

# **The Role of Transaction Costs in Contracts for Environmental Goods:**

## An Application to the Water Management Program in Hungary

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EFFECT

**The Role of Transaction Costs in Contracts for  
Environmental Goods:**  
An Application to the Water Management Program in Hungary

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**MSc Thesis**

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Front page image: @AboutHungary

## **Preface**

In front of you is my master thesis '*The Role of Transaction Costs in Contracts for Environmental Goods: An Application to the Water Management Program in Hungary*'. I wrote this thesis at the chair group Agricultural Economics and Rural Policy as part of the master Management, Economics & Consumer studies. During my thesis I was able to delve into the world of transaction costs. Before starting my thesis, I had only had some theoretical knowledge about this concept, but never explored its application in practice. In addition, I had the opportunity to collect my own data, which was a valuable learning experience. Finally, doing research on contract for environmental goods has given me more insight into European policies and has given me the opportunity to specialise further in the field of agricultural economics!

I would like to thank my supervisor Liesbeth Dries, who guided me throughout the thesis process and provided me with feedback and advice. The door was always open for a brief consultation on a certain subject. In addition, my appreciations are for József Fogarasi (University of Óbuda) in advising and translating my survey questions and the Hungarian Agricultural Chamber for conducting my survey. Finally, I would like to thank my friends and family for their support and feedback during the thesis process.

## **Abstract**

In 2016, the Hungarian government established the Water Management Program (WMP) to improve the water quality solutions. Farmers had the opportunity, individually and collectively, to apply for investment support for building new sustainable irrigation facilities or for improving existing irrigation facilities. However, previous research indicates that such contracts for environmental goods often involve (high) transaction costs. This research investigates the private transaction costs incurred by farmers in the application to WMP program. Based on a survey, transaction costs are identified per transaction activity. Results show that both the individual application and the collective application are perceived as a difficult and time-consuming procedure and therefore it can be concluded that the WMP program entail private transaction costs. In addition, the findings show that lack of trust and unwillingness of participation of neighbouring farmers can be argued to be important reasons for non-participation in the collective WMP program. Developments regarding the new established irrigation communities could provide a solution to this, and could be interesting for the Hungarian government to follow.

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## **1. Introduction**

The aim of this chapter is to introduce the research of this thesis. Section 1.1 discusses the detailed problem definition. Section 1.2 presents the research objective, followed by the research questions in section 1.3. Section 1.4 and section 1.5 elaborate on the theoretical framework and methodology used in the research. Finally, section 1.6 provides a description of the structure of this thesis.

### **1.1 Detailed problem definition**

Over the half past century, climate change has led to changes in climate extremes, including heat waves, heavy precipitation and droughts (EEA, 2017). These environmental consequences, and in particular water imbalances through drought and floods, are expected to increase environmental risks in agriculture (EEA, 2017; EFFECT, n.d.; IPCC, 2013). In Hungary, climate extremes also occur more frequently (European Commission, 2022; Miskó et al., 2019). This is exacerbated by a limited and outdated irrigation system, and because only 2.4% of the agricultural area is irrigated in Hungary (European Commission, 2022; Miskó et al., 2019). As a result, both traditional and intensive crop production will be affected (EFFECT, n.d.).

To improve adaptation practices to climate change and enhance water quality solutions, the Hungarian Water Management Program (WMP) has been established in 2016. The WMP Program consists of investment contracts for funding the sustainable development of water management (EFFECT, n.d.). Farmers and groups of farmers had the opportunity to apply for investment support for building new irrigation facilities or for improving existing irrigation facilities (EFFECT, 2022a). In return, farmers are expected to update their irrigation practices in a more sustainable manner and reduce nutrient leaching (EFFECT, n.d.).

Several studies have already emphasized that contracts for environmental goods are associated with high transaction costs (e.g. Falconer, 2000; Mettepenningen et al., 2009; Peterson et al., 2015). Transaction costs include the costs of informing, negotiating and monitoring environmental contracts (North, 1990). High transaction costs can hinder farmers from (fully) participating in a program, which results in a lower effectiveness of the policy (e.g. Falconer, 2000; Jongeneel et al, 2012). It is therefore important to identify the main transaction costs in



applications to the WMP program, and especially the private transaction costs that are borne by the farmers (private actors) rather than the government (public actor).

In addition, the WMP program allows for submitting an individual application or a collective application. Several studies question the ecological effectiveness of the individual contracts for environmental goods that are currently applied (e.g. Falconer, 2000; Franks, 2011; Kleijn and Sutherland, 2003; Mettepenningen et al., 2011; Slangen et al., 2008). The collective application for environmental goods may overcome these issues, as it could have geographical and ecological scale merits and empowers individual farmers to address issues that exceed their farmland (OECD, 2013). Moreover, collective applications may operate at lower transaction costs due to sharing knowledge and expertise, and transactional economies of scale (Falconer, 2000; OECD, 2013; Ostrom, 1990). However, collective applications could also lead to additional transaction costs due to, for example, unwillingness of neighbours to co-operate and a lack of trust (Falconer, 2002; Ostrom, 1990). Importantly, it was observed that far fewer collective than individual applications have been submitted for the WMP program. Hence, the transaction costs of collective WMP applications and the associated barriers and incentives deserve special attention.

## **1.2 Research objective**

The objective of this research is to investigate the role of private transaction costs in the application to the Water Management Program in Hungary.

## **1.3 Research questions**

1. How can private transaction costs be conceptualised in contracts for environmental goods?
2. What is the Hungarian Water Management Program and how is it organised?
3. What are the main transaction costs in the application to the individual and the collective Water Management Program?
4. What are the barriers and incentives to collective applications?

## **1.4 Theoretical framework**

Contracts for environmental goods facilitate the transaction of environmental goods between the farmer, as seller, and the government, as buyer. Given that transaction costs arise during

this transaction of environmental goods, the theory of Transaction Cost Economics by North (1992) seems to be the appropriate theoretical framework. Hence, transaction costs are defined as costs of (1) contact, information costs and decision-making costs; (2) contract, application costs/negotiations costs; and (3) control, monitoring costs and enforcement costs.

### **1.5 Methodology**

This research consists of a case study of the WMP program in Hungary. Research questions [1] and [2] have been answered by means of a literature study. Literature on transaction costs related to contracts for environmental goods (e.g. Falconer, 2000; Hobbs, 1997; Mettepenningen et al., 2009; Royer, 2011) has been reviewed to create a clear context for investigating transaction costs in this case study. In addition, studies on collective action for the provision of environmental goods have been analysed (e.g. Falconer, 2002; Ostrom, 1990). Main keywords that were used in the literature search are 'transaction costs', 'payment for environmental services', 'environmental good' and 'collective action'. Besides, a literature study of the WMP program has been conducted.

Research questions [3], [4] and [5] have been answered by means of an analysis of primary data. In co-operation with the Hungarian Agricultural Chamber (in Hungarian abbreviated to NAK), an online survey was distributed to agricultural advisors who are affiliated with NAK's network. These agricultural advisors advise farmers on various (policy) issues and support farmers in completing applications, and are expected to have a good understanding of the application procedure of the WMP program. Focus points of the survey were *experiences with the individual application*, *experiences with the collective application*, *reasons for non-participation* and *incentives for participation*. Through the collaboration with NAK, information has been collected about both farmers who applied for the call and farmers who chose not to make a claim. The analysis of the data uses mainly descriptive statistics.

### **1.6 Content overview**

The thesis is organised as follows. After the introduction in Chapter 1, Chapter 2 develops a clear concept of transaction costs related to contracts for environmental goods. Next, Chapter 3 introduces the Hungarian Water Management Program and the method used, followed by the results of the research in Chapter 4. The final chapter, Chapter 5, will contain the discussion and the overall conclusions.

## 2. Theoretical framework

The aim of this chapter is to develop a clear concept of transaction costs associated with contracts for environmental goods. Section 2.1 defines the transaction of relevance in environmental contracts and explains how transaction costs in these contracts can be approached from the theory of Transaction Cost Economics. Section 2.2 reviews the transaction costs associated with collective action for environmental goods, followed by a conclusion in section 2.3.

### 2.1 Definition of transaction costs in the context of contracts for environmental goods

Since the 1990s, contracts with payments for environmental goods have been one of the incentive-based policy instruments of agricultural policy in various countries to reduce pressure on the environment (European Commission, 2017; OECD, 2010; OECD, 2013). They provide financial support for mitigating the environmental impact of agriculture, supporting biodiversity, enhancing the landscape and improving the quality of water, air and soil. Hence, from a Transaction Cost Economics point of view, these environmental contracts facilitate the transaction of environmental goods between the farmer as seller and society, represented by the government, as buyer (Mettepenningen & Van Huylbroeck, 2009; Mettepenningen et al., 2009;). This transaction should resolve the market failure of a missing market for environmental goods and therefore deal with environmental challenges (Coase, 1992; Muradian, 2013).

The theory of Transaction Cost Economics is mainly focused on the (economic) efficiency of the transaction, i.e. minimizing the transaction costs (Muradian, 2013). Transaction costs in environmental contracting occur in many forms, and are borne by both private and public actors (Mettepenningen et al., 2009; Peterson et al., 2015). In this research the focus is on the investigation of transaction costs of private actors, i.e. farmers, in contracts for environmental goods. Transaction costs are defined by North (1992) as the costs of (1) *contact*, finding relevant information and partners; (2) *contract*, negotiating an agreement; and (3) *control*, monitoring and enforcing the contract. This broad categorisation provides an insight into the different types of transaction costs and will be further elaborated in the following paragraphs.

In the contact stage, *information costs* arise ex ante to the transaction, and include the costs of obtaining program information and searching for suitable partners (Hobbs, 1997). The farmer

can gather information from program brochures, agri-environmental studies, (agricultural) advisors, and by attending information meetings. In addition, the farmer may develop a strategy in which various options (i.e., alternatives for agri-environmental management) are weighed to reach a decision. Mettepenningen et al. (2009) refer to the latter as *decision-making costs*.

Next, the contract stage involves the costs of negotiating the terms of the transaction and formally drawing up the contract, also known as *negotiation costs* (Hobbs, 1997). However, in case of environmental contracts, the terms of the agreement set by the government are stringent, i.e. 'take it or leave it' contracts, and no real negotiation procedure is applicable (Mettepenningen et al., 2009; Royer, 2011). Therefore, the term *application costs* is used rather than negotiation costs, which covers the costs associated with applying to the program (e.g. to fulfill preliminary requirements, administrative costs) and the costs of reviewing and signing the contract (Mettepenningen et al., 2009; Splinter & Dries, 2022).

Finally, the control stage consists of *monitoring costs* and *enforcement costs* that occur ex post to the transaction (Hobbs, 1997). It includes costs incurred by the farmer as a result of monitoring and enforcement tasks imposed by the government (Mettepenningen et al., 2009; Royer, 2011). The farmer may be required to report to the funding agency on the progress of project related activities and to carry out administrative checks to demonstrate compliance with the contractual obligations. In addition, the costs related to conflict resolution are also covered in the enforcement costs (Splinter & Dries, 2022).

## **2.2 Transaction costs in collective action for environmental goods**

The development of collective environmental contracts to support the conservation and protection of biodiversity, landscapes and water, air and soil quality by groups of farmers has been discussed in several studies (e.g. Falconer, 2000; Franks, 2011; Kleijn et al., 2011; MacFarlane, 1998; Westerink et al., 2015). These contracts between the government and a group of farmers (rather than an individual farmer) can be especially useful when environmental challenges exceed the farmland boundaries and extend to neighbouring land, and are referred to here as *collective action for environmental goods* (OECD, 2013). For the success of collective action for environmental goods, Franks (2011) describes two pre-conditions that relate to transaction costs: (1) neighbouring farmers must be willing to co-operate and (2) the contracts must be (economically) efficient.

### 2.2.1 Willingness to co-operate in collective action

Co-operation of farmers to provide environmental goods is driven by the need to counter the environmental consequences on farmland (Falconer, 2002). Participation can be for non-economic reasons and farmers may co-operate based on a shared interest (Falconer, 2002; Davies et al., 2004; OECD, 2013). For example, farmers may have a shared interest in preserving bird biodiversity around the farm. Intrinsic motivation, rather than economic motives, can thus be an important reason to co-operate in collective action (Falconer, 2002). In addition, the willingness to co-operate can also be driven by economic reasons, for instance by improving land quality through sustainable irrigation and thereby increasing production yields. Davies et al. (2004) emphasise that the existence of trust and shared interests between farmers could reduce transaction costs in *the contact stage* and *the contract stage*.

However, there may also be challenges regarding participation that need to be addressed in collective action. For example, there could be a potential unwillingness to work with neighbours (e.g. individualism, unawareness) or there is sceptical behaviour towards collective action (e.g. not accepting the evidence) (OECD, 2013). Consequently, collective action may not be feasible or the search for suitable partners could take a lot of time, which would increase the transaction costs in *the contact stage*. Trust in neighbouring farmers can be an important prerequisite for successful co-operation (Ostrom, 2010). Several studies point to the free rider problem in collective action, where farmers are reluctant to act because they can benefit from the activities of other members without putting in effort themselves. This in turn will affect trust within the community (OECD, 2013). There may also be other (personal) reasons, for instance based on previous collaborative experience, why there is a lack of trust. Both the free rider problem and the lack of mutual trust can lead to an increase of the transaction costs in *the control stage*.

### 2.2.2 Efficiency of contracts in collective action

Collective action for environmental goods has geographical and ecological scale merits and empowers individual farmers to address issues that exceed their farmland (OECD, 2013). Moreover, collective action contracts may operate more efficiently than individual contracts because of economies of scale (Falconer, 2000). For example, information gathering may be divided among farmers and expertise could be pooled to provide the environmental good (Ostrom, 1990; Polman et al., 2010). In addition, there may be scope for economies of scale in relation to the development of the strategy, where farmers will develop and execute (approximately) the same strategy within the community (Falconer, 2002). The increased

efficiency of these activities can result in a decrease of the transaction costs in *the contact stage*. Furthermore, since there is only one set of negotiations with the government, rather than negotiations with each individual farmer, transaction costs can also decrease in *the contract stage* (Boonstra, et al., 2021). Finally, the performance of monitoring and enforcement tasks can lead to a reduction in transaction costs in the *control stage*, as a result of lower information asymmetries and more social control in the community (Falconer, 2002).

However, collective action in environmental goods may also lead to additional transaction costs, for instance, because of the increased role of the community in monitoring tasks. Moreover, several studies suggest that the burden of transaction costs in collective environmental contracts may have shifted from the public actor to the private actor (e.g. Jongeneel & Polman, 2019; Falconer, 2002; Splinter & Dries, 2022). This would mean that collective action contracts are less economically efficient for farmers.

### **2.3 Conclusion**

In conclusion, this chapter examined the concept of transaction costs in the context of contracts for environmental goods. Environmental contracts facilitate the transaction of environmental goods between the farmer and the government. However, this transaction involves transaction costs that are important to identify. The conceptualisation of transaction costs based on the definition of North (1992) is summarised in table 2.1.

In addition, several studies promote the development of collective action for the provision of environmental goods. There are two preconditions for the success of collective action for environmental goods: (1) neighbouring farmers must be willing to co-operate and (2) the contracts must be (economically) efficient. Behavioural aspects are of high importance and trust in neighbouring farmers is needed to promote co-operation. Besides, economies of scale in the contact, contract and control stage can result in a reduction of transaction costs. However, several studies suggest that the burden of transaction costs in collective environmental contracts may have shifted from the government to the farmers, making the contracts in collective action less economically efficient. Chapter 3 introduces the Hungarian case-study, followed by a discussion of the method to investigate the transaction costs in the Hungarian WMP program.

Table 2.1 Transaction costs in contracts for environmental goods

<b>Transaction stage</b>	<b>Transaction costs</b>	<b>Examples</b>
Contact stage	Information costs	<ul style="list-style-type: none"> <li>▪ Information gathering from program brochures, agri-environmental studies, (farm) advisors and by attending information meetings</li> </ul>
	Decision-making costs	<ul style="list-style-type: none"> <li>▪ Developing a strategy</li> </ul>
Contract stage	Application/negotiation costs	<ul style="list-style-type: none"> <li>▪ Applying to the program</li> <li>▪ Reviewing and signing the contract</li> </ul>
Control stage	Monitoring costs	<ul style="list-style-type: none"> <li>▪ Completing monitoring tasks</li> <li>▪ Reporting to the paying agency</li> </ul>
	Enforcement costs	<ul style="list-style-type: none"> <li>▪ Completing enforcement tasks</li> <li>▪ Carrying out administrative checks</li> <li>▪ Conflict resolution</li> </ul>

Source: Hobbs (1997), Mettepenningen et al. (2009), North (1992), Royer (2011) and Splinter & Dries (2022)

### 3. Methodology

The aim of this chapter is to elaborate on the methodology that will be used to investigate the private transaction costs in the Hungarian case study. Section 3.1 introduces the case-study of this research, the Hungarian Water Management Program. Section 3.2 discusses the method for investigating the transaction costs in the Water Management Program, followed by a conclusion in section 3.3.

#### 3.1 Description of the Hungarian Water Management Program

Support for rural development policy is the 2<sup>nd</sup> Pillar of the European Common Agricultural Policy (CAP). It aims to reduce rural poverty, support economic development and strengthen the sustainability and greening of agriculture, inter alia by providing contracts for environmental goods (European Commission, 2022; Jongeneel & Polman, 2019). Based on six rural development priorities set by the EU, Member States can develop more specific targets that address national/regional challenges. The priorities and Hungary's related targets are summarised in Table 3.1.

Table 3.1 Hungary's rural development targets

EU's priorities	Hungary's targets
1 Knowledge transfer and innovation in agriculture, forestry and rural areas	1A: Fostering innovation, co-operation, knowledge base 1B: Strengthening links (with research etc.) 1C: Training
2 Farm viability, competitiveness and sustainable forestry	2A: Economic performance, restructuring & modernisation 2B: Generational renewal
3 Food chain organisation, including processing and marketing of agricultural products, animal welfare and risk management	3A: Improving competitiveness of primary producers 3B: Farm risk prevention and management
4 Restoring, preserving and enhancing ecosystems related to agriculture and forestry	4A: Biodiversity 4B: Water management 4C: Soil erosion and management



5	Resource efficiency and shift to low carbon and climate resilience economy in agriculture, food and forestry sectors	5A: Water efficiency
		5B: Energy efficiency
		5C: Renewable energy
		5D: Reducing GHG and NH3
		5E: Carbon conservation and sequestration
6	Social inclusion, poverty reduction and economic development in rural areas	6A: Diversification, creation of small enterprises and jobs
		6B: Fostering local development

Source: EC (2022)

In support of Target 2A, Target 2B, Target 5A and Target 5B, i.e. more efficient water management in agriculture, the Hungarian Water Management Program (WMP) has been established in 2016 by the government. The WMP program consists of investment contracts for partially funding the sustainable development of water management (EFFECT, n.d.). In the call for *Development of the Agricultural Water Management Sector (VP2-4.1.1-16)*, farmers and groups of farmers could submit an application for investment support for building new irrigation facilities or improving the existing irrigation facilities (EFFECT, 2022a). In return, farmers that are funded are expected to make their irrigation practices more sustainable and to combat nutrient leaching (EFFECT, n.d.). This call was scheduled to be closed in 14 June 2021, but was extended until 30 June 2023.

In accordance with EU guidelines, the contracts for environmental goods are entered voluntary and have a specified duration (European Commission, 2017; EFFECT, 2022a). The duration of the projects has a maximum of 24 months (Miskó et al., 2019). If farmers decide to invest in sustainable water management, they have to obtain a water-use license for irrigation from the competent public authority. Hence, in the case of implementing a new irrigation system, obtaining the water license for irrigation is the first step in the irrigation development process.

The total budget of the WMP program is 99.57 billion HUF, which corresponds to approximately 260 million EUR (EFFECT, 2023). The amount of support that can be applied for by farmers is maximum 1 billion HUF in the case of individual projects and maximum 2 billion HUF in case of collective projects. Until the end of 2020, 951 applications were submitted of which 407 contracts were supported (EFFECT, 2020). With the extension of the WMP program, a total of 1317 applications were submitted by March 2023 (EFFECT, 2023).

However, almost only individual applications have been submitted and accepted for this call (EFFECT, 2022a). Until 2020, only 46 applications have been granted for a collective project (EFFECT, 2020). To facilitate farmers' collective applications in the future, a new call (*VP5-16.5.2-21 Support of the Cooperation of Irrigation Communities*) has been made available for irrigation communities since March 2020. The aim of this new call is to encourage voluntary co-operation and to support farmers in effectively organising their irrigation management. Jointly creating and operating the infrastructure needed for irrigation can result in more efficient use of available water resources and higher economic returns. An irrigation community can be founded by at least two farmers.

### **3.2 Method**

Investigating transaction costs in contracts for environmental goods can be difficult. Reasons for this are that transaction costs may need to be constructed on the basis of indirect observations, may vary substantially among different actors and transactions may not even occur when transaction costs are too high (Mettepenningen & Van Huylenbroeck, 2009; Splinter & Dries, 2022). This research follows the approach of several other studies, and data collection on private transaction costs in the WMP program was conducted through a survey (e.g. Falconer, 2000; Mettepenningen et al., 2009; Royer, 2011).

In co-operation with NAK, the Hungarian Agricultural Chamber, the survey was distributed online in Hungarian to agricultural advisors who are affiliated with the NAK network. These agricultural advisors advise farmers on various (policy) issues and support farmers in completing applications, such as the WMP application. Therefore, it can be assumed that the agricultural advisors have a good understanding of the WMP application procedure. Besides, by surveying agricultural advisors, information can also be collected from applications that have not been successful. Furthermore, some agricultural advisors are also farmers themselves. If this is the case, they were asked if they could complete the survey from their perspective as a farmer rather than as an advisor.

Using the theoretical framework described in Chapter 2, respondents were questioned on the distribution of transaction costs across the different transaction stages. Experiences regarding the individual application and collective applications for the WMP program were asked, including a motivation for choices made. Answer options were based on the literature (e.g., Falconer (2000), Falconer (2002), Mettepenningen et al. (2009) and Splinter & Dries (2022)).

Next, respondents were asked about their familiarity and experience with the recently established irrigation communities. Background information was gathered relating to the respondents' characteristics, such as educational degree, gender and region in which they were active.

Mettepenningen et al. (2009) point out that measuring the monetary value of transaction costs is difficult. Therefore, it was opted to take difficulty and time involved as a proxy for transaction costs. Motivated by the research of Falconer (2000), difficulty in the different transaction stages was measured using a five-point Likert scale, allowing qualitative values to be converted to quantitative data. For example, 'Not difficult at all' responses scored 1, 'not difficult' responses scored 2, 'indifferent/neutral' responses scored 3, 'difficult' responses scored 4 and 'very difficult' responses scored 5. Additionally, respondents were asked in an open question to estimate the time spent (in hours) on the whole application procedure. For the complete survey in English, see annex 1.

The analysis of the data collection uses mainly descriptive statistics. The answers to multiple choice questions are categorised and coded. In this way, answers can be presented clearly through frequencies and percentages, and a comparison can be made between the answers of farmers and answers by agricultural advisors. In addition to this, the averages of the Likert scales are presented. The analysis is performed with Excel and SPSS.

### **3.3 Conclusion**

This chapter discussed the methodology for investigating the private transaction costs in the WMP program. The WMP program promotes more efficient water management in agriculture and consists of investment contracts for partially funding the sustainable development of irrigation. The contract for environmental goods involves both an individual application procedure and a collective application procedure. However, almost only individual applications have been submitted and accepted for this program. To promote farmers' collective applications in the future, irrigation communities have been established from March 2020.

For investigating the transaction costs in the WMP program, the data collection was conducted through a survey. The survey was distributed to agricultural advisors. Since some agricultural advisors are also farmers themselves, they were asked to complete the survey from their perspective as a farmer rather than an advisor. Respondents were questioned on their

experiences with activities in the different transaction stages for the individual application, collective application and the application for support for irrigation communities. Based on a five-point Likert scale, respondents had to indicate the difficulty of certain activities. In addition, in an open question, respondents were asked to estimate time spend on the entire application procedure. Next, Chapter 4 discusses the results of the survey.

## 4. Results

The aim of this chapter is to discuss the results of the research. Section 4.1 briefly describes the sample on the basis of the respondents' characteristics. Section 4.2 presents the results of the analysis of the survey data, followed by a conclusion in section 4.3.

### 4.1 Description of the sample

Table 4.1 shows descriptive statistics of the respondents in the survey. In total, 219 agricultural advisors responded to the survey. However, many of them had no experience with the WMP program, and therefore did not complete the survey. As a result, only 46 respondents completed all relevant parts of the survey. As mentioned in Chapter 3, some agricultural advisors are also farmers themselves. They completed the survey from their perspective as a farmer, and will be referred to as *farmer* throughout this research.

Table 4.1 shows that the majority of respondents have obtained a degree of higher education in agriculture. Note that the questionnaire only asked for the degree in higher education because this is a requirement to be an agricultural advisor. Moreover, most applications for the WMP program were submitted by farmers in the (south) east of Hungary (EFFECT, 2022b). This corresponds with the sample in this research, as most respondents practice their profession in the North Great Plain and South Great Plain, i.e. eastern Hungary.

Table 4.1 Descriptive statistics of the sample

	Farmer ( <i>N</i> = 15)		Agricultural advisor ( <i>N</i> = 31)	
	Frequency	Percentage	Frequency	Percentage
Birth year				
▪ 1940-59	2	13.3%	8	25.8%
▪ 1960-79	9	60.0%	15	48.3%
▪ 1980-99	4	26.7%	8	25.8%
Gender <sup>a</sup>				
▪ Female	4	26.7%	10	32.3%
▪ Male	11	73.3%	20	64.5%

Higher education degree <sup>b</sup>				
▪ Agriculture	10	55.6%	19	50.0%
▪ Agricultural economics	3	16.7%	3	7.9%
▪ Agricultural Water Management	1	5.6%	3	7.9%
▪ Water Management	-	-	1	2.6%
▪ Another field	4	22.2%	12	31.6%
Years in the profession				
▪ 0-9 years	1	6.7%	16	51.6%
▪ 10-19 years	7	46.7%	8	25.8%
▪ 20-29 years	4	26.7%	6	19.4%
▪ > 30 years	3	20.0%	1	3.2%
Region <sup>b</sup>				
▪ Central Hungary	1	5.6%	2	4.0%
▪ Northern Hungary	2	11.1%	6	12.0%
▪ Northern Great Plain	8	44.4%	22	44.0%
▪ Southern Great Plain	5	27.8%	12	24.0%
▪ Central Transdanubia	-	-	4	8.0%
▪ West Transdanubia	2	11.1%	2	4.0%
▪ South Transdanubia	-	-	2	4.0%
Crops <sup>b</sup>				
▪ Grain	12	28.6%	-	-
▪ Corn	11	26.2%	-	-
▪ Oilseeds	10	23.8%	-	-
▪ Vegetables	4	9.5%	-	-
▪ Fruits	2	4.8%	-	-
▪ Other	3	7.1%	-	-

Source: based on own data collection

<sup>a</sup> Respondents had the option to answer 'prefer not to say'

<sup>b</sup> Respondents had the option to provide multiple answers

## 4.2 Survey results

In what follows, the results will be presented on private transaction costs in the individual application, the collective application and the application for support for irrigation communities. In addition, results on incentives and barriers to collective applications, and other observations regarding the WMP program will be given. It is important to note that the sample size may differ per observation. Therefore, for each result, the N size is reported. Additionally, note that standard deviation is abbreviated to s.d.

### 4.2.1 Results on private transaction costs

As discussed in Chapter 3, the proxy chosen to investigate private transaction costs is the difficulty of activities in the application process and an estimate of the time spent on the application process. Tables 4.2 – 4.4 summarise the difficulty scores related to activities in the different transaction stages, based on the five-point Likert scale. It can be noticed that all activities in the WMP application procedure have an average score above 3. This may mean that the application procedure is perceived as difficult. Looking at the results for the individual application, the farmers generally assessed the application procedure more difficult (mean score: 4.00, s.d.: 0.93) than the agricultural advisors (mean score: 3.79, s.d.: 1.11). The collective application was also perceived as more difficult by farmers (mean score: 4.33, s.d.: 1.16) than by the agricultural advisors (mean score: 3.50, s.d.: 1.20). Besides, it may be noted that farmers generally experienced the collective procedure as more difficult, while agricultural advisors generally considered the individual application to be more difficult.

In addition, respondents were asked to identify the most time-consuming activity in the WMP application procedure. Table 4.5 summarises these results. For the individual application, activities that took the most time are finding relevant information and coming up with a management plan, both identified by 33.3% of the respondents. Reviewing the contract and fulfilling the requirements of the contract seem less time consuming, as identified by 2.6% and 23.1% of respondents, respectively. For the collective application, a slightly different distribution of answers can be observed. Coming up with a management plan was identified as most time-consuming activity by 36.4% of the respondents. This was followed by finding relevant information (18.2%), reviewing the contract (18.2%) and fulfilling the requirements of the contract (9.1%)

Table 4.2 Likert scores for responses to difficulty of the individual application in the different transaction stages <sup>a</sup>

	General application procedure	Finding relevant program information	Coming up with a management plan	Reviewing the contract	Fulfil requirements of the contract
Farmers	4.00 ( <i>N</i> =8)	3.50 ( <i>N</i> =8)	3.75 ( <i>N</i> =8)	3.25 ( <i>N</i> =8)	3.63 ( <i>N</i> =8)
Agricultural advisor	3.79 ( <i>N</i> =29)	3.37 ( <i>N</i> =30)	3.40 ( <i>N</i> =30)	3.15 ( <i>N</i> =27)	3.68 ( <i>N</i> =28)
Average	3.84 ( <i>N</i> =37)	3.39 ( <i>N</i> =38)	3.47 ( <i>N</i> =38)	3.17 ( <i>N</i> =35)	3.67 ( <i>N</i> =36)

Source: based on own data collection

<sup>a</sup> A five-point Likert scale is used, where 1 is not difficult at all and 5 is very difficult.

Table 4.3 Likert scores for responses to difficulty of the collective application in the different transaction stages <sup>a</sup>

	General application procedure	Finding relevant program information	Coming up with a management plan	Reviewing the contract	Fulfil requirements of the contract
Farmers	4.33 ( <i>N</i> =3)	4.67 ( <i>N</i> =3)	4.00 ( <i>N</i> =3)	4.00 ( <i>N</i> =3)	3.67 ( <i>N</i> =3)
Agricultural advisor	3.50 ( <i>N</i> =8)	3.50 ( <i>N</i> =8)	3.25 ( <i>N</i> =8)	3.63 ( <i>N</i> =8)	3.38 ( <i>N</i> =8)
Average	3.73 ( <i>N</i> =11)	3.82 ( <i>N</i> =11)	3.45 ( <i>N</i> =11)	3.73 ( <i>N</i> =11)	3.45 ( <i>N</i> =11)

Source: based on own data collection

<sup>a</sup> A five-point Likert scale is used, where 1 is not difficult at all and 5 is very difficult.



Table 4.4 Likert scores for responses to difficulty of the support for irrigation communities application in the different transaction stages <sup>a</sup>

	General application procedure	Finding relevant program information	Coming up with a management plan	Reviewing the contract	Fulfil requirements of the contract
Farmers	4.00 (N=2)	4.50 (N=2)	3.00 (N=2)	3.00 (N=2)	3.00 (N=2)
Agricultural advisor	4.00 (N=8)	3.75 (N=8)	3.75 (N=8)	3.38 (N=8)	3.63 (N=8)
Average	4.00 (N=10)	3.90 (N=10)	3.60 (N=10)	3.30 (N=10)	3.50 (N=10)

Source: based on own data collection

<sup>a</sup> A five-point Likert scale is used, where 1 is not difficult at all and 5 is very difficult.

Table 4.5 Most time-consuming transaction activity

	Individual application N=39		Collective application N=11	
	Frequency	Percentage	Frequency	Percentage
Finding relevant information	13	28.3%	2	18.2%
Coming up with a management plan	13	28.3%	4	36.4%
Reviewing the contract	1	2.2%	2	18.2%
Fulfil requirements of the contract	9	19.6%	1	9.1%
Other activity	3	6.5%	2	18.2%

Source: based on own data collection

Table 4.6 Time spent on the entire application procedure (in hours)

	Individual application			Collective application			Support irrigation communities		
	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
Farmers	30	280	105 ( <i>N=8</i> )	50	100	70 ( <i>N=3</i> )	70	100	85 ( <i>N=2</i> )
Agricultural advisor	4	300	68 ( <i>N=31</i> )	2	240	88 ( <i>N=8</i> )	3	200	59 ( <i>N=8</i> )
Average	4	300	76 ( <i>N=39</i> )	2	240	83 ( <i>N=11</i> )	3	200	64 ( <i>N=10</i> )

Source: based on own data collection

Table 4.6 presents the results of the time spent on the entire application procedure. It shows that it takes an average of 64 to 83 hours to submit an application for the WMP program. In addition, applying collectively for the WMP program took on average more time, 83 hours (s.d.: 62.0), than applying individually, 76 hours (s.d.: 70.6). The high standard deviation and the substantial difference between the minimum and maximum responses, however, indicates that there was high variability in answers.

#### *4.2.2 Results on incentives and barriers for the collective application*

Figures from the WMP program show that farmers appear to be less interested in a collective application than an individual application (EFFECT, 2022a). To gain more insight, agricultural advisors and non-participating farmers were asked to give the reasons for not participating in the collective application. A summary of the responses is given in table 4.7. In particular, it may be noticed that almost half of the respondents (21 out of 43) give the lack of trust in the farming community as a reason for non-participation. Moreover, the unwillingness of neighbouring farmers to participate (16.0%) and the too complex application procedure (15.1%) are also often mentioned reasons.

Next to the reasons for non-participation, respondents were asked under what circumstances they would be willing to apply for the collective application. Table 4.8 shows that more than half of the respondents (27 out of 43) indicated that one of the incentives would be a greater willingness of neighbouring farmers to collaborate. Besides, a faster application procedure (15.3%) and more trust in the farmer community (15.3%) are often mentioned incentives to encourage farmers in applying collectively. It may be observed that these incentives roughly correspond to the above-mentioned barriers to participation in the collective application.

Table 4.7 Reasons for non-participation in the collective application <sup>a</sup>

	Farmer		Agricultural advisor		Average	
	<i>N=12</i>		<i>N=31</i>		<i>N=43</i>	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Not aware of the possibility to apply collectively	1	3.4%	-	-	1	0.9%
Collective application procedure is too complex	6	20.7%	10	13.0%	16	15.1%
Collective application procedure is too time-consuming	4	13.8%	6	7.8%	10	9.4%
Subsidy did not sufficiently consider additional costs	4	13.8%	8	10.4%	12	11.3%
Unwillingness of neighbouring farmers to participate	3	10.3%	14	18.2%	17	16.0%
Lack of trust in the farmer community	6	20.7%	15	19.5%	21	19.8%
Communication in the farmer community is not open enough	3	10.3%	10	13.0%	13	12.3%
Strong competition in the farmer community	2	6.9%	8	10.4%	10	9.4%
Not known <sup>b</sup>	-	-	3	3.9%	3	2.8%
Other	-	-	3	3.9%	3	2.8%

Source: based on own data collection

<sup>a</sup> Respondents had the option to provide multiple answers

<sup>b</sup> The answer option 'not known' is only shown in the agricultural advisor survey

Table 4.8 Incentives for participation in the collective application <sup>a</sup>

	Farmer <i>N=12</i>		Agricultural advisor <i>N=31</i>		Average <i>N=43</i>	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Higher aid envelope	4	11.1%	4	4.9%	8	6.8%
Higher aid intensities	4	11.1%	10	12.2%	14	11.9%
More favourable lending conditions	5	13.9%	6	7.3%	11	9.3%
Faster application procedure	5	13.9%	13	15.9%	18	15.3%
More professional support during the application procedure	2	5.6%	6	7.3%	8	6.8%
Greater willingness of neighbouring farmers to participate	7	19.4%	20	24.4%	27	22.9%
More trust within the farmer community	5	13.9%	13	15.9%	18	15.3%
More clear communication in the farmer community	3	8.3%	5	6.1%	8	6.8%
Not known	-	-	3	3.7%	3	2.5%
Other	1	2.8%	2	2.4%	3	2.5%

Source: based on own data collection

<sup>a</sup> Respondents had the option to provide multiple answers

### 4.2.3 Results on other observations regarding the WMP program

Besides measuring the transaction costs in the different transaction activities, it is also important to investigate whether transactions may not take place because of too high transaction costs. In the survey, respondents were asked about farmers' reasons for non-participation in the WMP program and under what circumstances they would apply for the program. Respondents had the option to give multiple answers. A summary of the responses is given in table 4.9 and table 4.10. It may be stated that obtaining the water-use license is a major hurdle to apply for the WMP program. Table 4.9 shows that, out of the total of 22 respondents, 19 respondents indicate that the water-use license procedure is too complex and 14 respondents indicate that the water-use license procedure is too expensive. In addition, in table 4.10, often mentioned reasons for participation are the facilitation of the water-use licensing procedure (20.3%), a less expensive water-use licensing procedure (19.2%) and a faster application procedure (18.7%). Table 4.10 also shows that several farmers (7.1%) are more interested in applying for the WMP program when a larger part of the investment is subsidised. The WMP program currently finances up to 50% of the total project investment (EFFEKT, 2020).

Table 4.9 Reasons for non-participation in the WMP program <sup>a b</sup>

<i>N</i> =22 <sup>c</sup>	Frequency	Percentage
Application procedure is too complex	12	13.0%
Application procedure is too time-consuming	8	8.7%
Investment requirement is too costly	9	9.8%
Less expensive water license procedure	14	15.2%
Less complex water license procedure	19	20.7%
Intensity of aid is low compared to total investment	10	10.9%
Concerns regarding future changes in rules	9	9.8%
Location is not suitable for irrigation	9	9.8%
Not known	1	1.1%
Other	1	1.1%

Source: based on own data collection

<sup>a</sup> Respondents had the option to provide multiple answers

<sup>b</sup> No figures are given for the answer option 'they do not need irrigation on their farm' since it has not been filled in by any of the respondents

<sup>c</sup> This question has been filled in by agricultural advisors

Table 4.10 Incentives for participation in the WMP program <sup>a</sup>

<i>N</i> =57 <sup>b</sup>	Frequency	Percentage
Higher aid envelope	14	7.7%
Higher aid intensities	13	7.1%
Higher support intensity	22	12.1%
More favourable lending conditions	12	6.6%
Faster application procedure	34	18.7%
Less expensive water license procedure	35	19.2%
Less complex water license procedure	43	23.6%
Not known	4	2.2%
Other	5	2.7%

Source: based on own data collection

<sup>a</sup> Respondents had the option to provide multiple answers

<sup>b</sup> This question has been filled in by farmers. The *N* is higher than described in section 4.1, since experience with the WMP program was asked next and many had no experience from both the farmer as agricultural advisor perspective. Therefore, they did not complete the entire survey.

Next to non-participation in the WMP program, there are also farmers who did apply successfully for the investment contract, but eventually did not use the allocated funds. Respondents (*N*=8) were asked to indicate the reasons of farmers for not using these funds. The answers to this question varied widely. In some cases, investments in sustainable irrigation were no longer possible due to inflation or farmers had concerns regarding future operating costs. These answers have been indicated in respectively 30.0% and 20.0% of the total number of responses (*N*=20).

Finally, the survey briefly addressed the recently established irrigation communities. Table 4.4 already showed the Likert scores of responses related to the difficulty of the application procedure for the program to support irrigation communities. It may be observed that the application procedure is generally perceived as difficult (mean score: 4.00, s.d.: 0.82). In particular, the activity to find relevant program information is considered as difficult by respondents (mean score: 3.90, s.d.: 0.738). Next, the survey focussed on the helpfulness of the program to support irrigation communities. Based on a five-point Likert scale, where 1 is not helpful at all and 5 is very helpful, respondents had to indicate to what extent the support program for irrigation communities helps farmers to apply collectively. Farmers (*N*=2) seem to find the program helpful for collective applications in the WMP program (mean score: 4.0, s.d.:

0.00). By contrast, agricultural advisors ( $N=8$ ) were indifferent about the helpfulness of the support program (mean score: 3.0, s.d.: 1.51).

### **4.3 Conclusion**

This chapter discussed the results of the research regarding the Hungarian WMP program. The proxy chosen to investigate private transaction costs is the difficulty of activities in the application process and an estimate of the time spent on the application process. Difficulty was measured using a Likert score. It may be observed that all activities in the WMP application procedure have an average Likert score above 3. This may mean that the application procedure is perceived as difficult. In addition, the most time-consuming activities in the application procedure were identified. Activities that took the most time in both the individual application and the collective application are finding relevant information and coming up with a management plan. In total, applying for the WMP program is taking on average 64 to 83 hours.

Next, the results show that often mentioned reasons for non-participation in the collective application are the lack of trust in other farmers in the community, the unwillingness of neighbouring farmers to participate and the too complex application procedure. Subsequently, a greater willingness of neighbouring farmers to collaborate, a faster application procedure and more trust in the farmer community were often indicated as circumstances under which a farmer might be interested in a collective application. Finally, it may be noted that the water-use license procedure is an obstacle for farmers to apply for the WMP program in general.



## 5. Discussion and conclusions

The aim of this chapter is to interpret the meaning of the results. Section 5.1 reviews validity, interprets results, discusses limitations and provides suggestions for future research. Section 5.2 presents the overall conclusions from this research.

### 5.1 Discussion

This research aimed to investigate the role of private transaction costs in the application for the Water Management Program in Hungary. The investment contract offered to farmers in the WMP program is also referred to as a contract for environmental goods. Farmers funded are expected to make their irrigation practices more sustainable and to combat nutrient leaching. A survey has been conducted in order to investigate the private transaction costs, as defined by North (1992), in the WMP program. This survey was distributed among agricultural advisors affiliated with the NAK network, who advise farmers on various (policy) issues and support farmers in completing applications. Besides, some agricultural advisors are also farmers and have completed the survey from this perspective. However, it may be noted that the sample size of this research is rather small. The survey has been filled in by more than 200 agricultural advisors from NAK, but many respondents indicated in the introductory questions that they do not have the ability to extract surface water for irrigation purposes in their area or do not have experience with the WMP program. Therefore, only 46 respondents completed the entire survey. This means that the majority of the advisors are not involved in supporting farmers for the WMP program. Nevertheless, the results can give an indication of whether transaction costs are relevant and for which transaction activities these costs occur most.

The findings show that all transaction activities included in the WMP application procedure are perceived as neutral to difficult. Subsequently, one of the reasons for non-participation is that the application procedure of the WMP program was perceived to be too complex. This could confirm that the transaction activities indeed involve transaction costs. However, the results per transaction activity do not deviate much from each other and the findings differ between the individual and collective application. Therefore, it is not possible to define the most difficult transaction activity. Results regarding the most time-consuming activity show clearer findings. In the individual application, both *finding relevant information* and *coming up with a management plan* were perceived as most time-consuming. In the collective application the

activity *coming up with a management plan* in particular was indicated as most time-consuming. These activities both take place in the contact stage. Moreover, the results show that applying for the WMP program takes on average 64 to 83 hours. This implies that the WMP program does indeed involve private transaction costs. However, comparing these results with existing literature on contracts with payments for environmental goods is not applicable due to the specific case-study and qualitative character of this research.

It is noteworthy that the most mentioned reasons for non-participation relate to obtaining the required water-use license. It seems that this is perceived as a complex and time-consuming procedure, making it a major barrier to apply for the WMP program. Moreover, often mentioned reasons for participation are facilitating the water use permit procedure. These outcomes suggest that policy makers should take a closer look at this procedure and whether it can be simplified. In a broader context, this may mean that the surrounding regulatory framework may hinder implementation of contracts for environmental goods.

The findings on the barriers and incentives for the collective WMP application show the importance of trust for the willingness to participate. Nearly half of the respondents indicated that lack of trust was one of the reasons for not collectively applying for the WMP programme. In addition, more than half of the respondents indicated that one of the incentives to apply collectively would be a greater willingness of neighboring farmers to co-operate. This is in line with the theory described in Chapter 2, which stated that a prerequisite for (successful) collective action is the willingness to co-operate, including trust in neighboring farmers (Franks, 2011). The recently established irrigation communities may offer a solution to these problems, since farmers perceive it as helpful.

Some critical notes could be placed to the method used. First, transaction costs are difficult to measure (Mettepenningen & Van Huylenbroeck, 2009; Mettepenningen et al., 2009; Splinter & Dries, 2022). In this research, transaction costs are mainly defined by identifying the degree of difficulty, without looking to quantify costs using administrative and operational costs, and labour costs. However, higher difficulty level does not necessarily lead to high transaction costs. Second, the number of respondents that had experience with the collective application is too low to make a proper comparison between the individual application and collective application. Therefore, the low number of collective applications in the WMP program cannot yet be attributed to (excessively) higher transaction costs compared to the individual

application. Lastly, the survey was filled in by agricultural advisors. These agricultural advisors may have assisted multiple applications for the WMP program, therefore they may be benefiting from economies of scale. Additionally, the results show that agricultural advisors, on average, indicate a lower level of difficulty than the farmers. Hence, this could mean that the private transaction costs in the WMP program are underestimated.

Finally, the results show that the hours spent by the respondents on the entire application procedure differ greatly. This study has not been able to identify the origin of these high variability in answers. Therefore, future research is needed to understand the factors that cause these large differences in time spent on the WMP application. Additional, further research into the irrigation communities is recommended. Farmers indicated they perceive the irrigation communities as helpful, but it is important to know whether they also solve the problems regarding unwillingness to co-operate and trust. Lastly, in addition to this mainly qualitative study, it would be interesting to conduct a more quantitative study of the transaction costs in the WMP program. Inspired by Mettepenningen et al. (2009) research could be based on labour costs, administrative and operational costs. This would make it possible to measure the amount of transaction costs and to compare with other studies on transaction costs in contracts for environmental goods. In that case, reimbursement of the additional transaction costs in the contract for environmental goods may be considered.

## **5.2 Conclusions**

The main goal of this research was to investigate private transaction costs in the Hungarian Water Management Program. In a qualitative study, respondents were asked to rate the difficulty of various transactional activities. Results show that the WMP application procedure is generally perceived as difficult. This is in line with the conclusion that one of the barriers to participation in the WMP program is the complex application procedure. In addition, the application procedure can be labelled as time consuming, since an average of 64 to 83 hours is needed to apply. Most of this time was spent on activities in the contact stage. Based on these findings, it can be concluded that the application of this contract for environmental goods carries private transaction costs. For future research it would be interesting, in addition to this qualitative study, to conduct quantitative study of the transaction costs. Subsequently, reimbursement of the additional transaction costs in the contract for environmental goods may be considered.

Besides, based on this thesis, it cannot be assumed that the low number of applications for the collective WMP program are the result of (too) high transaction costs. However, lack of trust and unwillingness of participation of neighbouring farmers can be argued to be important reasons for non-participation in the collective WMP program. It is therefore interesting for the Hungarian government to follow the developments of the recently established irrigation communities and find out whether this solves the barriers mentioned above.

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## Annex 1

*EFFECT project survey - distributed in Hungarian in the beginning of 2023*

EFFECT project survey: study of the transaction costs of the irrigation development subsidies examined in the Hungarian case study

Thank you for completing this survey of the University of Óbuda, the National Chamber of Agricultural Economics (NAK) and the University of Wageningen, in which we collect data for the study of the transaction costs of irrigation development subsidies related to the Hungarian case study within the framework of the EFFECT project\* (<https://project-effect.eu/>). By filling in the survey, you contribute to uncovering possible deficiencies and problems that may occur during irrigation development and water management grant applications, thus creating an opportunity to eliminate and solve them in the future.

The entire survey consists of 6 parts and completing the questions will take approximately 10 minutes. After a few general questions about your background, the core of the survey refers to the costs incurred when applying for the Development of the Agricultural Water Management Sector and Support for the Cooperation of Irrigation Communities Rural Development Program measures.

Your answers are anonymous and will be treated confidentially. The data is used for research purposes in the EFFECT project. By completing and submitting the survey, you consent to the storage, processing and sharing of your answers among the partners participating in the research.

If you have any further questions or comments to the survey, please do not hesitate to share these by email ([fogarasi.jozsef@kgk.uni-obuda.hu](mailto:fogarasi.jozsef@kgk.uni-obuda.hu)).

\* EFFECT is a European H2020 funded research project with the overarching goal to develop and test innovative agri-environmental contract mechanisms to improve the provision of environmental goods.

The aim of the project:

- Develop and co-design contractual frameworks with local farmers and stakeholders;
- Test these contractual frameworks in case studies around Europe;
- Help reconcile farmers' private benefits with the achievement of climate and environmental public goods;
- Take social and behavioural aspects of farmers' decision making into account in the design of new contractual frameworks;

- Improve the collaboration of different academic fields of expertise: natural sciences, agronomy, law, economy, political sciences;
- Build an international consortium that can take advantage of cross-country and interdisciplinary learning;
- Give new inputs to decision makers and agricultural stakeholder on effective design of agri-environmental contracts.

### 1 Introduction questions

The aim of the following questions is to gain insight into the availability of irrigation opportunities, as well as how well you know the *Development of the Agricultural Water Management Sector* (VP2-4.1.4-16) and the *Support of the Cooperation of Irrigation Communities* (VP5-16.5.2-21) grants.

(1) Is it possible to extract surface water for irrigation purposes in your area?

- Yes ⇒ move to question 2
- No ⇒ Thank you for your contribution, unfortunately we do not have any follow-up questions for you.

(2) Have you ever heard of subsidy program the *Development of the Agricultural Water Management Sector* and *Support of the Cooperation of Irrigation Communities*?

- Yes ⇒ move to question 3
- No ⇒ Thank you for your contribution, unfortunately we do not have any follow-up questions for you.

(3) Besides your role as an advisor, are you also a farmer yourself?

- Yes ⇒ move to question 4
- No ⇒ move to questions 6

(4) As a farmer, have you ever attempted to apply for the *Development of the Agricultural Water Management Sector* for your own farm?

- Yes ⇒ move to questions survey farmer's perspective
- No ⇒ move to questions 5

(5) As a farmer, under what circumstances would you be interested in an application of the *Development of the Agricultural Water Management Sector* subsidy?

- In case of a higher aid envelope
- In case of higher aid intensities
- In case of a larger amount of support

- In case of more favourable lending conditions, to finance the self-reliance necessary for the application
- If the application process would be faster and the application process would be more predictable: it would take less time from submission to payment
- Less expensive water rights licensing procedure
- Less complex water rights licensing procedure
- I do not know
- Other, please specify: \_\_\_\_\_

(6) As an advisor have you ever given advice regarding the *Development of the Agricultural Water Management Sector* subsidy?

- Yes ⇒ move to questions survey agricultural advisor's perspective
- No ⇒ Thank you for your contribution, unfortunately we do not have any follow-up questions for you.

Survey farmers perspective

## 2 General questions

The questions below are intended to collect general information about you as a farmer.

*We would like to ask you to continue filling out the survey from your farmer perspective, prioritizing your experience as a farmer compared to your work as a specialist consultant.*

(7) What is your year of birth?

\_\_\_\_\_ (open question)

(8) What is your gender?

- Female
- Male
- Prefer not to say

(9) What is the highest level of education completed?

- Higher education in Agriculture
- Higher education in Agricultural Economics
- Higher education in Agricultural Water Management
- Higher education in Water Management
- Higher education in another field

(10) How many years have you been a farmer?

\_\_\_\_\_ (open question)

(11) How many hectares does your farmland consist of?

\_\_\_\_\_ (open question)

(12) What kind of crops do you mainly grow? You can give multiple answers.

- Grain (except corn)
- Corn
- Oilseeds
- Sugar beet
- Potato
- Fruits
- Vineyards

- Vegetables
- Other, please specify: \_\_\_\_\_

(13) In which region is the farm located?

- Bács-Kiskun
- Baranya
- Békés
- Borsod-Abaúj-Zemplén
- Csongrád-Csanád
- Fejér
- Győr-Moson-Sopron
- Hajdú-Bihar
- Heves
- Jász-Nagykun-Szolnok
- Komárom-Esztergom
- Nógrád
- Pest
- Somogy
- Szabolcs-Szatmár-Bereg
- Tolna
- Vas
- Veszprém
- Zala

### **3 Development of the Agricultural Water Management Sector: Application experiences**

The questions below are intended to gain more insight into your application experience in the application of the *Development of the Agricultural Water Management Sector*.

(14) Was your application to the *Development of the Agricultural Water Management Sector* successful?

- Yes ⇒ move to question 15
- No ⇒ move to question 19

(15) What is the subsidy amount that you have applied for?

- <10,000,000 HUF
- 10,000,000 HUF – 30,000,000 HUF
- 30,000,000 HUF – 100,000,000 HUF
- > 100,000,000 HUF

(16) What share was the subsidy of the entire irrigation investment? Give your answer in percentages.

\_\_\_\_\_ (open question)

(17) Did you finally implement the irrigation development investment after a successful application?

- Yes ⇒ move to question 19
- No ⇒ move to question 18

(18) What was the reason that you did not use the funds? You can give multiple answers.

- I could not fulfil the requirements for receiving the subsidy
- Due to the inflation of the costs, the difference between the estimated costs and the actual costs became too large and therefore I could not make the investment in the end.
- I did not need the subsidy anymore, I realized the investment on my own
- The planned financial resources (own resources) was not available for the implementation of the investment
- I had concerns regarding future operating costs
- I had concerns regarding future changes in rules
- Too much time passed between application submission, favourable assessment and payment, and in the meantime the market conditions for production changed
- Too much time passed between the submission of the application, the favourable assessment and the payment, and in the meantime the costs of implementing the investment changed
- Other, please specify: \_\_\_\_\_

#### **4 Development of the Agricultural Water Management Sector: Individual application**

The purpose of these questions is to learn about the difficulties you encountered as a farmer in the individual application process.

(19) Have you ever attempted to apply for the individual application?

- Yes ⇒ move to question 20
- No ⇒ move to question 27

(20) As a farmer, how difficult did you find the procedure of the application in general?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1
- 2
- 3
- 4
- 5
- Not applicable

(21) As a farmer, how difficult did you find it to find the relevant program information?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(22) As a farmer, how difficult did you find coming up with a management plan (including seeking for information, consultation, meetings)?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(23) As a farmer, how difficult did you find the reviewing the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(24) As a farmer, how difficult did you find the fulfilment of the requirements of the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(25) Considering the whole procedure from learning about the program to finishing the application to the program, how many hours would you estimate that you have spent on this?

\_\_\_\_\_ (open question)

(26) As a farmer, which of the steps do you think took the most time?

- Finding of relevant information
- Coming up with a management plan
- Reviewing the contract

- Fulfilling the requirements of the contract
- Other, please specify: \_\_\_\_\_

### **5 Development of the Agricultural Water Management Sector: Collective application**

The purpose of the questions in this section is to learn more about your views towards a collective application of the *Development of the Agricultural Water Management Sector*.

(27) Did you know that you could also submit a collective application?

- Yes ⇒ move to question 28
- No ⇒ move to question 36

(28) Have you ever attempted to apply for the collective application?

- Yes ⇒ move to question 29 – 35
- No ⇒ move to question 36 – 37

(29) As a farmer, how difficult did you find the procedure of the application in general?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(30) As a farmer, how difficult did you find it to find the relevant program information?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(31) As a farmer, how difficult did you find coming up with a management plan (including seeking for information, consultation, meetings)?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable



(32) As a farmer, how difficult did you find the reviewing the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1     
  2     
  3     
  4     
  5     
  Not applicable

(33) As a farmer, how difficult did you find the fulfilment of the requirements of the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1     
  2     
  3     
  4     
  5     
  Not applicable

(34) Considering the whole procedure from learning about the program to finishing the application to the program, how many hours would you estimate that you have spent on this?

\_\_\_\_\_ (open question)

(35) As a farmer, which of the steps do you think took the most time?

- Finding of relevant information
- Coming up with a management plan
- Reviewing the contract
- Fulfilling the requirements of the contract
- Other, please specify: \_\_\_\_\_

*Move to question 38*

(36) Why did you not submit a collective application? You can give multiple answers.

- I was not aware of the possibility to apply for the collective investment
- The collective application procedure is too complex
- The collective application procedure is too time-consuming
- The subsidy for the collective applications did not sufficiently consider the additional costs of making a collective investment (think of the costs of time of extra meetings with farmers and agreements between farmers to establish trust)
- Other farmers in my community did not want to participate in the collective application
- There is not enough trust in my community to participate in a collective application
- The communication between farmers in my community, which would be necessary for participation in a joint application, is not open enough

- There is a strong competition in my community, and therefore farmers do not want to cooperate
- Other, please specify: \_\_\_\_\_

(37) Under what circumstances would you be interested in a collective application? You can give multiple answers.

- In case of a higher aid envelope
- In case of higher aid intensities
- In case of more favorable lending conditions, to ensure the self-reliance necessary for the application
- If the application process would be faster and the application process would be more predictable: it would take less time from submission to payment
- If they would provide more professional support on the assessment and evaluation aspects of the application
- If there was a greater willingness to cooperate in my community
- If the trust between farmers in my community is higher
- If the communication in the farmer my community is more clear
- I do not know
- Other, please specify: \_\_\_\_\_

### **6 Support of the Cooperation of Irrigation Communities: Experiences**

The following questions are used to better understand your experience regarding the Support of the Cooperation of Irrigation Communities during the application procedure.

(38) Have you already applied for the *Support of Irrigation Community Cooperation*?

- Yes ⇒ move to question 39
- No ⇒ Thank you for your contribution, unfortunately we do not have any follow-up questions for you.

(39) To what extent does participation in the program to support irrigation community's collaboration help you to be able to jointly apply for a call for the *Development of the Agricultural Water Management Sector*?

*The questions below contain a Likert scale from 1 to 5, where 1 is not helpful at all and 5 is very helpful.*

- 1       2       3       4       5       Not applicable

(40) As a farmer, how difficult did you find the procedure of the application in general?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(41) As a farmer, how difficult did you find it to find the relevant program information?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(42) As a farmer, how difficult did you find coming up with a management plan (including seeking for information, consultation, meetings)?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(43) As a farmer, how difficult did you find the reviewing the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(44) As a farmer, how difficult did you find the fulfilment of the requirements of the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(45) Considering the whole procedure from learning about the program to finishing the application to the program, how many hours would you estimate that you have spent on this?

\_\_\_\_\_ (open question)

*Thank you for your contribution, we do not have any follow-up questions for you*

*Survey agricultural advisor's perspective*

## 2 General questions

The questions below are intended to collect general information about you as an advisor.

(46) What is your year of birth?

\_\_\_\_\_ (open question)

(47) What is your gender?

- Female
- Male
- Prefer not to say

(48) What is the highest level of education completed?

- Higher education in Agriculture
- Higher education in Agricultural Economics
- Higher education in Agricultural Water Management
- Higher education in Water Management
- Higher education in another field

(49) How many years have you been an advisor?

\_\_\_\_\_ (open question)

(50) In which region do you give advice?

- Bács-Kiskun
- Baranya
- Békés
- Borsod-Abaúj-Zemplén
- Csongrád-Csanád
- Fejér
- Győr-Moson-Sopron
- Hajdú-Bihar
- Heves
- Jász-Nagykun-Szolnok
- Komárom-Esztergom
- Nógrád
- Pest

- Somogy
- Szabolcs-Szatmár-Bereg
- Tolna
- Vas
- Veszprém
- Zala

### **3 Development of the Agricultural Water Management Sector: Application experiences**

The questions below are intended to gain more insight into some background information regarding the farmer's application of the *Development of the Agricultural Water Management Sector*

(51) Have you advised farmers who ultimately chose not to apply?

- Yes ⇒ move to question 3b
- No ⇒ move to question 3c

(52) What is the usual amount of subsidy that farmers apply for?

- <10,000,000 HUF
- 10,000,000 HUF – 30,000,000 HUF
- 30,000,000 HUF – 100,000,000 HUF
- > 100,000,000 HUF

(53) Have you ever given application advice to a farmer who ultimately did not apply?

- Yes ⇒ move to question 54
- No ⇒ move to question 55

(54) What reason(s) do farmers give for not applying? You can give multiple answers.

- They do not need irrigation on their farm
- The application procedure is too complex
- The application procedure is too time-consuming
- The investment requirement of irrigation is too costly
- The water rights licensing procedure is too complicated
- The water rights licensing procedure is too expensive
- The intensity of the support is low compared to the total investment
- They had concerns regarding future changes in rules
- The location of their farm is not suitable for irrigation
- Farmers did not provide an explanation
- Other, please specify: \_\_\_\_\_

(55) Have you advised farmers who applied successfully but ultimately did not use the subsidy?

- Yes ⇒ move to question 56
- No ⇒ move to question 57

(56) What were the reasons that farmers did not use the funds? You can give multiple answers.

- They could not fulfil the requirements for receiving the subsidy
- Due to the inflation of the costs, the difference between the estimated costs and the actual costs became too large and therefore the farmer could not make the investment in the end.
- The farmer(s) did not need the subsidy anymore, they realized the investment on their own
- The planned financial resources (own resources) was not available for the implementation of the investment
- They had concerns regarding future operating costs
- They had concerns regarding future changes in rules
- Farmers did not provide an explanation
- Other, please specify: \_\_\_\_\_

#### **4 Development of the Agricultural Water Management Sector: Individual application**

The purpose of the questions is to learn about your experience as an advisor, which helped farmers submit their individual applications and gave professional advice.

(57) As an advisor, how difficult did you find the procedure of the application in general?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(58) As an advisor, how difficult did you find it to find the relevant program information?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(59) As an advisor, how difficult did you find advising the farmer when drawing up a management plan (including seeking for information, consultation, meetings)?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(60) As an advisor, how difficult did you find reviewing the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(61) As an advisor, how difficult did you find advising the farmer regarding fulfilment of the requirements of the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(62) Considering the whole procedure from learning about the program to finishing the application to the program, how many hours have you usually spent on this, as an advisor?

\_\_\_\_\_ (open question)

(63) On average, which of the steps took the most time?

- Finding of relevant information
- Advising the farmer when drawing up a management plan
- Reviewing the contract
- Advising the farmer regarding fulfilling the requirements of the contract
- Other, please specify: \_\_\_\_\_



### **5 Development of the Agricultural Water Management Sector: Collective application**

The purpose of the questions below is to learn about your experience as an advisor in providing expert advice to farmers in connection with the joint application for the *Development of the Agricultural Water Management Sector*.

(64) Did you know that farmers could also submit a collective application?

- Yes ⇒ move to question 65
- No ⇒ move to question 73

(65) Have you advised farmers who attempted to apply for the collective application?

- Yes ⇒ move to question 66
- No ⇒ move to question 73

(66) As an advisor, how difficult did you find the procedure of the application in general?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1
- 2
- 3
- 4
- 5
- Not applicable

(67) As an advisor, how difficult did you find it to find the relevant program information?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1
- 2
- 3
- 4
- 5
- Not applicable

(68) As an advisor, how difficult did you find advising the farmer when drawing up a management plan (including seeking for information, consultation, meetings)?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1
- 2
- 3
- 4
- 5
- Not applicable

(69) As an advisor, how difficult did you find the reviewing the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(70) As an advisor, how difficult did you find advising the farmer regarding fulfilment of the requirements of the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

- 1       2       3       4       5       Not applicable

(71) Considering the whole procedure from learning about the program to finishing the application to the program, how many hours have you usually spent on this, as an advisor?

\_\_\_\_\_ (open question)

(72) On average, which of the steps do you think took the most time?

- Finding of relevant information
- Advising the farmer when drawing up a management plan
- Reviewing the contract
- Advising the farmer regarding fulfilling the requirements of the contract
- Other, please specify: \_\_\_\_\_

(73) In addition, many farmers have not submitted a joint/collective investment. In your experience, what could have been the reason for this? You can give multiple answers.

- The farmer was not aware of the possibility to apply for the collective investment
- The collective application procedure seemed too complex for the farmer
- The collective application procedure seemed too time-consuming for the farmer
- The subsidy for the collective applications did not sufficiently consider the additional costs of making a collective investment (think of the costs time of extra meetings with farmers and agreements between farmers to establish trust)
- Other farmers in their community did not want to participate in the collective application
- There is not enough trust among farmer in their community to participate in a collective application

- There is not enough clear communication among farmers in their community to participate in a collective application
- There is a strong competition in their community, and therefore farmers do not want to cooperate
- I do not know
- Other, please specify: \_\_\_\_\_

(74) In your experience, under what circumstances would the farmers be interested in a joint/collective application? You can give multiple answers.

- In case of a higher aid envelope
- In case of higher aid intensities.
- In case of more favorable lending conditions, to ensure the self-reliance necessary for the application
- If the application process would be faster and the application process would be more predictable: it would take less time from submission to payment
- If there would be more professional support regarding the assessment and evaluation aspects of the application
- If there was a greater willingness to cooperate in the farmer their community
- If the trust between farmers in their community is higher
- If the communication in the farmer their community is more clear
- I do not know
- Other, please specify: \_\_\_\_\_

### **6 Support of the Cooperation of Irrigation Communities: Experiences**

The following questions are used to better understand your experience in supporting the *Support of the Cooperation of Irrigation Communities* during the application process.

(75) Have you already advised a farmer, who applied for The Support of Irrigation Community Cooperation?

- Yes ⇒ move to question 76
- No ⇒ Thank you for your contribution, unfortunately we do not have any follow-up questions for you.

(76) To what extent does participation in the program to support irrigation community collaboration help farmers to be able to jointly apply for a call for the *Development of the Agricultural Water Management Sector*?

*The question below contain a Likert scale from 1 to 5, where 1 is not helpful at all and 5 is very helpful.*

1       2       3       4       5       Not applicable

(77) As an advisor, how difficult did you find the procedure of the application in general?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(78) As an advisor, how difficult did you find it to find the relevant program information?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(79) As an advisor, how difficult did you find advising the farmer when drawing up a management plan (including seeking for information, consultation, meetings)?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(80) As an advisor, how difficult did you find the reviewing the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(81) As an advisor, how difficult did you find advising the farmer regarding fulfilment of the requirements of the contract?

*The question below contains a Likert scale from 1 to 5, where 1 is not difficult at all and 5 is very difficult. If a question does not apply because you did not get that far in the procedure, choose 'not applicable'.*

1       2       3       4       5       Not applicable

(82) Considering the whole procedure from learning about the program to finishing the application to the program, how many hours have you usually spent on this, as an advisor?

\_\_\_\_\_ (open question)

*Thank you for your contribution, we do not have any follow-up questions for you*