

Draft

23 February, 1999

**Wetland creation in Southern Sweden:
Determinants of farmers' willingness to participate
in an environmental programme**

by

Tore Söderqvist*

* Beijer International Institute of Ecological Economics, The Royal Swedish Academy of Sciences, Box 50005, S-10405 Stockholm, Sweden. E-mail: tore@beijer.kva.se.

Abstract

Voluntary participation in programmes for environmental protection is an increasingly important tool for accomplishing environmental policy objectives. Based on data obtained from a questionnaire to a random sample of farmers, an empirical analysis is carried out of landowners' motives for their willingness (or reluctance) to voluntarily participate in a programme for wetland creation in an agricultural district in Southern Sweden. It is concluded that besides private profitability, various public and private environmental benefits are of importance for farmers' willingness to participate. Implications for implementation strategies of programmes based on voluntary participation are discussed.

1. Introduction

Voluntary participation in environmental protection programmes as a tool for accomplishing environmental objectives has gained an increased attention and use (Segerson and Miceli 1998). Whilst regulators tend to rely increasingly on voluntariness, this does not mean that they rely on spontaneous individual action.¹ On the contrary, incentives that induce voluntary agreements are typically present, either as possibilities to obtain subsidies (carrots) or more or less underlying threats (sticks) of introducing mandatory participation if the voluntary approach would not turn out to be successful. Segerson and Miceli noted that the carrot approach is commonly used in certain industries, in particular in agriculture. This suggests that legislative threats tend to be weak in these industries. In the case of agriculture, achievements of environmental objectives may require land use changes. Mandatory participation would then involve a conspicuous infringement of farmers' rights to decide the use of their land. In many communities, the principle of private property rights has probably a sufficient authority to make a threat of its infringement not very credible.

There are of course also other explanations to why legislative threats sometimes tend to be weak. For example, Swedish agricultural policy relies traditionally to a large extent on soft, communicative policy instruments, such as information, advice, education and negotiations. If economic policy instruments are used, they are typically carrots, not sticks. One reason to this soft policy style is the substantial involvement of landowners' organisations in the processes of policy formulation and implementation (Eckerberg and Niemi-Iilahti 1997:49).

¹ One case when spontaneous individual action resulting in an efficient provision of a public good may in fact be expected is the special case of a small community and a "weakest-link" technology for the production of the public good (Mueller 1989:22-25). Such a technology is present when the amount of the public good provided corresponds to the smallest individual contribution to the public good by any member of the community.

This co-operative tradition is likely to constitute an important institutional obstacle to rapid changes to new policy types.

The carrot approach sometimes involves subsidies intended to cover all extra costs due to farmers' voluntary participation. For some farmers, such a carrot may still not be sufficient to cause participation due to other determinants of participation than purely financial ones. For other farmers, the carrot may however be too tasty in the sense that they would be willing to participate also at a lower rate of subsidisation. A regulator has seldom information that allows a differentiation of subsidies according to willingness to participate, but a given rate of participation may be accomplished at a lower general subsidy rate if enough farmers have other motives than purely financial ones to participate.

What types of non-financial motives may exist? Weaver (1996) studied explanations to some farmers' prosocial behaviour, i.e., their voluntary efforts for increasing or preserving the supply of a public good, for example, environmental quality. He defined two main types of farmer utility functions: (1) utility is only determined by privately appropriable profits ("selfish hedonist"), and (2) utility is also dependent on prosocial behaviour; a farmer's own contribution to the public good ("egoistic hedonist"), and possibly also the aggregate amount available of the public good ("imperfect altruist"). Weaver's theoretical analysis predicted that the possible environmental efforts by selfish hedonists are only affected by determinants of profit-maximisation, whereas the efforts by egoistic hedonists and imperfect altruists are also affected by producer preferences and their determinants, such as socio-demographic variables, values and beliefs.

This paper presents the results of an empirical study of farmers' motives for voluntary participation in a municipal water and nature conservation programme in the County of Scania, Southern Sweden. This programme relies on farmers' willingness to convert parts of their land to wetlands (mostly ponds) and buffer zones along watercourses. Participating farmers obtain full coverage of costs, given that they are not considered to gain financially from creating a wetland.

The study indicates to what extent farmers' willingness to participate is determined by purely financial motives (Weaver's case of selfish hedonists), or if prosocial behaviour not necessarily spurred by financial motives is to be expected (Weaver's cases of egoistic hedonists and imperfect altruists), and motives for such a prosocial behaviour. In particular, is prosocial behaviour due to own non-market benefits of the public good or is it due to the general increase in the supply of the public good? The study also indicates reasons for why some farmers are not willing to participate despite the existence of generous financial support.

The paper is organised as follows. Section 2 describes the municipal water and nature conservation programme in some detail. The data collection work is summarised in Section 3. Section 4 presents general empirical results, and Section 5 is devoted to a detailed analysis of determinants of farmers' willingness to participate in the programme. Section 6 provides some concluding remarks.

2. The Kävlinge River Programme

In the last decade, creation of wetlands (mostly ponds) has been carried out as a water and nature conservation measure in several drainage basin in the County of Scania. The municipal

water and nature conservation programme for the drainage basin of Kävlinge River (“the Kävlinge River Programme” or simply “the Programme” henceforth) is one of the county’s greater conservation programme of this type. It was constituted as a co-operative agreement between the nine municipalities found wholly or partly within the borders of the drainage basin. The agreement is running from 1 July 1995, and 12 years ahead, but can be renegotiated every three years. Funding for the Programme is mainly received from the nine municipalities. The Programme’s main purpose is to reduce the nutrient load to the sea, but other purposes are to increase the biological diversity and the amount of land available to the general public for recreation. For more details on the Programme, see Ekologgruppen (1998) and Söderqvist and Lewan (1998).

The execution of the Programme follows the sequence in Figure 1. Diffusion of information about the programme is crucial since its implementation hinges upon the willingness of the drainage basin’s landowners to voluntarily convert some of their land. The potential places for wetland creation are evaluated on the basis of, *inter alia*, land use and size of the drainage basin of the feeder stream to the potential wetland. For each place that is selected, a draft design of the wetland is eventually subject to discussions with the landowner and the Scania County Board. Negotiations also take place with the landowner about municipal leasing of the land to be converted. The term of the lease is 30 years. The leasing agreement does not change the property rights to the land, which means that the landowner’s hunting and fishing rights, if any, are not affected. The Swedish right of public access may however be applicable to the converted land, which means that the general public is allowed to visit the wetland for, e.g., recreation.

The landowners are offered a rent equal to the construction costs of the wetland plus the opportunity costs of land, measured as the market value of the land subject to conversion. In a case when a landowner is judged to benefit financially from the conversion, mainly through irrigation, the policy is to pay not more than 60% of the construction costs. Successful negotiations result in a preliminary leasing agreement between the Programme and the landowner.

The subsequent step in the execution is to invite tenders for the construction of the wetland. The most favourable tender is selected, and the wetland is then constructed in consultation with the Programme. The final leasing contract is signed when the construction of the wetland is completed. Landowners are responsible for creating a vegetation cover, but the Programme supplies them with appropriate seeds and seedlings.

FIGURE 1

3. A survey of farmers

A mail questionnaire was developed as a survey instrument for obtaining data on the determinants of farmers' willingness (or reluctance) to participate in the Programme. By courtesy of the Federation of Swedish Farmers, a random sample of 200 farmers living in the Kävlinge River drainage basin was made from the Federation's roll of members. To be precise, the sample concerned members living in 28 parishes in the municipalities of Eslöv, Lund and Sjöbo. These three municipalities cover 78% of the drainage basin's area, cf. Figure 2, and the focus on them made it possible to select 28 parishes that are wholly situated in the drainage basin. The total number of members in these parishes was 797.

FIGURE 2

The survey instrument was developed as a four-page questionnaire plus information about the Programme and the Kävlinge River drainage basin as two separate sheets of paper. The questions included in the questionnaire are found in the Appendix.² The questionnaire was sent out in March 1998, and a response rate of 59.5% was obtained after three reminders, i.e., 119 respondents. Open-ended questions on motives and attitudes were used in order to minimise the introduction of cues. Whilst open-ended questions are demanding to respondents and implies laborious work of categorising answers, they have the potential to convey considerably more detailed pieces of information than closed-ended questions. The questions and the answers received are presented in detail in the following section.

4. Questions and answers

Table 1 summarises some basic data on the respondents and their farms (some variables are explained in Section 5). Not surprisingly, only a few respondents were female (4.2%) or inactive farmers (5.0%). On average, the respondents have lived for several decades (median: 41 years) in the municipality they reside in at present. The time of residence for 10% of the respondents is between 64 and 80 years. This means that some respondents may even have an own remembrance of the Kävlinge River drainage basin before the last large-scale draining activities in the early 1940's (cf. Wolf 1956). In Table 2, some other respondent characteristics are compared to data about the population. This comparison shows no major differences.

² The complete survey instrument is available upon request to the author.

Figure 3 reports the responses to the central question on willingness to participate in the programme (Q7), given its design (including financial support) as described in Section 2. This question was closed-ended with five response alternatives: (1) “yes, I already participates”; (2) “yes, I have announced interest in participating”; (3) “yes, I am interested in participating”; (4) “no, I am not interested in participating”; and (5) “don’t know”. As shown in Figure 3, 13% of the respondents had already approached in Programme in some way, and 33% reported an interest in participating. 35% reported a reluctance to participate and 19% gave a “don’t know” answer. In the analysis of in Section 5, responses to alternatives (1,2,3) and (4,5) respectively were merged in order to create the binary variable INTEREST, see also Table 1.³

FIGURE 3

What are the motives for showing willingness to participate in the Programme? The questionnaire included (1) follow-up questions about own motives to those respondents who reported a willingness to participate (Q8 and Q9), and (2) a question to all respondents about what motives they think landowners have for participating (Q16). The latter question thus concerns respondents’ perception of landowners’ motives in general, not necessarily identical to their own motives. Table 3 provides a detailed description of the answers. The most common motives refer to general environmental improvements, such as reduced nutrient emissions and a cleaner river and sea, and they have been categorised as “an improved environment”. “Biodiversity” constitutes another rather important group of motives. This category includes motives that referred to advantages to animals and plants without

³ The fact that only a small number of farmers already participate in the Programme implies that this variable (INTEREST) measures intentions rather than actual behaviour.

mentioning improved hunting or fishing opportunities – “hunting” and “fishing” constitute separate, and less important, categories.

Table 3 also suggests one way of aggregating the categories into the broader groups of (1) public environmental benefits, (2) private environmental benefits, (3) private agricultural benefits and (4) other motives, where the third category contains the motives that are most tightly connected to farmers’ financial situation. As is shown by Figure 3, private agricultural benefits are rather seldom stated as a motive for own participation, but they are often perceived as a motive for landowners in general. To some extent, the opposite is true for public environmental benefits.

This difference seems at least partly to be due to the fact that Q16 was posed to all subjects, not only those who in Q7 indicated a willingness to participate in the Programme. In fact, a null hypothesis of independence between [willingness or no willingness to participate in the Programme (the binary variable INTEREST)], and [perception of private agricultural benefits as motives for landowners’ participation or perception of all other motives], could be rejected ($\chi^2(1 \text{ degree of freedom})=2.80, p=0.094$). This rejection of independence is mainly due to the tendency among those who were *not* willing to participate to perceive private agricultural benefits as a motive for landowners’ participation.

TABLE 3

FIGURE 4

This finding suggests that financial motives may be common among the respondents who in Q7 did not report any willingness to participate in the Programme. According to the

categories in Table 4, about 20% of all motives stated in Q10 and Q11 by these respondents referred to the farmer's limited supply of land or an uncertainty about whether the grants are sufficiently high. Other types of motives are however at least equally common. Many respondents referred to high age (10.0%) or uncertainty whether to continue as a farmer (8.3%). Perceived (rightly or wrongly is another issue) geographical reasons are also common, in particular "no watercourse nearby" (16.7%).

TABLE 4

All respondents were asked to report perceived personal (Q12a) and social (Q12c) advantages and personal (Q12b) and social (Q12d) disadvantages that would occur due to an implementation of the Programme, irrespective of whether they would participate themselves or not. That is, the information on motives for participation or not received by Q8-Q11 is complemented by more general attitudes towards the effects of the Programme.

Categories of personal and social advantages are reported in Table 5. They correspond rather well to the results in Table 3, but a few details should be noticed. Firstly, the results indicate that a general improvement of the environment is to some extent perceived as a personal advantage, i.e., the existence of a private share of the public good of environmental quality is acknowledged. Secondly, recreational opportunities besides hunting and fishing are now reported as both a personal and social advantage. Finally, goodwill is now perceived as the most important private agricultural benefit. This is probably due to the fact that the question did not presuppose participation by the respondent.

As to personal and social *disadvantages* (Table 6), many respondents perceive no disadvantages at all. In comparison with Table 3, public intrusion is however now introduced as an important personal disadvantage. Such an intrusion would be the consequence of more land available for recreation through the Swedish right of public access. The predominant social disadvantage is simply the observation that the Programme implies costs. A few respondents did not like the idea of the decreased food production that could be the result of less cultivated land.

TABLE 5

TABLE 6

It seems likely that respondents' perception of advantages and disadvantages is of importance for their willingness to participate in the Programme, and this potential relationship is studied in Section 5. However, it should also be noticed that there are relatively low response rates in Q12a-12d; 44.5-61.3% if "don't know" is considered as a response, and 37.8-54.6% if not, cf. Tables 5 and 6. This may be due to the fact that some respondents did not feel they had anything new to report in comparison with their answers to Q8-11. There is however an interesting asymmetry between respondents who reported a willingness to participate in the Programme and respondents who did not. A null hypothesis of independence between [willingness or no willingness to participate in the Programme (the binary variable INTEREST)] and [answer or no answer (including "don't know")] could be rejected for all four questions, but considerably strongly so for Q12a and Q12b about *personal* advantages and disadvantages.⁴ That is, respondents who reported a (did *not* report any) willingness to participate in the Programme more clearly tended to answer (not answer) the questions about

personal advantages and disadvantages than the questions about social advantages and disadvantages. Also this relationship is studied in more detail in Section 5.

In the questionnaire's final question (Q17), subjects were asked to rank their valuation of a selection of eleven services provided by the nature in the Kävlinge River drainage basin, see Appendix. Not all respondents ranked all given activities from 1 to 11; some of them discriminated between all services, whereas other respondents gave an equal rank to two, a few or several services. Table 7 reports an attempt to summarise the answers in a way that takes into account all these different ways of answering the question. Firstly, the eleven examples of nature's services given were merged to three groups, see Table 7 for details: (i) services that are *not* directly perceptible to humans, (ii) services that are directly perceptible but not really integrated in humans' activities in nature, and (iii) services directly related to humans' activities in nature. Secondly, these groups were given a rank of 1, 2 or 3 for each respondent, based on the mean value of the ranks given by a respondent to the individual services included in each of the three groups. Finally, the total number of ranks 1, 2 and 3 was calculated, see Table 7 for results.

The results indicate a clear dominance of the non-perceptible services, and, in particular, the perceptible services. Humans' activities in nature only occasionally received the first or second rank. The same pattern was found when groups from the general public were asked to carry out the same ranking, see Söderqvist and Lewan (1998). Moreover, respondents who reported a willingness to participate in the Programme and other respondents do not seem to have different rankings. For example, a null hypothesis of independence between [willingness or no willingness to participate in the Programme (the binary variable INTEREST)] and [first

⁴ $\chi^2(1)=15.4$, $p<0.001$ and $\chi^2(1)=10.5$, $p=0.001$ for Q12a and Q12b respectively, and $\chi^2(1)=5.40$, $p=0.02$ and

rank to non-perceptible services, perceptible services or humans' activities in nature] could not be rejected ($\chi^2(2)=1.86$, $p=0.395$).

5. An analysis of determinants of willingness to participation

This section is devoted to a statistical analysis of the determinants of respondents' willingness or no willingness to participate in the Programme. That is, we consider models of participation, where the dependent variable INTEREST is a function of a row vector \mathbf{x} of explanatory variables, so that

$$\begin{aligned}\text{Prob}\{\text{INTEREST}=1\} &= F(\mathbf{b}\mathbf{x}') \\ \text{Prob}\{\text{INTEREST}=0\} &= 1-F(\mathbf{b}\mathbf{x}')\end{aligned}$$

where \mathbf{b} is a row vector of coefficients to be estimated. The commonly used logit model will be employed for the specification of $F(\cdot)$, which means that $F(\mathbf{b}\mathbf{x}') = \exp(\mathbf{b}\mathbf{x}')/[1+\exp(\mathbf{b}\mathbf{x}')]]$, see, e.g., Greene (1993:636-638).

Four groups of explanatory variables will be considered as components of \mathbf{x} :⁵

1. Scale of farm operation characteristics (ARABLE, FOREST, OTHERL and LIVESTOCK). Following Weaver (1996), these variables are interpreted as determinants of private profitability.
2. Variables describing the geographical location of the farm in the drainage basin (LUND and SJÖBO). These variables may capture different conditions for agriculture (soil fertility is in general greater in Eslöv and Lund than in Sjöbo), but also variations in the perceived need for a water and nature conservation programme; the agricultural landscape

$\chi^2(1)=4.16$, $p=0.04$ for Q12c and Q12d respectively.

⁵ It should be mentioned that some attempts were carried out to let the models include explanatory variables related to respondents' ranking of nature's services (Q17). However, this did not result in any significant results, which is consistent with the χ^2 test reported in Section 4.

is considerably more monotone and dominant in Eslöv and Lund than in Sjöbo. Sjöbo is also situated farther away from the sea, i.e., from the final recipient of nutrient emissions. Not very surprisingly, there were initial difficulties in persuading the local authorities in Sjöbo to let Sjöbo be a part of the co-operative agreement that constitutes the Kävlinge River Programme.

3. Personal (socio-demographic) characteristics (AGE and LIVING).
4. Variables related to subjective values and beliefs (SELFISH, PERSON, SOCIETY, PADV, PDADV, SADV and SDADV).

Estimation results from five different models are presented in Table 8. The models are increasingly refined in the sense that groups of explanatory variables are added in a sequential way. Model A includes farm operation characteristics only. In model B, geographical characteristics are added, and model C also includes personal characteristics. Models D and E also take into account subjective values and beliefs.

The farm operation characteristics are included in all models, but they do not show any statistically significant impact on $\text{Prob}\{\text{INTEREST}=1\}$. In addition, the joint explanatory power of the farm characteristics in model A is low. ARABLE is however somewhat less weak than the other farm characteristics, and shows a consistent and positive influence on $\text{Prob}\{\text{INTEREST}=1\}$. This indicates that the probability of participation is greater for farms with relatively large areas of arable land. Such farms probably have greater opportunities to set aside some land for wetlands or buffer zones.

The inclusion of the geographical characteristics in model B improves the explanatory power, and there is a significantly negative relationship between farm location in the municipality of

Sjöbo and $\text{Prob}\{\text{INTEREST}=1\}$. Also the coefficient of LUND is negative, which suggests a positive relationship between farm location in the municipality of Eslöv and the probability of participation. As noted above, several explanations to the significance of the SJÖBO variable are possible.

When personal characteristics are included (model C), it turns out that AGE has a significantly negative influence on $\text{Prob}\{\text{INTEREST}=1\}$, which is consistent with the fact that “high age” was stated by some respondents as a motive for no willingness to participate in the programme, cf. Table 4. Turning to the LIVING characteristic, respondents who have lived for a relatively long period of time where they live now tend to be more willing to participate, but the relationship is not significant.

The subjective variables in models D and E add an additional explanatory power to the models, but in the same time they tend to reduce the significance of the objective variables AGE and SJÖBO. It was noted already in Section 4 that respondents who think that landowners participate because of private agricultural benefits tend not to be willing to participate in the Programme. This tendency is evident also from the statistical significance of SELFISH in models D and E. However, a deeper understanding of this attitude cannot be gained from the data available. One may speculate that there is scepticism against altruistic behaviour (“other farmers are not altruistic, so why should I be different?”), or that private agricultural benefits are more important as a motive for participation than was indicated by the answers to Q10-11.

The significance of PERSON and insignificance of SOCIETY are consistent with the earlier finding that respondents who reported a *personal* advantage or disadvantage in Q12a-12b are

relatively more willing to participate. The sign of the coefficient of SOCIETY suggests a similar relationship, but it is not supported by statistical significance. It thus seems as if an ability to perceive personal consequences – positive or negative – encourages participation. A hypothesis that it is the personal *connection* rather than the perception of personal *advantages* that is of importance gains some support from the estimation results for model E. PERSON and SOCIETY are now replaced with variables that discriminate between advantages and disadvantages. There is a positive and significant relationship between respondents who reported personal advantages (PADV) and $\text{Prob}\{\text{INTEREST}=1\}$, and whilst not significant, the coefficient of personal disadvantages (PDADV) is also positive. The coefficients of social advantages (SADV) and disadvantages (SDADV) are however negative and insignificant. In order to focus on the influence of social advantages and disadvantages, a model was estimated where all variables of model E were kept except for PADV and PDADV. In this case, the coefficients of SADV and SDADV turn positive, but they do not show any statistical significance.

6. Concluding remarks

The empirical analysis of this paper indicates that farmers' voluntary participation in the Kävlinge River Programme to a considerable extent is spurred by a concern for public environmental benefits, though the respondents of the questionnaire seem to assess their own concern as being greater than the concern of other landowners. However, whilst other landowners are judged to be relatively more concerned about farm profitability, they are not considered to ignore neither public nor private environmental benefits. This means that a given rate of participation may be obtained also for a less tasty carrot than full cost coverage, at least if the programme is designed in a way that allows participating landowners to enjoy

private environmental benefits and/or if public environmental benefits are enough perceived by landowners.

The statistical analysis in Section 5 emphasises the role of beliefs and perceived consequences of participation for farmers' willingness or reluctance to participate in the Programme, whereas determinants of profitability (scale of operation variables) tend to be of relatively unimportant. In particular, farmers who are able to form an opinion of the perceived *personal* consequences tend to show a relatively high willingness to participate in the Programme. This suggests that a regulator that wants to induce participation should choose a communication strategy where stress is laid upon information on the personal consequences of participation rather than on the social consequences. Finally, the analysis indicates that if it is made public that some farmers in fact care for the provision of private and public environmental benefits in addition to private agricultural benefits, this may encourage other farmers to participate.

Acknowledgements

The sample of farmers could be made by courtesy of the Swedish Federation of Farmers (LRF Service Syd AB) and Helén Rosengren. I also wish to thank Lillemor Lewan for comments. The paper describes work carried out in the research project *Ecological-Economic Analysis of Wetlands: Functions, Values and Dynamics (ECOWET)*. Funding from the EU/DGXII Environment and Climate Programme and the Swedish Council for Planning and Coordination of Research (FRN) is gratefully acknowledged.

References

- Eckerberg, K. and A. Niemi-Ilahti (1997), "Local Implementation of Agri-Environmental Policy: Comparative Studies in the Nordic Countries", pp. 45-62 in K. Eckerberg, I-M. Gren and T. Söderqvist (eds.), "Politics and Economics of Baltic Sea Environmental Enforcement", Beijer Occasional Paper Series, Beijer International Institute of Ecological Economics, The Royal Swedish Academy of Sciences, Stockholm.
- Ekologgruppen (1997), "Kävlingeå-projektet. Årsrapport 1995-1996". Ekologgruppen i Landskrona AB
- Ekologgruppen (1998), "Kävlingeå-projektet. Årsrapport 1997". Ekologgruppen i Landskrona AB.
- Greene, W. H. (1993), *Econometric Analysis. Second Edition*. Macmillan Publishing Company, New York.
- Hjort, P., L. Martins, A. Robertsson and A-L. Thelander (1979), "Vattenresursplanering för Kävlingeåns avrinnings- och influensområde. Del 1: Inledande inventering". Report 3021, Department of Water Resources Engineering, Lund Institute of Technology, Lund University.
- Mueller, D. C. (1989), *Public Choice II*. Cambridge University Press.
- SCB, Statistiska Centralbyrån (1992), *Statistisk Årsbok 1992*. Statistics Sweden, Stockholm.
- SCB, Statistiska Centralbyrån (1998), *Jordbruksstatistisk årsbok 1998*. Statistics Sweden, Stockholm.
- Segerson, K. and T. J. Miceli (1998), "Voluntary Environmental Agreements: Good or Bad News for Environmental Protection?", *Journal of Environmental Economics and Management* **36**, 109-130.
- Söderqvist, T. and L. Lewan (1998), "Wetland Creation in the Kävlinge River Catchment, Scania, South Sweden: A Pilot Study on Implementation, Perceived Benefits, and Knowledge of Ecosystem Services", Beijer Discussion Paper Series No. 115, Beijer International Institute of Ecological Economics, The Royal Swedish Academy of Sciences, Stockholm.
- Weaver, R. D. (1996), "Prosocial Behavior: Private Contributions to Agriculture's Impact on the Environment", *Land Economics* **72**, 231-247.
- Wolf, P. (1956), *Utdikad civilisation*. Gleerups, Lund.

Appendix. Questions in the questionnaire

Q1. What is your sex?

Q2. What is your age?

Q3. In what parish and municipality do you live?

Q4. Since when have you lived in the municipality to live today?

Q5. Are you a farmer?

Yes → Q6.

No → Q7

Q6. We would be grateful for the following information about your farm: Area of arable land: _____ hectares; area of forested land: _____ hectares; area of other land: _____; livestock: _____

Q7. Are you interested in participating in the Kävlinge River Programme by leasing out land to the Programme?

Yes, I already participate. → Q8

Yes, I have announced interest in participating. → Q8

Yes, I am interested in participating. → Q8

No, I am not interested in participating. → Q10

Don't know. → Q11

Q8. In what way do you participate or are interested in participating in the Programme?

Q9. Why are you interested in participating? → Q12

Q10. Why are you not interested in participating? → Q12

Q11. What do you need to know more before you decide if you are interested or not interested in participating? → Q12

Q12. In your opinion, in what ways are the landscape change that the Programme would cause...

Q12a. ...good for you personally?

Q12b. ...bad for you personally?

Q12c. ...good for society as a whole?

Q12d. ...bad for society as a whole?

[Q13-15. Questions on other landscape changes and driving persons and groups in the Kävlinge River Programme. The answers to these questions are not subject to analysis in this paper.]

Q16. In your opinion, what motives do landowners have for participating in the Programme?

Q17. Nature supply services to humans in the drainage basin. How do you value them? Rank them by placing 1 in the box in front of the service you consider to be of the highest value, 2 in front of the service you consider to be of the second highest value, and so on.

[The services given were the following: Rainfall – silence – wild plants and animals – carbon dioxide uptake by growing trees/crops – wetlands' nutrient reduction – nutrient addition in soil from weathering – hunting opportunities – fishing opportunities – opportunities to other nature experience – birds' consumption of insects/pests – nitrogen uptake by alders and leguminous plants.]

Table 1. Statistical description of respondent characteristics

Variable	Variable name	Mean	Median	Std. dev.	Range
Female (1=yes, 0=otherwise)	FEMALE	0.0420	0	0.201	0/1
Age (years)	AGE	53.7	53	12.9	27-93
Time of living in the municipality (years)	LIVING	41.2	41	17.4	5-80
Farmer (1=yes, 0=otherwise)	FARMER	0.950	1	0.220	0/1
Arable land (hectares)	ARABLE	56.3	37	73.6	3-517
Forested land (hectares)	FOREST	17.6	0	142	0-1,500
Other types of land (hectares)	OTHERL	5.21	1	8.99	0-40
Livestock (1=yes, 0=otherwise)	LIVESTOCK	0.696	1	0.462	0/1
Residence in Lund (1=yes, 0=otherwise) ^a	LUND	0.210	0	0.409	0/1
Residence in Sjöbo (1=yes, 0=otherwise) ^a	SJÖBO	0.471	0	0.501	0/1
Willingness to participate in the Programme (1=participates already; has already announced interest to the Programme; or interested in participating; 0=otherwise)	INTEREST	0.460	0	0.501	0/1
Answered question on personal advantages <u>or</u> disadvantages from the Programme (1=yes, 0=otherwise)	PERSON	0.588	1	0.494	0/1
Answered question on societal advantages <u>or</u> disadvantages from the Programme (1=yes, 0=otherwise)	SOCIETY	0.571	1	0.497	0/1
Stated personal advantages from the Programme (1=yes, 0=otherwise)	PADV	0.462	0	0.501	0/1
Stated personal disadvantages from the Programme (1=yes, 0=otherwise)	PDADV	0.303	0	0.461	0/1
Stated societal advantages from the Programme (1=yes, 0=otherwise)	SADV	0.529	1	0.501	0/1
Stated societal disadvantages from the Programme (1=yes, 0=otherwise)	SDADV	0.176	0	0.383	0/1
Belief that landowners participate because of private agricultural motives (1=yes, 0=otherwise)	SELFISH	0.467	0	0.502	0/1

^a Residence is in Eslöv if neither in Lund nor Sjöbo.

Table 2. Respondent characteristics and some population characteristic

Characteristic	Respondents	Population
Median age (years)	53	50-54 ^a
Residence in Eslöv (per cent)	31.9	27.0 ^b
Residence in Lund (per cent)	21.0	20.5 ^b
Residence in Sjöbo (per cent)	47.1	52.5 ^b
Mean area of the farm's arable land (hectares)	56.3	41-50 ^c
Mean area of the farm's forested land (hectares)	17.6	11-30 ^c

^a Median age group of Swedish farmers (SCB 1998:19).

^b Percentage for total sample (respondents + non-respondents).

^c Mean interval for Scania (SCB 1998:19).

Table 3. Motives for willingness to participate in the Programme

Motive	Own motives (% of all stated motives)	Landowners' motives in general (% of all stated motives)
<i>Public environmental benefits</i>		
An improved environment	34.4	25.0
Biodiversity	14.8	7.5
Aesthetics	6.6	6.7
<i>Private environmental benefits</i>		
Interest in and responsibility for the environment	14.8	11.7
Hunting	1.6	3.3
Fishing	1.6	2.5
<i>Private agricultural benefits</i>		
Grants	6.6	19.2
Goodwill	1.6	3.3
Use of marginal land	..	4.2
Irrigation	3.3	9.2
Moderation of waterflows	1.6	1.7
Crabfish production	..	0.8
<i>Other motives</i>		
Watercourse nearby	9.8	..
Restoration of old wetlands	1.6	..
Prevent overgrowing of existing water	1.6	..
Reformation of agriculture	..	0.8
To be able to communicate opinions	..	0.8
Instructive and educating	..	0.8
All types of motives		0.8
No motives exist	..	1.7
	Total	99.9
		100.0

Source: Questions 8 and 9 (44 answers, 0 “don’t know”, 7 no answer) and 16 (70 answers, 5 “don’t know”, 44 no answer).

Table 4. Motives for no willingness to participate in the Programme

Motive	% of all stated motives
No watercourse nearby	16.7
Marl-pits, ponds or ditches already present	8.3
There is enough water already	1.7
Not enough land; no suitable land; can't afford to give up any land	10.0
The grants may not be sufficiently high	8.3
Not enough benefits from participation	1.7
Bureaucracy	3.3
Obligations	3.3
Don't want such things on my land	1.7
May look artificial	1.7
High age	10.0
May not continue as a farmer	8.3
Not enough time	3.3
Tenant farmer	3.3
Uncertain about what is suitable for my land	8.3
Don't know the effects	5.0
Don't have enough information	5.0
Total	99.9

Source: Questions 10 (36 answers, 0 “don't know”, 3 no answer) and 11 (18 answers, 1 “don't know”, 3 no answer).

Table 5. Perceived personal and social advantages from the programme

Advantage	Personal (% of all stated advantages)	Social (% of all stated advantages)
<i>Public environmental benefits</i>		
An improved environment	16.5	42.9
Biodiversity	16.5	13.1
Aesthetics	15.3	9.5
<i>Private environmental benefits</i>		
Satisfies interest in and takes responsibility for the environment	10.6	..
Recreational opportunities	7.1	3.6
Hunting	7.1	3.6
Fishing	2.4	..
<i>Private agricultural benefits</i>		
Grants	1.2	..
Goodwill	4.7	..
Irrigation	1.2	..
Moderation of waterflows	2.4	..
More rational cultivation	1.2	..
<i>Other advantages</i>		
Restoration of old wetlands	3.5	1.2
Consistent with KRAV (organic) cultivation	1.2	..
A more balanced development	1.2	2.4
More engaged farmers	..	1.2
Improved water management	..	1.2
A more attractive region	..	1.2
More jobs	..	1.2
Violence and trouble are due to our Negligence towards nature	..	1.2
“Yes”, “good”	3.5	15.5
No advantages	4.7	2.4
Total	100.3	100.2

Source: Questions 12a (60 answers, 13 “don’t know”, 46 no answer) and 12c (65 answers, 7 “don’t know”, 47 no answer).

Table 6. Perceived personal and social disadvantages from the programme

Disadvantage	Personal (% of all stated disadvantages)	Social (% of all stated disadvantages)
Costly, requires money	..	31.9
Revenue losses, less cultivated land	21.8	6.4
More work	7.3	
Land fragmentation	7.3	..
More weeds	1.8	2.1
Flooding risks	1.8	..
Risk of impaired drying up of land in springtime	1.8	..
Damage to land and forests	..	2.1
Intrusion from the public	20.0	..
Aesthetics	1.8	2.1
Drowning risks	1.8	..
Not close to the river	1.8	..
A lower rate of development	..	2.1
The cause of the problems is not solved	..	2.1
“Yes”	5.5	..
No disadvantages	27.3	51.1
Total	100.0	99.9

Source: Questions 12b (51 answers, 12 “don’t know”, 56 no answer) and 12d (45 answers, 8 “don’t know”, 66 no answer).

Table 7. Ranking of three main groups of nature's services

	Non-perceptible services ^a	Perceptible services ^b	Humans' activities in nature ^c
No. of rank 1 ^d	33 (42.9%)	36 (46.8%)	13 (16.9%)
No. of rank 2 ^d	31 (40.3%)	33 (42.9%)	17 (22.1%)
No. of rank 3 ^d	13 (16.9%)	8 (10.4%)	47 (61.0%)
Total	77 (100.1%)	77 (100.1%)	77 (100.0%)

^a The services that are not directly perceptible to humans include “carbon dioxide uptake by growing trees/plants”, “wetlands' nutrient reduction”, “nutrient addition in soil from weathering”, and “nitrogen uptake by alders and leguminous plants”.

^b The services that are directly perceptible but not really integrated in humans' activities in nature include “rainfall”, “wild plants and animals” and “birds' consumption of insects/pests”.

^c The services directly related to humans' activities in nature include “silence”, “hunting opportunities”, “fishing opportunities” and “opportunities to other nature experience”.

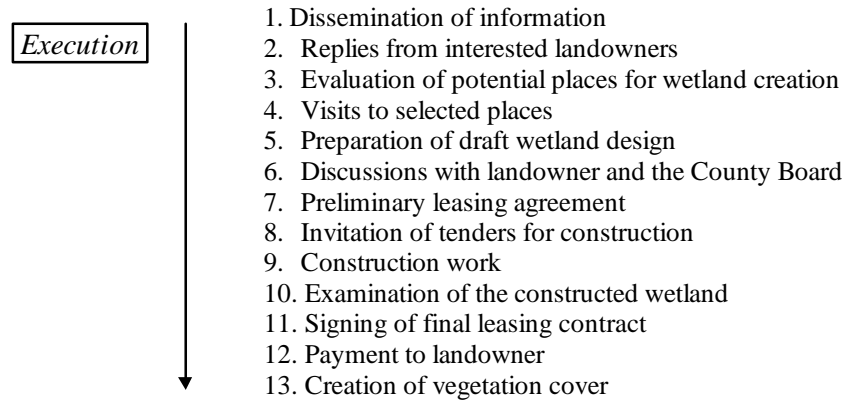
^d The mean value of the ranks given by a respondent to the individual services included in each of the three groups of services was calculated. For each respondent, rank 1 was then assigned to the group with the highest mean rank, rank 2 was assigned to the group with the second highest mean rank, and rank 3 was assigned to the group with the lowest mean rank.

Table 8. Estimation results for the logit analysis of determinants of willingness to participation (dependent variable: INTEREST)

Explanatory variable	Coefficient estimates (t values based on asymptotic standard errors) ^a				
	Model A (n=106)	Model B (n=106)	Model C (n=105)	Model D (n=70)	Model E (n=70)
Constant	-0.438 (-1.03)	0.0327 (0.0640)	1.97 (1.65*)	0.0746 (0.0400)	-0.118 (-0.061)
ARABLE	0.00585 (1.17)	0.00550 (1.24)	0.00386 (0.932)	0.00452 (0.801)	0.00441 (0.701)
FOREST	0.000447 (0.126)	0.00116 (0.339)	0.00157 (0.369)	-0.0166 (-0.803)	-0.0168 (-0.707)
OTHERL	0.0152 (0.609)	0.0194 (0.763)	0.0280 (1.06)	0.0108 (0.287)	-0.00949 (-0.218)
LIVESTOCK	-0.207 (-0.452)	0.179 (0.364)	0.119 (0.234)	0.387 (0.572)	0.441 (0.622)
LUND	..	-0.428 (-0.760)	-0.699 (-1.16)	-0.931 (-1.12)	-0.424 (-0.469)
SJÖBO	..	-1.46 (-2.88***)	-1.49 (-2.83***)	-1.21 (-1.69*)	-0.617 (-0.789)
AGE	..	..	-0.0487 (-2.14**)	-0.0236 (-0.780)	-0.0210 (-0.670)
LIVING	..	..	0.0200 (1.27)	0.00987 (0.470)	0.0121 (0.570)
SELFISH	..	..	..	-1.34 (-2.03**)	-1.25 (-1.73*)
PERSON	..	..	..	1.81 (2.38**)	..
SOCIETY	..	..	..	0.417 (0.578)	..
PADV	..	..	..	..	2.42 (2.76***)
PDADV	..	..	..	..	0.688 (0.897)
SADV	..	..	..	..	-0.464 (-0.535)
SDADV	..	..	..	..	-0.263 (-0.301)
χ^2	5.13	14.6**	18.9**	19.9**	23.9**
McFadden's R ²	0.0351	0.090	0.130	0.205	0.246
% correct predictions	58.5	66.0	67.6	70.0	71.4

^a *, ** and *** denotes p<0.1, p<0.05 and p<0.01 respectively.

Figure 1. The process of execution of the Kävlinge River Programme



Source: Ekologgruppen (1998:5)

Figure 2. Sweden, the County of Scania and the Kävlinge River drainage basin
 Sources: Ekologgruppen (1997), Hjort et al. (1979) and SCB (1992)

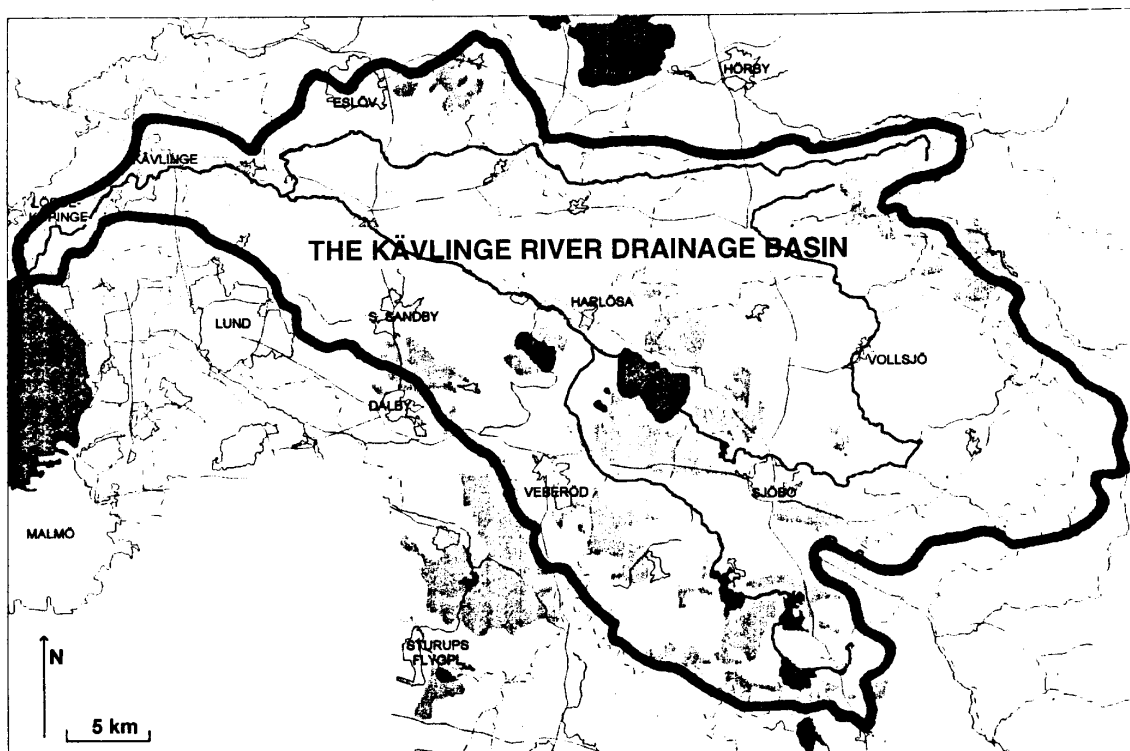
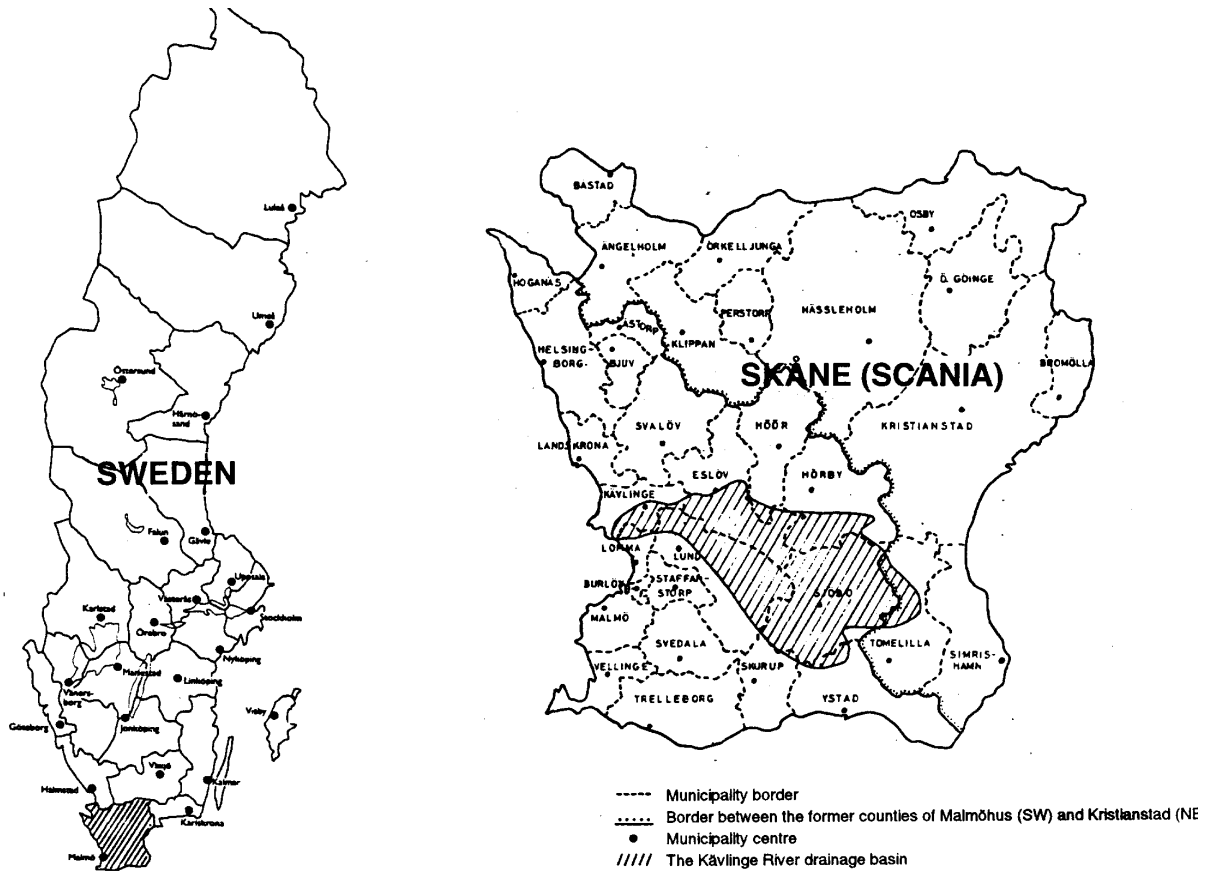


Figure 3. Willingness to participate in the programme

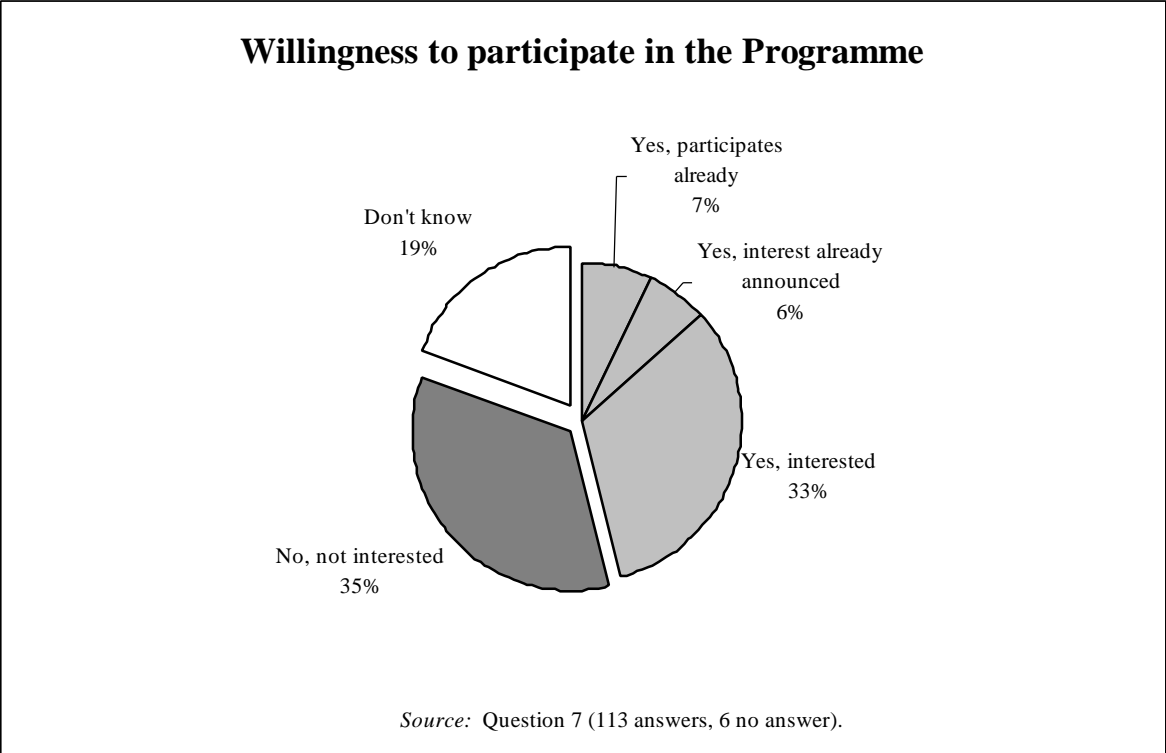


Figure 4. Motives for participation in the Programme

