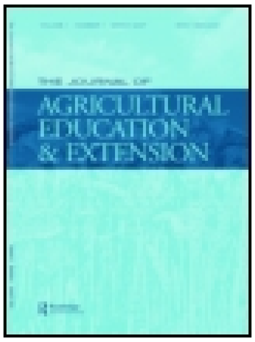

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Unraveling relevant factors for effective on farm demonstration: the crucial role of relevance for participants and structural set up

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Unraveling relevant factors for effective on farm demonstration: the crucial role of relevance for participants and structural set up

Y. Alexopoulos[a], E. Pappa[a], I. Perifanos[a], F. Marchand [b], H. Cooreman [b], L. Debruyne[b], H. Chiswell[c], J. Ingram[c] and A. Koutsouris[a]

[a]Dept. of Agricultural Economics & Rural Development, Agricultural University of Athens; [b]Flanders Research Institute for Agriculture, Fisheries and Food (ILVO); [c]University of Gloucestershire LBG (CCRI)

ABSTRACT

Purpose: The paper focuses on exploring the influence of structural and functional characteristics of demonstrations on their effectiveness.
Design/Methodology: In the framework of AgriDemo-F2F project, we analysed the responses to 345 post-demonstration questionnaires filled out by the attendees of 31 demo events held in 12 EU countries. Factor analysis was employed and on a subsequent step a linear regression to predict general effectiveness.
Findings: Results indicate that the very first steps in the organisation of on-farm demonstration are of critical importance for the successful delivery of their objectives, particularly decisions relating to relevance to farmers' needs and the structure of the event. Moreover, the paper offers first evidence that when/if on-farm demonstrations are appropriately structured and delivered they can meet their objectives regardless of the status and strength of the corresponding AKIS.
Practical implications: Demonstration organisers should take special care with regard to the relevance of the topic and the group (demonstrator and attendees) as well as of the structure of the event.
Theoretical implications: The various elements influencing the success of on-farm demonstrations are examined together and ranked.
Originality/Value: The study generates important (theoretical and practical) insights concerning the success of a widely used technique of advisory/extension services, that is on-farm demonstrations, based on a large data-set from demonstration events through out Europe.

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On farm demonstration; structural characteristics; functional characteristics; effectiveness; peer-to-peer learning; quantitative analysis

Introduction

Farmers and small scale foresters tend to be most influenced by proof of successful farming methods by their peers, which are thus their most commonly cited sources of information and ideas (Hamunen et al. 2015; Kilpatrick and Johns 2003; Oreszczyn,

CONTACT A. Koutsouris koutsouris@aua.gr Dept. of Agricultural Economics & Rural Development, Agricultural University of Athens

Lane, and Carr 2010; Rogers 2003; Schneider et al. 2009; Warner 2007). In this respect, peer-to-peer learning is suggested as a powerful approach for knowledge building networks between farmers, based on practical experience of actors in the field (EIP-AGRI 2015). One of the most employed devices in such peer learning approaches has long been considered to be on-farm demonstrations, which have become an established component of advisory/extension systems and provide the blueprint for a number of different on-farm group learning formats (Burton 2020; Coutts et al. 2005; Vanclay 2004).

'Seeing is believing' is the basic philosophy of (extension concerning) field demonstrations; on-farm demonstrations allow farmers to see a new/innovative technology, practice or system in operation on a working farm not too dissimilar to their own and talk to someone actively engaged in the practice and to whom they can relate – i.e. peers (Bailey et al. 2006; Miller and Cox 2006). The opportunity to observe the results of on-farm trials, allows farmers to make a decision to introduce the innovations much faster, especially those technologies that are costly, complex, or require a major shift in the operation (Miller and Cox 2006). On-farm demonstrations thus allow for the dissemination of practical knowledge that can be directly used on farms.

On-farm demonstrations have proved to be effective means of addressing problems and testing solutions at the farm level (Angell et al. 2004; Bailey et al. 2006). The farms on which on-farm demonstrations are held are a meeting place where on-the-farm trials are conducted, their results or methods are shown, experiences are exchanged, advice and training is provided and the dissemination of knowledge and know-how is taking place (Kania and Kielbasa 2015; Madureira et al. 2015). If appropriately organised, on-farm demonstrations are a very powerful and efficient environment where active learning can take place through visualisation and discussion (Bailey et al. 2006; Smallshire, Robertson, and Thompson 2004). Indeed, on-farm demonstrations have served for a long time as one of the most effective extension education tools developed in order to speed up the technology transfer process (Hamunen et al. 2015; Hancock 1997; Kittrell 1974; Leeuwis 2004; Rogers 2003). Nevertheless, according to Ingram et al. (2018), our understanding of learning in demonstrations is anything but well developed, and there has been little analysis of how such learning might be enabled (see also Lankester 2013).

This paper is a first attempt to quantify the influence of characteristics of demonstrations on the effectiveness of these demonstrations. Analysis is based on the large data set collected through the AgriDemo-F2F - Building an interactive AgriDemo-hub community: enhancing farmer to farmer learning (H2020) project (2017-01-01–2019-06-30) aiming at exploring ways to improve farmer-to-farmer learning on demonstration farms in Europe. Furthermore, the influence of attendees' characteristics on their perception of effectiveness is explored since such characteristics are likely to impact farmers' evaluation of demonstrations' effectiveness (see Koutsouris et al. 2017). Finally, we examine the possibility that on-farm demonstration effectiveness is influenced by the characteristics of the national Agricultural Knowledge and Innovation System (AKIS) in the sense that actors and arrangements pertaining demonstration activities sit within AKIS (Birner et al. 2009).

In the following sections, first we discuss the concepts and theories used in our research. Then, we outline the methodology; following we present the results and conclude upon them.

Theoretical background[1]

Particularly suited to understanding the demonstration context is the notion of structural and functional analysis (see Hekkert et al. 2007). Structural components are the presence of actors, networks and institutions, actors' capabilities or institutional capacities while the functional components are the most important processes that (take place during a demonstration and) lead successfully to learning (for example, hands-on experiences, facilitated dialogue, knowledge scaffolding, etc.). Learning is, thus, the outcome of an on-farm demonstration. Following we briefly explore the key terms and concepts relevant to the central aim of this paper.

Demonstrations' structural characteristics

Structural characteristics of on-farm demonstrations include, among others actors and their roles; and characteristics at the event level, including location and layout, frequency, duration and timing (for a full account see Koutsouris et al. 2017; Pappa et al. 2018). These characteristics are comparable to what Prager and Creaney (2017), in their examination of participatory extension programmes, call 'Programme characteristics'.

Actors that may initiate an on-farm demonstration can be very diverse (farmers; commercial companies; NGOs; development organisations; extension/ advisory services; research/ universities; ministries/ national agencies). Usually, partnerships between such entities are involved in initiating on-farm demonstrations and networks (Fisk III, Arch, and Arch 1989; Mitchell 2016; Stammen 2016; USDA/NRCS 2016). Furthermore, a demonstration activity usually is part of the wider information and advice landscape, not an activity for its own sake (Angell et al. 2004). Funders and organisers comprise, more or less, the same range of actors as initiators although the latter are often representatives of the initiators and deliver the programme at a number of different levels (programme, network or farm). Specialists (advisors/extension agents/experts) have a role both in relation to the local organisation and programme delivery level and as facilitators at demonstration events; nevertheless, they, often, take the role of demonstrator as well.

The demonstrator can be a farmer, researcher, specialist/extension agent/advisor, or other actor (e.g. commercial company's expert). Demonstrations that are farmer-led (and possibly researcher/advisor supported and facilitated) provide a sense of ownership for both the demonstrator and participants. Indeed, farmer participants will have more confidence and will be more receptive to innovations, if a new practice is shown by a fellow farmer (Kuipers, Klopčič, and Thomas 2005; Kumar 2014; Miller and Cox 2006; Oakley and Garforth 1985). Furthermore, the farmer-demonstrator's characteristics are identified in the literature as an important factor in effective demonstrations (Franzel et al. 2015; Gibbons and Schroeder 1983; Kiptot et al. 2006; Kumar 2014; Miller and Cox 2006). These include farming experience/ good farming skills in their local context; communication in the local language and sensitivity to local cultures, farming practices and needs; good leadership and communication abilities; good reputation and status in the community; and, conformity to the image of a 'typical' farmer, representing 'typical' conditions. Additionally, demonstration farmers should be hospitable, willing to show their farm to visiting groups and easily approachable by other farmers and extension workers.

Participants are defined as the on-farm demonstration attendees. It is very important during the planning of demonstration activities to define the type of farmers for whom the intervention is intended and ensure it is relevant to their needs/interests, level of knowledge(s) and technology. On the other hand, the number of people involved in and reached by the activities is equally important (Franzel et al. 2015; Stammen 2016).

The selection of the demonstration farm is also important for effective demonstrations. The farms' biophysical context and farming system are important determinants of a demonstration's success. Moreover, as aforementioned, one of the most critical factors for demonstration effectiveness is the farmer's ownership of the demonstration farm (Bailey et al. 2006; Gibbons and Schroeder 1983; Lauer 2009; Miller and Cox 2006). There is a greater chance of making an impact when a demonstration occurs on an actual working farm, at field scale, setting innovations outside of the 'unreal', scientific realm of the research station and placing them firmly within the bounds of a farmer's everyday experience.

Finally, the frequency (single or repeated events), the duration (demonstration operational for one or for more seasons; also duration of the event in hours and/or days) and the timing (re: particular management activities/farming practices) of demonstrations are other important factors characterising demonstration events (DAE 1999). These may vary according to the site setup and the purposes of the demonstration programme but it is suggested, for example, that demonstrations at harvest time or repetition of demonstration events concerning the same topic may add to their effectiveness (DAE 1999; Hancock 1997).

Demonstrations' functional characteristics

Given the importance of peer-to-peer interactions for learning (Baumgart-Getz, Prokopy, and Floress 2012; Isaac et al. 2007; Schneider et al. 2009) and thus for innovation adoption (Prager and Creaney 2017; Sewell et al. 2017), the extent to which the activities that are organised and take place during a demonstration event enable such interaction is seen as crucial for demonstrations' success (Ingram et al. 2018).

In this respect, providing a positive and open learning environment is key for a demonstration event. In such a setting, farmers are able to ask questions, engage in discussion and talk openly; the provision of time/space for questions and probing and the opportunity for participants to guide the learning agenda and come to their own conclusions are crucial (Millar and Curtis 1997).

In addition to bringing together peer knowledge, a key role of demonstration farms is also to act as a forum for combining different types of knowledge; therefore, successful demonstrations help to combine scientific knowledge and practical experience (see Hubert et al. 2012). Demonstrations aim to produce experiences that develop trust, encourage dialogue and prompt individuals to critically reflect on assumptions of the world through negotiation, dialogue, debate, questioning and reflection. Therefore, demonstration activities are well placed to engage attendees in interactive (participatory) style of problem solving with outside intervention taking the form of facilitation (Blackmore 2007; Darnhofer et al. 2010; King and Jiggins 2002; Leeuwis and Pyburn 2002; Moschitz et al. 2015).

Ensuring effective mediation in the process of demonstration is, thus, also important. A mediator can be an expert demonstrator or facilitator. Outside intervention, taking the form of facilitation, formalises and organises the learning environment and learning processes (Leeuwis and Pyburn 2002). It manages critical discussion among participants with the view to create deeper levels of understanding, inquiry, and innovation over time. Facilitators should foster active listening, learning and questioning by providing (confrontational) feedback, raising questions, stimulating people to talk, as well as translating and structuring information, and educating/training, depending on their remit (Leeuwis 2004).

Hence, at the farm and event level the main enabling functional characteristics include the provision of a positive and open learning environment in which participants can engage in dialogue and talk/discuss openly; the use of diverse mediation and facilitation techniques, tools to enable active learning; and, taking account of the variation in learning capacities and learning styles of individual farmers. Such characteristics are comparable to what Prager and Creaney (2017), in their examination of participatory extension programmes, call 'Characteristics of the approach'.

Learning through demonstrations

As aforementioned, learning is taken either as an 'intermediate' variable affecting the adoption of novel practices or as an outcome per se. In the latter case Cooreman et al. (2018) propose that learning is assessed through, for example, the number of participants who state they have learned something new during a demonstration, express their willingness to go on with some change in behaviour or practices at their own farm (intention to adopt) and/or talk to non-participants about the demonstration (intention to disseminate). The same authors, through their in-depth review and synthesis of the literature addressing education for sustainable development (see, inter alia, Tilbury 2011), adult learning (see Knowles 1980) and peer assisted learning (see, for example, Topping and Ehly 2001) propose, that certain processes (namely engagement, communication initiation and interactive knowledge creation), form a conceptual framework of core interacting effective learning processes. These processes, then, allow for the investigation and reflection upon the dynamics between these learning processes and demonstration effectiveness.

By building upon these processes, cognitive conflict and metacognition as effective learning processes are induced, and provide both immediate learning opportunities but also allow for reflection and double-loop-learning (DLL; Argyris and Schön 1996). Cognitive conflict (Topping and Ehly 2001) refers to the process of learners being confronted with information that does not fit with their own previous knowledge and beliefs, through for example a demonstration or discussion. People can learn effectively from a similar surprising experience. Metacognitive skills and DLL put critical reflection forward as an important process. Critical reflection fostered by for example questions, discussions and cognitive conflict can improve awareness of underlying values connected to the topic and awareness of the own learning process (Grudens-Schuck et al. 2003; Mezirow 1991). Peer learning gives rise to more meta-cognitively skilled and self-regulated learners, reflecting the important adult learning principle of ownership (Knowles 1980). Furthermore, given that there is no such thing as a 'stereotypical' adult learner

(Long 2004), trigger factors such as why the farmer is learning, the learning style, the nature and source of knowledge and the time span (Kilpatrick and Johns 2003; Toillier, Baudoin, and Chia 2014) are all important factors that need to be accommodated in demonstration activities.

AKIS

Finally, according to Birner et al. (2009) frame conditions influence advisory/extension services' components which, in turn, explain their performance. These components (governance, methods employed and advisors' capacities) are the ones extension managers can directly influence and as Faure, Rebuffel, and Violas (2011) have shown are interrelated. Thus, the Agricultural Knowledge and Innovation System is expected to influence the success of advisory/extension services (Birner et al. 2009; Faure, Rebuffel, and Violas 2011; Klerkx, Aarts, and Leeuwis 2010). Consequently, it may be expected that services' interventions, among which on-farm demonstrations are (or should be) dominant, will be influenced in the sense that in a strong and integrated AKIS on-farm demonstrations are systematically organised and delivered (vs. random demonstrations in weak and fragmented AKIS) and thus their effectiveness is expected to be higher.

Materials and methods

Data were collected in the framework of the AgriDemo-F2F project aiming, among others, at understanding the role of European commercial demonstration farms in the application of scientific findings and the spreading of best practices and innovative farming approaches within the farming community (see Editorial of current Special Issue). To this end various research tools (see Marchand et al., current Special Issue) were used in order to delineate demonstration events (interviews, surveys, observations). The current piece of work is based on the responses of participants collected through the post-demonstration questionnaire.

In particular, at the end of demonstration events, participants were requested to take some time to express the level of agreement/disagreement with statements regarding their experiences during/from the demonstration and the level of their satisfaction with the demonstration. A structured questionnaire covering the concepts discussed in the theoretical frame: structural, functional, and learning characteristics of the event, along with the perspective of the participants on the event's effectiveness was thus used. A four-level agreement Likert scale was used to measure respondents' agreement (disagreement) with these statements. The selection of a four-level, instead of a five-level, likert scale is used when the researchers seek to avoid the usually defensive selection of the neutral option by respondents, and thus, to enable respondents to proceed with a positive or negative assessment of statements. This informed decision of the research team bares the risk to not capture those respondents who might actually have been indifferent to the statements. However, as participants were adequately involved in the topics of the survey, it was expected that they had formed an explicit opinion and, thus, any such risk was moderated. Those who had little or no involvement in the topic of the survey, and thus could not decide, they used the N/A option, excluding their answers from the analysis of the results. This scaling is preferred in such cases, as relevant literature indicates (Chyung et al. 2017; Weems and Onwuegbuzie 2001).

The questionnaires were distributed to the participants of 31 events in 12 EU countries (see Table A1 in Appendix as well as Marchand et al. in this Special Issue for more information on the selection of participants in different events). Overall, 345 questionnaires were collected and used in the current analysis. Responses were cross-checked to confirm that there is not any event and/or country dominating their distribution as well as that there are no outliers.

For this analysis 28 (4-point Likert scale) variables focusing on the structural, functional and learning aspects of on-farm demonstrations, along with 6 variables (Table 1) representing the events' effectiveness according to farmers' perceptions, were used. Therefore, we did not select the most usually used outcome indicators such as adoption (in line with the tenets of the Diffusion of Innovations theory; Rogers 2003), economic indicators or 'knowledge acquisition' which is usually assumed to translate into practice changes (Knook et al. 2018, 2020; Prager and Creaney 2017).

Factor Analysis (Principal Components - PCA) and Multiple Linear Regression were employed, the former to reduce the set of 28 variables and the latter to test which structural and functional characteristics influence the effectiveness of on-farm demonstrations. Finally, six additional variables, related to the demographics of participants plus a dummy regarding the status/performance of the national AKIS, were introduced in the original linear model, in an attempt to further inform the model and explore any possible impact they might have on the dependent variable (general effectiveness).

Results

Six (6) of the variables representing the event's effectiveness were selected to form the factor termed 'general effectiveness'. The factor comprises three variables on the general effectiveness of the event(s) and another three variables focusing on the actions that participants stated that were ready to take on, because of the event they attended. The 'general effectiveness' dimension was constructed of the average score of the 6 variables presented in Table 1 below.

The reliability test of this factor resulted in a Cronbach-alpha score of 0.80, which implies a very good internal consistency of the scale created. It should be noted that, as a general rule, a Cronbach-a score between 0.60 and 0.70 is acceptable and a score over 0.80 is very good (Ursachi, Horodnic, and Zait 2015).

Factor analysis with principal components and Varimax rotation was run for the remaining 28 variables. Factor analysis is a technique that can simplify interrelated measures through mathematical procedures, in order to observe internal patterns in a group of different variables (Child 2006). It is used as a data reduction technique, as it supports the reduction or summarisation of a large set of variables, returning a smaller set of components, namely factors. It looks for variable grouping patterns, based on the intercorrelations of a set of variables. The two main approaches are exploratory and confirmatory factor analysis. The first, exploratory, is often used in order to gather information regarding the interrelationships among a set of variables. The second, confirmatory, tests and confirms or rejects specific hypotheses or theories

Table 1. The list of variables making up 'general effectiveness'.

'General Effectiveness' Cronbach-a = 0,804
The demonstration met my expectations regarding what I wanted to learn.
The demonstration exceeded my expectations.
How effective did you find the demonstration for you to learn something?
I thought about how I could implement some of the ideas and practices on my own farm.
I felt like the demonstration increased my ability to rely on myself as a farmer.
I'm thinking about an action I could undertake myself, because of the demonstration.

regarding the underlying structure in a set of variables, and it is mostly used in the later stages of a research process (Pallant 2011). For the purposes of this paper, an exploratory factor analysis was selected as the most suitable technique, in order to observe the interrelationships between variables and the possibility of reducing dimensions prior to data analysis. To this end, the principal components method was used and six factors were extracted with eigenvalue greater than 1. The six factors that were indicated through Varimax rotation are as follows:

- The 1st Factor 'structure', consisted of 7 items, forming a scale with Cronbach-a = 0.80;
- The 2nd Factor 'relevance (of knowledge/content and group)', consisted of 8 items, forming a scale with Cronbach-a = 0.81;
- The 3rd Factor 'participation', consisted of 4 items, forming a scale with Cronbach-a = 0.79;
- The 4thFactor 'metacognition (thinking about learning)', consisted of 3 items, forming a scale with Cronbach-a = 0.73;
- The 5th Factor 'knowledge (development - reflexivity)', consisted of 3 items, forming a scale with Cronbach-a = 0.70;
- Finally, the 6th Factor 'facilitation (of activity/ climate)', consisted of 3 items, forming a scale with Cronbach-a = 0.69.

Table 2 provides a more detailed view of which variables formed each of the factors (for the results of factor analysis see Table A2 in Appendix).

The factors that emerged through factor analysis were then used to form new variables by computing the average of the responses given to the questions comprising them. The new, continuous scale variables, take numerical values between 1 and 4 and have their own mean score and standard deviation (see Table A3 in the Appendix). The computing procedure (missing values and/or N/A answers) reduced the number of cases to be entered in the model. Thus, out of 345 questionnaires 325 cases produced a valid score to the 'general effectiveness' dimension (dependent variable) as well as to the six extracted factors (independent variables).

A multiple linear regression was then run to predict the influence of the abovementioned 6 factors on general effectiveness. The model equation was as follows:

GEN_EFFECT = b0 + b1(factor1) + b2(factor2) + b3(factor3) + b4(factor4) + b5(factor5) + b6(factor6)

and, by using the coefficients derived from the regression analysis, the model equation was developed as:

Table 2. The lists of variables comprising the six factors.

1st factor *Structure* **Cronbach-a = 0,804**	2nd factor *Relevance* **Cronbach-a = 0,810**	3rd factor *Participation* **Cronbach-a = 0,785**	4th factor *Metacognition* **Cronbach-a = 0,732**	5th factor *Knowledge* **Cronbach-a = 0,695**	6th factor *Facilitation* **Cronbach-a = 0,691**
I think the host farm operation was well suited for this demonstration	The demonstration built on my current understanding/ knowledge.	When there were any discussions, I felt comfortable sharing my opinion.	I thought about why I want to learn about the topic (s) of this demonstration.	The demonstration event complemented other information sources I use.	If participants didn't agree with each other during discussions, somebody (demonstrator/other participant) tried to reach a consensus between them.
I think the day was well structured.	I think the content was relevant to my own situation.	I felt actively involved during the whole demonstration process.	I thought about how we learn something new on demonstrations.	I reflected on my own point of view at some point during the demonstration.	The demonstration felt like an informal activity to me.
I think the demonstrator had the right skills to carry out the demonstration.	I felt like I could trust the knowledge of (most of) the other participants.	I felt encouraged to ask questions during the demonstration.	I felt surprised at some point(s) during the demonstration.	I learnt about the principles underlying a practice.	The demonstrator included the impact of the topic(s) on other aspects of the farm during the demonstration (instead of showing isolated topic(s)/technique(s)).
I had the feeling I could trust the demonstrators knowledge.	I think the group consisted of an interesting mix of people.	In my opinion, there were interesting discussions during the demonstration.			
The group was the right size.	I could relate well to other participants.				
The aims of the demonstration were clear to me.	I got along very well with the demonstrator.				
I found the topic interesting.	I obtained a clearer understanding of the topic(s) demonstrated				
	I have the feeling I learned something new.				

GEN_EFFECT = -0.208 + 0.215(structure) + 0.325(relevance) + 0.148(participation) + 0.147(metacognition) + 0.107(knowledge) + 0.090(facilitation)

The F-test was found significant at the 99.5% confidence level ($F_{(6,318)} = 84.898$, $p < .000$); see Table A4 (Appendix), and it can be assumed that this model explains a significant amount of the variance of the 'general effectiveness' of the event. More specifically, the multiple linear regression model summary and overall fit statistics table shows that the adjusted R^2 of the model is 0.608 (Table 3). This means that the six independent variables-factors used in the multiple linear regression explain 60.8% of the variance of the dependent variable of general effectiveness.

All six variables contributed positively and statistically significantly to the prediction ($p < .05$) meaning that at 95% confidence level, the hypothesis that each factor makes no impact to the model is rejected. Finally, from the B column in Table 4 (the coefficients table), it is implied that '**factor2 [*relevance*]**' is the one with the strongest impact on the dependent variable (general effectiveness), as an increase in its score by 1, will improve the general effectiveness by 0.325. Respectively, an increase in the score of factor1 [*structure*] by 1, will improve the general effectiveness by 0.215, and so on.

The Durbin-Watson d = 1.833, is between the two critical values of 1.5 < d < 2.5, and it can be assumed that there is no first order linear auto-correlation in the multiple linear regression data. From the collinearity statistics columns it can be concluded that there is no implication of multi-collinearity in this multiple linear regression model, as the Tolerance is > 0.1 and VIF < 10 for all variables.

While the results were considered significant and robust, an additional step was taken in order to inform the model with additional data the research team deemed interesting to explore vis-à-vis 'general effectiveness'. Six (6) variables concerning the demographics of demo participants (age, gender, education, occupation, experience; see Rogers 2003) as well as their familiarity with the demo activity were selected for this purpose. In addition, a variable reflecting the status/performance of the national AKIS (PROAKIS 2015) was constructed (See Table A5 in Appendix) in an attempt to control whether AKIS impacts upon the dependent variable (general effectiveness) and/or improves the explanatory potential of previously constructed factors.

Thus, ANOVA tests for equality of means were first performed to observe potential differences in the factors or the dependent variable (effectiveness) due to differences within those variables. In the next step, the variables were transformed and added as dummy to the original linear model. The results of these two steps are reported in Table 5.

The results of this exercise indicate that while some of the additional variables may be statistically significant regarding some factors (column b) there is no statistically

Table 3. Regression model – summary of results.

Model Summary[b]										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0,785[a]	0,616	0,608	0,332	0,616	84,898	6	318	0,000	1,833

a. Predictors: (Constant), factor6_6, factor4_6, factor1_6, factor3_6, factor5_6, factor2_6
b. Dependent Variable: gen_effectiveness2
N = 325

Table 4. Regression coefficients[a].

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	-,208	,157		−1,332	,184		
	factor1_6	,215	,061	,181	3,515	,001	,458	2,185
	factor2_6	,325	,078	,266	4,148	,000	,294	3,403
	factor3_6	,148	,043	,163	3,451	,001	,543	1,840
	factor4_6	,147	,031	,196	4,736	,000	,706	1,416
	factor5_6	,107	,046	,111	2,310	,022	,527	1,898
	factor6_6	,090	,034	,106	2,669	,008	,761	1,313

a. Dependent Variable: general effectiveness

Table 5. Impact of demographic and AKIS variables on effectiveness.

Variable	Impact on factors and/or effectiveness (ANOVA tests)	Variable as a dummy into linear regression
Age	statistically significant only for factor 6	adjusted R^2 same, all factors significant., Age non significant.
Gender	statistically significant only for factor 6	adjusted R^2 same, all factors sig., Gender non sig.
Education	statistically significant only for factor 4	adjusted R^2 same, all factors sig., Education non sig.
Occupation	statistically significant only for factors 1, 5 & 6	adjusted R^2 same, all factors sig., Occupation non sig.
Experience	statistically significant only for effectiveness	adjusted R^2 larger (0,06), all factors sig., Experience non sig.
Familiarity	statistically significant for all factors & effectiveness	adjusted R^2 same, all factors sig., Familiarity non sig.
National AKIS	statistically significant for all factors & effectiveness, except factor 1	adjusted R^2 same, all factors sig., National AKIS non sig.

significant contribution of any of them into the model (column c) and, hence, they don't have any decisive impact in predicting the dependent variable (general effectiveness).

Discussion and conclusions

On-farm demo literature has long placed considerable effort to identify and assess the critical characteristics that should be taken into consideration when planning and organising demonstration programmes and events. Following this line of thinking, this paper, in the first place, sought to examine which 'variables/ characteristics' influence demonstrations' 'effectiveness/ success'. In this quantitative analysis we constructed a composite 'effectiveness' factor, deviating from the general trend to use 'adoption/ practice change', 'productivity' and the like as outcome variables, in line with the tenets of the Diffusion of Innovations theory (Rogers 2003). Neither did we use 'learning' as an outcome variable (Knook et al. 2018, 2020); instead aspects of farmers' 'learning' were used to examine 'effectiveness' as perceived by them. We tested our 'effectiveness' factor, built upon attendees' views, with a number of other factors based on a large international data base (345 questionnaires from 12 EU countries).

Results indicate that the 'relevance' and 'structure' of the event, as described in the preceding analysis, are the factors that contribute the most to the 'general effectiveness' dimension; a potential increase of their value by 1 (as a result of greater attention given and thus improvements of the characteristics described in each item comprising these factors – see Table 2) will lead to an increase of the value of 'general effectiveness' (as farmers perceive it) by 0.325 and 0.215 respectively. Relevance refers to both the content of the demonstration and the group. This finding thus confirms previous research underlying that an appropriate topic, matching farmers' interests and prior knowledge enhances effectiveness (see Cooreman et al. 2018; Koutsouris et al. 2017). On the other hand, the selection of the demonstration farm and farmer, the group (attendees) and the activities to take place during the event are similarly important as much of the literature indicates (Kuipers, Klopčič, and Thomas 2005; Kumar 2014; Miller and Cox 2006; Oakley and Garforth 1985). Moreover, when these two dimensions (relevance and structure) are carefully designed and implemented they, along with proper facilitation, seem to provide the necessary space for an open and meaningful participation of farmers in the event. This, in turn, allows farmers to actively engage in social/peer learning as well as to increase their ability to enter into double loop learning processes as suggested by literature (Blackmore 2007; Darnhofer et al. 2010; Hubert et al. 2012; Leeuwis and Pyburn 2002; Millar and Curtis 1997; Prager and Creaney 2017). The current analysis according to which 'participation', 'metacognition' and 'knowledge' factors are identified and are additionally found to contribute to an on-farm demonstration's 'effectiveness'. More specifically, a change (decrease or increase) by 1 of the value of 'participation' or 'metacognition' results to a change in the same direction (decrease or increase) of the value of general effectiveness by 0.148 and 0.147 respectively, while if the value of 'knowledge' changes by 1 then the general effectiveness value changes by 0.107. These factors (see Table 2 for the variables that comprise each factor and Table A2 in the Appendix for the factor loadings) should then be taken seriously by those who initiate, fund, plan and/or carry out demonstrations. While these may be considered as being 'common-sense' for on-farm demonstrations' organisers, our findings indicate that this is not always the case.

A further interesting finding is that demography variables (age, gender, education, occupation, farming experience; see Table A5 in the Appendix) were not found to influence the demonstrations' effectiveness. This outcome is probably due to the wide variety of demonstration events included in our sample with some of them being focused and delivered only to strictly targeted participants and others being open to a wider audience. Thus demographics may be non-influential because demonstrations, in general, attract 'progressive farmers'; weak as they do not follow a particular pattern; or, when omitted from the model, indirectly expressed through the statements of participants (re: questionnaire). While this may be seen as being at odds with the relevant diffusion literature (Rogers 2003) that underlines the importance of farmers' demographic characteristics, it should be noted that in this paper, effectiveness is related to the participants' perceptions on the successful delivery of the demonstration objectives and on their promptness to take action after the event. Thus, it is not measured as in the adoption literature; it would require an additional, follow up research with participants of the events in order to explore their actual steps toward adopting what they have been exposed to and learned during the demonstration events.

Finally, a further interesting finding of this analysis relates to the limited impact of AKIS on the effectiveness of the demo events, i.e. an indication, which rather differs from suggestions in previous research (Birner et al. 2009; Faure, Rebuffel, and Violas 2011; Klerkx, Aarts, and Leeuwis 2010). Despite expectations it seems that in weak and/or fragmented

AKIS contexts on farm demonstrations can be effective owing to the efforts and skills of the specific actors involved in their organisation and implementation. This is promising since in such contexts demonstrations, being a 'multi-actor meeting place' may act as a catalyst for the institutional strengthening of AKIS as well as a means to deliver AKIS objectives. The policy implications of this remark are deemed of considerable importance especially if this finding will be confirmed in future research.

Currently in the EU there is a renewed interest in advisory services and, in particular, on demonstrations as effective means of transferring and exchanging knowledge, technology and practices (EU SCAR AKIS 2019). Further study is thus needed to build up the evidence base in order to make demonstrations work better for both advisory/extension agencies and farmers, for example, using larger samples, (possibly) improved sampling and measurement techniques, testing new or multiple 'effectiveness' variables as well as complementary variables, and incorporating qualitative data - mixed-methodology – to include in-depth exploration; see: (Knook et al. 2018, 2020).

Note

1. The theoretical background of this paper draws largely on an analytical framework (devised for the H2020 Agridemo-F2F project by Koutsouris et al. 2017) derived from in depth reviews of on-farm demonstrations' structural and functional characteristics (see Pappa et al. 2018 and Ingram et al. 2018 respectively) as well as of peer learning (Cooreman et al. 2018).

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Notes on contributors

Dr Yiorgos Alexopoulos is senior researcher at the Department of Agricultural Economics and Rural Development, Agricultural University of Athens. His main research interests lie in bottom-up and demand-driven innovations, social innovations and social impact assessment. Moreover, he focuses on multi-actor approaches and stakeholder analysis, especially on how collective/co-operative schemes and networks improve access to services and facilitate peer learning among rural actors.

Eleni Pappa (MSc) is a PhD candidate and participates in projects at the Lab of Agricultural Extension, Agricultural Systems & Rural Sociology, Agricultural University of Athens. Her main research interests lie in agricultural systems analysis, pluralistic advisory services, organizational change management and network analysis.

Ioannis Perifanos (MSc) is data analyst at the Lab of Agricultural Extension, Agricultural Systems & Rural Sociology, Agricultural University of Athens. His interests focus in social and behavioural (qualitative and quantitative) research and he has experience in business strategy and innovation management projects. He is also interested in how applied research could enhance decision and policy-making processes.

Prof. Dr. ir. Fleur Marchand is coordinator within the Social Science Unit of ILVO. She is doctor in science (UA, 2006) and agricultural engineer (UGent, 2001). She builds her expertise mainly on empirical case-studies of learning processes with stakeholders striving for sustainable agriculture and food chains. She uses mainly a transdisciplinary and system approach focusing on the following research topics: knowledge exchange, agroecology and transition of the food system.

Hanne Cooreman currently works as PhD student at the Research Institute for Agriculture and fisheries (ILVO) in Flanders, Belgium. She is connected to the Research unit for Education, Culture and Society, University of Leuven. Hanne does research in Educational Theory, Didactics, Peer Learning and Adult Education. She obtained a master degree in educational sciences (UGent, 2016) and is currently preparing her PhD thesis related to the Horizon 2020 European project 'AgriDemo-F2F: Peer Learning between Farmers at On-Farm Demonstrations'.

Dr. Lies Debruyne is a senior researcher at the research group Agricultural and Farm Development of the Social Sciences Unit of ILVO (Flanders Research Institute for Agriculture, Fisheries and Food). Her main research interests lie in learning processes of farmers and other agricultural stakeholders, with a focus on the role of various formal and informal networks on learning. Furthermore, she looks into how such networks can support transitions in agriculture.

Dr Hannah Chiswell is Research Fellow at the Countryside and Community Research Institute, University of Gloucestershire. Hannah has a particular research interest in understanding on-farm decision-making, particularly in the context of agri-environment scheme design and behaviours. She has a range of experience managing, conducting and analysing farmer and land manager interviews in the social science context and is a QSR certified NVivo (qualitative analysis software) 'expert'.

Dr Julie Ingram is Reader in Sustainable Agri-environmental Systems at the Countryside and Community Research Institute, University of Gloucestershire, UK. Her main research interests are concerned with Agricultural Knowledge and Innovation Systems, specifically, how farmer learning and adaptation can be supported.

Prof (Dr) Alex Koutsouris is the Head of the Lab of Agricultural Extension, Agricultural Systems & Rural Sociology, Dept. of Agricultural Economics and Rural Development, Agricultural University of Athens. His research interests revolve around sustainable rural development focusing on topics such as agricultural extension (interactive innovation & communication), training & education, project design and evaluation, with emphasis on systemic and participatory approaches.

ORCID

F. Marchand http://orcid.org/0000-0002-3110-7615
H. Cooreman http://orcid.org/0000-0001-5480-3966

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Appendix

Table A1. Post-demonstration participants' survey (Number of valid cases per country).

Country code	Country	Frequency	Percent (%)
AT	Austria	45	13.0
BE	Belgium	44	12.8
DK	Denmark	13	3.8
ES	Spain	34	9.9
FR	France	21	6.1
GR	Greece	29	8.4
IE	Ireland	47	13.6
NL	Netherlands	34	9.9
PL	Poland	43	12.5
RS	Serbia	19	5.5
SW	Sweden	7	2.0
UK	United Kingdom	9	2.6
Total		345	100

Table A2. Factor Analysis – Rotated Component Matrix[a].

	Component					
Variables	1	2	3	4	5	6
I think the host farm operation was well suited for this demonstration.	,757					
I think the day was well structured.	,748					
I think the demonstrator had the right skills to carry out the demonstration.	,727					
I had the feeling I could trust the demonstrators knowledge.	,553					
The group was the right size.	,512					
The aims of the demonstration were clear to me.	,495					
I found the topic interesting.	,476					
The demonstration built on my current understanding/knowledge.		,732				
I think the content was relevant to my own situation.		,610				
I felt like I could trust the knowledge of (most of) the other participants.		,564				
I think the group consisted of an interesting mix of people.		,501				
I could relate well to other participants.		,441				
I got along very well with the demonstrator.		,436				
I obtained a clearer understanding of the topic(s) demonstrated.		,413				
I have the feeling I learned something new.		,401				
When there were any discussions, I felt comfortable sharing my opinion.			,757			
I felt actively involved during the whole demonstration process.			,620			
I felt encouraged to ask questions during the demonstration.			,613			
In my opinion, there were interesting discussions during the demonstration.			,609			
I thought about why I want to learn about the topic(s) of this demonstration.				,776		
I thought about how we learn something new on demonstrations.				,753		
I felt surprised at some point(s) during the demonstration.				,742		
The demonstration event complemented other information sources I use.					,716	
I reflected on my own point of view at some point during the demonstration.					,606	
I learnt about the principles underlying a practice.					,606	
If participants didn't agree with each other during discussions, somebody (demonstrator/other participant) tried to reach a consensus between them.						,774
The demonstration felt like an informal activity to me.						,522
The demonstrator included the impact of the topic(s) on other aspects of the farm during the demonstration (instead of showing isolated topic(s)/technique(s)).						,514

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation.
a. Rotation converged in 8 iterations.

Table A3. Descriptive statistics of 'general effectiveness' dimension and factors.

	N	Minimum	Maximum	Mean	Std. Deviation
general effectiveness	345	1,00	4,00	3,12	,531
factor1_6	345	1,00	4,00	3,46	,451
factor2_6	345	1,00	4,00	3,28	,439
factor3_6	342	1,25	4,00	3,14	,587
factor4_6	338	1,00	4,00	2,93	,703
factor5_6	342	1,00	4,00	3,19	,554
factor6_6	334	1,00	4,00	3,06	,640
Valid N (listwise)	325				

Table A4. Multiple Linear Regression Model - ANOVA[a].

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	56,251	6	9,375	84,898	,000[b]
	Residual	35,116	318	,110		
	Total	91,367	324			

a. Dependent Variable: dimension_effectiveness2
b. Predictors: (Constant), factor6_6, factor4_6, factor1_6, factor3_6, factor5_6, factor2_6

Table A5. Additional variables (demographics and AKIS) controlled for their impact on general effectiveness

Variable	categories data Clustered into
Age (3 clusters)	<30; 31-45; 46+
Gender	Male; Female
Education (4 clusters)	None/primary; secondary, post-secondary (diploma/B.Sc.); MSc-PhD
Occupation (3 clusters)	Farmer; advisor; other
Experience in years (4 clusters)	0-5; 6-15; 16-25; 26+
Familiarity (Q: The participants of the demonstration were mainly) (3 clusters)	New to me / both new and familiar / familiar to me
Country (AKIS) 4 clusters	weak – fragmented → Greece, Spain; strong – fragmented → UK, Netherlands; moderately strong – more integrated → Sweden, Belgium, Poland, France; strong – integrated → Austria, Denmark, Ireland