



The power of argument

Hens Runhaar, Piety Runhaar, Machiel Bouwmans, Simon Vink, Arjen Buijs & David Kleijn

To cite this article: Hens Runhaar, Piety Runhaar, Machiel Bouwmans, Simon Vink, Arjen Buijs & David Kleijn (2019) The power of argument, International Journal of Agricultural Sustainability, 17:3, 231-242, DOI: [10.1080/14735903.2019.1619966](https://doi.org/10.1080/14735903.2019.1619966)

To link to this article: <https://doi.org/10.1080/14735903.2019.1619966>



© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 25 May 2019.



[Submit your article to this journal](#)



Article views: 558



[View related articles](#)




[View Crossmark data](#)



Citing articles: 1 [View citing articles](#)

The power of argument

Enhancing citizen's valuation of and attitude towards agricultural biodiversity

Hens Runhaar ^{a,b}, Piety Runhaar ^c, Machiel Bouwmans^{c,d}, Simon Vink^e, Arjen Buijs ^{a,f} and David Kleijn ^g

^aForest and Nature Conservation Policy Group, Wageningen University and Research, Wageningen, The Netherlands; ^bCopernicus Institute of Sustainable Development, Utrecht University, Utrecht, The Netherlands; ^cEducation and Competence Studies group, Wageningen University and Research, Wageningen, The Netherlands; ^dResearch Group Vocational Education, HU University of Applied Sciences Utrecht, Utrecht, The Netherlands; ^eCorporate Communications & Marketing, Wageningen University and Research, Wageningen, The Netherlands; ^fWageningen Environmental Research, Wageningen, The Netherlands; ^gPlant Ecology and Nature Conservation Group, Wageningen University and Research, Wageningen, the Netherlands

ABSTRACT

Agrobiodiversity has been decreasing substantially in Europe. Social scientific research in this area has paid limited attention to how citizens value agrobiodiversity and its decline, and how these valuations can be influenced. We explore the influence of different arguments for enhancing agro-biodiversity, delivered via short movies, on attitudes and behaviour of students, environmental professionals and people interested in nature conservation in the Netherlands. We conclude that information provision does not influence attitudes. However, it does influence values assigned to agrobiodiversity, but not always in the ways we hypothesized. Information about the intrinsic value of agrobiodiversity has the most effects on values assigned to agrobiodiversity. Among students, women and people with a low emotional attachment with agricultural landscapes ('place identity' and 'place dependence'), emphasizing the instrumental value of agrobiodiversity has a counter-intuitive effect. It does not influence the importance of this value but instead reinforces the intrinsic value they assign to agrobiodiversity. The latter finding is at odds with the instrumental biodiversity discourse in science and policy, which, under headings such as ecosystem services and natural capital, aims to mobilize support for nature conservation by emphasizing its instrumental, functional and economic values. Emphasizing the intrinsic value of agrobiodiversity seems more effective.



KEYWORDS


Agriculture; agrobiodiversity; motivations; the Netherlands; intrinsic value; aesthetic value; instrumental value

1. Introduction

Species abundance and diversity in agricultural landscapes (as from now: 'agrobiodiversity') has decreased substantially in Europe (EEA, 2015a, 2015b). A main reason is the transformation of agricultural landscapes as a consequence of scale enlargement and

agricultural intensification but also because of land abandonment (Ollerton, Erenler, Edwards, & Crockett, 2014; O'Rourke, Charbonneau, & Poinot, 2016; Sanderson, Kucharz, Jobda, & Donald, 2013). Notably agricultural intensification has been proven to have had a substantial negative impact on agrobiodiversity. As Runhaar et al. explain,

CONTACT Hens Runhaar  hens.runhaar@wur.nl  Forest and Nature Conservation Policy Group, Wageningen University and Research, P.O. Box 47, 6700 AA, Droeendaalsesteeg 3, Wageningen, The Netherlands; Copernicus Institute of Sustainable Development, Utrecht University, P.O. Box 80,115, 3508TC, Heidelberglaan 2, Utrecht, The Netherlands

 Supplemental data for this article can be accessed [doi:10.1080/14735903.2019.1619966](https://doi.org/10.1080/14735903.2019.1619966).

© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

Agricultural intensification, for instance, results in increased mechanization, more frequent mowing, increasing livestock densities, the removal of landscape elements such as hedges and hedgerows, lowering of groundwater levels, intensified nitrogen and phosphorus emission and deposition, and intensified use of pesticides. These developments in turn contribute to disturbance, loss of habitat, and eventually loss in flora and fauna (2017, p. 264).

The decline in agrobiodiversity is considered problematic because it is a problem in itself, but also because of an underutilization of the potential ecosystem services that agrobiodiversity can deliver (Dominati, Maseyk, Mackay, & Rendel, 2019). Finally, biodiversity loss is only one of the indicators of unsustainable farming practices, next to risks for human health degrading nature's life support systems for future generations (Whitmee et al., 2016).

Various governance arrangements have been implemented in order to stimulate nature conservation by farmers. Next to agri-environment schemes, public-private cooperations have emerged and, more recently, companies in agrofood chains have started initiatives aimed at promoting nature conservation by supplying farmers (Polman, Slangen, & Van Huylbroeck, 2011; Prager, 2015; Runhaar et al., 2017; Van Amstel, De Neve, De Kraker, & Glasbergen, 2007; Westerink et al., 2017).

Ecological research has provided much insight into the drivers of biodiversity loss as well as the development of measures that contribute to nature conservation in agricultural landscapes (e.g. Ollerton et al., 2014). These insights have resulted in recommendations for enhancing the performance of the above governance arrangements, particularly that of agri-environment schemes (Batáry, Dicks, Kleijn, & Sutherland, 2015). Social scientific research related to agrobiodiversity has addressed the *human dimension* of the above governance arrangement, e.g. on motivations of farmers to engage in conservation (Perry-Hill & Prokopy, 2014; Runhaar, Polman, & Dijkshoorn-Dekker, 2018), social enablers of nature conservation by farmers (Pretty, 2008) as well as a deeper understanding of the barriers to conservation (Roesch-McNally et al., 2018). The role of governments and other actors that aim to promote nature conservation by farmers has been analysed in studies on the effectiveness of agri-environment schemes (Runhaar et al., 2017). Thus far however limited attention has been paid to the roles of citizens (Runhaar, 2017). However, in their roles of consumers, volunteers, activists and voters they can play an important role in putting agrobiodiversity restoration on political

agendas, demand food that has been produced in ways that respect agrobiodiversity or contribute to agrobiodiversity restoration in other ways (Pascucci, Dentoni, Lombardi, & Cembalo, 2016; Runhaar, 2017).

This paper aims at filling this knowledge gap by exploring how citizens value the decline in agrobiodiversity and how they value agrobiodiversity more generally and for what reasons (Runhaar, 2017). Social scientific research in this area thus far has been scant (but see, e.g. Bernués, Rodríguez-Ortega, Ripoll-Bosch, & Alfnes, 2014). A better insight into how citizens value agrobiodiversity is important for at least two reasons. First, these valuations matter for retaining a political interest in the subject, for support for continued public funding for agri-environment schemes, for legitimizing other public and private conservation initiatives and for estimating citizens' willingness to contribute to agrobiodiversity conservation. Second, insight into how citizens value agrobiodiversity and for what reasons enables targeted information provision in order to reinforce citizens' appreciation of agrobiodiversity and for mobilizing their support for and cooperation with conservation efforts. For instance, a moral appeal on citizens to contribute to the conservation of bees because bee decline in part is caused by anthropogenic factors may be less convincing than instrumental or functional arguments (i.e. protecting bees because they provide pollinating services).

In this paper, we focus on the effects of interventions – namely short movies about agrobiodiversity giving arguments for nature conservation – on values assigned to and attitudes towards agrobiodiversity. The remainder of the paper unfolds as follows. In Section 2, we outline the theoretical framework of our paper. In Section 3, the methodology is explained. In Section 4, we present our results. A summary of our main conclusions and a reflection on the methodology and the results are described in Section 5.

2. Theoretical framework

For understanding people's values and attitudes towards agrobiodiversity, we employ a model developed by Ives and Kendal (2013). Based on well-established psychological theories on the relationships between values and attitudes, Ives and Kendal (2013) differentiate between fundamental values and applied values to understand people's attitudes, and ultimately their behaviour. According to Ives and Kendal (2013), the values people cognitively attach to agricultural land and agrobiodiversity (the *assigned*

values) are crucial to understand attitudes of the general public towards policy measures as well as individual behaviour favouring agrobiodiversity. Assigned values *express the importance or worth of the object relative to one or more other objects* (Brown, 1984, p. 233). Assigned values are considered more susceptible to change than fundamental values. When the specific context of a valuation changes, through, e.g. information transfer, changing use or changing visual appearances of the landscape, the assigned value may also change (Seymour, Curtis, Pannell, Allan, & Roberts, 2010). Based on the arguments from Ives and Kendal, this paper explicitly focusses on the assigned values.

The literature discusses a wide range of values and assigned values (Brown, 1984; Ives & Kendal, 2013; Kellert, 1996; Raymond et al., 2009; Seymour et al., 2010). In this paper, we focus on instrumental values, aesthetic values, and intrinsic values. Instrumental values relate to the value of agrobiodiversity for economic purposes, such as pollination (Wratten, Gillespie, Decourtye, Mader, & Desneux, 2012). Such instrumental values often are also labelled as ‘ecosystem services’ (e.g. Dominati et al., 2019). Aesthetic values relate to the assigned aesthetic quality of rural areas. Landscape preferences studies have convincingly shown that agricultural landscapes are often positively evaluated for their aesthetic value (Gobster, Nassauer, Daniel, & Fry, 2007; Plieninger, Dijks, Oteros-Rozas, & Bieling, 2013). Intrinsic values relate to the value of protecting natural areas and biodiversity for its own sake, including the intrinsic value of animals and plants as well of ecosystems and biodiversity (Buijs, 2009).

This paper focuses on the influence of information on assigned values and attitudes towards agrobiodiversity. Providing information is a widely used technique to change people’s attitudes and behaviours (Steg and Vlek, 2009) and several studies suggest that information on the functions and benefits of natural environments are possible triggers for changes in assigned values related to these environments (Cerri, Testa, & Rizzi, 2018; Polonsky et al., 2012). The actual effect of information on actual behaviours has been debated, and several studies show that the influence of information is related to the personal relevance of the issue as well as to socio-demographic characteristics (Cerri et al., 2018; Polonsky et al., 2012). Personal relevance may be linked to how people value agrobiodiversity (the previously discussed assigned values), but it may also be linked to

the personal relevance of rural places. Therefore we also include the concept of place attachment (Raymond, Brown, & Weber, 2010; Verbrugge & Van den Born, 2018; Williams & Vaske, 2003) in our theoretical model. We understand place attachment as people’s emotional and instrumental relationships with particular landscapes influences assigned values (Raymond et al., 2010).

Based on the above, we hypothesize that the provision of information about possible instrumental and ecological benefits of agrobiodiversity may influence people’s attitudes. The relationship between information and attitudes may be moderated by (i) assigned values towards agrobiodiversity (aesthetic, instrumental and intrinsic), (ii) place attachment and (iii) socio-demographics such as gender. We focus on two types of attitudes, people’s willingness to contribute to conservation in terms of their own behaviour (e.g. consumption, voting behaviour) and their support for (stricter) conservation regulations in agricultural policies.

3. Methods

We chose to conduct a quasi-experimental study, which is commonly used to estimate the causal effects of an intervention on its target population (e.g. De Leeuw, Valois, Ajzen, & Schmidt, 2015; Karpudewan, Ismail, & Roth, 2012). The intervention in our case consisted of a movie in which the problem of decline in agrobiodiversity was shortly introduced, followed by some arguments for the conservation of agrobiodiversity. Since we were interested in the effects of intrinsic, aesthetical and instrumental arguments on the dependent variables (i.e. assigned values and attitudes), we produced four different movies: one for the control group, in which only the problem was shortly introduced; one for experimental group 1 wherein the problem was shortly introduced and wherein the intrinsic argument was presented; one for experimental group 2, containing the problem and a presentation of the aesthetic arguments; and, finally, a movie for experimental group 3 which contained the problem and instrumental arguments. The survey participants were randomly assigned into one of the three experimental groups and the control group. The effects of the different arguments were measured on the base of survey-data, collected before (pre-test) and after the intervention (post-test). The survey was conducted in fall 2017. Below we explain the main methodological choices

made. More information can be found in the Online Supporting Information document.

3.1. Geographical delineation

Our research focuses on the Netherlands, where species diversity and abundance in agricultural landscapes has declined substantially and more than elsewhere in Europe (CBS, 2015; CBS et al., 2012; EEA, 2015b). Also relevant is that in this country, next to agri-environment schemes, a variety of public and private governance arrangements for nature conservation in agricultural landscapes is present (Runhaar et al., 2017). We hope that therefore trends in agrobiodiversity and conservation efforts are known by at least part of our respondents.

3.2. Survey set-up

We construed two surveys. The first survey, a pre-test, contained the dependent variables (i.e. assigned values and attitudes), place attachment and a question about where people had spent their youth. In the pre-test also gender was included as a commonly used control factor. The second survey, post-test, was sent to all respondents of the first survey and contained a randomly assigned movie, a control question about whether the participant had actually seen the whole movie and questions about the dependent variables.

The dependent variable of assigned values included items for intrinsic, the aesthetic and the instrumental values. Each type of assigned value was measured by four different items (see Online Supporting Information document). Explorative factor analyses per scale showed that all four items loaded on one single factor. The reliability of the three scales was good. More specifically, Cronbach's alpha of intrinsic values was $\alpha = .85$; for aesthetic values this was $\alpha = .81$; and for instrumental values it was $\alpha = .71$ after deletion of one of the items. Attitude was measured in terms of respondents' willingness to contribute to conservation in terms of their own behaviour (e.g. consumption, voting behaviour) and their support for (stricter) conservation regulations in agricultural policies (again, see Online Supporting Information document). Place attachment was measured based on a well-established scale measuring the two dimensions of place attachment, 'place identity' and 'place dependence' (Williams & Vaske, 2003). Place identity refers to the symbolic importance of a place that give meaning and purpose to life, whereas place dependence refers to a more

instrumental relationship with the countryside (recreation etc.)(Ibid.). In addition to place attachment, a question was included on the place people were born. As the sample had little variety on age and level of education, the socio-demographic diversity was only measured through including gender in the analysis (see Online Supporting Information document).

The survey was pilot tested among 39 students of different courses from the Wageningen University & Research, in order to check its understandability and internal consistency. Students filled out all items and were offered the possibility to leave comments and suggestions. Based on the outcomes of reliability and factor analyses, some items were adjusted (for instance, since items containing the word 'pity' in all three assigned values scales showed low factor loadings, these items were edited).

Participants in the survey received an invitation by email. This mail again contained a description of the goals and features of the study and a link to the online survey, hosted by Qualtrics. Respondents of the first survey were asked to leave their email address after which we could send an invitation mail for the second survey (about 3 weeks later). We ensured that the data would be used anonymously for scientific research ('informed consent'). In both surveys, reminders were sent after about 1 week. After about 6 weeks, all participants received a short summary of the preliminary findings.

3.3. Operationalization of the intervention (information provision via short movies)

In order to allow for a focused assessment of how information influences assigned values and attitudes (i.e. the intervention) we narrowed 'agrobiodiversity' down to a specific conservation measure, namely flower-rich field strips in arable farming. We had a number of reasons to select this measure:

- Relevance for all three assigned values.
- Relevance for illustrating the decline in agrobiodiversity.
- Recognizability.
- Direct coupling with attitudes.

In the Online Supporting Information document, these reasons are further explained.

Table 1 summarizes the arguments central to each movie that relate to intrinsic, aesthetic and instrumental values of flower-rich field strips.

Subsequently, the intervention was operationalized by collecting information about the intrinsic, aesthetic and instrumental values of flower-rich field strips. For each value, some arguments were developed of why flower-rich field strips were important. The information was presented in short movies (storyboards are included in the Online Supporting Information document). We chose for movies instead of the written text in order to engage our respondents in the survey, because it helps making 'biodiversity' and its values more concrete by visualizing (cf. Middleton, Bragin, & Parker, 2014).

The movies were about 1.5 min long in order to reduce drop-out due to fatigue bias. The movies started with a brief (ca. 30 s) introduction into the changes in agricultural landscapes in the last decade as a consequence of intensification and their

Table 1. Arguments related to intrinsic, aesthetic and instrumental values of flower-rich field margins.

Value	Arguments
Intrinsic	Flowers are an important food source for insects such as bees, butterflies and hoverflies. In the stripped countryside almost no flowers are present anymore and therefore the food source of these species has been reduced substantially. More and more species are disappearing as a consequence. Sowing flowers can help restoring bees and butterflies. This can help even threatened species such as the short-haired bumblebee. Also birds profit from field strips. Magnificent species such as the Partridge and Montagu's Harrier that have lived in the Netherlands for thousands of years have difficulties surviving. It is important to do what we can in order to protect them against extinction.
Aesthetic	Flower-rich field strips bring back some colour in our monotonous landscape. These kinds of field strips also attract birds which we can enjoy. In the past, my grand-parents often made cycle tours with me along dykes full of flowers, along grasslands and fields. Multi-coloured fields, grasslands filled with Lapwings and Black-tailed Godwits and humming roadsides full of insects. Nowadays it is utterly boring. Everything green and quiet. By sowing flower-rich field strips there is something to see again, to hear and smell things and allows us to fully enjoy the countryside again.
Instrumental	Nature is vital to us. Flower-rich field strips contribute to an increase in wild bees and hoverflies that are essential for the pollination of our crops. Nowadays that is particularly important because the honeybee is not doing well. Moreover, these field strips provide free pest control because they promote the presence of insects that eat aphids – such as ichneumon flies, hoverflies and lacewings. As a result farmers need less pesticides. Field strips also improve water and soil quality. Fewer nutrients from fertilizer leach to ditches and the soil contains more earth worms than regular agricultural land. In these ways, flower-rich field strips help the farmer.

implications for agrobiodiversity. This introduction was the same in all three movies and also shown to respondents in the control group to ensure all respondents had the same basic knowledge about the reasons for the decline in agrobiodiversity. In the second part of the movies, a flower-rich field strip was shown and some arguments were provided that relate to the value at issue. The actor was carefully chosen and had to be as neutral as possible (i.e. not resemble one of the stakeholders: a naturalist, a scientist, a farmer) in order to avoid bias because of respondents' feelings towards stakeholders. He was standing in front of a flower-rich field strip in all three movies. Because the argument differed per movie, each movie also contained some specific images (e.g. beautiful butter flies in the movie on the aesthetic value of agrobiodiversity and green lacewings in the movie on the instrumental value). The actor also spoke in a neutral voice. From other studies, we know that it matters by whom and how a message is delivered in a movie (e.g. Roubroeks, Midden, & Ham, 2009).

3.4. Target groups and response rates

Students formed the main target group of our study. Students are often used in experimental research on environmental attitudes and behaviour (e.g. Cohen, Holder-Webb, & Khalil, 2017; Opdam, Coninx, & Dewulf, 2015; Paço & Lavrador, 2017 Rikhardsson & Holm, 2008). Although students are not representative of Dutch citizens in general, they do represent young citizens (roughly between 18–25 years). We compared the influence of information about agrobiodiversity on students' assigned values and attitudes with the influence it has on adults working in the field of, or with an interest in, nature and the environment.

We approached students from four universities and one university of applied sciences. In this way, we had a mix of students from different educational levels but with a majority of university students. We targeted students from a wide range of programmes, environmental and non-environmental, agricultural and other, in order to prevent bias in terms of fundamental values or assigned values. Invitations were sent to students via teachers and programme coordinators via announcements on Electronic Learning Environments, emails and in general mailings were the invitation was among other subjects (ca. 4,000 email addresses in total). In a few cases, reminders were sent.

The second group consisted of environmental professionals working on a wide range of environmental

subjects, not limited to agrobiodiversity. Environmental professionals differ from students in an age and most probably in terms of values and knowledge about (the trends in) agrobiodiversity. Invitations were sent via the Dutch Association of Environmental Professionals (ca. 9,000 email addresses) and 'The Green Poll', a panel of citizens interested in nature and the environment and which is an initiative of the twelve Provincial Federations for Nature and the Environment (ca. 5,000 email addresses).

A third group consisted of people with an above-average interest in nature and nature conservation ('nature lovers'). Also this group was approached in order to compare with the group of students. Invitations were sent via the email newsletter of Naturetoday, a portal about nature and nature conservation in the Netherlands. Also an announcement was posted on that portal. In total about 13,000 email addresses were targeted in that way.

Table 2 shows the number of invitations sent and the response. Overall the response rate is low. Unfortunately, we observe a relatively large drop-out between the pre-test and the post-test among the students, for which we have no explanation.

3.5. Analysis techniques

In order to test the effects of the different movies on the dependent variables, paired samples t-tests were conducted measuring the difference between one's score on the dependent variables before and after having seen the movie. Analyses were conducted in SPSS – version 22.

Regarding the moderating effects of gender, place identity, place dependence and place where respondents spent their youth, we conducted the above mentioned paired samples test for women and men separately; for respondents with high (score above 5) and low place identity and place dependency, respectively (score below 5) separately; and for respondents who grew up in countryside, small village or large city separately.

4. Results

4.1. Pre-test: assigned values and attitudes

Table 3 shows the results from the pre-test. While for students the intrinsic value is the most important value of agrobiodiversity, environmental professionals and 'nature lovers' appreciate aesthetic values more. All groups rate the instrumental value much lower than the intrinsic or aesthetic value of agrobiodiversity. In general, students score lower on all values compared to environmental professionals and 'nature lovers' except for instrumental values. Students also show less positive attitudes than both other groups. The willingness of students to contribute to the conservation of agrobiodiversity is limited. An exception is their willingness to buy food products from farmers who contribute to nature conservation (average score 5.17).

4.2. Post-test: influence of information on assigned values

Table 4 shows the effects of the intervention (the provision of information about the values of agrobiodiversity by means of the short movies). Information about the intrinsic value of agrobiodiversity (movie 1) has the most effects of all the three movies. Interestingly, while it does not affect students' (lower) intrinsic values, it does reinforce the (already high) intrinsic values among environmental professionals and 'nature lovers'. Contrary to expectations, the movie on intrinsic values also positively influences the aesthetic values of students and environmental professionals. In contrast, the movie that emphasized the aesthetic value of agrobiodiversity had no effect on aesthetic values. Providing information on the instrumental value of agrobiodiversity (movie 3) had no significant effect on any of the assigned values of professionals and nature lovers. Moreover, it had a counter-intuitive effect among students as after watching the movie, students value the intrinsic value of agrobiodiversity significantly higher than in

Table 2. Response among the three survey groups.

	# Invitations sent	# Response pre-test	# Response post-test	Response rate (pre- / post-test)
Students	± 4,000	342 ^b	157 ^c	9% / 4%
Environmental professionals ^a	± 14,000	698	530	5% / 4%
'Nature lovers' ^a	± 13,000	738	549	6% / 4%

Notes: ^awe expect some overlap in the of email databases used to send invitations to the second group as well as second and third group; ^b248 university students and 94 students at the university of applied science. ^c120 university students and 37 students at the university of applied science.

Table 3. Values assigned to and attitudes towards agrobiodiversity among the three survey groups.

Assigned values/response groups	N	Average	Standard deviation
<i>Intrinsic value</i>			
Students	342	5.0716	1.13705
Environmental professionals	698	5.8990	1.01345
'Nature lovers'	738	5.8442	1.30887
<i>Aesthetic value</i>			
Students	342	4.8838	1.14533
Environmental professionals	698	6.0802	0.84092
'Nature lovers'	738	6.0437	1.14777
<i>Instrumental value</i>			
Students	342	3.6053	1.24138
Environmental professionals	698	2.8429	1.27877
'Nature lovers'	738	2.7565	1.53296
<i>Attitude-personal actions</i>			
Students	342	4.4000	1.63904
Environmental professionals	698	5.5398	1.37910
'Nature lovers'	738	5.3902	1.87507
<i>Attitude-policy</i>			
Students	342	4.1515	1.60705
Environmental professionals	698	5.4172	1.46058
'Nature lovers'	738	5.1808	1.68012

Note: values were measured by means of items on an 8-point scale (1 = completely disagree; 2 = disagree; 3 = disagree a little bit; 4 = neither disagree nor agree; 5 = agree a little bit; 6 = agree; 7 = completely agree; 8 = not applicable).

the pre-test. The movies have the lowest influence on 'nature lovers'; they only are sensitive to information about the intrinsic value of agrobiodiversity. Finally, none of the movies has had a significant effect on

attitudes. The effect on attitudes therefore is not shown in the Table.

4.3. Effects of moderating factors

As we explained in Section 2, we also assessed the influence of other, potentially moderating factors including gender, place attachment and place where people spent their youth. From these analyses, it appears that women do respond to movie 3 (instrumental value) in that we observe an .11 increase in intrinsic values ($t = -2.133$; $p < .05$). This means the counter-intuitive effect of movie 3 does not only apply to students but to a larger population. Among respondents with a high place dependence who only saw the introductory part of the movies (i.e. the control group; see Section 3.3), we observe a decrease in instrumental values of .47 ($t = 3.508$; $p < .01$), an effect we cannot explain. Among respondents with a low place dependence movie 3 (instrumental values) reinforces intrinsic values (.08, $t = -2.186$; $p < .05$); apparently the counter-intuitive effect that we also observed in students (see Section 4.2) applies to people who are at a larger distance from the countryside (see also below). Moreover, among respondents with a low place identity, we detected an effect of movie 2 (aesthetic values), namely an increase of instrumental values of .15 ($t = -2.088$; $p < .05$), which

Table 4. Effects of the interventions.

		Movie 1 (intrinsic value)	Movie 2 (aesthetic value)	Movie 3 (instrumental value)	Control group
Total sample	N:	296	297	291	297
	Intrinsic values	Increase of .13 ($t = -3.453^{**}$)	–	–	–
	Aesthetic values	Increase of .14 ($t = -3.964^{**}$)	–	–	–
	Instrumental values	–	–	–	–
Students	N:	41	44	34	38
	Intrinsic values	–	–	Increase of .24 ($t = -2.472^{*}$)	–
	Aesthetic values	Increase of .32 ($t = -2.512^{*}$)	–	–	–
	Instrumental values	–	–	–	–
Environmental Professionals	N:	123	126	131	127
	Intrinsic values	Increase of .15 ($t = -2.443^{*}$)	–	–	–
	Aesthetic values	Increase of .16 ($t = -3.294^{**}$)	–	–	–
	Instrumental values	–	–	–	Decrease of .23 ($t = 2.556^{*}$)
'Nature lovers'	N:	131	128	126	132
	Intrinsic values	Increase of 0.14, ($t = -2.541^{*}$)	–	–	–
	Aesthetic values	–	–	–	–
	Instrumental values	–	–	–	–

*= $p < .05$.

**= $p < .01$.

we cannot explain. Among these respondents we also observe effects of movie 3 (instrumental values), namely an increase of intrinsic values of .13 ($t = -2.476$; $p < .05$) and an increase of aesthetic values of .10 ($t = -2.095$; $p < .05$); the first effect again was also found among students and women. Among respondents with a high place identity, we found no effects that differed from the total sample, which is not what we expected.

Finally, we observe that the movies have most influence on respondents who grew up in large cities and no influence on respondents who spent their youth in the countryside or in small villages. Respondents who grew up in small cities show a decrease in intrinsic values (.12; $t = 2.120$; $p < .05$) as a consequence of viewing movie 2 (emphasizing aesthetic values); we have no explanation for this effect. Respondents who grew up in large cities reveal an increase in aesthetic values of .19 ($t = -2.196$; $p < .05$) after having seen the movie about the intrinsic value of agrobiodiversity and an increase of .15 in aesthetic values ($t = -2.300^*$) after having seen movie 2. Both effects are in line with what we expected.

5. Discussion

5.1. Reflection on findings

Our study showed that information provision about agrobiodiversity influences assigned values, although not always in the ways we expected. Emphasizing the intrinsic value of agrobiodiversity seems to be the most effective way for enhancing citizens' valuation of agrobiodiversity. The counter-intuitive effect of emphasizing the instrumental values among students, women and people with a low place attachment (i.e. dependence and identity), which did not enhance that valuation of agrobiodiversity but the intrinsic valuation of it instead, is interesting and at odds with the instrumental biodiversity discourse in science and policy, under headings such as ecosystem services and natural capital, which aims to mobilize support for nature conservation by emphasizing its instrumental, functional and economic values (Runhaar, 2017). Following Groffman et al. (2010) we recommend emphasizing the intrinsic and aesthetic values of agrobiodiversity as these values are meaningful for at least the respondents to our survey.

Our findings regarding place attachment (i.e. identity and dependence) and the environment in which

people spent their youth also suggest familiarity with the countryside is an important factor influencing the impact of the movies on assigned values. This is not the first study showing that people living in cities value (agro)biodiversity differently than people from the countryside, including farmers (e.g. Runhaar, Runhaar, & Vink, 2015; Vaske, Jacobs, & Sijtsma, 2011). We recommend further research into the mechanisms that explain these differences: knowledge, the specific relation that people have with particular forms of biodiversity (also in terms of costs and benefits), etc.

In contrast, no influence on attitudes was found. We assume this is due to the fact that the movies were short (1.5 min) and provided only a limited amount of information about the need for the conservation of agrobiodiversity. Longer movies with more information may have stronger effects.

The movies have the lowest influence on 'nature lovers'. A possible explanation is that this group has more knowledge about the different values of agrobiodiversity and about the state of agrobiodiversity and have more thought-through positions regarding the subject (compare: Cerri et al., 2018). The movies then provide limited to no new information. We therefore recommend further research into the role of background information about (trends in) agrobiodiversity; also because we assume this factor provides at least a partial explanation for the differences in effects between people who grew up in cities as compared to people who grew up in the countryside (see above). More insight into the role of the factor 'knowledge' has not only academic value but also practical value, as it is relevant for the design of information campaigns about agrobiodiversity.

For our theoretical framework, we draw from the literature on environmental and conservation values and attitudes. With our study, we complement this body of literature with a specific form of conservation values and attitudes, namely those of and towards agrobiodiversity. This adds to the empirical basis of this body of literature.

5.2. Reflections on methodology

The quasi-experiment that we conducted in this paper has several methodological limitations. One, we included three sub-groups of Dutch citizens that probably are not representative for the general population. Two, the relatively low response rate and the relatively

high drop-out during the post-test (particularly among students) also implies we have to be careful in generalizing our findings for the three sub-groups more generally. Three, next to the arguments and information presented in the movies we cannot exclude that the visual aspects of the movies have had an independent influence. Although we tried to make the movies as neutral as possible, showing pictures and views of agrobiodiversity and agricultural landscapes that were purely instrumental to the specific assigned values at issue, we cannot exclude that the visual aspects themselves have influenced assigned values (this would explain why movie 1 on intrinsic values also yielded an effect on aesthetic values in students and environmental professionals). We recommend further research into what is most influential: talking about a particular value of agrobiodiversity or showing it. Four, our survey focused on a specific form of agrobiodiversity, namely species associated with flower-rich field strips on arable land. Although that may not be relevant for the impact of information provision on these appreciations it is interesting to explore how citizens appreciate different forms of agrobiodiversity. In addition, our sample was not representative for the general public in the Netherlands. We recommend replication of our study in other agricultural sub-sectors (e.g. dairy farming), among other citizen groups and in other countries. Moreover, future research is recommended in the possibilities to influence not only assigned values and attitudes but also citizens' behaviour (support for agri-environment schemes, willingness to buy products from nature-friendly farmers, etc.).

Our findings and the above practical implications are based on a subset of Dutch citizens. The valuations of agrobiodiversity that we observed and the extent to which they are influenceable by information provision cannot be generalized to other contexts. However, the roles that citizens can play in contributing to more biodiverse agriculture (and more sustainable agriculture in general) will probably apply to other contexts as well (inside and outside Europe). We therefore recommend replication of this study in other contexts, in order to further explore how citizens can be mobilized in order to promote more biodiverse farming practices.

5.3. Practical implications

We conclude that among the three groups of citizens we surveyed, notably the intrinsic and aesthetic value

of agrobiodiversity are appreciated and that particularly the provision of information about the intrinsic value reinforces the appreciation of this value of agrobiodiversity, as well as that of the aesthetic value. For many respondents, emphasizing the instrumental value of agrobiodiversity has a negative influence on the appreciation of this value.

A lesson for information campaigns by the government or by nature conservation NGOs is that emphasizing the instrumental value of agrobiodiversity should be avoided, at least in campaigns that address the target groups we surveyed. Emphasizing the intrinsic value seems most effective. The same applies for farmers who communicate about their conservation activities (whether these are voluntary or subsidized; see Runhaar et al., 2018 for a study among Dutch farmers) in order to be appreciated for these activities and to legitimize them, and for food processors and retailers who sell products based on nature-friendly ways of farming.

We observe that among students knowledge provision about the value of agrobiodiversity influences their appreciations, although not precisely how we expected. Nevertheless, it overall enhances their valuation of agrobiodiversity. Institutes for higher education can contribute to enhanced valuation of biodiverse agriculture by incorporating the subject in courses and curricula, by creating learning situations in which students can develop capabilities to critically think about agrobiodiversity, by offering room for on-campus sustainable and biodiverse food initiatives and by stimulating students to engage with NGOs and local and regional food initiatives (Albareda-Tiana, Vidal-Raméntol, & Fernández-Morilla, 2018; Wals, Brody, Dillon, & Stevenson, 2014).

Human health benefits of nature are increasingly brought to the fore as arguments in favour of investments in nature (Aerts, Honnay, & Van Nieuwenhuyse, 2018). Although this argument is particularly voiced regarding urban nature, human health effects of nature are also associated with rural, agricultural areas (Stallman, 2011). Although health can be considered as an instrumental value in some sense, it is different from the way we defined instrumental values of agrobiodiversity in this paper (i.e. delivering benefits for farmers' operational management). Future research could explore what forms of agrobiodiversity deliver human health benefits and subsequently how citizens appreciate this argument.

A final important implication of this study is that apparently forms of agrobiodiversity with high

scores on intrinsic and aesthetic values are more appreciated than forms of agrobiodiversity with high instrumental values, at least for the groups of citizens we surveyed. This may have implications for conservation policies and initiatives – it seems their public support can be enhanced if the focus is on forms of agrobiodiversity that are highly appreciated by citizens. Further research is needed to identify these forms of agrobiodiversity but also what a shift in focus would mean for attention paid to which forms of agrobiodiversity. Already it seems that in conservation policy, voluntary conservation work, initiatives from agrofood companies to enhance agrobiodiversity, etc. some species are over-emphasized (in the Netherlands, e.g. birds, mammals and butterflies). Relying more on citizens' appreciations of agrobiodiversity may reinforce this inequality.

6. Conclusions

Agrobiodiversity has been declining in many European agricultural landscapes, due to land abandonment but primarily due to agricultural intensification. Ecological research has yielded much insight into the drivers of biodiversity loss as well as the development of measures that contribute to nature conservation in agricultural landscapes. Social scientific research on the human side of agrobiodiversity has focused primarily on governance, i.e. instruments and strategies that governments, NGOs and companies have implemented in order to motivate farmers to implement conservation measures, and the effectiveness of these instruments and strategies. Also studies have been conducted on how farmers perceive biodiversity loss and what motivates or hinders them to actively contribute to restoration. Thus far limited attention has been paid to the roles of citizens. However, in their roles of consumers, volunteers and voters they can play an important role in putting agrobiodiversity restoration on political agendas, raise awareness in the agrofood industry or contribute to agrobiodiversity restoration in other ways.

This paper aims at filling this knowledge gap by exploring how citizens value agrobiodiversity. Insight into how citizens value agrobiodiversity and for what reasons is important for retaining a political interest in the subject, for the legitimacy of agri-environment schemes and other public and private conservation initiatives and for estimating citizens' willingness to contribute to agrobiodiversity conservation, personally or by supporting (stricter) conservation regulations in

agricultural policies. It also is important for targeted information provision in order to reinforce citizens' appreciation of agrobiodiversity and for mobilizing their support for and cooperation with conservation efforts. The aim of this paper therefore was to explore how information about different values of agrobiodiversity affects the values that citizens assign to agrobiodiversity and the attitudes they hold towards policy schemes and personal buying behaviour.

Based on a survey among students, environmental professionals and people interested in nature conservation in the Netherlands, we draw three main conclusions. First, information provision about the values of agrobiodiversity does not influence attitudes but does influence values assigned to agrobiodiversity and the relative strength of these values, albeit not always in the ways we expected. Second, information about the intrinsic value of agrobiodiversity has the most effects on assigned values. Emphasizing the intrinsic value of agrobiodiversity therefore seems more effective in information campaigns on this subject, at least among the three groups of citizens we surveyed. Third, among students, women and people who do not associate themselves much with the countryside (low 'place identity' and 'place dependence'), emphasizing the instrumental value of agrobiodiversity has a counter-intuitive effect as it does not influence the importance of this value but instead reinforces the intrinsic value.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Professor Hens Runhaar is Professor of Governance of Biodiversity in Agricultural Landscapes at Wageningen University and Research and Associate Professor of Governance of Nature and Biodiversity at the Copernicus Institute of Sustainable Development at Utrecht University.

Dr. Piety Runhaar is Associate Professor at the Chair Group of Education and Learning Sciences at Wageningen University.

Dr. Machiel Bouwmans works at the Research Group Vocational Education of the University of Applied Sciences.

Simon Vink is Spokes person for the Executive Board of Wageningen University and Research.

Dr. Arjen Buijs is Assistant Professor at the Forest and Nature Conservation Policy Group at Wageningen University and senior researcher at Wageningen Environmental Research.

Professor David Kleijn is chair of the Plant Ecology and Nature Conservation Group at Wageningen University.

ORCID

Hens Runhaar  <http://orcid.org/0000-0001-7790-097X>

Piety Runhaar  <http://orcid.org/0000-0003-4151-5003>

Arjen Buijs  <http://orcid.org/0000-0002-1683-6182>

David Kleijn  <http://orcid.org/0000-0003-2500-7164>

References

- Aerts, R., Honnay, O., & Van Nieuwenhuyse, A. (2018). Biodiversity and human health: Mechanisms and evidence of the positive health effects of diversity in nature and green spaces. *British Medical Bulletin*, 127(1), 5–22.
- Albareda-Tiana, S., Vidal-Raméntol, S., & Fernández-Morilla, M. (2018). Implementing the sustainable development goals at University level. *International Journal of Sustainability in Higher Education*, 19(3), 473–497.
- Batáry, P., Dicks, L. V., Kleijn, D., & Sutherland, W. J. (2015). The role of agri-environment schemes in conservation and environmental management. *Conservation Biology*, 29(4), 1006–1016.
- Bernués, A., Rodríguez-Ortega, T., Ripoll-Bosch, R., & Alfnes, F. (2014). Socio-cultural and economic valuation of ecosystem services provided by Mediterranean mountain agroecosystems. *PLoS ONE*, 9(7), e102479.
- Brown, T. C. (1984). The concept of value in resource allocation. *Land Economics*, 60, 231–246.
- Buijs, A. E. (2009). Lay people's images of nature: Frameworks of values, beliefs and value orientations. *Society and Natural Resources*, 22, 417–432.
- CBS. (2015). Persbericht: weidevogels in duikvlucht, Den Haag: Statistics Netherlands. Retrieved from www.cbs.nl/nl-NL/menu/themas/natuur-milieu/publicaties/artikelen/archief/2015/weidevogels-in-duikvlucht1.htm?RefererType=RSSItem.
- CBS, PBL, Wageningen UR. (2012). Ontwikkeling soorten in natuurgebieden en agrarisch gebied 1975–2005, Den Haag/Bilthoven/Wageningen: Statistics Netherlands/Netherlands Environmental Assessment Agency/ Wageningen UR, The Hague/Bilthoven/Wageningen. Retrieved from www.compendiumvoordeleefomgeving.nl.
- Cerri, J., Testa, F., & Rizzi, F. (2018). The more I care, the less I will listen to you: How information, environmental concern and ethical production influence consumers' attitudes and the purchasing of sustainable products. *Journal of Cleaner Production*, 175, 343–353.
- Cohen, J., Holder-Webb, L., & Khalil, S. (2017). A further examination of the impact of corporate social responsibility and governance on investment decisions. *Journal of Business Ethics*, 146(1), 203–218.
- De Leeuw, A., Valois, P., Ajzen, I., & Schmidt, P. (2015). Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high-school students: Implications for educational interventions. *Journal of Environmental Psychology*, 42, 128–138.
- Dominati, E. J., Maseyk, F. J. F., Mackay, A. D., & Rendel, J. M. (2019). Farming in a changing environment: Increasing biodiversity on farm for the supply of multiple ecosystem services. *Science of the Total Environment*, 662, 703–713.
- EEA. (2015a). SOER 2015 — The European environment — state and outlook 2015. A comprehensive assessment of the European environment's state, trends and prospects, in a global context, European Environmental Agency, Copenhagen.
- EEA. (2015b). State of nature in EU. Results from reporting under the nature directives 2007–2012. EEA technical report no2/ 2015, European Environment Agency, Luxembourg.
- Gobster, P. H., Nassauer, J. I., Daniel, T. C., & Fry, G. (2007). The shared landscape: What does aesthetics have to do with ecology? *Landscape Ecology*, 22, 959–972.
- Groffman, P. M., Stylinski, C., Nisbet, M. C., Duarte, C. M., Jordan, R., Burgin, A., ... Cary, J. C. (2010). Restarting the conversation: Challenges at the interface between ecology and society. *Frontiers in Ecology and the Environment*, 8(6), 284–291.
- Ives, C. D., & Kendal, D. (2013). Values and attitudes of the urban public towards peri-urban agricultural land. *Land Use Policy*, 34, 80–90. doi:10.1016/j.landusepol.2013.02.003
- Karpudewan, M., Ismail, Z., & Roth, W.-M. (2012). Promoting pro-environmental attitudes and reported behaviors of Malaysian pre-service teachers using green chemistry experiments. *Environmental Education Research*, 18(3), 375–389.
- Kellert, S. R. (1996). *The value of life: Biological diversity and human society*. Washington, DC: Island Press.
- Middleton, A., Bragin, E., & Parker, M. (2014). Finding people who will tell you their thoughts on genomics – recruitment strategies for social sciences research. *Journal of Community Genetics*, 5(4), 291–302.
- Ollerton, J., Erenler, H., Edwards, M., & Crockett, R. (2014). Extinctions of aculeate pollinators in Britain and the role of large-scale agricultural changes. *Science*, 346(6215), 1360–1362.
- Opdam, P., Coninx, I., & Dewulf, A. (2015). Framing ecosystem services: Affecting behaviour of actors in collaborative landscape planning? *Land Use Policy*, 46, 223–231.
- O'Rourke, E., Charbonneau, M., & Poinsoy, Y. (2016). High nature value mountain farming systems in Europe: Case studies from the Atlantic Pyrenees, France and the Kerry Uplands, Ireland. *Journal of Rural Studies*, 46, 47–59.
- Paço, A., & Lavrador, T. (2017). Environmental knowledge and attitudes and behaviours towards energy consumption. *Journal of Environmental Management*, 197, 384–392.
- Pascucci, S., Dentoni, D., Lombardi, A., & Cembalo, L. (2016). Sharing values or sharing costs? Understanding consumer participation in alternative food networks. *NJAS - Wageningen Journal of Life Sciences*, 78, 47–60.
- Perry-Hill, R., & Prokopy, L. S. (2014). Comparing different types of rural landowners: Implications for conservation practice adoption. *Journal of Soil and Water Conservation*, 69(3), 266–278.
- Plieninger, T., Dijks, S., Oteros-Rozas, E., & Bieling, C. (2013). Assessing, mapping, and quantifying cultural ecosystem services at community level. *Land Use Policy*, 33, 118–129.
- Polman, N., Slangen, L., & Van Huylbroeck, G. (2011). Collective approaches to agri-environmental management. In A. Oskam & J. Silvis (Eds.), *EU policy for agriculture, food and rural areas* (pp. 363–368). Wageningen: Wageningen Academic Publishers.
- Polonsky, M. J., Vocino, A., Grau, S. L., et al. (2012). The impact of general and carbon-related environmental knowledge on attitudes and behaviour of US consumers. *Journal of Marketing Management*, 28, 238–263.
- Prager, K. (2015). Agri-environmental collaboratives for landscape management in Europe. *Current Opinion in Environmental Sustainability*, 12, 59–66.
- Pretty, J. (2008). Agricultural sustainability: Concepts, principles and evidence. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1491), 447–465.

- Raymond, C. M., Brown, G., & Weber, D. (2010). The measurement of place attachment: Personal, community, and environmental connections. *Journal of Environmental Psychology*, 30(4), 422–434.
- Raymond, C. M., Bryan, B. A., MacDonald, D. H., et al. (2009). Mapping community values for natural capital and ecosystem services. *Ecological Economics*, 68, 1301–1315.
- Rikhardsson, P., & Holm, C. (2008). The effect of environmental information on investment allocation decisions - An experimental study. *Business Strategy and the Environment*, 17(6), 382–339.
- Roesch-McNally, G. E., Basche, A. D., Arbuckle, J. G., Tyndall, J. C., Miguez, F. E., Bowman, T., & Clay, R. (2018). The trouble with cover crops: Farmers' experiences with overcoming barriers to adoption. *Renewable Agriculture and Food Systems*, 33(4), 322–333.
- Roubroeks, M., Midden, C., & Ham, J. (2009). Does it make a difference who tells you what to do? Exploring the effect of social agency on 26 psychological reactance, ACM International Conference Proceeding Series, 350, 15.
- Runhaar, H. A. C. (2017). Governing the transformation towards 'nature-inclusive' agriculture: Insights from the Netherlands. *International Journal of Agricultural Sustainability*, 15(4), 340–349.
- Runhaar, H. A. C., Melman, Th. C. P., Boonstra, F. G., Erisman, J. W., Horlings, L. G., De Snoo, G. R., ... Arts, B. J. M. (2017). Promoting nature conservation by Dutch farmers: A governance perspective. *International Journal of Agricultural Sustainability*, 15(3), 264–281.
- Runhaar, H., Polman, N., & Dijkshoorn-Dekker, M. (2018). Self-initiated nature conservation by farmers: An analysis of Dutch farming. *International Journal of Agricultural Sustainability*, 16(6), 486–497.
- Runhaar, H., Runhaar, M., & Vink, H. (2015). Badger reports in Dutch newspapers 1900–2013: Same animals, different framings? *Mammal Review*, 45(3), 133–145.
- Sanderson, F. J., Kucharz, M., Jobda, M., & Donald, P. F. (2013). Impacts of agricultural intensification and abandonment on farmland birds in Poland following EU accession. *Agriculture, Ecosystems and Environment*, 168, 16–24.
- Seymour, E., Curtis, A., Pannell, D., Allan, C., & Roberts, A. (2010). Understanding the role of assigned values in natural resource management. *Australasian Journal of Environmental Management*, 17, 142–153.
- Stallman, H. R. (2011). Ecosystem services in agriculture: Determining suitability for provision by collective management. *Ecological Economics*, 71(1), 131–139.
- Steg, L., & Vlek, C. A. J. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309–317.
- Van Amstel, M., De Neve, W., De Kraker, J., & Glasbergen, P. (2007). Assessment of the potential of ecolabels to promote agrobiodiversity. *AMBIO: A Journal of the Human Environment*, 36(7), 551–558.
- Vaske, J. J., Jacobs, M. H., & Sijtsma, M. T. J. (2011). Wildlife value orientations and demographics in the Netherlands. *European Journal of Wildlife Research*, 57, 1179–1187.
- Verbrugge, L., & Van den Born, R. (2018). The role of place attachment in public perceptions of a re-landscaping intervention in the river Waal (The Netherlands). *Landscape and Urban Planning*, 177, 241–250.
- Wals, A. E., Brody, M., Dillon, J., & Stevenson, R. B. (2014). Convergence between science and environmental education. *Science*, 344(6184), 583–584.
- Westerink, J., Jongeneel, R., Polman, N., Prager, K., Franks, J., Dupraz, P., & Mettepenningen, E. (2017). Collaborative governance arrangements to deliver spatially coordinated agri-environmental management. *Land Use Policy*, 69, 176–192.
- Whitmee, S., Haines, A., Beyrer, C., Boltz, F., Capon, A. G., De Souza Dias, B. F., ... Yach, D. (2015). Safeguarding human health in the Anthropocene epoch: Report of the Rockefeller Foundation-Lancet commission on planetary health (Review). *The Lancet*, 386(10007), 1973–2028.
- Williams, D. R., & Vaske, J. J. (2003). The measurement of place attachment: Validity and generalizability of a psychometric approach. *Forest Science*, 49, 830–840.
- Wratten, S. D., Gillespie, M., Decourtye, A., Mader, E., & Desneux, N. (2012). Pollinator habitat enhancement: Benefits to other ecosystem services. *Agriculture, Ecosystems and Environment*, 159, 112–122.