for brokers to develop their skills; they also underline that brokering is a time-demanding and costly job, thus concluding that the brokering is "[E]asier said than done" (p. 52). Furthermore, Klerkx and Gildemacher (2012) provide a typology of innovation brokers while also identifying key policy issues and providing a number of recommendations for practitioners, policy makers and project leaders. Nevertheless, it is quite clear that the broker role is still very new.

Conclusions

Given the changes in terms of innovation thinking as well as of knowledge infrastructure and knowledge demand and supply in agriculture (and rural development) new roles for extension emerge. Such new, 'intermediating' or/and 'enabling' roles, i.e., co-learning facilitation roles such as 'facilitation' and 'brokerage', point to an overall new 'praxeology' for extension, that is, a shift from a 'transfer of knowledge' to a 'facilitation of knowledge' perspective. As shown in the previous sections while the case of facilitation in not new in agricultural literature and practice a need for extension to move from an 'old' to a 'new KIBS' role clearly arises. On the other hand, the topic of brokerage in agricultural innovation is rather new and thus substantial research and theoretical work is needed.

At the same time, despite the overall positive 'intermediation' functions of facilitators and brokers in knowledge diffusion and interactive innovation generation, some points of concern also emerge. For example, the experience of Landcare groups, has shown that (Campbell, 1997): a) in many instances "Landcare facilitation often looks anything but strategic, and its puprose is often lost"; b) although the key premise is that facilitators (and brokers) hold an impartial-independent position, "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) and c) a facilitator should have both facilitation skills and appropriate technical background (see also the call for the training of 'social agronomists'; Leeuwis 2000, 2004).

Furthermore, the issue of sustainability is also of crucial importance. Despite Oakley *et al's* (1991) argument 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, as shown by Ljung and Emmelin (2000) and Cristóvão *et al.* (2008) the withdrawal of 'external', i.e. project supported facilitators results in the end of such work in the localities concerned.

Finally, the dilemma of 'top-down' vs. 'bottom-up' roles of an intermediary should be pointed out. This theme is extensively dealt with in participation literature dealing with the obstacles to participation and especially the 'expert syndrome' (see for example, Botes and van Rensburg, 2000; Cooke and Kothari, 2001; Leal, 2007; Quaghebeur *et al.*, 2004). In the specific case of process facilitators, Savage and Hilton (2001) also take notice of the need that sometimes arises for facilitators to steer processes towards consensus an action which the authors perceive as desirable. Similarly, Harvey *et al.* (2002), although favouring the 'enabling' approach, argue that under certain circumstances the task-oriented, practical approach is also effective while for Stetler *et al.* (2006) depending on the projects, specific sites, related progress,

and individuals involved the flexible facilitator may take either a directive or a non-directive style.

As already noticed, intermediation (facilitation and brokerage) has yet to be thoroughly described, operationally defined, or well-evaluated (Stetler *et al*., 2006). Therefore, on the one hand, there is a need for conceptual clarity since the current abundance of terminology and the use of the same terms but with different meanings complicate the scene. Explicit attention has thus to be given to theoretical developments; without nuanced a understanding of the concepts, terminology, and controversies, study findings will be difficult to interpret and guidance to practice change may become untenable. On the other hand, Klerkx and Leeuwis (2008b) underline that, despite inherent difficulties, there is a need to become able to measure the added value of intermediaries. This way their contribution will become explicit and thus recognised in the knowledge infrastructure. Such an agenda will help in further highlighting gaps in our knowledge as well as strategies to address such gaps and, thus, in building a solid knowledge base which will be valuable for policymakers, academics and researchers, and practitioners.

Lastly, it should be pointed out that the abovementioned considerations, changing the understanding as to how research and extension activities are carried out, especially with a view to sustainability, (tentatively) influence education, especially Higher Education Institutions (HEIs), as well. Among others, a) the abandonment of mono- disciplinary and reductionist science in favour of trans-disciplinarily (i.e., the bringing together of divergent worldviews (including the transgression of disciplinary boundaries as well as the involvement of stakeholders) thus creating new boundaries for exploration and understanding); b) a change from transmissive learning to transformative learning, i.e. to constructive and participative learning especially through the examination of and interaction with complex, controversial issues, and the use of complex teaching/learning methods (see: Bawden and Packham, 1993; Bawden *et al.,* 2007; Packham and Sriskandaraja, 2005; Valentine, 2005) should be highlighted. Additionally, following the emergence of new roles as pointed out in this paper, curricula must include an exposure to the 'intermediation' concepts, skills and tools concerning "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) so that graduates (engaged in the field of sustainable agricultural/rural development as either academics/researchers, policymakers or practitioners) are appropriately equipped to undertake relevant roles in their field of endeavour. Although change in HEIs is particularly slow, owing to the many risks (both cognitive and social) and obstacles for both students and academics/researchers, tertiary institutions (especially agricultural universities) will have to face the aforementioned changes/challenges pertaining agricultural (and rural) development theory and practice (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/art3/.

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_Ngwenya.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.