



Factors influencing farmer and resident willingness to adopt an agri-environmental scheme in Israel

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ABSTRACT

Providing for growing food demand while minimizing environmental degradation is a major contemporary environmental challenge. Agri-environmental schemes (AESs) are often promoted to meet this challenge by providing subsidies to farmers who adopt agri-environmental practices (AEPs). The success of these schemes depends on the ability to engage farmers, thus understanding farmers' perceptions about AEPs is pivotal. Yet, current knowledge is limited as most research explores farmer's attitudes towards existing AESs, often based on subsidies. We explored the attitudes of farmers and their communities towards five different AEPs, and towards a potential AES, in an area of intensive agriculture in Israel, where currently no AES are implemented. We conducted five focus group sessions with 41 farmers, 12 follow-up interviews, and a survey with 296 community members.

Findings indicate that farmers' willingness to implement AEPs was driven by environmental, personal, and social considerations, particularly perceptions of "good farming" practices, such as community cohesiveness and maintaining control of one's field. Farmers' lack of trust in the government, and lack of personal or local experience with specific AEPs, are other major barriers for joining a potential AES. Farmers perceived financial compensation as a safety net, but placed social and cultural values on par with, or above, financial considerations for joining an AES. Farmers' communities demonstrated high support for implementing AEPs, indicating that communities could be an asset for AES development. Therefore, while incentives for many AESs are based primarily on monetary compensation, to achieve their desired long-term results they should also focus on farmer resilience, independence, knowledge creation, and socio-cultural capital development.

1. Introduction

Agricultural ecosystems, covering approximately 38% of terrestrial land, have undergone intensification processes that have led to substantial loss of biodiversity and ecosystem services (Foley et al., 2005; Tilman et al., 2011; Rockström et al., 2017). Agri-environmental practices (hereafter AEPs) are intended to protect the environment in and around farmlands by promoting more sustainable agricultural activity. To date, much research has been dedicated to assessing the environmental and ecological outcomes of AEPs, such as increasing local species richness and abundance, improving ecological integrity, and decreasing the detrimental environmental impacts of intensive farming at local and regional scales (e.g., Batáry et al., 2015; Albrecht et al., 2020; Shackelford et al., 2019). Specifically, AEPs such as pesticide reduction and

field margin restoration have been found to increase the abundance of natural predators and pollinators (Kennedy et al., 2013; Segre et al., 2019); conservation tillage reduces soil erosion, and enhances soil microbial diversity and related soil ecosystem services (Wang et al., 2017); and increasing the structural complexity and diversity of agricultural landscapes has been shown to enhance biodiversity (Holland et al., 2016; Dainese et al., 2019). However, in some cases AEPs can increase pest abundance (Tschamtko et al., 2016; Karp et al., 2018), reduce yields and revenues, and threaten the livelihoods of farmers (Teschner and Orenstein, 2021; Segre et al., 2019). Since farmers are the key stakeholders in agricultural systems, understanding how they perceive AEPs, and what affects their willingness to adopt them, is necessary to effectively develop agricultural policies that promote the application of AEPs, especially in places where such programs have not yet been

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implemented.

Agri-environmental programs or schemes (AES) often provide incentives to compensate farmers for their potential losses due to the implementation of AEPs. For instance, about 40% of the budget of the European Union is directed towards the Common Agricultural Policy (CAP), which provides financial compensation to encourage farmers to adopt AEPs (Pe'er et al., 2017; European Commission, 2021). Yet, accumulated experience from the CAP and other programs worldwide indicate that financial support is not a guarantee for success, and there is more to farmer considerations than monetary compensation (Farmer et al., 2011, 2015; Comerford, 2014; Selinske et al., 2015; Bopp et al., 2019). Including farmers in the process and providing appropriate knowledge and guidance has been shown to be pivotal for achieving CAP objectives (Whittingham, 2011). Thus, understanding the factors that impede or facilitate farmers' willingness to participate in AES is pivotal for AES success (De Krom, 2017; Teschner and Orenstein, 2021). Beyond demographic factors and farm characteristics (e.g., age, gender, parcel size, crop type; see Comerford, 2014; Liebman et al., 2016; Brown et al., 2019), three main categories arise as motivations or barriers for joining an AES: *environmental, personal, and social*.

Environmental motivations involve the desire to protect natural resources and the services they provide to agriculture (Ryan et al., 2003; Kelemen et al., 2013; Selinske et al., 2015). Farmers also perceive environmental agriculture as a pathway for advancing the conservation of open spaces and preventing loss of farmland to development (Kline and Wichelns, 1994; Miller et al., 2012) and to gain favorable publicity (Herzon and Mikk, 2007). In this regard, some agri-environmental policies are also aimed at improving the connection between farmers and society (De Krom, 2017).

Personal motivations for adopting AESs related to economic gain are often suggested in the literature as the main incentive for participation in AES (e.g., Daugbjerg et al., 2011; Home et al., 2014; Sutherland, 2010). The financial aspects of the proposed AES, such as length of governmental commitment (in years), higher compensation rates, and program flexibility, were all found to be correlated with a higher likelihood of implementing AES (Ruto and Garrod, 2009; Daugbjerg et al., 2011). Related factors, such as financial stability (Daugbjerg et al., 2011), occupational stability, and quantity and quality of hired workers (Miller et al., 2012), were also found to influence farmers' participation. However, studies suggest that financial motivations have been over-emphasized in the literature and in policy, and that this is one of the reasons many AES fail to yield lasting changes in farmers' environmental attitudes and practices (De Snoo et al., 2013; Dessart et al., 2019; van Dijk et al., 2016).

Social motivations, including the preservation of local or regional lifestyles, heritage, social learning, and partnership values, highly influence farmers' decisions to participate in AES (Farmer et al., 2011, 2015; Kline and Wichelns, 1994; McLeod et al., 1999). Other considerations related to both personal and social motivations were found to influence farmer AES perceptions, include place attachment and identity (Jorgensen and Stedman, 2006; Paolisso et al., 2013; Vaske and Kobrin, 2001), social mobility and norms (Selinske et al., 2015), and continuity and preservation of family heritage and ownership of the land (Ingram et al., 2013). Sutherland et al. (2012) emphasize the importance of cultural constructions that influence perceptions of "good farming", and thus how farmers perceived AEPs. They connect this to Bourdieu's concept of *habitus*, the individual dispositions and evaluations that are the product of socialization processes. They argue that "good farming" is an everchanging concept, calling attention to the societal and conceptual processes that should be considered when promoting AES (Sutherland et al., 2012). Burton and Schwarz (2013) found that AESs that included a component of innovation supported the conferral of social status, provided prestige, and created short- and long-term social capital for participating farmers. In Belgium, farmers' AES participation was more substantial and produced long-lasting pro-environmental behavior change only when implementation led to their community's

appreciation for their efforts (De Krom, 2017).

Partially overlapping with these three consideration categories (environmental, personal, social), studies of Theory of Planned Behavior (TPB) suggests that intention to adopt certain practices is determined by three psychological constructs: *Attitude* - the positive or negative evaluation of a proposed behavior; *Subjective norms* - the perception of the social pressure to perform a behavior; *Behavioral control* - one's perception of their capability to perform the behavior (Borges et al., 2014). TPB was applied in several studies of farmer planned behavior regarding AEPs and AESs (e.g., Bagheri et al., 2021; Borges et al., 2014; Senger et al., 2017), with Borges et al. (2014) finding that community-related considerations extended beyond family and friends, to include neighboring farmers, traders, suppliers, extension agents, and government officials.

Agroecosystems are by their very nature socio-ecological systems, but few works acknowledge the need to understand community values and attitudes when planning or applying AESs (e.g., Wilhelm et al., 2020; Bullock et al., 2021), and those focus primarily on community ecosystem services, aesthetic preferences, or values, rather than actual community support for joining an AESs. Moreover, socio-psychological aspects, as well as social and cultural context, require more attention in the design of AES (van Dijk et al., 2016). The goal of this study, therefore, is to understand the factors that facilitate or impede the application of AEPs and the attitudes of farmers' community towards these practices, in a region of intensive agriculture, where no AES has been implemented.

To date, most research that has explored farmers' motivations to participate in AESs assessed existing programs. Post-implementation studies provide important feedback for AES planning and management, especially for existing programs; however, farmers' perceptions may change after implementation, and are influenced by their experience with specific policies. Thus, knowledge about farmers' perceptions of AEPs and potential AESs in countries where such policies have not yet been implemented can provide important and novel perspectives that could contribute to tailoring and promoting AESs. This is the case in Israel, where there is currently no integrative and comprehensive agri-environmental policy or scheme, though the government has announced its intention to develop such programs (Israel Ministry of Agriculture, 2010).

In this context, we were interested in exploring the following: (1) how farmers perceive AEPs and which factors influenced their perceptions; (2) to what extent farmers would show a higher rate of willingness to apply AEPs under a policy that provides financial compensation; and (3) how members of farmers' communities perceive AEPs, and which factors influence these perceptions. To investigate these questions, we adopted a mixed methods approach including an online survey, focus groups, and interviews. We hypothesized that monetary compensation would enhance willingness to adopt AEPs, but also that some environmental, personal, and social variables would influence farmers' perceptions of AEP implementation. Additionally, we expected that farmers' communities would demonstrate support for applying AEPs, and that expressions of support would vary with personal characteristics of respondents such as age, nature relatedness (Nisbet et al., 2009), and level of education.

2. Method

The study focused on farmers and their communities in and around Harod Valley, Northern Israel, and included four parts: five focus group sessions (n = 41 in total); pre- and post-surveys for all 41 participants before and after a hypothetical AES was presented to them; twelve follow-up individual interviews with agricultural sector heads; and a quantitative residents' survey to capture community perceptions regarding an AES (n = 294). The studied area is approximately 250 km², features intensively cultivated agricultural lands (Kaplan and Penslar, 2011), and consists of a mosaic of field crops, orchards, pasturelands,

water reservoirs, fish farms, small rural settlements, some sparsely planted trees in the north, and unfarmed, rocky hillsides in the south (Fig. 1). Contrasting the intensive cultivation characterizing the area, the valley is surrounded by several small, protected natural areas and forests. The Israel Nature and Parks Authority has officially included the Harod Valley in the national ecological corridor map, as it provides north-south terrestrial contiguity (Fig. 1).

2.1. Selection of agri-environmental practices

Five common, widespread, and effective agri-environmental practices (AEPs) with high relevancy for implementation in the region were selected (full details on the process of AEP selection see Supporting Information: Text S1). We chose the British Entry and Higher Level Stewardship program as a model AES (Natural England, 2013), due to its online and language accessibility. The five practices were:

- 1) **Reducing soil erosion:** Methods which are included in the Israeli Ministry of Agriculture program to reduce soil erosion (i.e., reducing tillage and creating terraces; see Israel Ministry of Agriculture, 2019);
- 2) **Maintaining vegetated field-margins:** Maintaining or regenerating semi-natural habitats with local vegetation along field margins. This practice has been commonly applied in Europe for over two decades, and shown to have considerable ecological benefits in agricultural landscapes in the study area (Segre et al., 2019);
- 3) **Reducing chemicals (pesticides and fertilizers):** Reducing the use of environmentally destructive chemicals that harm local species, as well as contribute to air, soil and groundwater pollution (Teschner and Orenstein, 2021);
- 4) **Increasing structural complexity:** Increasing landscape heterogeneity by sowing a variety of crops, and integrating natural elements such as hedges, trees, and rocks that can benefit farmland biodiversity and ecosystem function (e.g., Tamburini et al., 2020).
- 5) **Enhancing community outreach:** Encouraging access to farms and orchards for educational or eco-tourism purposes for tourists and locals, strengthening relations and opening communication within and between local communities, providing knowledge and raising

awareness regarding farms, farmers, and farming practices (De Krom, 2017; Stanciu, 2015; Orenstein and Shach-Pinsly, 2017).

2.2. Focus groups with farmers

We recruited 41 farmers to participate in five focus groups (Eizenberg et al., 2018) during the months of August–September 2015. Sessions were between 1.5 and 2 h each and took place in five collective rural communities (kibbutzim) in the Harod Valley area: Beit Alpha (10 participants); Ein Harod Meuhad (10 participants); Sde Eliahu (6 participants); Nir David (4 participants); and Geva (11 participants). Participants worked in a variety of agricultural contexts, including arable crops, orchards, fisheries, cattle, and agricultural instruction. Participants were chosen using a “snowball” sampling method (Johnson, 2014), in which researchers approached one group of participants, who recommended others, etc. Sessions were videotaped, transcribed, and thematically analyzed.

During sessions, participants first filled out a short questionnaire to determine their nature relatedness (NR; 6-item nature relatedness scale; Nisbet et al., 2009), ecological knowledge, and several demographic descriptors (e.g., gender, age). To measure ecological knowledge, we assessed participants’ ability to identify common names of widespread species. Following Colleony et al. (2019), respondents were shown 12 images of common bird, butterfly, and plant species, and asked to tick the ones they recognized and later write down their common names (see Fig. S1).

After completing the first step, interviewers displayed five images symbolizing the five selected practices (see Fig. S2), and asked participants to suggest a name for each image. Building on participants’ answers, we held a discussion in which we presented the five practices. We then asked participants to state their willingness to adopt each practice on a 5-point Likert scale (1-not at all to 5-very much), and then to explain their answer and share their opinion regarding each practice. We then gave a short explanation of the British Stewardship scheme works: its goals, characteristics, and implications for both farmers and the environment. The participants were then asked to share their opinion regarding the applicability of this program for Israel and for their own farms. Participants were also asked to say which incentives would

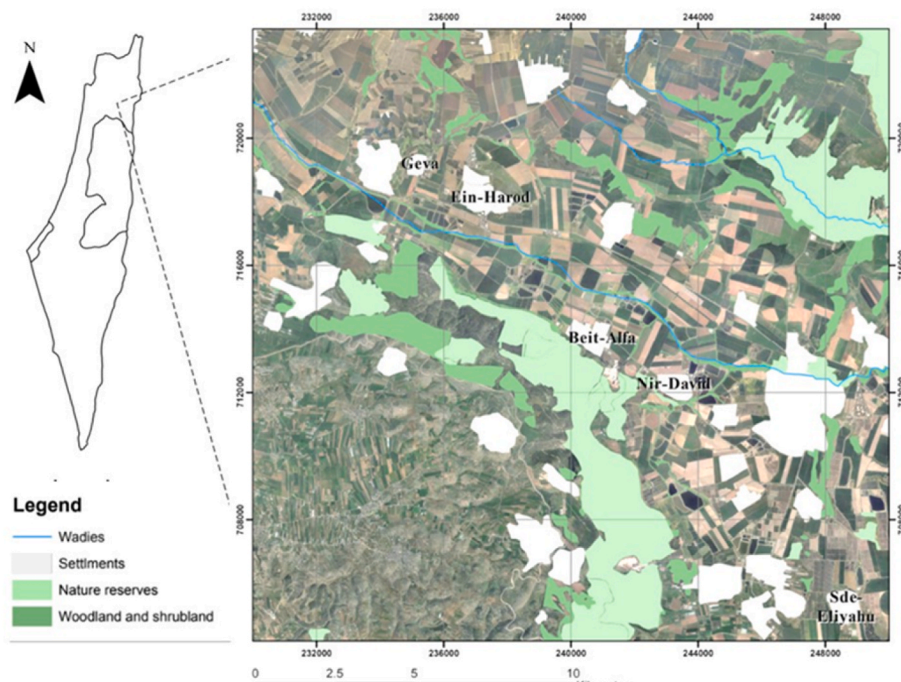


Fig. 1. – A map of the study area (Harod Valley) representing the intensive agricultural mosaic, the main settlements and main wadies and protected areas.

encourage them to adopt each practice. Finally, they were again asked to answer the same set of five questions regarding their willingness to adopt each practice, but this time if the practices were part of a national agri-environmental program, similar to the British AES (farmer survey questions in Text S2).

2.3. Follow-up interviews: agricultural sector heads

Following the findings of the focus group sessions, semi-structured interviews were conducted with 12 people central to agriculture activities in the Harod Valley, predominantly agricultural sectors heads (e.g., orchards, arable crops): nine participated in the focus groups, and three were chosen via referral from focus group participants. Interviews were conducted during April–May of 2016 (~6–8 months after the focus groups). Interviewees were asked about the importance and challenges of farming in the area and about practices taken to mitigate possible harmful effects of farming. The interviews, lasting ~20–30 min, were videotaped, transcribed, and thematically analyzed. Interviews were performed to provide a deeper understanding regarding farmer opinions, as well as the optimal terms perceived by the farmers as necessary to adopt the suggested AEPs (interview questions in Text S3). They also served for ascertaining which perceptions were persistent over time and allowed the researchers to access additional stakeholders, mainly regional branch leaders.

2.4. Valley residents' survey

To explore how members of the farmers' communities perceived AEPs and which factors influenced these perceptions, we developed a questionnaire targeting this population. The questionnaire was based on close-ended questions in which participants were asked to rate their level of agreement to given statements on a 5-point Likert scale. To validate and pilot the questionnaire, we conducted two sets of interviews with locals and non-locals (for more details see Text S4). The final questionnaire contained 46 items and administered online between December 2015–March 2016 via Harod Valley community websites (see Text S5). The first section included 12 items reflecting perspectives on the contribution of local agriculture in the study area to *quality of life* (4 items), *economic prosperity* (3 items), and *nature conservation* (5 items). 16 additional items were used to measure the extent of resident support for implementation of the proposed AEPs in the valley, including AEPs for: *soil erosion* (2 items), *vegetated margins* (3), *reducing chemicals* (4), *structural complexity* (3) and *community outreach* (4). We also measured nature relatedness (NR) (6) and ecological knowledge using the protocol described for the focus group (12). Finally, we collected demographic information, including *gender*, *age*, *place*, *length of residency in the valley*, *income*, *level of education*, *field of occupation*, and *childhood place of residency* (urban/rural).

2.5. Data analysis

2.5.1. Qualitative analysis

Focus group sessions and interviews were analyzed using Atlas.ti software for thematic analysis. In thematic analysis, short descriptions ("codes") are assigned to sections in the text to briefly summarize their content and related topics. Reoccurring themes among codes are identified, and connections between themes noted and linked to the research topic (Braun and Clarke, 2006; Aronson, 1995). Each focus group and interview were analyzed separately, and their codes were aggregated into common themes.

2.5.2. Quantitative analysis

Results of the focus group questionnaire and resident online survey were analyzed separately, but in a similar manner. First, we used factor analysis to ensure that the items of the factors were consistent with the nature of the factor that we expected to derive from the items (see

Tables S1–3 for factor analysis results). We then averaged the scores after verifying internal consistency using Cronbach's- α (Tables S1–3). Items related to enhancing community outreach were excluded from the analysis, as internal reliability was not satisfactory (Cronbach's- α = 0.36; Taber, 2018). Ecological knowledge was calculated based on the number of images participants named correctly to the family or genus level (following Colleony et al., 2019).

Statistical analyses were performed using R software (R version 3.3.3). For the focus group questionnaire analysis, we build six Generalized-Linear Mixed-effect Models (GLMM) with Gaussian distribution to assess the effect of six variables (NR, ecological knowledge, gender, age, level of education, and childhood place of residence) on the willingness to adopt each practice before and after the presentation of the British AES (R packages 'nlme', 'lme4'). We also averaged the scores for all practices before and after the presentation of the British AES to explore the sum of agreement to adopt an AES. Focus group and farmer ID were used as random factors to account for the block design of our data and the repeated measures per participant (respectively). For the resident survey, we built four Linear Models to explore the relationships between respondent support for implementing the five AEPs and their perception of the potential benefits of agriculture (quality of life, economic prosperity, and nature conservation), NR, ecological knowledge, and demographic variables. Description of all variables that were entered into the models appear in Table S4). We used model selection with model-averaging to rank the explanatory variables according to their importance (Burnham and Anderson, 2002) with package MuMIn (Barton, 2020). We present estimates and SE for variables with importance larger than 0.5 and with standard error lower than the estimate, and flag "very important" variables with importance larger than 0.95 (see Text S5 for more details).

3. Results

3.1. Farmers' divergent perceptions of AEPs

Quantitative analysis of the focus group survey demonstrated high support (average > 4.0) for three out of five AEPs among farmers (Table 1). The remaining two practices (maintaining vegetation in field-margins and increasing structural complexity) received slightly lower support (Table 1). Willingness to adopt AEPs under a policy similar to the British AES significantly increased for two practices: restoring field-margins and reducing chemicals, and for all practices together (Table 1). Nature relatedness was positively and significantly related to farmer willingness to adopt the five AEPs and all practices combined, with farmers with medium level of education more supportive of the vegetated margin practice than others. Interview and focus group findings shed light on these results (see Fig. 2).

3.1.1. Reducing soil erosion

Nearly all farmers (95%) were willing or strongly willing to adopt practices for reducing soil erosion. There was a consensus in the focus group discussions that soil erosion is a major problem in the study area, and several farmers indicated that they were already taking measures to decrease soil erosion (e.g., reduced-tillage and cover crops). While this was especially true for fields with steeper slopes, answers indicated that all farmers felt that this issue was relevant and pressing for them, or as one participant said: "*The basic thing is soil conservation. Because the soil is the foundation*". Some participants also mentioned that they received different forms of assistance (e.g., subsidizing machinery, training) from the Ministry of Agriculture. However, participants did not refer to AEPs such as restoring vegetated field margins and increasing structural complexity (apart from terraces) as solutions for soil erosion. However, participants indicated that solutions that would decrease soil erosion would be more likely to be implemented by farmers if they had more knowledge about them.

Table 1

Mean willingness to adopt the five practices and all practices together before and after presenting the British scheme and the results of six linear mixed models. Models explore the relationships between farmer’s willingness to adopt each AEP before and after presenting the British scheme, nature relatedness, ecological knowledge, and demographic variables (for categorical variables the coefficient refers to the category in parentheses compared to the intercept). All variables included in the model are listed, but coefficients±SE are presented only for those variables which were important in the model averaging (importance >0.5) and * represent variables which were strongly important (i.e., importance >0.95; see Text S5 and Table S4 for more details).

Variables	Vegetated Margins	Chemical Reduction	Structural Complexity	Soil Erosion	Outreach	All Practices
Mean before (SD)	3.22 (1.34)	4.05 (0.87)	3.48 (1.13)	4.62 (0.59)	4.25 (0.75)	3.92 (0.62)
Mean after (SD)	3.49 (1.18)	4.25 (0.84)	3.43 (1.25)	4.64 (0.74)	4.22 (0.89)	4.01 (0.78)
Intercept	0.75 ± 2.90	0.89 ± 1.99	0.59 ± 4.53	0.59 ± 4.63	1.41 ± 6.07	1.17 ± 2.18
Before/after (after)	0.61 ± 0.25	0.44 ± 0.19	–	–	–	0.46 ± 0.43
Nature Relatedness	0.66 ± 0.26	0.72 ± 0.17*	0.79 ± 0.28	0.79 ± 0.28	0.55 ± 0.20	0.64 ± 0.16*
Ecological knowledge	–	–	–	–	–	–
Childhood settlement (urban)	–	–	–	–	–	–
Gender (male)	1.21 ± 1.08	–	–	–	–	–
Age	–	–	–	–	–	–
Level of education (professional diploma)	–1.02 ± 0.39	–	–	–	–	–
Level of education (1st degree)	–0.79 ± 0.40	–	–	–	–	–
Level of education (2nd degree or above)	0.79 ± 0.74	–	–	–	–	–

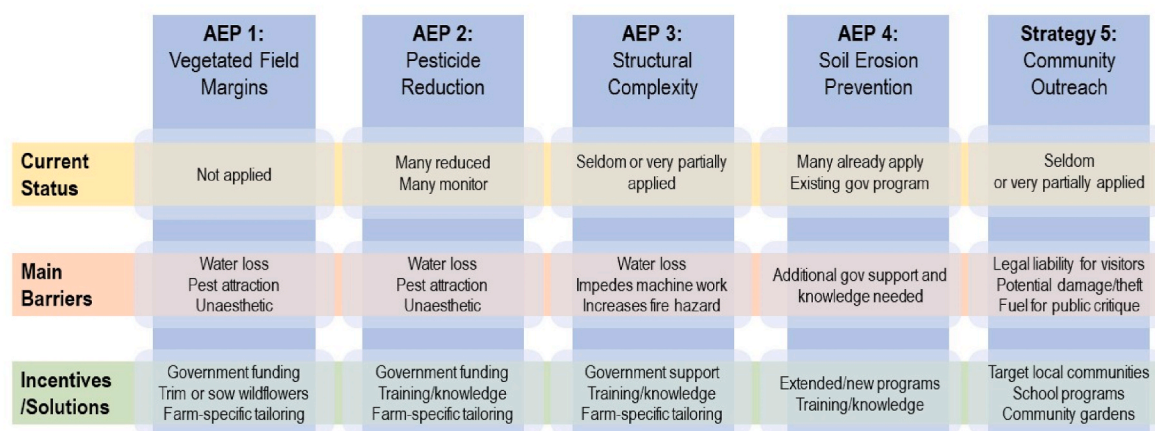


Fig. 2. Farmer reports of status, barriers, and incentives for agri-ecological practices.

3.1.2. Vegetated field-margins

Only 50% of farmers were interested in restoring natural vegetation around their fields. Most also responded negatively to leaving field-margins uncultivated/vegetated in the discussion, although some were unaware of the ecological value vegetated field margins might have for biodiversity. One argued: *There’s enough natural areas around us [...] There’s enough space for animals and their species to reproduce. [...] I don’t think you need it [vegetated field margins]*. Others were concerned that natural vegetation in the field margins would lead to damage to their crops. Participants voiced concerns regarding unwanted pests and weeds infiltrating their fields and fire hazard that vegetated margins might pose when they dry, and others suggested that implementing this practice would force them to increase chemical pesticide use. Several participants claimed that the fields would look untidy and less aesthetic, especially in summer, if this practice was implemented, reflecting their view that leaving field margins untreated is tantamount to neglect, something a “good farmer” would not do. Yet, some suggested that they might be willing to sow seasonal flowers in the field edges or mow the field margins so that they appear “managed”. Some farmers stated that they would adopt the field-margin practice if they received financial incentives, guidance, or assurances for compensation to counterbalance any potential losses resulting from implementation (Statements 1–2, Table 3). Finally, when asked what would make them adopt a vegetated field-margin practice, one participant said that *“the issue of soil erosion [could persuade us]. We would be the first to cooperate. It is the ABC of farming”*.

3.1.3. Reducing the use of chemicals (pesticides and fertilizers)

77% of farmers interviewed in the five focus groups were interested in reducing the use of chemicals. Most participants in the interviews and group discussions stated that they were already inclined to do so due to high prices of pesticides and wanting to reduce environmental harm. Two farmers mentioned that the strict EU regulations regarding chemical use on imported crops was another reason for reducing chemicals. The main deterrents for reduction are related to fear of crop damage and a general sense of unease - *“I sleep better at night if I know the fields were sprayed that day”*, as one farmer put it. Farmers indicated that the sense of unease about reducing pesticide use also resulted from reluctance to break with conventional ways of farming. Some farmers mentioned that they would need careful monitoring and/or/expert assistance and guidance if they were to opt for using less environmentally harmful chemicals. Conversely, one farmer said he sleeps better at night if his neighbor doesn’t spray the fields that day, and another noted that his Kibbutz reduced pesticide spraying to protect their community (Statement 3, Table 3).

3.2. Increasing structural complexity

Increasing landscape complexity received moderate support from farmers (61%). The participants’ initial reaction to the photograph of a European landscape depicting structural complexity indicated that they perceived it as highly aesthetically pleasing, although several promptly added that due to the drier local climate, such a result would be difficult to replicate in Israel. The main obstacle for adopting this practice, some

Table 2

The results of four linear models exploring the variables that influence the support of the rural community in implementing each AEP. Variables include demographic variables, NR, ecological knowledge, and perceptions regarding the contribution of agriculture to well-being, economic prosperity, and nature conservation. All variables included in the model are listed, but coefficients±SE are presented only for those variables which were important in the model averaging (importance >0.5) and * represent variables which were strongly important (i.e., importance >0.95; see Text S5 and Table S4 for more details).

Variables	Vegetated Margins	Chemical Reduction	Structural Complexity	Soil Erosion
Intercept	1.69 ± 0.51	2.30 ± 0.49	0.77 ± 0.65	0.34 ± 0.51
Quality of life	–	–	0.17 ± 0.10	0.28 ± 0.09*
Economic prosperity	–	–	0.13 ± 0.07	0.13 ± 0.07*
Nature conservation	0.31 ± 0.07*	0.27 ± 0.07*	0.41 ± 0.08*	0.06 ± 0.07
Nature Relatedness	0.41 ± 0.07*	0.39 ± 0.07*	0.41 ± 0.07*	0.28 ± 0.07*
Ecological knowledge	–	–	–	0.03 ± 0.01
Childhood settlement (urban)	–	0.21 ± 0.10	–	–
Gender (male)	–	–0.29 ± 0.08*	–0.07 ± 0.09	–
Age	–0.01 ± 0.003	–	–	–0.02 ± 0.00*
Time lived in the valley	–0.006 ± 0.005	–	–0.004 ± 0.002	–0.004 ± 0.002
Income	–0.10 ± 0.05	–	–0.10 ± 0.04	–
Level of education (professional diploma)	–	–0.21 ± 0.14*	–0.36 ± 0.14	–
Level of education (1st degree)	–	–0.35 ± 0.13*	–0.39 ± 0.13	–
Level of education (2nd degree or above)	–	–0.58 ± 0.14*	–0.31 ± 0.15	–

argued, was the technical challenges it would pose in cultivating the fields, including ploughing and pesticide application. Therefore, some said, it would be more suitable for orchards than for field crops. Others explained that Israel does not usually have large, monoculture fields typical of Europe or North America, so, due to the smaller spatial scales of landscape patchiness and high crop rotation, the existing cultivated landscape could already be considered structurally complex. Farmers also argued that leaving elements hedges, rock piles, bushes, or trees, is problematic because woody species would take water from the crops, rocks pose obstacles for machinery, and trees could present a fire hazard. Some farmers stated that they would be more inclined to leave large trees than rocks or hedges in the field-margins, due to the aesthetic and recreational value trees provide for farmers and others (Statement 4, Table 3).

3.3. Community outreach

Attitudes towards community outreach were relatively high, with 87% of respondents expressing interest in adopting such practices. Yet, respondents also indicated an ambivalence to certain types of outreach. Several farmers complained that the public does not appreciate farmers and has become disconnected from farming, and therefore it is important that people learn more about agricultural practices (Statement 5, Table 3). Several farmers also said that they would be happy to reach out to their own local communities, including, for instance, creating model farms, working with schools, or contributing to community gardens. Some said that they knew of other farms who organized field visits, especially for local community members (particularly school children).

Table 3

Key statements that were raised during the focus groups and interviews.

Statements
1 “I’ll do this [keep vegetated field margins], but you [the authorities] handle the pests. [...] Do you see how absurd this is? I mean, we support nature, and at the end of the day - we suffer.”
2 “I don’t know any program for managing margins, what we know today is to destroy everything. If we develop a program where I go wild, let’s say, and I sow a weed that’s good for us and doesn’t harm us, then we can talk. [...]. Today [...] it’s either bad weeds come in and do a lot of damage, or we kill everything [...]. We chose killing everything because that’s the easiest option for us”.
3 “There is a “belt” around the Kibbutz that’s organic and isn’t sprayed. [...] Slowly we enlarged the strip, to put distance between the Kibbutz and the harsher chemicals”.
4 “He’s talking about trees in the field. This is a bad phenomenon in every way. You can’t spray, you can’t cultivate, you leave disorganized patches. [...] But in the margins, there are a lot [of trees] here. [...] In the middle of the field we took down what we could”.
5 “Most of the public is disconnected from [farming]. [...] Ninety something percent have no clue, and the kids don’t know anything about where products come from. Nothing gets to the supermarket on its own. It’s really important to get them closer. However, it needs to be very smart and very well organized. It can’t be spontaneous”.
6 “For us, who work with animals, we have a huge problem. In the fishponds, a lot of people come in on Saturdays, especially if it’s near a public area. They go into the ponds, catch fish, it’s life threatening, for us and for them. It’s a non-stop war [...]”.
7 “They look at the only two dead fish in the pond and say that it’s genocide [...]”.
8 “Yes, [you reject] anything that comes into your field and competes with you for resources that you invest in the field”.
9 “It’s all about whether you want to change the whole image of farmers, so that the public won’t feel like we’re stealing from them [due to government subsidies]. It’s part of the problem of how the public perceives us; they pay taxes and then read that farmers receive [government] support.
10 “Look, today, the most difficult and meaningful problem is the sense that although we’re doing something that is very, very important, the backing that we get from the state and the significance that the state attributes to it is zero. They just don’t care about the farmers”.
11 “There’s no way this could work in Israel. No way! Today, only if a meteorite falls on us and we start all over again, maybe. There is no chance that a state whose government and Finance Minister are [so often] replaced and all the laws and everything, it all changes. So, how can a farmer believe in his government? [Otherwise,] we would be the first to support these things, I have no doubt about it”.
12 “The general public, I mean they don’t care. [...] People think that they are subsidizing farmers and it’s on their backs. And no one will make an effort for the farmer! [...]”.
13 “There is one thing that’s right for everyone and that everyone should do. [...] Every area, every farmer, according to their crop type [...] needs to learn what’s right for them, and you may need to help them find what’s right for them. If the state will help and encourage farmers to start this, [...] you can put the farmer on that skateboard, and they can take it from there.”

Agritourism was raised by some farmers as a potential source of income. However, most participants voiced a clear concern regarding outside visitors allowed to enter their fields or farms, due to unwillingness to assume responsibility for the visitor safety and fear of possible damage to their crops, based on previous experiences (Statement 6, Table 3). Farmers were also concerned that animal rights activists would harshly scrutinize farming practices, severely damaging outreach efforts and the farm’s reputation (Statement 7, Table 3).

3.4. Willingness to adopt an agri-environmental scheme (AES)

Three general themes relating to farmers’ willingness to adopt an AES appeared in focus group discussions and interviews after the British scheme was presented: pragmatic considerations, group identity values, and trust in the government. These themes were not associated directly with a specific AEP. Beyond financial gain and stability, pragmatic considerations included issues of water costs (due to limited precipitation and high irrigation costs), pest control, and occupational security or “land security” (i.e., retaining ownership of the land into the future). These issues negatively influenced farmer willingness to take risks associated with adopting AEPs. For instance, leaving vegetated field-margins or trees intact was considered to increase water demand, a main concern for participants (Statement 8, Table 3). Frequently, even

after farmers were introduced to the idea of compensation, they continued to display risk-aversion for joining schemes, fearing they would limit their ability to be independent in their management decisions. The same farmers that emphasized economic independence also expressed a conservative and traditional approach to land cultivation methods. Change, in this case, was considered a gamble, leading to loss of control over one's farmstead, and therefore to uncertainty in general. However, pragmatic considerations were also stated as a reason for changing traditional approaches. This was the case with farmers reducing pesticide quantity to comply with EU regulations, or applying soil erosion AEPs to avoid soil loss.

Group identity perceptions (how farmers see themselves in relation to other farmers) were raised by farmers in focus group discussions and interviews as a second consideration for participating in AESs. Some respondents worried that implementing new AEPs could affect not only their fields, but also neighboring fields, as one farmer asked rhetorically: "Do you think it's fair that I take it [government money] and my neighbor won't, and he'll suffer from this whole thing?". Farmers also expressed how important public perceptions are for them (Statement 9, Table 3), reporting a sense of public and governmental ingratitude and disrespect. This, they claimed, was especially evident and difficult for them because in the past, being a farmer was considered an act of patriotism. Moreover, several farmers stated that Israel's food security relied on farming, but that the public, as well as the government, seemed to be unaware and unappreciative of this fact (Statement 10, Table 3).

Other farmer concerns, raised mostly after the British AES was presented, included distrust of the government, perceiving potential government subsidies as unrealistic, given lack of governmental stability, and inability to implement a long-lasting policy (Statement 11, Table 3). The themes of distrust and the issue of public and government appreciation for farmers were often interconnected (Statement 12, Table 3). Nonetheless, farmers mentioned that a governmental soil conservation program was applied successfully. Farmers also described positive past experiences with certain authorities, such as the Israel Nature and Park Authority and Water Authority, to whom the farmers attributed forming positive relationships and generating trust among farmers, creating a more positive perspective for current and future collaborative programs with government agencies. Thus, governmental programs can be greeted with either suspicion or trust, as one respondent suggested: "The farmers are willing, I think, to undertake almost anything, but only if they [the government] undertake it together with them."

Lastly, the issue of knowledge and learning from personal experience has also come up as a factor for AEP consideration and implementation. One farm funded and performed experiments itself to seek solutions to problems such as herbicide-resistant weeds, which increased due to zero-tillage practices. One farmer said: "there are other ways and other methods. We need to learn how to decrease pesticide use", and another stated that farmers "need to know how to increase their yield and bring in new types of crops, without increasing the use of pesticides". Importantly, another farmer mentioned the need for tailored knowledge to assist independent AEP application (Statement 13, Table 3).

3.5. Resident survey

We obtained 296 questionnaires from residents of the valley (with three questionnaires excluded since respondents lived outside the valley). Approximately half of the respondents were female (48%), 62% held a bachelor's or a higher degree and most respondents spent their childhood in rural areas (78%). Respondents identified 6.7 ± 2.73 (average \pm SD) species to the family level out of the 12 species presented. The mean score for NR was 4.03 ± 0.04 (out of 5). The survey demonstrated that residents perceive that agriculture in the valley contributes to their well-being (4.50 ± 0.76), economic prosperity in the valley (4.25 ± 0.69) and to lesser extent to nature conservation (2.21 ± 0.93). Agreement level for items constructing well-being and economic prosperity varied between 85% and 96%, while agreement level for

nature conservation items demonstrated higher variation. Residents also showed high support for implementing AEPs. The strongest support was recorded for reducing soil erosion (4.14 ± 1.10) and pesticide use (4.09 ± 1.01), conserving field-margins (4.02 ± 1.03), and increasing structural complexity (3.53 ± 1.10).

Linear models revealed that NR and the extent to which respondents thought agricultural areas contribute to nature conservation were positively related to the level of support in the five practices (Table 2). Respondents who thought that agricultural areas contribute to their well-being and the economic prosperity in the valley also wanted to see higher structural complexity in the valley and wanted to reduce soil erosion (Table 2). Vegetated margins and soil erosion practices received higher support from older respondents and respondents who lived longer in the valley. Length of residence was also related to increasing structural complexity. Gender (male), level of income, and education were negatively associated with support for increasing structural complexity and reducing the use of chemicals. Participants who spent most of their childhood in rural areas were more inclined to reduce the use of chemicals. Finally, ecological knowledge was positively associated with support in practices aiming to reduce soil erosion (Table 2).

4. Discussion

The main hypothesis of the current study was that farmer willingness to implement AEPs would rise considerably after they were offered to apply an agri-environmental schemes (AES) which includes monetary compensation. However, while willingness to adopt did improve for two AEPs and all practices combined, the findings also point to a more complex decision-making process and support the calls of others to address the non-economic factors that drive farmers to implement AEPs (Farmer et al., 2015; Comerford, 2014; Selinske et al., 2015; Bopp et al., 2019). The findings of this study indicate that this process involves environmental, personal, and socio-cultural considerations, as well as considerations that relate to government-farmer relations (Fig. 3). These findings challenge the widespread premise that prolonged monetary compensation should always be the main component of AES (Pe'er et al., 2017; European Commission, 2021); they suggest a different, more nuanced, focus, which would integrate and address farmers' perceptions, norms, and collective values regarding AEP adoption. Thus, the current study's results join a growing body of literature demonstrating that AESs can benefit from providing solutions to farmers' non-material needs, in particular contributing to a sense of security and certainty, farmer agency and resilience, government and public respect, access to knowledge, social and cultural capital, and community-related values (Farmer et al., 2015; Comerford, 2014; Selinske et al., 2015; Bopp et al., 2019). Moreover, the current findings suggest that AESs would also benefit from fostering better farmer-government relationships, especially in cases where an AES has not yet been instated, or where farmers have not had sufficiently positive interactions with the government in the past.

Studies of AES adoption typically only survey farmers and only in the post-implementation phase, after they have already agreed to, and experienced the implementation of a specific AES. This study offers a unique opportunity to gain insights of pre-planning, pre-recruitment, and pre-implementation perceptions, motivations, and attitudes towards AEPs as they are manifested before any comprehensive AES has been implemented or even suggested. While this is one specific case study, these findings can contribute to and support the growing literature on AEPs and AES adoption and highlight potential synergies between motivations for implementing AES by farmers on one hand, and community perceptions of farming, AEPs, and AESs on the other.

4.1. Environmental considerations

Nature relatedness (NR) correlated positively and significantly with the willingness of farmers to adopt all AEPs regardless of the idea of



Fig. 3. – Factors influencing farmer attitudes towards AES adoption.

compensation. Focus group discussions also indicated that some farmers would like to use more environmentally friendly practices, and that some participants already use AEPs, such as decreasing pesticide use, using less harmful pesticides, or using minimum- or no-tillage practices, without any financial incentive. We can thus infer that environmental considerations, in and of themselves, are already an incentive to adopt AEPs for certain farmers. The resident survey showed that residents are generally supportive of AEP implementation. Residents saw farming as contributing to the quality of life and economic prosperity of the valley, but to a lesser extent to nature conservation, in accordance with the general consensus among ecologists that intensive farming causes negative ecological impacts (e.g., Tilman et al., 2011; Rockström et al., 2017). Respondents who thought that farming contributes to nature conservation and those with high NR scores demonstrated high support in all AEPs studied. NR is already high among rural residents in Israel (Bashan et al., 2021), although awareness about the impact of farming on nature is limited. This could suggest that disseminating knowledge about AEPs and mobilizing pro-environmental attitudes of residents, which are the families, friends, and community members of farmers, could in turn lead to further support for AEPs implementation, in line with the Theory of Planned Behaviour (TPB) notion that planned behavior is influenced by subjective norms (Borges et al., 2014).

4.2. Personal considerations: knowledge and experience

Farmer attitudes varied between different AEPs, with noticeable overlap between preferred AEPs and those with which farmers were familiar (Fig. 2). This was either the result of previous or existing small-scale government-supported policies (i.e., soil conservation) or due to market demands and community health considerations (i.e., pesticide reduction). These findings indicate that farmers may refrain from the unfamiliar, but when provided with the opportunity to experience a safe, informed, and successful switch to AEPs themselves, they are more inclined to apply them. Furthermore, Burton and Schwarz (2013) suggest that innovative knowledge could also provide more social and cultural capital, and elevate farmer status, especially if coupled with a goal-oriented (pay-for-performance) program that gives higher status to farmers who apply AEPs successfully. Our findings suggest that even involving a few local farms in AESs could have an important role in spreading knowledge, as well as familiarizing and normalizing AEPs, for other farmers. This finding is supported by Kunfuss and colleagues (2016) who suggest that knowledge of others enrolling in AES could “nudge” farmers who are still on the fence to join them or to re-enroll in AES. Dessart et al. (2019) argue that the knowledge spread by farmers who have implemented AEPs might support other farmers in doing so, acting as a source of information and, eventually, as a form of peer-pressure to opt into AESs, especially for farmers who prioritize farmer group cohesion, and who might otherwise be personally averse to change, or to new and unfamiliar situations.

Accordingly, our participants asserted that having more knowledge about, and experience with, AEPs, would increase their inclination to implement those AEPs while maintaining more control and agency. This

predisposition echoes notions such as farmers’ need for embodied, cultural, or tacit knowledge, i.e., the type of knowledge that is difficult to communicate without personal interaction and shared experiences (Morgan and Murdoch, 2000). Moreover, some farmers argued for the need for farm-specific, tailored knowledge, i.e., learning how to apply AEPs according to a specific crop-types or other farm characteristics. This argument, and the assertions above, correspond with the TPB notion of behavior control, i.e., the individual’s belief in their abilities to perform the intended behavior (Borges et al., 2014). Such on-the-ground, tailored, and participatory training is another non-financial sphere that would provide farmers with a sense of support, security, and precise knowledge that could be developed through a short-term program, and support longstanding and independent AEP application.

4.3. Socio-cultural considerations: group identity and cultural capital

A central theme which was expressed in farmer interviews and focus groups had to do with *farmer habitus*, i.e., the sense of group identity, social and cultural capital, group norms, and socialization processes (Sutherland et al., 2012; De Krom, 2017). This is important, as the lack of consideration for farmers’ norms, culture, and habitus in European AES planning is associated with the failure to achieve a long-term effect on farmers’ practices (Burton and Paragahawewa, 2011). To create lasting AEP implementation, as Burton and Paragahawewa (2011) claim, we need to change farmers’ collective perception of “good farming”. To change planned behavior, one must address or change the subjective norms, i.e., how an individual evaluates how others in the same milieu perceive the current or planned behavior (Borges et al., 2014). One way to contribute to this change is if AESs provide alternative paths to gain cultural capital or group appreciation (competing with the power of neo-liberal ideas and incentives), and/or by major revisions to the way AESs are planned and executed. They call for studies, such as this, to be conducted to explore or suggest such alternative models (Burton and Paragahawewa, 2011).

Our results demonstrate that habitus-related themes included potential barriers to AEP or AES implementation. One such barrier was the sense of indignity due to the decline in appreciation by the government and the public for a group whose members were previously celebrated and admired as the epitome of pioneering and patriotism. However, if AEPs lead farmers to recast their image as protectors of open areas, of nature, and of the environment, they may transform the public-farmer relationship to one of synergy rather than conflict. For example, one reason given by farmers for public decline in appreciation was pesticide use, and resident responses substantiated this perception by indicating high support for pesticide reduction. Thus, implementing pesticide reduction practices could be linked to improving public perceptions of farmers, and thus raise farmer social and cultural capital as environmentally conscious and responsible professionals.

The second habitus-related barrier is associated with group accountability, as some farmers were concerned that applying new AEPs may hurt neighboring fields who did not opt for joining an AES. This

behavior is thus perceived by those farmers as irresponsible and inconsiderate, as it can cause conflicts, hurt group cohesion and interdependence, and would go against group norms that are perceived as imperative for both individual and collective success. Such an approach, which would consider the impact on adjacent fields and lands, could reduce the sense of risk for farmers otherwise interested in joining an AES. Another strategy would be to apply AES collaboratively by groups of farmers, which is a relatively new, yet promising, approach (Mack et al., 2020).

The theme of farmers feeling responsible for other farms and farmers also connects to a central habitus-related barrier: group norms and ethos. Farmers were reluctant to implement AEPs if such changes were perceived as contradictory to their concept of what constitutes “good farming”; that is, what responsible “good” farmers do. This concept of the “good farmer” ethos includes having full knowledge of, and control over, what happens in their field; protecting crops from any danger; and keeping an orderly and aesthetic field. Given the negative correlation we found between the farmer length of residence in farming communities and support in AEPs adaptation, it may be valuable to increase farmer awareness to the ways in which AEPs could not only be part of “good farming”, but of “better farming”. Yet, our results also shows that AEPs could be more attractive and more sustainable for farmers if they support farmer values of order, control, and aesthetics, alongside other values reported by farmers, such as nature conservation, need for public appreciation, professional development, and community health and wellbeing. The idea that it is possible to change the collective norms and values of farmers finds support in the caveat suggested by Sutherland et al. (2012) that farmer habitus and perceptions are not static and can be changed with the right framing.

Community-related considerations therefore play an important role in farmers’ decision-making processes. This is suggested by several studies conducted in the last two decades (e.g., Jorgensen and Stedman, 2006; Paolisso et al., 2013; Vaske and Kobrin, 2001), with specific calls for AESs to relate to farmer perceptions of social norms (Selinske et al., 2015), heritage and partnership values (Ingram et al., 2013; Farmer et al., 2011, 2015). Additional studies also called for addressing community or regional wellbeing, culture, and lifestyle (McLeod et al., 1999; Farmer et al., 2011, 2015). However, these and other studies do not include a study of the perceptions of local residents, despite recognizing their impact on farmers’ decision-making considerations. The results of the residents’ survey provide additional insights to those considerations. Residents’ perceptions of agriculture as supporting community wellbeing, local economic resilience, culturally valuable landscapes, and nature conservation (to lesser extent), indicates that the four can and should coexist in residents’ minds. Moreover, most surveyed residents supported the application of the proposed AEPs, a proclivity that can be harnessed to gain farmer support for them.

4.4. Government: trust and government-farmer relations

In addition to environmental, personal, and community-related considerations, farmer interviews and focus group protocol yielded an additional theme, or in fact a new category of themes: a lack of trust in the government. Farmers displayed skepticism regarding the possibility of a mutually beneficial compensation scheme. This was not the usual case of the prevalent theme of hesitance or resistance to engaging in governmental bureaucracy found in other studies (e.g., Del Rossi et al., 2021). Farmers fundamentally doubted the possibility of such a scheme being decided and implemented in a reliable and sustainable way. This mistrust, as well as cynicism, are substantial barriers for AEP implementation, suggesting that more work needs to be done to improve farmer trust and farmer-government relations in Israel, preferably before an AES is finalized or executed. This issue may hamper attempts to establish AES in countries with political instability, though not exclusively. De Vries et al. (2019) note that in the case of European farmers, the lack of trust in government officials, institutions, and

schemes, were a key barrier to AES success, as well as a major reason for farmers to opt out of AESs. They add that trust in this context must be approached as an ongoing and dynamic process, which focuses on farmer communities rather than individuals, stressing the importance of creating better, closer, and more frequent trust-building interactions between farmers and governments to reduce uncertainty and distrust (De Vries et al., 2019).

Lastly, while AESs usually promote a long-term ecological view that seeks to change the human-ecosystem interface in the long run (e.g., Burton and Paragahawewa, 2011), some farmers prefer short-term programs due to their flexibility, less commitment, or alternatively, the potential for innovation that they offer (Burton and Schwarz, 2013). Paradoxically, the answer to a long-term approach could be found in short-term projects. In the current study, farmers’ sense of lacking government stability, commitment, or support could affect their willingness to join a long-term plan. Short-term schemes (2–4 years) could offer flexibility, as well as provide lasting tools, knowledge, stability, and capital in terms of innovation, scientific support, and first-hand experience. These, in addition to initial financial compensation, could support long-term results. Instead of fostering farmer dependency on governmental compensation, AESs would be providing farmers with the proverbial training wheels (or “skateboard” in the words of one farmer) that would support their agency and community resilience, while fostering ecologically sustainable farming norms and behaviors.

5. Conclusions

Agri-environmental schemes that focus on monetary compensation rarely target farmers’ values and perceptions, which is part of why some of them fail to achieve long-term beneficial impacts on biodiversity in farmland (Pe’er et al., 2017; Dessart et al., 2019). The current study, which was conducted in an area where AES was not yet implemented, has identified several key themes that can be used to develop better AES beyond economic considerations, such as group identity, norms, social capital, knowledge, experience, and trust in the government. These are relevant on several levels of the diverse relationships of farmers with their colleagues, with their local or extended communities, with the public, and with the authorities.

In terms of research development, while this is a local case study of one area in Israel, the results of this study suggest the potential of adding further dimensions to the emerging social research of AES acceptance beyond financial incentives. First, they support the inclusion of farmers’ perceptions in the pre-implementation phase, adding to existing post-implementation literature. Second, they suggest a possible differential treatment of various AEPs within a planned or proposed AES, which in turn, if relevant, would call for separate, deeper investigation into acceptance of each AEP for a given scheme. Third, the results indicate that farmers communities’ perceptions and other environmental, personal, and social factors can influence the willingness to engage in AES, in addition to monetary compensation. Decision makers can thus benefit from assessing and addressing these factors to develop AES that are more willingly adopted, and for a longer time.

For Israel and for other countries or regions in the pre-implementation phase, the findings suggest the need for policies that provide opportunity for first-hand experience, knowledge gaining and sharing (with farmers and their communities) to form social and cultural capital for the program. Including a short-term financial “safety net”, as well as supplying specific professional and scientific knowledge, monitoring, and tailored solution based on the specific farm or crop, might also lead farmers and their neighbors to independently and sustainably implement AEPs, possibly even without monetary compensation or inducement. Such programs would also yield positive and open farmer-government experiences and interactions, helping to overcome the barrier of farmers’ lack of trust in the government. Lastly, while some of the factors found here may apply to several or even most regions, extensive assessments will also uncover the unique needs, barriers, and

motivations of local farmers, and allow better tailored AESs for each region.

Author statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvman.2021.114066>.

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