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Disentangling critical success factors and principles of on-farm agricultural demonstration events

Anda Adamsone-Fiskovica ^a, Mikelis Grivins ^a, Rob J. F. Burton ^b, Boelie Elzen^c, Sharon Flanigan^d, Rebekka Frick^e and Claire Hardy ^d

^aBaltic Studies Centre, Riga, Latvia; ^bRuralis: Institute for Rural and Regional Research, Trondheim, Norway;

^cBusiness unit Field Crops, Wageningen University and Research, Lelystad, the Netherlands; ^dSocial, Economic and Geographical Sciences (SEGS) Department, The James Hutton Institute, Aberdeen, Scotland;

^eDepartment of Socio-Economic Sciences, Research Institute of Organic Agriculture FiBL, Frick, Switzerland

ABSTRACT

Purpose: The paper identifies, outlines, and categorises establishment and operational factors that contribute to successful agricultural on-farm demonstration.

Design/Methodology/approach: The paper is based on a literature review on demonstration activities and meta-analysis of 24 original case study reports from 12 European countries.

Findings: Based on a combination of deductive and inductive analysis, the success determinants are classified into nine critical success factors deemed important in designing an on-farm demonstration event (the 'Nine Ps'): Purpose, Problem, Place, Personnel, Positioning, Programme, Process, Practicalities, Post-event engagement. Each factor ('what') is framed in terms of success principles to provide a guide to its enactment ('how').

Practical implications: The results of the analysis can serve as a practical decision-support tool for organisers and evaluators of on-farm demonstration events.

Theoretical implications: The paper broadens the perspective on the character, interlinkages, and relative importance of the factors underlying demonstration and their successful application within the agricultural knowledge and innovation system.

Originality/Value: The paper addresses the deficit of comprehensive empirical studies investigating on-farm demonstrations by offering a rich research-based analysis of the factors and principles underlying their successful implementation.

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Agriculture; on-farm demonstration; critical success factors; success principles; Europe; learning

1. Introduction

As a form of agricultural extension, agricultural on-farm demonstration (hereinafter – demonstration) has attracted the attention of policymakers and academics as a means of promoting and studying farmers' learning, innovation, and behavioural change (Van den Ban and Hawkins 1996; Leeuwis 2004). Dedicated measures

CONTACT Anda Adamsone-Fiskovica  andaaf@gmail.com  Baltic Studies Centre, Kokneses prospekts 26-2, Riga, LV1014, Latvia

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under the European Union (EU) Member States' Rural Development Programmes for 2014–2020 have been devoted to knowledge transfer and information actions, including a specific sub-measure for demonstration projects. Corresponding guidelines by the European Commission (2014) specify that a demonstration is a

practical session to illustrate a technology, the use of new or significantly improved machinery, a new crop protection method or a specific production technique. The activity can take place in a farm or in other places such as research centres, exhibition buildings, etc. (3)

However, this definition does not specify its objectives and expected outcomes, which are crucial in assessing these types of activities. In our conception, a demonstration, primarily aimed at public good, incorporates a diverse array of learning and practical instruction to provide farmers with tangible and multi-sensory experience with farming methods and technologies that can be applied to improve their own practices. While it is only one in the myriad of group extension methods used by advisory services, and has many similarities with demonstrations in other fields that benefit from a situated-learning environment and practical instruction, we consider that it requires a targeted analysis due to the variety of engaged stakeholders (farmers, advisors, researchers, etc.), the diverse sociodemographic profiles of participants, the strong element of peer-to-peer learning, and the largely uncontrolled environment in which on-farm demonstration is held.

Over 100 years, demonstrations have proven to be effective in practical application (e.g. Knapp 1916; Burton 2020). However, very few studies into what makes them effective had been conducted prior to the EU 'Horizon 2020' (H2020) projects Agri-Demo-F2F (Ingram et al. 2018; Pappa et al. 2018; Cooreman et al. 2018) and PLAID (Burton et al. 2017; Elzen and Burton 2019) focusing on the role of peer-to-peer learning in promoting innovation through demonstration, which was further developed in the H2020 project NEFERTITI. Earlier accounts focus either on single case studies or on certain aspects (e.g. setting up the demonstration, running the event), or they cover a broader set of extension, learning and knowledge exchange methods without an explicit focus on demonstrations. Furthermore, as noted by Knook et al. (2018), there are relatively few evaluations of farmer participatory extension programmes conducted within a developed country context.

The aim of this paper is to enrich understandings of factors and principles underlying successful demonstration events in terms of their design, development, and implementation. It does this by combining a review of the existing literature on agricultural demonstration in search of factors that have been identified as conducive to farmer engagement and learning, with a subsequent meta-analysis of 24 original PLAID case study reports on demonstration events carried out in 12 European countries. While the case study focus was initially informed by the results of earlier studies, the meta-analysis allowed us to develop a more refined and comprehensive list of demonstration critical success factors and principles, which serve as a useful tool for both the implementation and assessment of demonstration events.

The paper begins by highlighting some contested issues in the evaluation of demonstrations to discuss changes in conceptualising the role of agricultural extension activities, and to explore the concept of critical success factors. Next, we describe the empirical basis of our study, present the results of the literature review, and then build

on it to refine and describe the critical success factors and principles of demonstration as revealed by the original empirical research. We conclude by reflecting on key messages stemming from the analysis and identifying future research areas.

2. Evaluation of demonstrations

Assessing success of a demonstration event is not a straightforward exercise as, like with any evaluation of knowledge transfer interventions (Hill, Bradley, and Williams 2017), there are many conceptual and methodological considerations that need to be addressed. Assessment of agricultural extension activities can be embedded in distinct models of knowledge communication representing a set of preconceptions regarding their aim, form, content, and expected outcome.

Among other things the evaluation can be guided by different perspectives on the effects the demonstration (should) have – either focusing merely on innovation adoption and monetary benefits or, instead, considering a wider range of social effects (Prager and Creaney 2017). As demonstrated by early accounts, demonstrations were shown to not only facilitate farmers' learning and lead to innovation uptake, but also strengthen farmers' confidence and self-reliance, build community conscience, improve social life, and enable natural organisation of communities (Knapp 1916; McDowell 1929). Thus, the effects go beyond increased productivity and profitability, to encompass enhanced capacity for adaptation, improved environmental sustainability, improved quality of life, and/or empowerment of farmers. Studies have shown that social networking, peer-to-peer learning, and interaction play an important role in promoting innovation adoption and practice change among farmers and building their social capital (Kilpatrick 2000; Saint Ville et al. 2016; Torabi, Cooke, and Bekessy 2016), thus highlighting the wide potential of on-farm demonstrations.

The present debate on innovation and learning is largely guided by a paradigm shift from linear top-down technology transfer to farmer-centred interactive approaches in agricultural research and extension (Scoones, Thomson, and Chambers 2009; Black 2000) promoting user engagement and peer-to-peer learning (Molas-Gallart and Davies 2006). This shift also evokes debate on the perceived and practiced knowledge and power relations between farmers and extensionists (Landini 2016), as well as the prevalence of upward vs. downward accountability (Lund 2020) of demonstration organisers – either primarily catering for the reporting needs of funders or those of users.

In our analysis, we approach the evaluation of on-farm demonstrations from the farmer-centred perspective by taking account of the participatory nature and the extended set of potential benefits for the visitors brought about by the event in terms of promoting farmers' formal and peer-to-peer learning and building their social capital. Based on this premise, we apply the concept of critical success factors (CSFs) originating from the management literature (Rockart 1979) where it is used to refer to elements necessary for an organisation or project to reach its objectives and thus requiring special attention by the management team when strategically planning and pursuing its business activities. While we approach demonstration as the provision of a public good rather than a business endeavour, we find the underlying CSF approach –

identifying a set of skills and resources with the highest strategic leverage as the determinants of success (Ellegard and Grundert 1993) – useful for analysing demonstration events.

Given the diverse and inconsistent ways concrete CSFs are formulated by scholars using this approach across a variety of thematic fields (see e.g. Santos et al. 2018; Singeh, Abdullah, and Kaur 2020; Townsend and Gershon 2020), we propose to make a more refined differentiation between ‘success factors’ and ‘success principles’ as featuring the ‘what’ and the ‘how’ dimension of the CSFs, respectively. Namely, while we define ‘success factors’ as those features of the demonstration that play an important role in the success of the event, the underlying ‘success principles’ are those that specify the way each factor needs to be approached to achieve the desired success.

3. Data sources and methodology

The main objective of this study was to identify the key factors and principles determining the success of demonstration events. To arrive at these CSFs and principles, we combined two approaches.

First, in 2016–2017 we conducted a non-systematic review of scientific and professional extension literature to identify existing studies on on-farm demonstrations and synthesise the key factors that have been considered to promote successful demonstration activities. The review was undertaken as part of the PLAID project’s initial conceptual framework for guiding the further empirical work within the project (see Burton et al. 2017). Studies ($n = 16$; See Table 2) were selected on the basis that they featured accounts of single or multiple demonstration activities across different countries, and/or included practice- or expert-based evaluative reflection on the facilitating and impeding factors at play in these extension settings. An extensive list of specific elements ($n = 78$) identified by these studies was condensed to a reduced list ($n = 48$) by merging the overlapping ones, which were finally inductively grouped into six broader categories of ‘success factors’, namely: goal and topic; demonstration site; knowledge provider; motivation and incentives; demonstration process; publicity and follow-up. Insights from the review were also used to develop the research questions and methodology for the empirical case studies.

Second, we conducted a meta-analysis of a series of 24 original case study reports produced as part of the PLAID project in 2018, based on empirical investigation of demonstrations in 12 European countries (see Table 1), many of which are also part of the FarmDemo thematic networks of the NEFERTITI project. Demonstrations were selected to cover a variety of events across different agrarian subsectors, farming systems, scales of expected audience, frequency of events, and historical durability (see Lafarga, Gárriz, and Elzen 2017). Standardised guidelines were applied across 24 case studies to ensure the resulting accounts were comparable and fit for secondary analysis.

Each demonstration was visited by a team of two or more project researchers¹ (from the same country as the demonstration) who gathered data through a mix of in-depth interviews, participant observation, focus groups, and visitor surveys. Information was gathered on: demonstration context; set-up of the demonstration and its organisation; actual implementation of the demonstration; participants’ motives, learning and networking; application of demonstration lessons by participants; and wider use of

Table 1. Original case studies of demonstration activities.

Country	Case study ID	Case studies
Belgium	BE1	Open Energy day
	BE3	Bayer ForwardFarming programme: demonstrations on innovative solutions for sustainable agriculture
Bulgaria	BG1	Demonstration on renewable energy sources in milk production
	BG2	Demonstrations on new plant protection technologies in grain crop production
Croatia	HR1	Wheat and barley field day
	HR3	On-farm demonstration on vegetable production
France	FR3	INOSYS network: demonstration days on livestock breeding
	FR4	SYPPRE project: demonstrations on innovative cropping systems
Italy	IT1	DEMOfdays on sustainable viticulture
	IT2	Demonstration day on soil management in organic farming
Latvia	LV1	Informal farm visits in integrated fruit production
	LV2	Herbivore project: farm days in animal husbandry
Netherlands	NL1	National leek day
	NL3	Grounded maize cropping project: demonstration on undersowing grass with maize
Norway	NO1	Field day on optimal soil culture
	NO2	Theme day on berry production in plastic tunnels
Poland	PL1	National potato day
	PL2	Festival of onion, potato and soya
Spain	ES1	Farm visits on extensive crop trials
	ES2	Demonstration on organic cow cheese production
Switzerland	CH1	Arenenberg Arable day
	CH2	PROVIEH programme: organic cattle day
United Kingdom	UK3	Field event on integrated farm management
	UK5	Lothian Monitor Farm

Note: All case study reports are available at <https://zenodo.org/record/3444499#.XhLQ30czYWU>.

demonstrated novelties. The case study reports were prepared, again using a standard format, by the research teams from the country where the demonstration was held. Based on the analysis along the listed thematic lines, in writing the case study reports, authors from the different countries had been asked to assess the ‘facilitating and impeding factors for successful demonstrations’. It was through reviewing these analyses that the CSFs and principles of demonstration were elaborated.

As a first step in the case study meta-analysis we deductively categorised data along the six success factors identified in the literature review, simultaneously listing any additional features inductively emerging from the analysis. It is important to note that in our analysis we focused on the perceived rather than the actual CSFs (see Ellegard and Grundert 1993), with the latter requiring different methodological tools and longitudinal data, thus ‘success’ in this part of the analysis is defined through the eyes of the participants and organisers, mediated by the researchers’ theory-informed view on demonstration as outlined in the preceding section. Demonstration CSFs were identified as practical arrangements perceived by organisers and participants to create a wide spectrum of positive effects for farmers, with a primary focus on ensuring effective learning opportunities and empowerment of farmers, with arrangements defined as activities related to the setting up, carrying out, and following up of the demonstration.

The initial factors stemming from the literature review were then reassessed in the light of the results of the case study meta-analysis to arrive at a more refined and extended set and description of CSFs and underlying principles. We introduce these in this paper as the ‘Nine Ps’: (1) Purpose, (2) Problem, (3) Place, (4) Personnel, (5) Positioning, (6) Programme, (7) Process, (8) Practicalities, and (9) Post-event engagement

Table 2. Characteristics of the demonstration success factors and principles.

Success factor	Description	Challenge	Success principle	Relevant earlier studies	Original case study reports highlighting the factor
PURPOSE	The objective(s) the organisers implicitly or explicitly define for the demonstration	The needs and interests of supply and demand side can diverge or fail to be articulated. Absent or poorly formulated objectives limit the possibility to assess the demonstration outcome.	Set a clear and jointly agreed objective at the outset	Hancock 1997; Bailey et al. 2006; Heiniger et al. 2002	BE1, BE2, NL2, PL1
PROBLEM	The topic chosen for the demonstration	The choice and definition of the topic influences the prospects of attracting the target audience. The main challenge is to balance local user demand and national/public interest.	Identify and frame a topic tailored to farmers' needs	Bailey et al. 2006; Leeuwis 2004; Magill and Rogers 1981; Hancock 1997; Heiniger et al. 2002; Millar and Curtis 1997; Gandhi et al. 2009; Kania and Kielbasa 2015; Pangborn, Woodford, and Nuthall 2011; Richardson 2003	CH1, CH2, LV1, LV2, BE1, BE3, BG1, ES1, ES2, IT1, IT2, FR3, NO2
PLACE	The geographical site of the event and profile of farm where the demonstration is held	Selection of the site has implications for the benefits and credibility perceived by the target audience. It is not only about spatial but also social proximity of the host farm.	Select a physically and socially accessible and credible site	Bailey et al. 2006; Hancock 1997; Knapp 1916; Leeuwis 2004; Kania and Kielbasa 2015; Richardson 2003	BE1, BE3, IT1, IT2, BG1, ES1, PL1, PL2, LV1, LV2, UK2
PERSONNEL	The profile of individuals involved in the organisation and implementation of the demonstration	The personnel need to possess a range of complementary personal and professional characteristics to allow for both efficient management and user-value of demonstration.	Ensure a motivated and trusted team of organisers and facilitators	McDowell 1929; Warner 2006; Hancock 1997; Elmquist and Kryzstoforski 2015; La Grange et al. 2010; Lukuyu et al. 2012; Millar and Curtis 1997; Gandhi et al. 2009; Bailey et al. 2006; Kania and Kielbasa 2015; Richardson 2003	FR3, NO1, NO2, LV1, LV2, UK1, UK2, BE3, CH1, CH2, BG1, ES1, ES2, IT1, IT2, HR3
POSITIONING	The pre-event process of profiling the demonstration and recruiting the potential visitors	The value and impact of demonstration can be undermined by having either limited or unsuitable audience. The challenge lies in positioning the activity vis-à-vis the target group and communicating it in an unbiased way.	Identify, address, and reach the target audience	Knapp 1916; Elmquist and Kryzstoforski 2015; La Grange et al. 2010; Bailey et al. 2006; Hancock 1997	IT1, LV2, BE3, BG1, ES2, FR3, IT1, IT2, NL2, NO1, PL1, UK2
PROGRAMME	The structure of the event in terms of the type, sequence, and timing of planned activities	The challenge in designing the programme is to find the right balance between different types of activities that satisfy the objectives of the organisers and are attractive enough for the attendees.	Design a balanced set of formal and informal activities		CH2, NL1, NL2, NO1, NO2, PL1, UK1, BG1, BE1, BE3, CH1, CH2, IT1, IT2, ES1, ES2, FR3

PROCESS	The mix of means used to communicate the solutions demonstrated	The number and diverse cognitive profiles of visitors can limit an even distribution of learning effects across the audience.	Align the form and the content of communicated knowledge to different learning styles	Gandhi et al. 2009; La Grange et al. 2010; Millar and Curtis 1997; Warner 2006; Leeuwis 2004; Magill and Rogers 1981; Hancock 1997; Knapp 1916	BE1, BE3, CH1, CH2, BG1, ES1, ES2, IT1, IT2, LV1, LV2, NL1, NL2, NO1, NO2, PL1, PL2, UK1, UK2, HR3 UK1, IT1, NL1, LV1, LV2, FR3
PRACTICALITIES	Practical issues that need to be addressed to cater for basic human needs and to ensure a good learning environment	A well-intended demonstration concept focusing only on the content might not utilise its full potential if inhibited by factors that distract visitors and/or create inconveniences in accessing and staying on the site.	Ensure the provision of suitable infrastructure and limit distracting external conditions		
POST-EVENT ENGAGEMENT	Communication and promotion of the demonstration message(s) after the event	A single event might not be enough to ensure that the communicated content is taken up by visitors and that it reaches a wider audience of non-attendees. Ignoring visitor feedback can lead to making the same mistakes in future demonstrations.	Reinforce the demonstration message and follow up with the participants	Elmqvist and Kryszoforski 2015; La Grange et al. 2010; Gandhi et al. 2009; Millar and Curtis 1997; Bailey et al. 2006	LV2, ES1, FR3, NL2, NO2, PL1, UK1

(see Table 2). While seven of the ‘Nine Ps’ integrate, in a refined and reconceptualised form, the initial six factors that were present in at least three of the studies identified in the literature review, the additional two – Programme and Practicalities – emerged from the original empirical case studies. The inclusion of factors within the nine Ps, stemming from the meta-analysis, was dependent on their being highlighted in at least four of the case study reports to demonstrate generalisability. Success factors that did not meet these requirements were excluded from the list.

4. Critical success factors and principles

In the following section, we first present the results of the literature review to outline the initial set of CSFs, followed by the refined list and brief descriptions of the ‘Nine Ps’ supported by insights from the meta-analysis of case study reports. Table 2 presents these factors in association with underlying challenges, and success principles, with references to earlier accounts and the original empirical reports that particularly highlighted each factor.

4.1 Results of the literature review

One of the major issues with regards to demonstration success highlighted by earlier studies is the importance of a clearly defined *goal* and *topic* for the demonstration to be focused (Hancock 1997; Bailey et al. 2006; Heiniger et al. 2002; Richardson 2003). The value of undertaking careful analysis of farmers’ problems (Leeuwis 2004) and of local demand for the innovation (Magill and Rogers 1981) are important to ensure demonstrations are pitched appropriately (Hancock 1997; Heiniger et al. 2002; Millar and Curtis 1997). Knowing the ‘problem’ also helps to associate the demonstration with tangible benefits (Gandhi et al. 2009; Pangborn, Woodford, and Nuthall 2011) and applicability to local conditions (Hancock 1997). High value is attached to farmer engagement from the outset of demonstration design (Leeuwis 2004), following into the demonstration process, including farmer involvement in partnerships (Warner 2006) and delegation of responsibility to community members (McDowell 1929).

Arguments for demonstration to be undertaken under realistic farming conditions (Leeuwis 2004) underline the importance of the *demonstration site*. Demonstrations are advised to be held in farmers’ fields under regular conditions and management, and close to the targeted community (Knapp 1916; Hancock 1997; Richardson 2003). Demonstrations should be carried out on several sites to avoid overexploitation of single farms (Bailey et al. 2006) as well as reduce the possibility of social differentiation in farmer-to-farmer communication (Leeuwis 2004), with a single host farm potentially attracting only a specific profile of farmers and excluding others (e.g. based on gender, social status).

Studies point to the importance of the presence and qualities of key *knowledge providers*, emphasising the need to ensure high levels of specialist knowledge and progressive-minded profile of the advisor (Elmqvist and Krysztoforski 2015; La Grange et al. 2010), and to choose a credible and locally respected host (Bailey et al. 2006; Richardson 2003) representative of the targeted farmers (Hancock 1997; Gandhi et al. 2009). Research also suggests selecting peer farmers as trainers by identifying those through existing farmer groups and local communities (Lukuyu et al. 2012; Millar and Curtis 1997). An

important prerequisite of the choice of knowledge providers lies in their systematic and continuous contact with the targeted community and understanding of local conditions (McDowell 1929; La Grange et al. 2010). Studies show that bringing together different stakeholders in networks of cooperation help to use demonstrations for linking science and practice and addressing farmers' needs (Kania and Kielbasa 2015).

Research highlights the role of *motivation* and *incentives* in terms of encouraging voluntary engagement of participants in adult learning (Elmquist and Krysztoforski 2015; La Grange et al. 2010) and ensuring compensation for the contribution of knowledge providers (Bailey et al. 2006; Lukuyu et al. 2012). Providing support to develop farmers' capacity to act as facilitators includes training in teaching methods and practice (La Grange et al. 2010) and ensuring farmer-trainers can rely on extension workers as a technical backup (McDowell 1929; Lukuyu et al. 2012).

Several studies underline characteristics of the *demonstration process* as a core element of the learning activity. For this purpose, moderation to facilitate information and knowledge exchange is deemed extremely important (Gandhi et al. 2009) along with engagement of the different senses of visitors by making active use of visualisation techniques (Leeuwis 2004; Magill and Rogers 1981) and hands-on activities (Hancock 1997; Millar and Curtis 1997). The demonstration should be simple in character and limited to a few fundamental things (Knapp 1916), bearing in mind the diversity of attendees (La Grange et al. 2010). Moreover, it should maintain a balance between passive and active learning (Millar and Curtis 1997), repetition and novelty (Hancock 1997; Gandhi et al. 2009). A good demonstration is associated with the facilitators' capacity to enable mutual exchange through encouraging open debate, visitor involvement, and co-learning (Leeuwis 2004; Millar and Curtis 1997; Warner 2006; La Grange et al. 2010).

Finally, *publicity* and *follow-up* are presented as relevant factors, whereby it is essential that both pre-event and post-event communication is carried out allowing for efficient promotion (Bailey et al. 2006; Hancock 1997) and for subsequently reinforcing the message among the target audience (Elmquist and Krysztoforski 2015; La Grange et al. 2010; Gandhi et al. 2009; Millar and Curtis 1997).

4.2. The Nine Ps

In the following presentation of the 'Nine Ps' representing the CSFs of demonstration events we identify each factor and the underlying success principle, supporting this by insights and reflections stemming from the original empirical research.

Purpose: Setting a clear and jointly agreed objective at the outset. It has been observed that demonstration objectives are seldom or belatedly articulated by the organisers. When present, the purpose can range from boosting overall productivity and competitiveness, improving environmental sustainability, and promoting emerging sectors, to promoting sales of specific products or services. Thus, objectives can be attributed to the demonstration as a means of showcasing the social, economic, and/or environmental benefits of certain practices, as well as a commercial and marketing tool. Irrespective of this diversity of orientations, it is important that the key objective is made explicit among the involved parties and that, in defining the purpose, the needs and interests of funders and organisers do not prevail over the aim of achieving positive outcomes for the visiting

farmers and contributing to a broader learning and knowledge sharing strategy. Timely agreement on the objective also helps to focus all other aspects of the demonstration.

Problem: Identifying and framing a topic tailored to farmers' needs. It is crucial to specify the problem and frame the topic of the demonstration. Topic selection practices range from top-down to bottom-up models, often depending on the profile of the organiser and the funding source. The degree and format of farmers' involvement in problem definition has strong implications for the perceived relevance of the demonstration to the target audience. Thus, it is more successful if stakeholders are engaged from the beginning, using consultative bodies, engaging existing networks and groups, or asking farmers directly. Problem definition should include topics of known need as well as innovations and novelties. New dimensions to topics that are already on farmers' agenda help to avoid repetition. Importantly, success lies in framing the topic from a user perspective; in this regard, demonstrations driven by a policy-induced need (e.g. new environmental schemes) can also be successful if framed in a way that is deemed relevant by the target audience.

Place: Selecting a physically and socially accessible and credible site. The site of the event impacts both on the accessibility and the style of demonstration therefore the choice of the hosting farm's profile is crucial. Farmers attribute great value to demonstrations held on commercial farms as these provide opportunities that relate to their peers and are perceived as closer to their own practices. The real-life conditions of a farm and the demonstrated practice act as a motivating and encouraging factor for the visitors. The degree of similarity between the host and attending farmers can be critical as highly experimental or innovative farms may be seen to represent unattainable targets. To ensure that the different situations of attending farmers are accounted for, it may be desirable to use host farms of varying sizes, levels of performance, and ambition as demonstration sites. Accessibility can be increased by establishing several locations for demonstrations on the same topic to allow a wider and more diverse group to benefit. Changing sites can also help avoid demonstrations from becoming too repetitive and prevent blocking the entry of new demonstration farms. Proximity should be balanced with the added value of the site.

Personnel: Ensuring a motivated and trusted team of organisers and facilitators. The profile of individuals involved in the organisation and management of demonstrations contributes to their success. Depending on the planned demonstration, personnel can range from a single farmer to a team of individuals from different backgrounds, including advisors, researchers, farmers, and skilled process facilitators. Aside from the social status of the demonstrator (i.e. an individual respected by other farmers), valued skills and traits include open-mindedness, willingness to learn, self-confidence, openness in respect to farm business, impartiality, good communication skills, and enthusiasm for civic activism and cooperation. Personnel need to be able to manage the relations between different contributors to gain maximum value through collaboration. Such multi-actor arrangements need effective facilitation, clear terms of reference, mutually agreed division of roles, and clearly defined responsibilities right from the start. Mutual support, approachability and teamworking are essential for successful management of a demonstration.

Positioning: Identifying, addressing, and reaching the target audience. A pre-event process of identifying and reaching the target audience through effective 'market' research and communicating the planned activity to potential visitors is important.

The nature of the target group should be kept in mind when engaging in pre-event advertising and recruitment of participants. A specific group of farms/farmers may be identified as requiring knowledge, and these then serve as a basis for organising demonstration. Alternatively, a topic may be relevant within the broader national framework, followed by a more refined identification of the target groups to be approached. Considering the size of the audience is an important part of ensuring the attendance of the highest number visitors that the host site and learning environment can accommodate. Too many visitors can inhibit the quality of demonstration by limiting learning possibilities. Pre-registration of participants can help ensure that the group is of the appropriate size. Positioning is facilitated by providing background information on the demonstrated practice prior to the event, by specifying the profile of expected attendees to better streamline the audience, and by clear branding of the activity in conjunction with the defined objective and topic.

Programme: Designing a balanced set of formal and informal activities. The programme for the event must ensure that the demonstration enables farmers to learn, absorb, and discuss information within a comfortable environment. The duration of the event, and allocation of time and space for knowledge exchange are particularly important. Enough time is required for communicating new information, facilitating discussion, and breaks (e.g. for comfort, refreshments, and social exchanges). Exchanges need to be planned both as part of the core programme and during gaps and breaks. Dedicated time for informal discussions and social interaction during and after the event results in a range of social and human capital benefits including mutual knowledge gains, contacts, and enjoyment. Having a well-prepared programme reduces the need to improvise and ensures a smooth running of the event. Where possible, a trial run to ensure timings are realistic is ideal.

Process: Aligning the form and content of communicated knowledge for different learning styles. The appropriate degree of (in)formality in the structure and language used by speakers is important in determining that the audience feels at ease during the event. Removing communication barriers by providing plain explanations allows demonstrations to cater to a broader range of visitors. Communication and mediation techniques promoting interaction are core to successful demonstration, which might include physical contact between visitors and the demonstration objects, question and answer sessions, use of web tools to gather participants' opinions or experiences, and encouragement of formats that promote peer-to-peer learning. There is an acknowledged value of combining lecture- and seminar-type modes of instruction with practical activities and field walks. Engagement with the demonstration site is stimulated by enabling and activating sensory (touch, sight, hearing, smell, taste) experiences. A key role is played by skilled facilitators keeping time, providing space for participant involvement and interactions, and ensuring opportunities for explanation and interpretation of the observed demonstration. Group size and format are significant determinants of engagement in the process. Smaller groups support communication by providing appropriate space for peer-to-peer interactions at a more specific, informal, and personal level.

Some basic principles in the way content is communicated include giving the reasons for promoting the demonstrated object, balancing theory and practice, relating personal experiences of the host, embedding the demonstrated practice in the overall management of the farm, identifying do's and don'ts, sharing concerns and problems, giving practical

examples, as well as reflecting on the cost-effectiveness, social, economic, and technological benefits and disadvantages, and highlighting the relevance and applicability of the practice for the visitors' farms. A commonly identified basis for successful demonstration is the combination of different profiles of speakers, each of which carries a different type of knowledge on the issue. Repetition of clear, concise, and convincing points that can be transformed into simple take-home messages is greatly valued. This can also be facilitated by timely sharing of resources (e.g. field diagrams, figures, photographs) as a means of communicating specific information or replicable practices (do-it-yourself instructions).

Practicalities: Ensuring the provision of suitable basic infrastructure and limiting distracting external conditions. Catering for basic human needs and ensuring a good learning environment are key to success. The infrastructure should be appropriate for the size and needs of the topic and the group, including signposts, parking space, and functionality of the premises (meeting room, electricity, internet, seating opportunity, sanitary amenities). Limited on-farm facilities can be overcome by splitting the event into on- and off-farm parts to make use of nearby premises better suited for seminar and lecture formats. It is important to ensure good audibility and visibility and limit physical and environmental noise, where possible, as well as to implement all safety and bio-security measures. The added value of providing food and refreshments should not be underestimated in terms of social gains. While demonstration should ideally take place in a season and time of the day when farmers are able and likely to attend, the choice needs to be balanced against the possibilities for undertaking a demonstration on the specific topic. Contingency planning is crucial as there are many conditions that can interfere with the demonstration (e.g. poor weather conditions, power outages, unexpectedly high visitor numbers). Rehearsing the main points of the event in advance allows for a smoother running of the programme.

Post-event engagement: Reinforcing the demonstration message and following up with the participants. It is essential that some follow-up occurs after the event to reinforce the message to event visitors and a wider farming community. The provision of printed and online material after the event, as well as the presence of advisors to ensure further individual or group support to farmers adds to the success. Providing contact lists of event attendees (with their permission) may also facilitate further formal and informal networking and thus encourage the development of social capital. An important part of post-event engagement involves gathering and analysing participant feedback to allow for reinforcing the positive aspects and correcting for failures in future demonstrations.

5. Discussion

The above analysis aims to advance our understanding and conceptualisation of on-farm demonstration by disentangling – identifying, outlining, and categorising – establishment and operational factors and principles that contribute to its success. Earlier studies have explored various aspects of demonstration as part of agricultural education and extension, including identification of advantages and disadvantages associated with on-farm demonstrations (see e.g. Richardson 2003). To the best of our knowledge, however, there have been no attempts to conduct a comprehensive supranational research on, and analysis and categorisation of, factors crucial in efficient planning

and implementation of farm-based demonstration events across a variety of contexts. By applying and refining the concept of critical success factors widely used in the field of project management, the present study has advanced earlier insights and addressed several of the contemporary issues in the wider international research agenda dealing with agricultural advisory services, not least those related to the approaches and methods of advisory activities and their assessment (Faure, Desjeux, and Gasselin 2012; Prager, Creaney, and Lorenzo-Arribas 2017).

The ‘Nine Ps’ approach put forward in this paper offers a structured and applied perspective on carrying out and assessing on-farm demonstrations. However, it provides little advice to address the routine challenges associated with demonstration. In practice, the factors are strongly interlinked, and any decisions made require manoeuvring between the limitations and opportunities associated with each P.

Providing a list of success factors does not mean that all are equally important. A further comparative assessment of the relative importance of each factor for success is required – an assessment that may depend on contextual factors such as the nature of the audience, sector, budget, etc. Referring to the concept of CSFs, the distinction between conjunctive and compensatory factors (Ellegard and Grundert 1993) can be useful to differentiate between those that can and cannot be compensated by others. Alternatively, one can rate the factors as ‘essential’, ‘important’, or ‘desirable’ to serve as a context-dependent indication of which ones to prioritise if, in establishing demonstration, a decision needs to be made concerning which of the Ps to focus on. Likewise, scholars of CSF research also point to the temporality of individual factors (Amberg, Fischl, and Wiener 2005), each possibly spanning a different timeframe and thus featuring differing levels of relevance at various moments of setting-up and running a demonstration event.

Furthermore, we argue that the success of demonstration lies not in simply addressing each single factor in line with the identified principles, but in the complex interplay between the measures taken vis-à-vis each CSF and the effect of interlinkages between individual factors. The design and implementation of demonstration depends first and foremost on the *purpose* set, which in turn has direct implications for the selection of the topic (*problem*), target group (*positioning*), site (*place*), methods used (*process*), etc. The idea for a demonstration does not necessarily originate from a pre-defined objective – the instigating factor could also be the *problem*, the *place*, or the *personnel*, which can as well be based on an established practice used before. This, however, does not make the need for setting a clear objective prior to designing the novel or recurrent demonstration unimportant. Likewise, there is affinity between the most appropriate host (*place*) and the stage of innovation that is to be demonstrated (*problem*) – as more experimental and early-stage innovations may be better suited to research farms, while close-to-market innovations may be more successfully demonstrated on commercial farms. Some other examples of interrelatedness of CSFs include the possibilities or limitations presented by the host (*place*) on the practical arrangements (*practicalities*) and on the audience attending (*positioning*), as well as those provided by the plan of activities (*programme*) on the on-site learning opportunities (*process*).

The above examples show that choosing the best design of a demonstration event can be quite challenging if all the identified CSFs and principles are considered, but it is important that at least some consideration is given to each. It can also be useful to

think of CSFs and principles as antipoles of ‘critical failure factors’ (Akhavan and Peze-shakn 2014), thereby trying to avoid practical arrangements that are not in line with or hinder effective application of the former. There will be variability in the effectiveness with which the ‘Nine Ps’ are applied by skilled demonstrators compared to inexperienced ones due to the intangible role of know-how – the knowledge that cannot be codified in any formal guidelines (Zwikael and Globerson 2006). However, the ‘Nine Ps’ offer a practical framework within which demonstration organisers can apply the core requirements for a successful event, going beyond the mere number of attendees as an ultimate criterion. The underlying principles should ensure greater inclusivity of demonstrations (Sutherland et al. 2020), *int. al.* facilitating a move away from one-way expert-dominated didactic knowledge transfer to mutually enriching and reciprocal knowledge exchange, co-learning, and value co-production (Sewell et al. 2017; Lioutas et al. 2019).

6. Conclusions

Demonstrations have proved to be an important and effective element of the agricultural knowledge and innovation system. Yet, despite increasing evidence-based knowledge on this phenomenon, there are still many gaps in both theorising and practicing this specific mode of instruction and learning, not least due to the wide variety of settings and contexts in which demonstration activities are being carried out (see Sutherland and Marchand 2020). In this paper we have brought forward the concept of the ‘Nine Ps’ to serve as a common point of reference for conceptualising the critical success factors and principles of an on-farm demonstration and practically guiding the process of setting up and implementing on-farm demonstrations, particularly within the H2020 NEFERTITI project. Based on a combination of literature review and meta-analysis of a unique set of 24 original case studies we have argued that nine factors – Purpose, Problem, Place, Personnel, Positioning, Programme, Process, Practicalities, Post-event engagement – guided by farmer-centred principles *int. al.* aimed at ensuring physical, social, and cognitive accessibility, user involvement, and interactivity, are crucial in the design and delivery of successful demonstration. These factors and principles can serve both as an *ex-ante* checklist in the design process and a framework for monitoring and/or carrying out an *ex-post* evaluation of demonstration.

Whilst we believe this paper contributes significantly to the pool of knowledge on on-farm demonstration, it also highlights areas that require further investigation. Our research can be seen as a stepping stone to further this area of expertise and understanding of agricultural demonstration. The present study was exploratory and thereby did not aim for quantification or ranking of the individual CSFs, which represents an effort that can now be pursued in a systematic way building on the ‘Nine Ps’. There is also considerable room for inquiry into the pre-demonstration stage with a focus on on-farm trials preceding the demonstration event, as well as the more long-term post-demonstration effects to develop comprehensive and in-depth understanding of the processes triggered by demonstration at farm and sectoral level.

Note

1. Including four of the authors of this paper.

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Notes on contributors

Anda Adamsonė-Fiskovica is a researcher at the Baltic Studies Centre in Riga, Latvia. She holds a master's degree in Society, Science and Technology in Europe from Linköping University and a doctoral degree in sociology from the University of Latvia. She has undertaken research on innovation policy, science communication, public understanding of science, and citizen engagement. A more recent academic interest is related to agricultural knowledge and innovation systems and farmers' learning as well as food studies.

Mikelis Grivins is a post-doctoral researcher at the Baltic Studies Centre in Riga, Latvia. He holds a doctoral degree in sociology from the University of Latvia with a specialisation in education research and sociology of education. More recently he has undertaken research on agro-food systems, food supply chains, rural development, wild products, and forestry.

Rob Burton is a professor level researcher (Forsker 1) at Ruralis: Institute for Regional and Rural Research in Trondheim, Norway. He has over 20 years' experience in agricultural research in Europe and New Zealand, with his early work focusing on farmer behaviour and behavioural change. His current interest lies in understanding long-term transitions in agriculture through historical analysis.

Boelie Elzen is a senior researcher at Wageningen Research in the Netherlands. He has a PhD in innovation studies and his research focus is on the analysis of sustainability transitions in agriculture. He is primarily interested in bridging gaps between science and practice by being involved in various multi-stakeholder projects, both national and at the European level, where scientists and practitioners jointly try to make steps forward towards making agriculture more sustainable.

Sharon Flanigan is a qualitative social scientist at the James Hutton Institute in Aberdeen, Scotland. Her background is in rural topics, primarily focussing on aspects of farming and tourism in rural areas, including a PhD in agritourism. She is particularly interested in exploring connections between people in rural contexts and opportunities for interaction, learning, and collaboration (e.g. peer-to-peer, host-guest) in terms of effect on individuals, businesses, and communities.

Rebekka Frick holds a MSc in Environmental Governance from the University of Freiburg (Germany). She has been working at FiBL since 2017 and her focus is on governance of environmental problems related to agriculture with an emphasis on local and regional governance mechanisms. In particular, she has looked at the connection of agriculture and cities by studying the meanings of urban gardening activities and by analysing food flows to cities. Participatory engagement of various actors of the supply chain, i.e. production, processing, trade as well as consumption and catering has played a crucial role in her work.

Claire Hardy is a researcher at The James Hutton Institute, Aberdeen, Scotland. She has a background in farm management and a PhD in Aquaculture/Animal Behaviour from the University of Stirling. She has a keen interest in farmer behaviour, peer-to-peer learning and decision making. She is following an interest in the use of digital media and virtual immersion to engage stakeholder groups in issues around innovation, climate change and health and wellbeing.

ORCID

Anda Adamson-Fiskovica  <http://orcid.org/0000-0002-8549-7110>

Mikelis Grivins  <http://orcid.org/0000-0002-9004-2014>

Rob J. F. Burton  <http://orcid.org/0000-0001-6911-9999>

Claire Hardy  <http://orcid.org/0000-0002-2986-3737>

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