



Humanising agricultural extension: A review

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ABSTRACT

Agricultural extension is booming. This interest is critical in the context of numerous pressing issues linked to agrarian change and rural development. Because of its importance, extension has attracted significant critique for its persistent exclusion of social and political factors. In this light, the history of extension can be thought of as a paradigm composed of approaches aimed at increasing agricultural production through the transfer of technologies from experts to farmers, and a series of criticisms of technology transfer as hampered by neglect of socio-political factors, a process labelled 'rendering technical'. By reviewing criticisms of extension for its rendering of socio-political factors, we account for the rendering of power, place, and people. Equally important, we offer examples that consolidate critiques in order to open the possibility that humanized extension may more successfully support farmers. Our review is an effort to engage extensionists in order to speak about power to those who attempt to speak truth to power.

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1. Introduction

Across the array of existential challenges facing humanity, agricultural scientists, government agencies, commercial vendors, and the development sector (hereafter 'extensionists') have attempted to resolve agricultural problems by focusing on the transfer of technological innovations. These interventions typically take the form of attempts to influence farmer practices via the introduction of technologies (Ison et al., 2000; Russell & Ison, 2000). Following Loevinsohn et al. (2013, p. 2), agricultural technologies are:

"The means and methods of producing goods and services, including methods of organisation as well as physical technique. New technology is 'new' to a particular place or group of farmers, or represents a 'new' use of technology that is already in use within a particular place or amongst a group of farmers."

While adoption is:

"The integration of a new technology into existing practice; usually preceded by a period of 'trying' and some degree of adaptation. Dis-adoption refers the process of reversion to the pre-existing technology following a relatively short period of adoption" (Loevinsohn et al., 2013, p. 3).

While agricultural livelihoods and the adoption of technologies are undoubtedly beset by technical knowledge and practice (Bebbington, 1993, 1996), it has long been recognised that extension is mediated by powerful socio-political processes (Birkhaeuser et al., 1989; Russell & Ison, 2000; Vanclay, 2004; Vanclay & Lawrence, 1994; Landini et al., 2017). Surprisingly, these forces have remained largely excluded from the extension discourse: set aside while extensionists determine the (cost) effectiveness of competing technologies. As Bartlett (2010, p. 11) stated as part of an effort to introduce extension to 'the real world', extensionists have largely ignored the socio-political and economic processes that shape rural lives. These exclusionary practices establish boundaries that legitimise and delegitimise certain knowledge-practices, a process that, following (Li, 2007, 2011), is labelled 'rendering technical', which forms the analytical basis of this review of the extension discourse.

Farmer access to agricultural technologies has long been recognised as critical to farmers' livelihoods, for example explored within the World Bank's emphasis on learning and education, with mention of an 'innovation paradox' (Cirera & Maloney, 2017). Extension is embedded within the political economy of agrarian change, long positioned as central to achieving poverty reduction and rural development (Akram-Lodhi & Kay, 2012). With reference to smallholder farmers, the extension discourse emphasises the unrealised economic rewards of available technologies, nearly always assumed to be achieved via increased on-farm production. The potential gains of extension-adoption for farming – and possibly for farmers – is given added importance with appreciation for

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the amplifying uncertainties associated with climate variability, ongoing soil erosion and degradation, salinity, pest and disease vectors, global population trends and consumption habits, mechanisation, and rapidly shifting labour (Borras & Franco, 2012; Hall et al., 2015). The plight of rural farmers is dire and subject to many powerful forces; into this situation extensionists add technologies while excluding the socio-political.

In this review, we analyze the rendering of socio-political factors from extension, which we argue represents the enduring essence of extension. We write for those contributing to the boom of academic publications (see Fig. 1), drawing attention to the ever-present boundary-making that has inhibited the efforts of extensionists who aspire to support farmers. Section 2 situates the extension discourse, showing a recent proliferation amongst scientific publications. Section 3 introduces the analytical framework while section 4 examines the dominant approaches to agricultural extension: *technology transfer, participatory, decentralised, and system thinking*. Our review documents a constant effort to extend technologies to farmers with the hope of altering their practices, and a *simultaneous effort to set-aside, oversimplify, or exclude socio-political factors*. Finally, section 5 discusses the rendering of power, place, and people within the prevailing framing of extension, noting the arguments and practices that legitimise and delegitimise aspects of extension-adoption: determining what can be investigated, practiced, and represented (Rose, 1999). We demonstrate that what is known about extension remains strikingly partial and disconnected from farmers' realities, relationships, and practices (Bartlett, 2010). In response, we attempt to reverse these renderings. We advocate *Humanized Extension* via inclusion of and reflection on power, place, and people. This involves actively seeking to unbound extensionists' preconceptions and to examine the socio-political processes that hinder farmer empowerment, though aware that 'naïve populism' (Thompson & Scoones, 1994) and intervention by powerful 'outsiders' will remain a perpetual challenge. The prevalence of extension highlights the need for extensionists to continue working with farmers to challenge dominant knowledge-practices, which hinder farmer empowerment and more socially just forms of extension (Li, 2010).

2. Extension is booming

Modern extension has its roots in Green Revolution efforts to extend the practices, varieties, knowledge, and techniques that fed a booming post-war world (Pingali, 2012), though its origins can be traced to earlier efforts to control rural populations (Bartlett, 2008, 2010). Its long history means that the concept has 'risen and fallen' over generations as those concerned with agricultural production have contemplated the implications of high-input, technical agriculture, often within debates tinged with Malthusian predictions of famines (Boserup, 2014). Across this history, there have been numerous moments when extension appeared to have 'died' or been surpassed because of its inability to affect the societal changes sought by extensionists (Bartlett, 2008; Rasmussen, 2018; Rivera & Qamar, 2003; Vanclay, 2004).

Despite its repeated failures, extension continued as a relatively niche topic associated with agronomy, economics, rural studies, and elements of the social sciences. More recently, advanced searches of the extension discourse suggest a 'boom' of publications. For example, Scopus in English¹ exposes a relatively stable

¹ The advanced search used the following criteria: TITLE-ABS-KEY ("agricultural extension") AND PUBYEAR greater than 1950 AND PUBYEAR < 2019 AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "AGRI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "ECON") OR LIMIT-TO (SUBJAREA , "EART") OR LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "ARTS")) AND (LIMIT-TO (LANGUAGE , "English"))

history until the new millennium when a rapid increase began (Fig. 1a), specifically amongst Agricultural and Biological Sciences, Environmental Sciences, and Social Sciences journals (Fig. 1b). While some of this trend is likely a product of global research and academic publishing practices, sometimes referred to as 'masification' (Altbach et al., 2009), the resulting avalanche of outputs carries significant implications. Against this outpouring of publications, following Leeuwis (2013), it is also clear that a segment of researchers critical of prevailing knowledge-practices are no longer using the term or embracing the concept of agricultural extension. This review, then, comes at a time when a significant proportion of those concerned with socio-political considerations have left the discourse, while those who remain are both prolific and, seemingly, disinclined towards consideration of socio-politics. What these opposing trends mean for the future of extension is revisited in the conclusion.

3. Methodology

3.1. Audience and theory of change

This review is written for extensionists because they are a relatively overlooked and powerful class of actors. While accepting that global political economy structures extension, and without detracting from the need to analyse and argue for change amongst global actors like the World Bank and the Bill and Melinda Gates Foundation, we assert that changing complex systems also requires engagement with those embedded in everyday practices – recognising the local materialisations of global extension. This co-productive understanding (Jasanoff, 2004a) of global-local helps to connect the structuring forces that shape extension with recognition for how praxis can help to apply pressure and open possibilities for change (Ison et al., 2014). Drawing on Sharp's (2012, 2013) explorations of nonviolent resistance to authority, we note that key enabling actors (i.e., extensionists) can contribute to changing entrenched systems of knowledge-practices through withdrawal of obedience, cooperation, and submission (Sharp, 2012, 2013) to the knowledge-practices that they deem detrimental. Extensionists, then, are key actors in both the continued reassertion of knowledge-practices, as well as sufficiently empowered to trial alternatives, moderate dictums, and contribute to fundamental change.

While appreciating the wide range of power discrepancies amongst extensionists, we write for those contemplating the extensionist-farmer intersection in order to draw attention to the practices of rendering. Extensionists are embedded within the global political economy of agrarian change while also having a range of opportunities to alter, amend, and adjust everyday knowledge-practices, should they choose. As is demonstrated in the discussion, we do so also to open avenues in service of more humanised forms of extension.

3.2. Extension-adoption and socio-political factors

Extension is co-constituted by adoption, a set of knowledge-practices that mediate interactions between extensionists and farmers, ideally resulting in improved farmer livelihoods (Haug, 1999, p. 263). The socio-political factors that shape extension-adoption are numerous (Bourdieu, 1986; Hawkins & Maurer, 2009; Melo Zurita et al., 2018), including: social (i.e., gendered networks of relations) (Quisumbing et al., 2014; Ragasa, 2014), cultural (i.e., the knowledge, skills, and status of farmers within society), and political (i.e., the power to achieve objectives via their social networks).

Advocacy for inclusion of socio-political factors within agricultural extension is now decades-old, becoming a highly developed

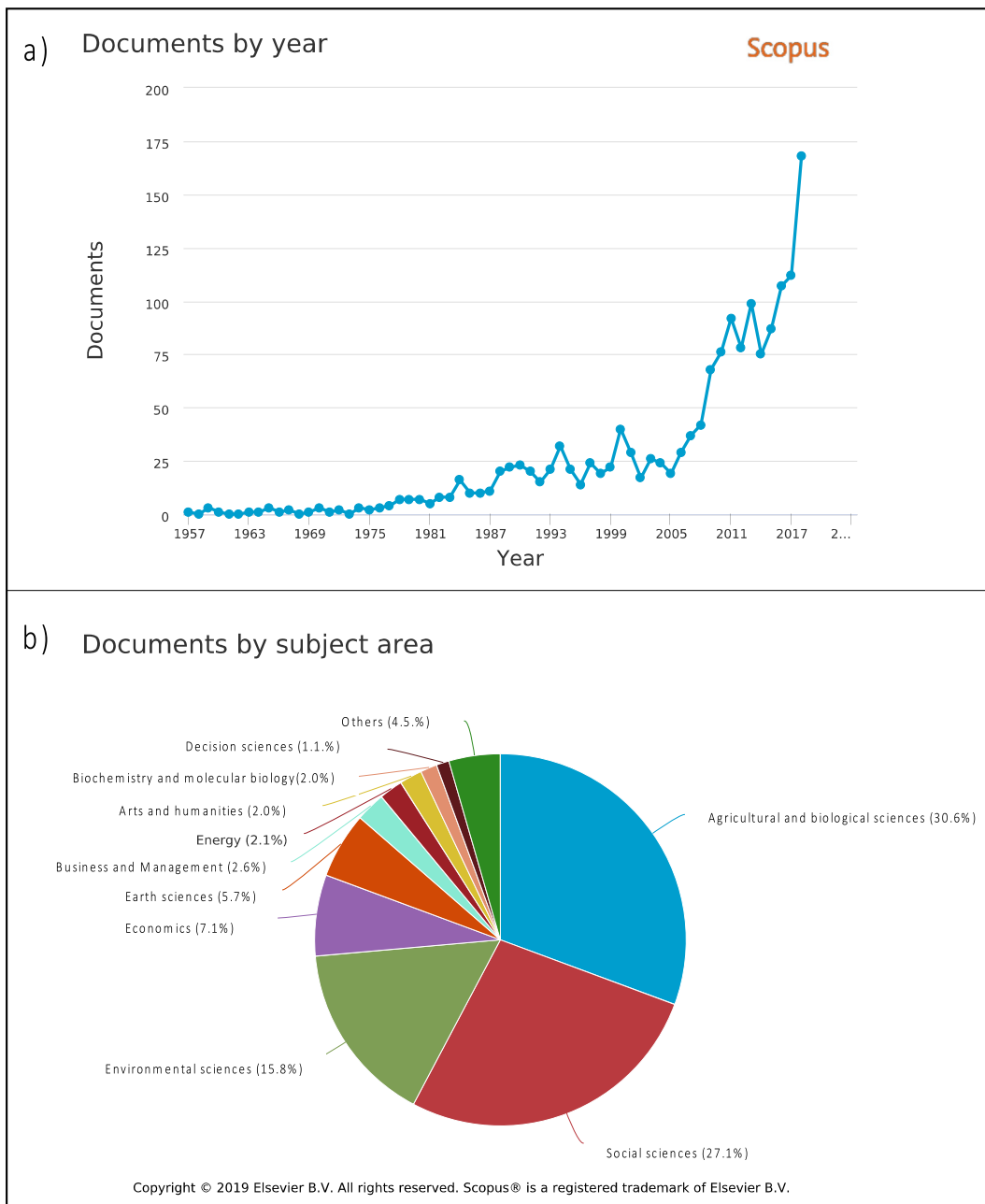


Fig. 1. The ongoing agricultural extension 'publishing boom'.

and pluralistic discourse that is, simultaneously, bounded and myopic. Calls to consider socio-political factors have been mainstreamed while also being constrained and only admitted in very limited ways. For example, others who note the important-but-excluded centrality of socio-political factors include: Russell and Ison (2000) who critique the outcome emphasis of extension and highlight the importance of human relationships; Bartlett (2008) who stresses the ignored nature of informal social relations that accompany agricultural interventions; Landini et al. (2017) who call for recognition of group and individual learning processes; and Ragasa (2014), who exposes neglect for gender.

3.3. Analytical framework: Rendering technical

Throughout the extension discourse there has been a near-continuous exclusion of socio-political processes despite an acceptance that those very processes are central: they are erased as

extension becomes 'rendered technical' – a concept refined by Li (2007), Li (2011, p. 57) to denote the:

“Practices concerned with representing ‘the domain to be governed as an intelligible field with specifiable limits and particular characteristics . . . defining boundaries, rendering that within them visible, assembling information about that which is included and devising techniques to mobilize the forces and entities thus revealed’ (Rose 1999, p. 33).

This rendering process is an act that transforms social challenges beset with power struggles into technical problems (Weinberg, 1966), which are then suited to technical intervention (Ferguson, 2006). Thus, like the parable of the blind men and the elephant, extension has been bounded such that only a very partial understanding dominates. As a result, despite continuous change to the terminology, as reviewed below, the essence of extension has remained unchanged.

Rendering technical requires an examination of the technical matrix in which extension and its boundaries are defined by extensionists as they develop possible solutions (Li, 2007). Rendering technical is part of an 'anti-politics machine', used to depoliticize complex problems and reduce them to technical problems, which enables prescriptive technical solutions that aim to control and transform rural lives in the service of economic interests (Ferguson, 2006). As Mosse (2013) explains, rendering technical rearranges social relations and their political processes in terms of expert designs and objectives, without really challenging the nature of the social structures that have historically subjected farmers to poverty and socio-economic marginalisation. In simple terms, power is rendered out of consideration in order to create more palatable aims and objectives for the experts tasked with supporting smallholder farmers (Li, 2007, 2011).

Exploring how extension is rendered technical is a question concerning power, which, following (Foucault, 1977, 1990) we understand to be the ability to define, assemble, and maintain a vision of how the world ought to be. Our focus requires a closer examination of the 'politics of knowledge' and the socio-political drivers that have governed agricultural extension, especially as they have been operationalised by extensionists. We apply *rendering technical* in order to 1) expose and better understand the processes whereby extension discourses exclude and erase socio-political factors, and 2) 'open-up' (Stirling, 2008) those processes to identify opportunities to humanise extension.

3.4. Meta-analysis of reviews

Because of the immensity of the discourse linked to agricultural extension, we have emphasized review articles due to their role in the synthesis of theoretical and methodological research, as well as their structuring of research agendas and questions. We adapted a methodology developed by Kalla and Broockman (2017), beginning our sample with an initial search for review articles and book chapters using Scopus, resulting in a total of 155, which expanded to 711 (382 reviews, 329 book chapters) following peer-review. We then prioritized reviews that included reference to socio-political factors or participation, resulting in a total of 65 reviews, as well as the publications that cited these key syntheses; a further 66 articles and book chapters were added with recognition for systems thinking. For each document we collected information about: the projects/cases reviewed, aims, scale (global, regional, national); form of participation, engagement methods, outcomes; the role of social networks and interpersonal relations; and what is missing? Who is missing? And key assumptions. We also included notes on relevant quotes and reflexive commentary, which were used to help the authors consider the importance given to socio-political considerations. This methodology allowed us to identify key collective shifts in the ways that socio-political factors have been portrayed over time, as well as explore how the rendering of these factors has and has not evolved.

4. Review of agriculture extension and socio-political factors

This history of agricultural extension is divided into periods in which specific approaches dominated extension: *technology transfer* (4.1), *participatory* (4.2.), *decentralised* (4.3), and *systems thinking* (4.4.). We introduce these approaches separately and in sequence, but they have overlapped, coexisted, and at times co-constituted one another. Because of the continuous centrality of technology transfer through diffusion, the following 'history', then, is better thought of as the emergence of a dominant paradigm, subsequent critiques, and proposed (but largely unfulfilled) alternatives.

4.1. Technology transfer approach

The word 'extension' came into use in England during the early nineteenth century, in relation to the transfer of 'Western Science' to the broader population (e.g., Society for the Diffusion of Useful Knowledge, 1926). In this sense, extension is not limited to agriculture, but was central to state modernisation, with government technology used to manage people, consolidate centralised institutions, and to reduce individual autonomy (Bartlett, 2008; Scott, 1998). For instance, the hugely successful BBC radio show *The Archers*, which aired in 1950 and continues today, was initially designed to provide information to farmers to boost production because food rationing was still the norm in post-war Britain. Also in the 1950s, with the Green Revolution, funding for extension services took off as part of multifunctional public programmes, becoming integral to national rural development in the 1960s. These programs included the provision of agricultural technologies, access to inputs, loans, and credit services to farmers (Gustafson, 1994). Agricultural extension was conceived as a tool to bridge farmers and experts in order to increase farmer yields and incomes, allowing nations to exert political control in rural areas, feed booming post-war populations, and to create economic incentives to respond to the nascent rural-to-urban exodus (Birkhaeuser et al., 1988). This approach positioned Western Science at the centre of solving agricultural problems (Anderson et al., 2006, p. 4).

Agricultural knowledge was presumed to be produced by 'experts' at research stations where conditions and inputs were controllable, with the resulting expertise then transferred to farmers (Chambers & Ghildyal, 1985). Agricultural extension interventions and methodologies included (see Table 1): farmer-to-farmer dissemination visits (1960s), which laid the foundation for subsequent approaches that targeted farmers as key agents in the diffusion of technologies to other farmers (Farrington, 1995); and rural extension programmes (1970s and 1980s), which expanded and scaled-up the one-way and top-down transfer of technologies (Feder et al., 2006; Picciotto & Anderson, 1997). As noted by Chambers and Ghildyal (1985, p. 5) the underlying assumption driving this approach was that:

"The transfer model uses a one-way information flow approach. When rural poor farmers do not adopt a new technology physical and social scientists assumed it was attributed to ignorance. This reinforces the idea that 'We must educate the farmer' ... 'We' have the relevant knowledge. Ignorant farmers do not have it. We must teach the ignorant farmers."

To educate farmers, the Training & Visiting (T&V) methodology (Benor & Harrison, 1977; Feder et al., 2006) was developed by Benor and initially implemented in Turkey, later adopted and expanded by the World Bank in more than 70 countries (1975 to 1995). T&V used a hierarchical, centralised, one-line command approach to promote technology transfer (Gustafson, 1994) (Anderson & Feder, 2007; Anderson et al., 2006). This created incentives for the transfer of information to farmers, which was not the main priority of public multipurpose programmes but part of the broader rural development agenda (Anderson et al., 2006) (further details on the T&V methodology available in Table 1).

There is no consensus regarding the 'success' or 'failure' of T&V interventions (Cernea et al., 1984; Redclift, 1983). Some authors acknowledge the existence of 'effective' T&V cases in Mexico (*Plan Puebla 1967–1969*) and Thailand (*Hill Tribe Extension Pilot Crop Replacement and Community Development Project 1972–1979*) (Purcell, 1994; World Bank, p. 38, 1994). However, the 'successes' of these two projects were measured in terms of increased yields (Puebla, 1974) and meeting peoples' 'needs' (as defined by the pro-

Table 1
Summary of dominant approaches to agricultural extension

Title	Key period	Aims and assumptions	Key interventions and methodologies
Technology transfer	19th century, 1950s (Green revolution), and 1960s (rural development)	One-way, top-down transfer of information to farmers. Embedded within the broader <i>rural development agenda</i> . Aimed for the provision of agricultural technologies to increase production, grant farmers' access to credit, inputs, markets, education, health assistance, and road infrastructure Anderson et al. (2006), Gustafson (1994). The assumption is that Western Science can solve agricultural problems, being separated from rural contexts Anderson et al. (2006), p. 4. Thus, agricultural knowledge is produced by 'experts' at research stations Chambers and Ghildyal (1985)	1960s: <i>Farmer-to-farmer dissemination visits</i> performed by Oxfam in Central America and Southeast Asia Farrington (1995) 1970s and 1980s: <i>Rural extension programmes</i> expanded and scaled-up, targeting specific commercial crops and technologies Feder et al. (2006), Picciotto & Anderson (1997) 1975-1995: <i>Training & Visiting (T&V)</i> methodology Benor and Harrison (1977), Feder et al. (2006): focused on the delivery of messages to farmers with strict regularity (i.e., biweekly visits to 'contact farmers' and fortnightly training by experts) Farrington (1995). Included the reporting of farmer problems to researchers and the training of 'contact' farmers who were expected to disseminate information to other farmers Birkhaeuser et al. (1989), World Bank (1994). The World Bank adopted the T&V model, initially in Southeast Asia with a later expansion to more than 70 countries (Anderson & Feder, 2007; Anderson et al., 2006). 1970s: <i>Livelihood approaches</i> for rural development, which brought together poverty alleviation and sustainability (i.e., <i>sustainable livelihood approaches</i>) Scoones (2009). By focusing on local complexity, livelihood approaches fostered a consolidation of diverse teams of researchers and practitioners, as well as more involvement of marginal groups (Neely et al., 2004). 1970s forward: <i>Farmer First</i> methodologies, aimed to foster more equitable interactions amongst farmers, researchers, and extensionists (Black, 2000). The use of participatory methodologies that emerged since the 1940s and forward for agricultural extension. Including: <i>Participatory Action Research (PAR)</i> , <i>Participatory Rural Appraisal (PRA)</i> , <i>Participatory Technology Development (PTD)</i> , <i>Farmer Participatory Research (FPR)</i> , <i>Rapid Assessment Procedures</i> , and <i>Theatre for development</i> (see extended list in Black, 2000). 1980s forward: <i>participatory learning approaches</i> that position leaning as leading extension practice (Pretty 1995). 1989 forward: <i>Farmer Schools</i> or <i>Farmer Field Schools</i> , introduced by the Food and Agriculture Organisation (FAO) (Feder et al., 2003). A model that also promoted knowledge diffusion from graduates to other farmers (Feder et al., 2006, p. 14). At each school, selected farmers received 8 to 12 weeks of training and opportunities for experimentation, which sought to foster informal discussions and create more empowered adoption; some farmers were also trained to become facilitators (Feder et al., 2006). They relied on experiential, ecology-based learning, which differs from the diffusion of recommended practices supported by the T&V. <i>Farmer Schools</i> originated from the dissemination of control management amongst rice farmers experiencing pesticide-resistant outbreaks in Indonesia (Feder et al., 2003). These later expanded to Philippines and subsequently to more than 78 countries (Braun et al., 2006; Van den Berg & Jiggins, 2007). 1970s forward: <i>Community-based extension</i> as linked to the development of community-based solutions to environmental problems (Dressler et al., 2010). 1980s forward: Decentralisation lead to the development of: <i>Public funding and delivery</i> , provided by new lower level authorities; <i>public funding and private delivery</i> , through contracting, subsidies, and grants for private providers; <i>private funding and public delivery</i> , which encompasses fee based projects; <i>private funding and delivery</i> , resulting from commercialisation and the privatisation of public services (Anderson & Feder, 2004). <i>Fee-for-extension</i> , offering a contractual market-oriented services such as: shared-cropping, in which services are provided in exchange for a share of a farmer's harvest; voucher schemes, through subcontracting; private service centres; and contract farming (Anderson & Feder, 2004; Kidd et al., 2000). 1980s forward: <i>Public-private partnerships</i> and outsourcing of extension services to <i>development NGOs</i> (Rivera & Alex, 2004; Swanson, 2006; Vanclay, 2004). NGOs were divided in two broader groups: i) <i>democratic participatory grassroots</i>
Participatory	1970s, 1980s, and 1990s	Two-way dialogue between farmers and extensionists or scientists, challenging the assumption that extensionists must educate farmers (Chambers (1983), Chambers and Thrupp (1994), Richards (1989)). It assumes that participatory approaches need to be <i>complementary</i> to technology transfer (Chambers, 1988).	
Decentralised	1970s and 1980s	Decentralisation as a tool to promote participation, reduce bureaucratic inefficiencies, privatise services, and facilitate the development of value chains to link farmers to global markets (Swanson, 2006). Aimed to grant farmers more control over extension programmes, enabling the diversification of tangible approaches tailored in relation to their diverse local needs and desires (Feder et al., 1999). Assumption that decentralisation promotes participation and reduces bureaucratic inefficiencies (Swanson, 2006).	

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Table 1 (continued)

Title	Key period	Aims and assumptions	Key interventions and methodologies
Systems thinking	1990s and 2000s	Paradigm shift in extension, moving from a focus on technology to <i>system-oriented innovation and agricultural research</i> (Ison & Straw, 2020). Aimed to enhanced <i>co-learning</i> and <i>co-design</i> among groups and methods (Gardien et al., 2014). It assumes that agriculture is rooted in complex and holistic agricultural innovation systems (Faure et al., 2016; Rivera & Alex, 2004, p. 26; Sulaiman & Hall, 2002; Vanclay, 2004).	<p><i>organisations</i> (including farmer associations, cooperatives, women's organisations), often part or linked to social movements, which fund and design their own programs; and ii) <i>NGOs funded by national and foreign aid</i>, whose programs are developed and funded by powerful actors and agencies, following their interests and visions (Watkins et al., 2012).</p> <p>1990s forward: system thinking builds on the <i>participatory learning approaches</i> to promote horizontal knowledge exchange, as well as exchanges across scales with the aim of supporting policy and technological innovations (Leeuwis, 2013).</p> <p>1990s forward: <i>Agricultural innovation systems (AIS)</i> "a network of organisations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organisation into economic use, together with the institutions and policies that affect the way different agents interact, share, access, exchange and use knowledge" (Hall et al., 2006, p. vi). A diverse approach with widely used 'subsystems' including: the <i>Agricultural Knowledge and Information Systems (AKIS)</i>, which analyses systems considering broader national or sectoral boundaries (Röling, 2009); and the <i>Agricultural research for development (AR4D)</i>, which involves a shift from research for development to research in development through innovation systems that support systemic processes (Schut et al., 2016; Thornton et al., 2017). AR4D encompasses different types of applied and adaptive research, as well as outcomes aimed at consideration for entire value chains, policies, or institutions (Mbabu & Ochieng, 2006).</p> <p>2000s forward: <i>Co-innovation</i> promotes collaboration to foster change within farming systems, sectors, and supply chains (Berthet et al., 2018; Botha et al., 2017).</p> <p>2000s forward: <i>Innovation platforms (IP)</i>, build on earlier <i>Farmer Schools</i> and <i>participatory research</i> to support technology transfer (Cullen et al., 2014; Schut et al., 2016). The approach aims to create space for negotiation, relationships, interactions, and learning based on continuous engagement between actors. Highlights the importance of institutions and technologies as part of a system of innovations that are simultaneously economic, social, cultural, and politically viable (Schut et al., 2016, p. 538).</p> <p>2000s forward: <i>Communication for innovation</i>, defined as: "a series of embedded communicative interventions that are meant, among others, to develop and/or induce innovations which supposedly help to resolve (usually multi-actor) problematic situations" (Leeuwis, 2013, p. 27).</p>

ject) (Angkasith, 1984), which cannot be separated from the broader political, social, and environmental contexts. For example, in Thailand the government modified T&V by focusing on farmer groups, changing the frequency of visits, and pushing for more responsive and participatory interactions (World Bank, 1994, p. 22).

In assessing the impacts of the technology transfer approach, reviewers faced the challenges of comparing diverse technical matrixes and proxies that attempted to measure farmers' transferred knowledge and adoption, as well as farm outputs and productivity/efficiency (Angkasith, 1984; Birkhaeuser et al., 1989). The literature questioned the validity of performance indicators (e.g., 'input use', 'productivity impacts', 'productivity decomposition approach', 'total factor productivity index'), especially the econometric specifications used in reports and studies because they were unable to include the multiple exogenous factors that shape adoption (e.g., Birkhaeuser et al., 1989; World Bank, 1994). This challenge is explained by Anderson and Feder (2004, p. 47) as:

"Evaluating the impact of extension involves measuring the relations between extension and farmers' knowledge, adoption

of better practices, and use of inputs. . . But farmers' decisions and performance are influenced by many other systematic and random effects (prices, credit constraints, weather, other sources of information), so distinguishing the impact of extension advice requires careful use of econometric and quasi-experimental methods."

This inability to measure the cause-effect of T&V interventions was mainly attributed to the absence of a statistical framework able to unify evaluation criteria and to enforce the use of experimental design approaches. For example, in the urge to measure extension Birkhaeuser et al. (1989, p. 8) identified the social relations of farmer-to-farmer knowledge diffusion as a 'problem', framing socio-political relations as a 'bias':

"The problem of indirect or secondary information flows where knowledge which originates from extension contacts is passed on to other farmers who do not directly interact with extension personnel. . . It is clearly shown that most farmers in areas receiving extension services report that other farmers are their main source of information. . . In such a case, there may be no

difference in performance between farmers interacting directly with extension and other farmers, and an estimate of extension impact based on individual extension contacts would erroneously indicate zero extension effect.”

Similarly, the failure of extension was mainly attributed to farmers’ inability to adopt, extension agents’ poor training and low education levels, lack of linkages to research, and/or an inability to communicate, as well as the public nature of the programmes (Chambers & Gildyal, 1985; Picciotto & Anderson, 1997; Purcell, 1994; Umali-Deininger, 1997). As such, the validity, relevance, and appropriateness of the knowledge and technology that was being promoted was rarely questioned (Vanclay & Lawrence, 1994). This enforced a hierarchical system in which researchers had higher social status than extension workers who had higher social status than farmers, constraining the flow of information from below (Anderson & Feder, 2004). Indeed, farmers were often represented as ‘adopters’ or ‘rejecters/laggards’ in relation to their (non)adoption of technologies, ignoring their roles as ‘innovators’ (Farrington, 1995; Thompson & Scoones, 1994; Vanclay & Lawrence, 1994). These categories operated under the assumption that:

“The alert, cooperative, rational type of action is found when people have a reasonable basis for existence; but people under severe stress... they react by having either a high degree of hostility and aggression... being apathetic and indifferent and therefore not lift a hand to do much to save themselves... Therefore, the person who goes out to make changes within the cultures of other peoples must expect to find these negative reactions when the people are suffering stress, which of course is the case in most of the underdeveloped areas across the world” (Maunder, 1972, p. 16).

Further, this hierarchy was gendered. With few exceptions, extension was conceptualised and practiced as a masculine enterprise undertaken for a male farmer. That women make up roughly half the agricultural labour force and that there were gendered roles in farming was rendered invisible in the dominant patriarchal power structures that positioned women as irrelevant (De Beauvoir, 2011 [1949]). Indeed, it was the invisibility of female farmers that prompted economist Marilyn Waring to pen *If Women Counted* (Waring, 1988), which shed light on the exclusion of female labour from national accounting of farmers’ lives.

T&V interventions faced geographical challenges as they intersected with national political economies and socio-cultural dynamics. In response, in parts of Africa ‘contact farmers’ were shifted to ‘contact groups’, a change that was argued to follow ‘traditional’ farming dynamics and also created incentives for the creation of farmer groups; in the Philippines extension agents also engaged in the provision of credit services in response to smallholder farmers’ limited economic access to new technologies. Those interventions that managed to learn and adapt to local realities ended up being more effective (Gustafson, 1994). Although the importance of farmer-to-farmer interactions in shaping agricultural practices was acknowledged, relationships and their socio-cultural contexts, including class, age, religion, ethnicity and race remained only superficially addressed and were often excluded or dismissed. This framing of agriculture extension as separated from farmers’ contexts was highly problematic, as awareness through knowledge diffusion did not lead to adoption (Vanclay & Lawrence, 1994).

Key to the numerous critiques of the technology transfer approach (Farrington, 1995; Feder et al., 1999; Gustafson, 1994; Picciotto & Anderson, 1997; Vanclay & Lawrence, 1994) is the theory of change imagined by extensionists for ‘upscaling’ and further diffusion of behaviour change amongst farmers not directly

engaged. In theory, farmers/groups were responsible for the dissemination of extension messages to other farmers, creating a ripple-effect of technology transfer and adoption. However, in practice, T&V failed to provide mechanisms for subsequent transfer, relying on input packages and subsidies to incite farmer adoption (Purcell, 1994). This benefitted local elites, in many cases exacerbating socio-economic inequalities with limited ripple-effects (Anderson et al., 2006; Black, 2000; Vanclay & Lawrence, p. 67, 1994). Moreover, the trainings and visits increased staff numbers and extension costs, which faced financial constraints and fiscal unsustainability, raising costs by up to 40 percent in comparison to public multifunctional extension programmes (Feder et al., 1999; Picciotto & Anderson, 1997).

Additionally, critiques have highlighted inadequate support from governments to T&V and to extension as a whole, stressing the failure of public extension services and the importance of developing diversified, plural, and decentralised extension strategies (Rivera, 1996; Rivera & Qamar, 2003; World Bank, 1985). This shows evidence of the political economy of extension, at the service of global markets, which are not always aligned with national interests. With focus on a program’s methodological characteristics, many authors linked successful interventions with farmer empowerment, supporting the transitions towards more participatory approaches (Purcell, 1994; World Bank, 1994). Importantly, however, the historical processes and socio-political dynamics that structured farmer participation in hierarchical methodologies continued to be ignored. Feder et al. (1999) explored relationships and highlighted the need for local empowerment and participation, without critically addressing what participation would mean and/or entail for different actors with differing access to Western knowledge, capacity, and power. As is representative throughout the literature, Sulaiman & Hall (2002) exalted the importance of relationships between actors across different levels without discussing the nature of these relationships, or their building and maintenance. In rendering the transfer of agricultural technologies technical, researchers focused on how to measure, improve, and evaluate interventions, while excluding examination of the socio-political factors that shaped adoption. Concomitantly, the implications of gendered social relations for women’s role in decision making and access to information and resources received scant attention. This overall experimental and expert-centred approach actively and intentionally controlled for social biases and human factors, aiming to develop a universal, gender blind approach for agricultural extension that could be scaled and transferred to other places, peoples, and times.

4.2. Participatory approaches

“The existing model of extension [i.e., T&V] did not work well at all. It constituted neither good practice nor good theory. Promotion of innovative technology to the rural community has been based predominately on the linear extension ‘equation’: research → knowledge → transfer → adoption → diffusion... Experience of the deficiencies of this model in actual practice has led to the development of a very different conceptual system based on the idealised farmer-led model (Chambers et al. 1989)” (Ison et al., 2000, p. 19).

As noted in the quote above, criticisms of top-down transfer of technology emphasised the need for a paradigm shift, which led to widespread development of participatory approaches during the late 1970s and 1980s (see Table 1). This included the *Farmer First* methodologies, which aimed to foster more equitable interactions amongst farmers, researchers, and extensionists (Black, 2000). Chambers and Gildyal (1985) describe *Farmer First* as a holistic

interdisciplinary approach intended to represent farmers as clients. The transition from controlled and uniform experimental settings to collaborative experimentation on farms opened space to examine the biophysical complexity of farming systems. Conversely, however, farmer first did not emerge as an alternative to technology transfer but as complementary, as Chambers (1988, p. 11) noted:

“The essence [of Farmer First] is a family of approaches and methods which hang together as a new paradigm. This has been called ‘complementary’ rather than ‘alternative’, to emphasise that TOT [transfer-of-technology] will always be needed.”

The emergence of participatory approaches sought to initiate two-way dialogue between farmers and extension workers or scientists, which in theory challenges the assumption that extensionists must educate farmers. This framing reconceptualised farmers as active agents responsible for defining problems and creating possible solutions (Chambers, 1983; Chambers & Thrupp, 1994; Richards, 1989). As Chambers and Thrupp (1994, p. xix) explained:

“Instead of starting with the knowledge, problems, analysis and priorities of scientists, it starts with the knowledge, problems, analysis and priorities of farmers and farm families. Instead of the research station as the main locus of action, it is now the farm. Instead of the scientist as the central experimenter, it is now the farmer, whether woman or man, and other members of the farm family.”

The implementation of participatory approaches relied on extension staff and researchers who guided extension interventions on the ground. As highlighted by Black (2000), participatory approaches recognised the importance of farmers’ agricultural knowledge, ideally allowing them to become involved in research that could impact their livelihoods and communities. In valuing place-based knowledge production, researchers also started to engage with the complexity of social landscapes and the heterogeneous dynamics between farms and households. In theory, this transition aimed to integrate different sources of information, collaborate, and allow farmers to engage more equally in the development of solutions. Participatory efforts centred on the development of effective methodologies (see Table 1), but it inevitably retained control in the hands of agricultural experts and extensionists. Extension often involved different stages, where interdisciplinary teams worked with farmers to define problems, identify possible solutions, test solutions on farms and research stations, and evaluate the results (Chambers & Ghildyal, 1985).

As part of the participatory turn, the Food and Agriculture Organisation (FAO) introduced *Farmer Schools* (also referred to as *Farmer Field Schools*) in 1989. Farmer Schools were initially implemented to promote a reduction of pesticide use while increasing profits through reduction of inputs. Efforts to train farmers started in Indonesia and were later conducted in the Philippines and subsequently in more than 78 countries (Braun et al., 2006; Van den Berg & Jiggins, 2007). The scaling of Farmer Schools involved the development of a model used not only to educate individuals, but to promote knowledge diffusion from graduates to other farmers (Feder et al., 2006, p. 14). Farmer Schools saw the revival of a linear or deficit-model assumption, but under the banner of farmer participation and empowerment. These schools emerged as an innovative approach for farmer education and involved the centralised development of curricula, relying on extension workers from government or non-governmental organisations to facilitate on-site learning activities and training (Braun et al., 2006). The intensive training applied (nominally) participatory methods to deliver expert-crafted messages and foster the development of learning and problem-solving through experimentation and group

activities (Anderson & Feder, 2007; Van den Berg, 2004; Van den Berg & Jiggins, 2007).

However, Farmer Schools were not opened to all farmers: only those who met certain criteria were able to enrol (e.g., literate and interested in specific crops or challenges), which limited access for women, indigenous peoples, and smallholder farmers (Braun et al., 2006). In response to criticisms, extension agents subsequently divided farmers into sub-categories and developed programs directed at marginalised groups (Anderson & Feder, 2004). In this more collaborative context, participatory approaches were interpreted as mechanisms for changing farming practices, enhancing farmer learning, assisting with decision-making, management, and helping farmers as they respond to change and uncertainty (Knook et al., 2018). Socio-political considerations, then, were considered, but in service of extensionists’ aims.

Participatory approaches also facilitated the study of livelihood strategies for rural development. As Scoones (2009) notes, the analysis of rural livelihoods goes back to the 1950s. While some of these efforts involved groups of interdisciplinary teams, the majority remained marginal to the prevailing mono-disciplinary development interventions. This shifted in the 1980s and 1990s, when livelihood approaches were used to bring together poverty alleviation and sustainability (Scoones, 2009). This body of work focused on examination of people’s lives and the analysis of rural realities through participatory approaches (Neely et al., 2004). In assessing the impacts of participatory approaches, reviews drew primarily on yield rates and pesticide use, knowledge change (i.e., measuring awareness), and environmental and social impacts, which often involved before-after comparisons between graduates, their neighbours, and control villages (see Braun et al., 2006; Feder et al., 2003, 2004). These evaluations often used quasi-experimental research design, relying on quantitative sources such as surveys. Much fewer studies during this period adopted qualitative analysis of interviews, documents, or participant observations, with even fewer using mixed evaluation methods (Knook et al., 2018).

Like its T&V precursor, there is no consensus regarding the success or failure of participatory approaches (Feder et al., 2003, 2004; Van den Berg, 2004). The evaluation of participatory approaches was consistent with the transfer of technology approach, with many authors continuing to question econometric specification biases and the uncertainties in assessing cause-effect (Braun et al., 2006). Some reviews suggest a general reduction in the use of pesticides and an increase in productivity, but many others did not find economic and/or environmental benefits. For example, Feder et al. (2003), Feder et al. (2004) discuss why farmers’ livelihoods did not improve in Indonesia, linking the failure of farmer-to-farmer diffusion to socio-political challenges, including: the complexity of the message being delivered, farmer training absenteeism, issues with access to training materials, problems with extension agents’ commitment, and the quality of training. Braun et al. (2006) also question the differences between control and intervened villages, considering possible information flows between neighbouring villages, differences between better irrigated areas, or farmers with different land sizes. Interestingly, analyses also prioritised the use of quantitative assessments, questioning the objectivity of qualitative methods in effectively assessing the impacts of participatory programmes, as noted by Knook et al. (2018, p. 318):

“the qualitative approach finds a more positive outcome than the quantitative approach, which may be explained by interviewer bias and overly positive reporting in the qualitative interviews. Arguably, the use of a qualitative method for impact assessment and the subsequent comparison with a quantitative method is not a fair approach as the appropriate use of qualita-

tive methods should be to provide a more in-depth and nuanced understanding of participant motivations and perceptions (rather than being an alternative to quantitative impact evaluation)."

The methodological fixation and disparity between different evaluation criteria reveals the underlying scientific framing guiding participatory interventions. Thompson and Scoones (1994) argue that such participatory approaches were rooted deeply in Western Science, failing to deal with the privileges that scientific ways of knowing have had in agricultural extension. Participatory methodologies often maintained scientific framings that are thought to have dominated group discussions and interactions between actors, rooted in an unquestioned but implicit need for the findings and solutions to be transferable beyond the specific, resource-intensive efforts. Furthermore, the collaborations between farmers and experts were inevitably imbalanced with regard to power and decision-making. In the words of Thompson and Scoones (1994, p. 59):

"such an approach represents a form of 'naive populism' that fails to address the socio-political and political economic dimensions of knowledge creation, innovation, transmission, and use within rural societies and scientific organisations... 'supply-led populism' still assumes that development requires intervention or management by outsiders, even if it is more in line with farmers' needs... populist strategies encounter the same sorts of problems as other interventionist programs. No matter how firm the commitment, the concept of powerful outsiders helping powerless insiders is always present."

For example, the development and delivery of curricula had the tendency to generalise, failing to address the needs and socio-political dynamics of different groups of farmers (Braun et al., 2006). These curricula were often disconnected from the outside world, meaning that external social processes were excluded from consideration and avoided whenever possible, especially large-scale economic forces well beyond the control of farmer or project leaders. The ways in which participatory methodologies were used to develop extension programmes also overlooked the importance of the inter-personal, gendered relationships and their intersections with wider rural development interventions, political economies, and peasant struggles. Local knowledge systems continued to be subservient, particularly when they contradicted scientific assumptions and objectives. As such, the forms of participation implemented were partial and at times deceptive. Active participation reverted to education or consultation, often benefitting local elites and contributing to the exacerbation of socio-economic inequalities (Pretty, 1995). Moreover, in positioning farmers as active agents in agricultural extension, the participatory approaches did not problematise the socio-political context in which farmers operate, which in many cases is highly contested and representative of diverse groups of individuals with varied interests, capacities, and power. Drawing on Scott (1990), Thompson and Scoones (1994) argue that localised knowledge transfer is often kept hidden from expert-public interactions, calling for a closer examination of the 'hidden transcripts' that represent the practices and claims of rural farmers, which tend to be indirectly expressed in the form of rumours, jokes, stories, and songs; in their words:

"It is critical to reflect on the nature of farmer-researcher-extensionist relationships... in terms of the ongoing pattern of struggle, negotiation, cooperation, and compromise between different actors... Advocacy of simplistic, deterministic models of blue-print intervention (i.e., transfer of technology) or naive, populist processes of farmer participation (i.e., Farmer First) are

unable to account for the social and political forces at play" (Thompson & Scoones, 1994, p. 67).

Their critique highlights the importance of exploring the nature of the relationships that were fostered by 'participation', examining how knowledge becomes shared, produced, and transformed, as well as the ways in which localised political and social struggles enable and constrain extension efforts. Similarly, Russell and Ison (2000) elevated the role of 'conversations', which can be extended to that of 'relationships via dialogue', arguing that:

"So to converse is to dance: to turn together in a way that acknowledges the presence of two parties (one of course could and does converse with oneself) and acknowledges the willingness to act together in some mutually acceptable way... The experience of the conversation, is a unique creation and we have no certainty whatsoever as to what the outcome might be. It is neither a transfer nor a sharing of information, useful knowledge, knowledge that lead to satisfying action, is created by the joint action of both parties" (Russell & Ison, 2000, p. 22).

In stressing the impossibility of predetermining the outcomes of the interactions between different actors, Russell and Ison (2000) question the outcome-driven nature of extension-adoption interventions. This predetermination of problems-solutions represents a fundamental critique of extension, especially in instances where power-sharing and participation are implemented but where experts or extensionists have oriented efforts towards adoption of agricultural technologies for increased production. Knowledge was framed as objective and independent from both expert and farmer practices, allowing powerful actors to define what constitutes a 'better' practice, while the role of everyday farming was disregarded (Russell & Ison, 2000). Importantly, agricultural extension continued to assume that knowledge is produced by research, in a centralised manner, and that it can be transferred to individuals to affect behaviour change and further diffusion (Russell & Ison, 2000).

Even more progressive livelihood approaches often faced simplistic application of frameworks, focused on increasing employment as instrumental to poverty reduction. This focus limited the study of the complexity of rural livelihoods, often placing changing 'glocal' political economies in the background, which failed to link livelihood analysis to power and political dimensions (Scoones 2009). Although this inattention to socio-political factors was subjected to academic criticism, those critiques occupy the margins of academic inquiry, as Scoones (2009, 181) notes:

"The regular pleas to pay attention to power and politics often fell on deaf ears, and an instrumental application proceeded as normal, but with a livelihoods label... Livelihoods approaches, coming as they did from a complex disciplinary parentage that emphasised the local, have not been very good at dealing with big shifts in the state of global markets and politics. In the frameworks, these were dumped in a box labelled 'contexts'. But what happens when contexts are the most important factor, over-riding the micro-negotiations around access to assets and the finely-tuned strategies of differentiated actors?"

Despite the efforts to alter the foundations of extension, key assumptions concerning socio-political dynamics remained dominant (i.e., learning, transfer, interaction, power, and gender). For example, learning is not equivalent to the transfer of information or the development of awareness, nor does information transfer develop problem solving and critical thinking (Rogers, 1996). In this way, the extensionists' technological 'fix' is as problematic as the participatory equivalent, which maintained a focus on the development of participatory methodologies (Black, 2000), using

participation as a mechanism to realise expert-led objectives for adoption of technologies and increased agricultural production. This fixation on method, has excluded more foundational criticisms of linear thinking (especially those of [Russell and Ison \(2000\)](#)), with preference given to unrealistic hope that minor adjustments to participatory methods might overcome structural socio-political dynamics, all while retaining expert-chosen objectives. When socio-political dynamics are considered, they have been almost universally in relation to the methods and techniques that might 'convince' farmers to understand and behave as extensionists would like. Across this vast literature, it is in the context of critique that consideration of socio-political factors and political economies of agricultural production are included, rather than through explorations of how human relationships intersect with socio-political processes.

Overall, in addition to being the basis and origin of agricultural extension, a top-down technology transfer approach – and especially the secondary consideration given to socio-political factors – largely informed the ways that participatory methods were designed and implemented ([Feder et al., 2004, p. 222](#)). Guided by donor and government rural agendas, timeframes, and funds, these participatory approaches have also been used as tools of government and political control and faced challenges similar to T&V, including fiscal unsustainability, elite capture, and bureaucratic inefficiency ([Quizon et al., 2001](#)). As a result, growing frustration with T&V and Participation resulted in efforts to reconfigure extension with the hope that further decentralisation and removal of government oversight could unshackle extension and benefit farmers.

4.3. Decentralised approaches

As a result of persistent failures to realise seemingly achievable objectives, public extension of agricultural technologies received profound criticisms in the 1980s. Critics during this period emphasised the active, and arguably central, role that the private sector (e.g., agribusiness companies, nongovernmental organisations (NGOs)) should play in supporting participatory and for-profit interventions. As depicted by [Rivera \(1996, p. 152\)](#):

“Public sector extension was severely attacked... for not being relevant, for insufficient impact, for not being adequately effective... The response was to scrutinise and make more effective current systems and to privatise interventions... decentralize the burden of extension costs through fiscal system redesign... decentralize central government responsibility for extension through structural reform... decentralize the management of programmes through farmer participatory involvement in decision making and, ultimately, taking responsibility for extension programmes.”

Infused with the emergence of neoliberalism, during this period the 'participatory' rhetoric aligned directly with the global push for the decentralisation of state services (see [Table 1](#)), which included agricultural extension ([Rivera, 1996](#)). In theory, decentralisation granted farmers more control over extension programmes, enabling diversification of approaches tailored in relation to local needs and desires ([Feder et al., 1999](#)). Broadly, this period idealised a shift from a top-down to a possibly more horizontal form of extension able to limit bureaucratic constraints associated with the public sector ([Feder et al., 1999; Kidd et al., 2000](#)). Moreover, decentralisation was premised on the need for extension to be a profitable activity in order to incentivise the private sector to take on roles that had previously been funded by governments and donor organisations ([Rivera, 1996](#)). This emphasis required the enactment of agricultural reforms to transfer power from a central

authority to lower levels of government, institutes, office branches, and the private sector ([Rivera & Qamar, 2003](#)).

Decentralisation is a long-term process ([Chapman & Tripp, 2003](#)) that leads to the development of complex, diversified, and often overlapping extension strategies (see [Table 1](#)). With transfer to local government delivery of extension services, the central/federal government agencies that had historically undertaken extension began to withdraw ([Chapman & Tripp, 2003; Rivera & Qamar, 2003](#)). This shift opened extension to the competitive interests of the private sector, leading to the consolidation of mixed and pluralist extension networks within for-profit initiatives ([Chapman & Tripp, 2003; Rivera, 1996](#)). Similarly, an increasingly decentralised public sector shifted extension from being a relatively unified system to a multi-institutional network, leading to the creation of public–private partnerships, many of which ended up outsourcing the delivery of extension services to NGOs. These programs were often, and continue to be, implemented via subcontracting grassroots NGOs, government agencies, unpaid volunteers, and public–private partnerships, while enforcing financial dependence on external organisations. In general, these programs are often translated and co-opted to fit national political and elite interests ([Li, 2007](#)).

Both decentralisation and participatory processes supported the creation of community organisations, which granted farmers an avenue for political representation ([Braun et al., 2006; Marsh & Pannell, 2000](#)), in the words of [Swanson \(2006, p. 16\)](#):

“farmer organisations become the basic building blocks of democratic institutions; therefore, getting farmers organised is important to the long-term political development of the country and ensuring that the interests of rural people are not neglected.”

With this focus on farmer organisations and NGOs, 'community-based extension' came to the fore, in which extension responsibilities were devolved from state agencies to communities. This form of extension responded to the exclusionist critiques directed at participatory approaches, providing a clearer entry point for female farmers and enabling communities to guide, plan, design, and deliver extension services. In many cases, this devolution made extension agents more accountable to extension users ([Feder et al., 2010; Wright et al., 2014](#)).

Community-based extension was also linked to the development of community-based solutions to environmental problems during the 1970s and 1980s, and to the growing importance of sustainable development and the International Labour Organisation's recognition for the collective rights of indigenous and tribal peoples (i.e., Indigenous and Tribal Peoples Convention in 1989) ([Dressler et al., 2010](#)). For many, community-based extension offered a potential solution to the failure of both public and market-driven extension by supporting rural farmers' needs and desires ([Wright et al., 2014](#)). This involved the development of relationships not only focused on the development of curricula, but also on the management and marketisation of farm products ([Rivera, 2011](#)). In theory, this form of extension required farmers' participation and autonomy, strengthening farmers' decision-making and supporting the provision of services that reflect farmers' needs and desires ([Wright, Teagle, & Feetham, 2014](#)). However, elite capture is thought to have undermined the transparency, empowerment, and accountability mechanisms needed for the power-sharing needed for community-based extension to succeed. As noted by [Feder et al. \(2010, p. 8\)](#):

“Rural communities and farmers' organisations are often dominated by middle-class and relatively wealthy [male] farmers. Poor farmers and socially marginalised groups typically play a limited role in the leadership of communities and rural organisations, even if they are members.”

Additionally, poor institutional coordination and non-alignment between bottom-up initiatives and national policies and plans, situated within a restrictive financial and technical support context, limited the up-scaling of community-based extension services. This process, though, was restricted by farmer and community organisations' high dependence on public resources coupled with the 'economies of scale' needed to justify investment in the programs (Feder et al., 2010).

With consideration for the complexity and diversity of overlapping service providers, assessment of the success of decentralised extension has become even more difficult than during earlier periods. With the emphasis on participation, relationships, and leadership within complex systems (Section 4.4) becoming critical to decentralised extension activities. This highlighted the role that key individuals play in increasing actors' acceptance of reforms and extension interventions. However, the importance of these actors has received very little concerted attention, with only Rivera & Alex (2004) and Turner et al. (2017) analysing the roles of particular individuals in building relationships, connecting agencies, and improving teamwork, as Turner et al. (2017, p. 18) recalled:

"One individual in (Sustainable Land Use Initiative) SLUI was identified as a project champion; 'a force of nature and incredible enthusiasm, and doesn't respond well to 'no'. This project champion brought people on board to deliver SLUI by forming relationships, challenging perceptions and misbeliefs about sustainable land management, and creating enthusiasm for the programme."

Apart from these notable exceptions, key individual actors and local leaders have, like the broader rendering of socio-political considerations in earlier approaches, been relegated to anecdotal accounts. Similarly, the successes and failures of extension interventions continued to disregard the role that gender, class, religion, and race play in blocking or enabling farmers to navigate highly asymmetric power relations in both extension activities as well as in the day-to-day realities of smallholder lives and livelihoods. Such overlooked relations undoubtedly shape innovation processes associated with extension (Faure et al., 2016). Thus, the way in which leadership and relationships are gendered, built, performed, and sustained in the context of decentralised and pluralistic extension services remains undertheorized and relatively unexplored. Rivera and Alex (2004, p. 33) underline the importance of leadership because it is central in the creation of networks able to cut across sectors and across scientific disciplines, explaining that:

"Leaders must show personal commitment to the organisation's vision and provide conceptual clarification as to the direction of the organization – where are we going and why! To be truly effective, leadership involves all leaders – not only executive leaders, but also networkers (front-line workers, in-house consultants, trainers, and professional staff who spread ideas throughout and outside the organisation) and local line leaders (branch managers, project team leaders, and other front-line performers)".

Additionally, the individual importance of key actors continues to be interpreted via a technical framing that results in exclusion of key socio-political questions: how and why individuals become a leader or key to extension networks; how gender affects the types of relationships that are fostered, and what is needed to build networks; what is the role of trust and time in decentralising systems; and how leadership and networks are shaped by broader socio-ecological, political, and economic forces.

Private and pluralistic extension services tend to overlook local realities, mainly serving the needs of market investors rather than

those of farmers (Chapman & Tripp, 2003; Faure et al., 2016). In this way, participation has remained largely constrained by the interests of financing entities, NGOs, and local elites. Private services focus on particular commodities and technological innovations, treating information as a commodity (Faure et al., 2016). Moreover, the rise of development NGOs has contributed to a reduction in the accountability of the state, increasing the role of private actors in the delivery of what used to be social services. This has, in turn, expanded dependence on foreign aid and subjected subcontracted grassroots organisations to the financial uncertainties of foreign financing (i.e., short-term contracts and grant periods) (Bebbington, 1997; Watkins et al., 2012). In this context, to fund extension programs, grassroots NGOs have to follow international guidelines (e.g., proposals, themes, activities, reports) and operate through hierarchical structures, which enforce political control over rural initiatives and increase income disparity among staff in urban-rural settings (Watkins et al., 2012).

The uneven distribution of extension services has historically marginalised women and rewarded non-representative groups of farmers, including the wealthier and more educated as well as village leaders, who remain the primary beneficiaries of extension services (Feder et al., 2010; 2004, p. 32). This interpretation of the economic accounting that shapes fee-based extension is highly relevant in the context of the withdrawal of publicly funded services (Rivera, 2011; World Bank, 1994). All of which highlights the importance of fostering diversified public and private funding and delivery strategies that can guarantee smallholder farmers access and support (Faure et al., 2016; Rivera & Qamar, 2003). Interestingly, decentralisation has been a slow and contradictory process with high dependence on centralised support to facilitate institutional linkages, coordinate programs, formulate national policies, and monitor/evaluate programme performances (Chapman & Tripp, 2003). In contradiction to its idealised form, decentralisation requires high investment in training, program coordination, and evaluation, all while being subject to fiscal priorities that challenge the assumption that private and decentralised extension are exempted from political or administrative constraints (Anderson & Feder, 2004; Kidd et al., 2000; Rivera & Qamar, 2003).

Lewis and Mosse (2006) and Mosse (2011) demonstrate that NGOs and other private agri-business programs rarely measure the impact of their interventions. Instead, success tends to be measured through 'success stories', acknowledging material inputs and capacity building programs, which create success rather than actually measuring changes on the ground (Watkins et al., 2012). In this way, poor institutional coordination and non-alignment between bottom-up initiatives and national priorities, together with restrictive financial and technical support, are thought to have limited the scalability of community-based extension services (Wright et al., 2014, p. 319). The underlying inertia of top-down extension structures, prescribed through the constraints of community-based funding sources (i.e., grants and subsidies), has contributed to the revival of central elements of the technology transfer period within decentralised extension interventions (Feder et al., 2010). For instance, the representation of farmers as 'innovators' has been problematised by those who argue that only partial solutions can emerge from past experiences and localised knowledge systems (e.g., Marsh & Pannell, 2000; Vanclay & Lawrence, 1994). This has reinforced the importance of experts in developing solutions within dynamic contexts (i.e., climate change), as Marsh and Pannell noted:

"we are concerned that there is a belief that farmers can solve difficult and complex land degradation problems themselves through group-based processes, even when it is apparent that the solution requires development of new technologies that

are probably complex and possibly require support from other farm sectors” (2000, p. 624).

Overall, decentralised extension results from collaboration and partnerships amongst different public agencies and private entities, frequently blurring the boundaries between public and private extension (Faure et al., 2016). Yet, the nature of these relationships is not equal and, as with gender relations, the differing power dynamics continue to be ignored or left implicit. Despite the efforts to make extension programs complexity-aware, linear assumptions and practices dominate the ways in which extension is conceived and practiced (Turner et al., 2017). In effect, there has been an inordinate supply of information provided to farmers who have limited control over the quality of the contents and the nature of the messages being delivered (Marsh & Pannell, 2000). Researchers have questioned the validity of extension-adoption as something ‘good’, arguing that it is clearly colonial and rooted in Western Science, resulting in an absence of flexibility for local circumstances (e.g., Vanclay, 2004). The logic of expansion and scaling extension has also been scrutinised, leading to the development of models that measure possible outcomes and impacts associated with particular technology innovations and practices (Wigboldus et al., 2016).

4.4. Systems thinking

“In view of such significant needs for redefinition (see also Sulaiman & Hall, 2002), some senior authors in the field of extension have chosen to completely abandon the notion of ‘extension’ altogether (e.g., Röling & Wagemakers, 1998; Van Woerkum et al., 1999; Ison & Russell, 2000). They feel that the word ‘extension’ has misleading connotations, and that it is practically impossible to stretch the meaning of the concept as necessary. In line with this, Van Woerkum and Röling no longer use the concept in many of their writings, and they have in their university renamed the field of Extension Science as Communication and Innovation Studies. Similarly, Ison and Russell (2000) speak of ‘second-order research and development’” (Leeuwis, 2013).

Systems thinking emerged as a ‘step away’ from extension in the 2000s, moving from programs focused on technology to system-oriented innovation and agricultural research (Ison & Straw, 2020; Röling, 1985). As the above Leeuwis quote highlights, many critical scholars who advocated for socio-political considerations have come to use systems thinking to reconceptualise agriculturally-connected challenges. In this way, following the decentralisation period, agricultural extension has, itself, extended well beyond agriculture in order to develop strategies able to transform, reinvent, or reconfigure the relationships that emerge from systems (Ison & Straw, 2020; Röling & de Jong, 1998).

This recent and rapidly diversifying discourse uses multiple terms and logics, relying on numerous strategies to define and limit the boundaries of systems (see Table 1). For example, agricultural innovation systems (AIS) considers science and technology as embedded in historical, social, political, and climatic contexts (Hall et al., 2006, p. vi). Interventions are understood as rooted in complex agricultural innovation systems, with the resulting focus on assessing the relations between technologies, farms, interactions, and environmental change (Faure et al., 2016; Rivera & Alex, p. 26, 2004; Sulaiman & Hall, 2002; Vanclay, 2004). This has allowed researchers to analyse extension as part of a wider rural development agenda, acknowledging a broader set of services that influence agricultural practices (e.g., nutrition and well-being) (Faure et al., 2016; Rivera, 2011; Röling & Van De Fliert, 1994). These

types of analyses recognise the impossibility of finding a universal solution, shifting the focus from ‘best practices’ to ‘best fit’ in relation to local and national contexts (Birner et al., 2006). This multi-part framework draws on qualitative and quantitative data, assessing the contextual factors that influence the structures of extension services (governance structures, capacity, management, and methods), which includes the policy environment, the capacities of service providers, the production system and market access, and community characteristics. They also emphasise high performance through evaluation of impacts on farm households, which translates into impacts in relation to yields, productivity, income, employment, distribution of effects, and empowerment (Birner et al., 2006; Cullen et al., 2014).

As a method and toolkit AIS and its ‘subsystems’ include: *Agricultural Knowledge and Information Systems (AKIS)* and *Agricultural research for development (AR4D)* (see Table 1), both of which aim to support structural changes and provide innovation support to farmers (Klerkx et al., 2012; Mbabu & Ochieng, 2006). This conceptualisation has supported a transition away from extension towards ‘communication for innovation’, which is defined as:

“a series of embedded communicative interventions that are meant, among others, to develop and/or induce innovations which supposedly help to resolve (usually multi-actor) problematic situations” (Leeuwis, 2013, p. 27).

As the citation suggests, like researchers from earlier periods struggling with the rendering of socio-political factors, researchers continue to seek ways of balancing the forces that shape agricultural development while also connecting to ‘on the ground’ challenges facing farmers (Bawden, 1992). Systems approaches involve co-learning, co-design, and co-innovation among groups and methods that facilitate working together to solve problems that encompass farming systems, sectors, and supply chains (Bawden, 1992; Gardien et al., 2014); these emerging sub-fields form part of a growing, and not yet fully-formed, field of research and development practice (Berthet et al., 2018; Botha et al., 2017; Leeuwis, 2013; Schut et al., 2016). Such learning approaches, which include *Innovation platforms (IP)* (see Table 1), seek to promote horizontal knowledge exchange, as well as exchanges across scales with the aim of supporting policy and technological innovations (Leeuwis, 2013).

Systems thinking has aimed to restructure production, supply chains, policies, management, decision making, monitoring, and evaluation, extending well beyond the traditional boundaries of the agricultural sector. In this way, there is recognition within this discourse that regimes are difficult to change and that innovations often end up fitting existing structures (Klerkx et al., 2012; Schut et al., 2016), requiring ‘second order’ logics (i.e., those that do not conform to prevailing praxis) to extend beyond dominant knowledge-practices (Ison & Russell, 2011; Röling, 2009). Amongst the diverse theories that can be grouped under systems thinking, how boundaries are conceptualised changes with different perspectives. This freedom to broaden and expand how agriculture is conceptualised, however, must also engage with the hard boundaries that continue to be used by international organisations and nations (Rivera et al., 2005). Others have argued that conceptualisations, such as AIS, offer an unavoidably static view of systems, often unable to reconcile conceptual appreciation for dynamic systems with the fixed realities of governance, private actors, and the need to hold things temporarily in place in order to make sense of the situation (Klerkx et al., 2012, p. 465). As a result of these challenges, like the preceding approaches-periods, researchers have continued to struggle with long-standing challenges associated with socio-political factors and a desire to set them aside while extensionists make sense and trial innovations. Although there have been important attempts to make systemic approaches more

participatory and integrated, they often continue to rely on top-down technology transfer approaches for innovation (Schut et al., 2016). Moreover, like the decentralised period, adherents are accused of creating bureaucratic burdens rather than enabling meaningful change.

Although systems thinking considers broader social, economic, and cultural contexts, the ways that ideas, theories, and pathways are articulated when outcomes are not clear remains problematic (Kuby, 1999). For instance, as Maru et al. (2018, p. 345) notes:

“AR4D, is largely about implementation logic rather than deep reflection on underlying worldviews, assumptions and theories that explain the mechanics that generate the desired change.”

Demonstrating the persistent challenge of socio-political rendering, Thompson et al. (2007, p. 41) acknowledge that:

“20 years of field experience has shown that innovations for improving agriculture and natural resource management need to address not only the technical challenges confronting small farmers and local resource managers, but also key socio-cultural and political-economic dimensions such as gender roles and relations, power relations, community organisations and institutional arrangements, collective action, property rights and land tenure, policy processes and governance regimes (Otsuka & Place, 2001; Thompson, 2006; Toulmin, 2003)”.

More recently, systems thinking has received criticism for the significant human and financial resources needed to conceptualise and intervene in systems (Schut et al., 2019, p. 591). Although systems thinking and the resulting platforms for intervention attempt to create more inclusive spaces, “dominant stakeholders with legitimate power and privilege can reinforce the trajectory of modernization and commercialization for their own interests and benefits” (Eidt et al., 2020, p. 15). Such echoes of past criticisms note that the reassertion of pre-existing socio-political power is very relevant given existing power asymmetries between actors in rural settings (Eidt et al., 2020; Turner et al., 2020). By bringing actors together, approaches attempt to lessen existing inequalities, yet, like experiences that characterise the emergence of the participatory period, the extent to which these programs are able to empower marginalised farmers, including women, indigenous people, and minorities, remains unclear.

Critics have asked whether understanding the extensive systems of exploitation that often compose agrarian systems enables them to be overcome (Eidt et al., 2020; Turner et al., 2020). More radical approaches conceptualise systems as processes in the making, in which meaningful relationships between actors are hindered by technologies, sociocultural, and economic divisions (Klerkx et al., 2012; Thornton et al., 2017). In accordance with past analyses of extension, systems thinking similarly points to agricultural development failures linked to: infrastructure, hard institutions (laws and regulations), soft institutions (values and culture), network (when actors are locked to other actors, limiting opportunities for new collaborations; capabilities failure, the lack of technical and organisational capacity), and market structures (monopoly, lack of transparency, and corruption) (van Mierlo et al., 2010). While systems thinking remains relatively nascent, the challenges of engaging with expansive and dynamic systems, especially socio-political systems, is resurfacing many of the challenges that have animated technology transfer, participatory, and decentralised periods.

5. The rendering technical of agricultural extension: power, place, and people

The rendering technical of agricultural extension is evidenced throughout the literature, enacted through boundary making (Gieryn, 1983) that determines what is and is not considered legitimate. Rendering is an act of framing (Miller, 2000) that establishes what is important, which is co-productive of what is thought possible and what is assumed can and should be done (Janoff, 2004b). Through rendering, a series of undeniably socio-political problems can be interpreted as the challenge of increasing yields on smallholder farms, affected via relatively inconsequential behaviour change at the farmer-scale.

5.1. The rendering of power

Rendering can be seen as a diffuse but incessant removal of the *consideration of power*, which, in turn, allows further and compounding renderings to collectively produce a depoliticized ‘solution’ that is severed from farmers’ lived experiences (i.e., extension of agricultural technologies to increased agricultural production). This argument is both made and exhibited by the extension discourse. Examples of the rendering of power from the extension literature include lack of consideration for: people and their bounded rationalities (Just et al., 2006), the role of gender in limiting and privileging certain individuals (Quisumbing et al., 2014; Ragasa, 2014), the intangible and qualitative considerations that affect agricultural production and decision making (Bartlett, 2008), the inapplicability of economic models founded on rationality and maximization (Batie, 1989), and, most importantly, disregard of capitalism and the extraction of wealth from poor and smallholder farmers by powerful and wealthy elites (Green & Estes, 2019; Scott, 2008).

An indicative example of the ‘blind spots’ that result from rendering power are the farmgate interactions between smallholders and transporters or buyers (Aker & Fafchamps, 2010). These asymmetrical interactions have long been known (Fafchamps & Minten, 2012), but extension has continued to render such exploitative power in order to facilitate expert understandings of agricultural technologies. Bound by such exploitative relations common for rural farmers (Nakasone et al., 2014), there is little incentive for farmers to increase productivity if they cannot benefit from their expanded production, particularly if they rely upon costly credit to implement practice change. There is an underlying assumption throughout the extension literature that farmers’ needs are predicated on increasing production (i.e., Neo-Malthusianism), situating rural farmers’ struggles over access and control of land and means of production, which are, themselves, shaped by gender relations and the broader political economy. This rendering process is, implicitly, based on the presumption that production can be separated from the socio-political in order to better understand, with the resulting enlightenment the basis for improved approaches that can apply across contexts (see rendering of place below). While perhaps obvious, the review confirms that decades of failed extension have falsified this way of bounding, understanding, and reintroducing extension.

Humanised extension would consider the boundaries that structure farmer decision making (McLaughlin & Dietz, 2008), recognising that both female and male farmers have extremely differing and limited opportunities to alter their practices or even to express dissatisfaction with their relative powerlessness (Kesby et al., 2007). Extension attuned to power could not position farmers as ‘agents of change’ separated from gendered social relations, class, religion, and race among other societal hierarchies, nor ignore that

capital accumulation for many elites is founded on extracting wealth from impoverished farmers (Green & Estes, 2019), sometimes through processes called ‘accumulation by dispossession’ (Glassman, 2006; Harvey, 2005). Humanised extension could not be uncritically premised on increased agricultural production as the driver of farmer livelihoods, as lowered- or non-production might be a superior means of raising household wealth through reallocated labour and reduced risk from borrowing (Green, 2019). Humanised extension might also consider the opportunity costs (Pingali & Rosegrant, 1995) of the increased labour requirements of technologies – including the transition to new technological regimes – given the rising costs of labour and opportunities for wages and remittances from off-farm sources (Huffman, 1980).

5.2. The rendering of place

With power rendered, place can also be excluded. In this way, an extremely place-dependant activity (i.e., agricultural livelihoods) is severed from the local factors that, in effect, *are the issue* (Boserup, 2014; Li, 2014). Land tenure is inarguably central to issues of agricultural development (Lamb et al., 2017; Mahanty & Milne, 2016), as precarious tenure might limit farmers’ willingness to invest in technologies; hypothetically, if land tenure is weak, farmers might choose to not improve the asset in order to avoid attention from the elites who could usurp their properties (i.e., informal and contestable land tenure). Issues of tenure are amplified for female farmers who may not only be tenant farmers on the land of non-relatives, but may effectively be positioned as such without shared tenure within a marriage. Similarly, by rendering place, the dire choices that farmers face are disconnected from the material considerations associated with the behaviour changes involved in increased production. Extensionists need only consider the farmers who inspired Paulo Freire’s ‘Pedagogy of the Oppressed’ (Freire, 1968 (1970)) selling themselves and their children into slavery to avoid famine – or the farmers forced off their lands and into the “living museum of human exploitation” (Davis, 2006) awaiting in cities – to realise both that smallholder farming is a horrifically risky, place-based livelihood and that the alternatives are often worse. By rendering place, such dehumanising choices are re-placed with the relatively inconsequential differences between competing technologies in terms of production applied to abstract space.

Humanised extension would situate (Haraway, 1988) extension and thereby accept the unique circumstances in which extension succeeds and fails. Place-based understandings would fundamentally challenge the ability to draw from cases and ‘up-scale’ lessons, which in turn undermines the prevailing econometric logic used to justify the costs of extension, and of research of extension practices (Millar & Connell, 2010; Röling & de Jong, 1998). With the removal of ‘up-scaling’, alternative ‘theories of change’ will be required to conceptualise how change might happen.

With attention for the situatedness of extension and adoption, a humanised extension could open-up (Stirling, 2008) Cartesian space for more networked realities. Power is not reversed or ‘undone’ when extensionists reorient their interventions, and certainly not when a ‘solution’ is moved from one place to another. To shift emphasis from top-down to bottom-up, from elites to farmers, or from government to the private sector does not overcome the power-relations that dominate farmers’ lives, including the places to which they are often bound. Awareness of agricultural technologies or access to credit, for example, does not enable relatively powerless farmers to escape the extractive relations that populate smallholder systems (Bartlett, 2010; Harvey, 2005; Scott, 1990, 2008).

It is a near-universal finding within agricultural extension that farmers watch and copy their neighbours, friends, and family,

which is logical given typical levels of similarity. As opposed to a bias to be avoided, humanised extension could recognise and embrace these relations as opportunities to build meaningful relationships amongst farmers and extensionists. If direct extension is the initial social relations that occur in place between extensionists and farmers, then secondary diffusion(s) is the often overlooked and difficult to quantify ‘ripples’ of practice change that flow through socio-spatial networks. These potentially important ripples are key to humanised extension. In such situations it is not required that a farmer be transformed from a so-called ‘laggard’ to an ‘innovator’ (Rogers, 2010) – a nonsensical proposal when the risks of adoption are considered – but that the slow, exploratory, and reflective processes be supported such that farmers can alter their practices in line with their objectives and as their situations allow.

5.2.1. The rendering of people I: Farmers

Rendering power orients the locus of intervention towards abstract individual farmers, presuming system change is possible through its weakest actors at the individual scale. Smallholder farmers and particularly female farmers are relatively powerless, often have precarious land tenure, are commonly dependent on more powerful actors for market access, and lack the economic and political power to respond to environmental, social, and technological variability (Fan & Chan-Kang, 2005; Wanjala & Muradian, 2013). The implausibility of smallholder farmers as effective agents of change is only conceivable because their relations with other individuals are rendered (Bartlett, 1980). In the ‘partial light’ following rendering, extension can plausibly be farmer-centred, but only in terms of realising technical solutions that are imagined by experts to increase on-farm productivity.

Flowing from this individualization and removal of place, blame for the continuous failure of extension to address poverty and well-being, whether explicit or implicit, rests with farmers. Blame is attributed to farmers’ (in)actions, lack of awareness, or incapacities rather than to the wide and unrelenting structural forces of marginalisation, gender hierarchies, exploitation, and profit seeking (McLaughlin & Dietz, 2008). This depoliticization and individualization of agricultural extension-adoption is emblematic of numerous socio-governmental debates in which the agency of individuals is emphasised while structural constraints are rendered (Burton & Wilson, 2006). As a result, extensionists can focus on uncontroversial issues such as farmer practices, competencies, and awarenesses, offering palatable solutions that do not challenge the power relations that operate inside households, within villages, amongst traders, across sectors, or that include the role of distant consumers or investors. Broadly, the rendering of power and place transforms a problem of relational power into one of individualised cognition, effort, merit, persistence, creativity, and failure.

With power and place rendered and the focus of extension oriented towards individuals, female and male farmers are transformed from dynamic actors in dynamic contexts into simple and predictable maximisers who, because of abstract conceptualisations of yield gaps (Fermont et al., 2009), are portrayed as deficient because they are not maximising the productivity of their smallholdings. The circular reasoning is, again, only possible because of the rendering of what is considered pertinent to extension. Critically, rather than structural limitations, this rendering of farmers enables a portrayal in which information and awareness are the key barriers to an improved agricultural system (Blaikie et al., 1997; Carr & Wilkinson, 2005). The rendering that construes farmer inaction and non-adoption as problems of awareness are assumed because of the need to ‘extrapolate’ and ‘scale-up’ lessons, which is grounded in the need to justify the expenses of research and extension programs. Broadly, with power and place rendered and with the agency of farmers needed to ‘lever’ system change,

the most logical and economical method for widescale impact is via mass communications, but such messaging has repeatedly been shown to be ineffective in the context of uncertain, controversial, future, or high cost behaviour change (Cook & Overpeck, 2019; Russell & Ison, 2017, 2000; Simis et al., 2016).

The rendering of farmers is shared by those who advocate or implement participatory methods, despite participatory efforts positioning themselves against the imposition of expert knowledge. This occurs because of the need to justify the high expenses of participatory research, resuscitating the deficit model when findings must be shared, scaled, or transferred to other people, places, and times to have greater impact (Cook & Melo Zurita, 2019; Ison et al., 2000). This 'pivot' from the empowerment of farmers in locally-situated spaces (Bartlett, 2008) to extrapolation of generic, abstract, and de-politicised information re-enacts the deficit/linear model but under the cover of participatory language and claims. With farmers' cognition and awareness the primary proxy for measuring the success of extension, the learning, trial and error, conflict, debate, negotiations, and compromises needed to produce knowledge is rendered.

Humanised extension would meaningfully orient extension towards female and male farmers, taking seriously their bounded realities (Just et al., 2006), perceptions and social relations (Vanclay, 2004), risk appetites (Stark & Levhari, 1982) and gender relations (Ragasa, 2014) when proposing technological changes that carry immense implications for livelihoods. Appreciation for the farming household would demand care for the rationality of precaution (Halstead & O'Shea, 2004) and the implausibility that farmers would risk their livelihoods based on the advice of foreign and likely unknown extensionists temporarily offering unfamiliar technologies. Appreciation for household dynamics would include the internal struggles that shape decision making (Hart, 1992), as well as their often-gendered nature (Lamb et al., 2017; Leach, 1992). Less often studied, consideration for household factors in decision making would humanise learning and behaviour change over time (Liu, 2013). With time, appreciation for learning, adaptation, patience, and waiting for better opportunities would emerge as central elements of extension.

In sum, rendering power, place, and people produces a very partial understanding of extension. By exploring the renderings that produce extension, and by following the rendering 'upstream' (Wilsdon & Willis, 2004), extension becomes not a problem in which there are substantial unknowns (e.g., the benefits of different technologies) or even known unknowns (e.g., the impact of climate change) but an issue in which there are known socio-political factors that compose the issue and that are rendered away. Given the ongoing boom of interest in extension, it is *the act of rendering* that must become central to research, analyses, debates, and reviews.

5.2.2. The rendering of people II: Experts

Rendering technical demands that extensionists consider the actors who *do* the rendering. Such a reflexive turn requires that the practices of extensionists also be folded into a broadened understanding of extension. This inclusion upends aspirations for objectivity and dispassionate observation in which experts stand 'outside' of the political (Gieryn, 1983); being 'inside' may be as unpleasant for extensionists as it is necessary. Extending consideration to extensionists as renderers offers pathways for the readmission of the socio-political, gendered, and power-laden structures that constitute extension-adoption. We argue that the challenges associated with power is what drives *the will to render* amongst extensionists, but it is also a critical step towards humanised extension.

With the rendering of power, place, and people, extensionists implement standardised and gender-blind methodologies, often

transporting farming to more controllable field sites or by incentivising on-farm practices that enable quantification and analysis. This form of accounting allows for the quantitative calculation of 'potential yields' with which to establish 'yield gaps' relative to on-farm practices (Fermont et al., 2009). Underlying the production of quantitative yield gaps is the additional need for economic valuation of the resulting production increases associated with different agricultural technologies. To establish these calculations requires acceptance of quantitative and realist-inspired methods, in addition to probabilistic accounting of agricultural production, as the metrics of success. With the rendering of power, place, and farmers, the locus of extension is the expert, including their preconceptions (i.e., dispassionate), values (i.e., objectivity), and aims (i.e., predictable and scalable results) rather than the wellbeing of farmers.

Humanised extension would recognise the personal considerations that influence the awareness, intentions, and actions of *extensionists*. This represents a fundamental attack on the residual realist inclinations that shape extension, and the noble-but-rendering desire for scientific findings (Li, 2011) that can be transferred and scaled-up for application in other locations. Without realist boundaries, researchers would not need to render socio-political processes, nor would they need to perform dispassion in the context of exploitation, marginalisation, and the often brutal outcomes of agrarian change. Given the boom of extensionist research, this is especially important with regards to the growing sub-literatures that focus on 'improved communications' (Aker, 2011), the use of 'big data' (Coble et al., 2018), and the 'neurological turn' (Mase et al., 2015) as means for realising extensionists' objectives. Broadly, such expert-determined efforts represent manipulative methods because they appropriate the power to determine the objectives of extension; further complicating incipient trends, the emergence of 'passive' manipulation enabled by behavioural psychology (Vondolia et al., 2012) represents a covert form of manipulation rather than a refocusing of extension onto the needs and aspirations of farmers. Reasserting appreciation for the harms of change and concern for the farmers who are subjected to the impacts of change will, likely, not align with the presently popular 'decentralisation' approach, though 'systems thinking' is sufficiently broad to allow such an emphasis. Importantly, by refocusing on the wellbeing of farmers and farmer households the misalignment between researcher and farmer objectives can be acknowledged and possibly reconciled.

Our review of extension exposes strikingly consistent processes of rendering whereby power, place, and people are removed from consideration. To date, reviews of extension stop before reflecting on 'why de-humanised extension persists?'. While there are powerful, global political economies that maintain extension as part of a broad modernisation project, it bears recognising that it is extensionists who implement rendering. It is therefore extensionists who oversee the persistently crippling disconnection between the practices of extension and the practices of farmers. While perhaps disconcerting, emphasis on the active role of extensionists exposes pathways for a humanisation of extension through refusal of the processes of rendering.

6. Conclusion: A turn for humanity

If humanising extension means that extension becomes impossible, then, like the systems thinkers (Leeuwis, 2013; Leeuwis & Aarts, 2011), all the better to abandon it in the context of agrarian change and remove one source of cover for the widespread marginalisation of low income female and male farmers. If this is the case, a more open and reflexive interpretation of extension is needed, preferable to the fantasy that power, place, and people can be set aside before

being later reinserted. There is no need to pretend that extension is a technical problem when, for more than half a century, significant financial and human resources have confirmed its extremely limited positive impact on smallholder farmers.

Refusing the traditional boundaries of extension also enables a re-contextualisation of extension within broader issues of governance. The need for cheap calories and docile rural populations can, as a result, be recognised as a means to an end, with that end being control and stability for those in power. Bartlett (2008, 2010) has argued that extension must be understood in its historical context, as an intervention aligned with processes of colonisation and de-colonisation, the Cold War, globalisation, rural–urban transitions, and an epoch of modernisation. Agricultural extensionists are therefore part of a wider extension of urban control over rural populations, not only with regard to farming practices but also in terms of modes of thought and values. This position as vanguards of global political economy, though, affords extensionists with opportunities to withhold obedience (Sharp, 2012) to rendering processes that they know to be harmful or counter-productive. In addition, humanising extension requires donors, private organisations, and governments to become accountable for their renderings (allocation of funds, temporal constraints, economic interests) and the resulting outcomes.

Returning to our focus on the extensionist–farmer intersection, we note that it is extensionists who are positioned to withhold obedience (Sharp, 2012) and to trial alternatives that do not, or that limit, rendering. In this light, though, the abandonment of agricultural extension by critical researchers (Leeuwis, 2013) raises new challenges. As a result of this ‘self-rendering’ of critical extensionists, the field is becoming more homogenous at a time when the amount of publications already complicates understanding. Given increasing specialisation, publishing trends, and expectations associated with the decentralised paradigm, it is unlikely that extensionists will engage with decades-old, critical research. Overall, abandonment of the concept is likely resulting in less pressure to consider the socio-political factors that complicate technical visions of extension, perpetuating the long-standing rendering of socio-political considerations.

The growing academic popularity of extension is indicative of the importance of agriculture and the need to sustainably produce sufficient food, but also of the need to challenge the boundaries that reproduce an ineffective, gender biased system from the perspective of farmers. Extension is a socio-political issue and the insistence that power, place, and people can be rendered is antiquated. If extension is to be salvaged, that future must be founded upon socio-politics through consideration for the active role that extensionists play in perpetuating and, potentially, in challenging existing practices. Extension is human.

CRedit authorship contribution statement

Brian R. Cook: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Supervision, Funding acquisition. **Paula Satizábal:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft. **Jayne Curnow:** Writing - review & editing.

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