Securing Sustainable Dendromass Production with Poplar Plantations in European Rural Areas

Call: H2020-BBI-JTI-2016

Grant Agreement Number: 745874

Deliverable

D5.1 Incentives and barriers to the engagement in dendromass production

Deliverable type:	Report
WP number and title:	WP5 (Life Cycle Assessment)
Dissemination level:	Public
Due date:	30.06.2018
Lead beneficiary:	Wood K plus
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Document History

Version	Date	Author/Editor	Description
0.1	16.06.2018	Barbora Pollakova, Lea Ranacher, Franziska Hesser	Initial draft and Version for revision
0.2	18.06.2018	Raffaele Spinelli	Revised version
1.0	25.06.2018	Barbora Pollakova, Lea Ranacher	Final version submitted
1.1	26.03.2019	Sandra Liebal	Revised (structure & layout according to recommendations during 1st Review)
2.0	28.03.2019	Lea Ranacher	Revised version based on comments and suggestions of the 1st review meeting

List of Abbreviations

Abbreviation	Denotation
D4EU	Dendromass4Europe
SRC	Short Rotation Coppice
WP	Work package

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1 Role and relevance of the deliverable within the project

Scientific literature refers to short rotation coppice (SRC) or short rotation plantations as a concept that can contribute to bioeconomy while providing benefits to farmers. However, several barriers have been identified preventing farmers from engagement in SRC. The aim of this study is to identify incentives and barriers impacting farmers' decision-making to engage in SRC on marginal lands in Western Slovakia. Marginal lands are considered for the following reasons: first, in Slovakia it is legal to establish short rotation coppice on marginal lands only; second, this project considers marginal lands since they are not productive for annual crop production and therefore do not stand in conflict with food security. After conducting desk research, the qualitative stage of the research in the form of in-depth interviews took place. In total 19 farmers were interviewed. The pool of farmers included farmers actually engaged in short rotation coppice as well as farmers not engaged in it. The results of this task support WP1 Land Evaluation/Remediation and Farm Cooperation well as WP6 Dissemination, Exploitation and Communication.

Wood K plus was responsible carrying out this task. IKEA Industry contributed by sharing their knowledge and experience regarding land acquisition as well as providing a list of farmers for the interviews.

2 Project, task and research objectives

Dendromass4Europe (D4EU) aims at establishing sustainable, Short-Rotation Coppice (SRC)-based regional cropping systems for producing agricultural dendromass on marginal land that feed into bio-based value chains and create additional job opportunities in rural areas. For that purpose, 2,500 ha of short rotation poplar coppices are being established, on marginal or currently unused land in rural areas of the Slovak Republic and Hungary. They will provide the feedstock for the establishment of four new bio-based value chains based upon products from wood and bark from poplar trees, and namely:

- a functionally adapted lightweight fibreboard,
- eco-fungicidal moulded fibre parts,
- a bark-enriched wood-plastic composite and
- a multi-purpose wood-plastic granulate.

Besides developing attractive business opportunities, the activities of the industrial partners in D4EU will generate profit for the rural economy (income for farmers, employment opportunities). A large number of farmers and rural land owners will directly benefit from the diversification and increase of revenues through their involvement with D4EU. The main responsible SRC owner IKEA Industry Malacky provides a framework for land acquisition. With the SRC management, the respective farmers and land owners in rural western Slovakia and in northwestern Hungary will have direct access to a new bio-based market of three industrial partners. Based on the above mentioned impact of D4EU coppices on the farmers' income, new primary agricultural jobs will be created, mainly for local people, opening possibilities for disadvantaged groups. New green jobs in rural areas will also originate from the D4EU at the production plants of the industrial partners. The consortium D4EU unites expertise from industrial and academic partners in the relevant fields along the production, processing and utilization of products from SRC.

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In addition to the expertise mentioned it is of fundamental importance to know if and how the local raw material producers are willing to engage into the targeted dendromass production. For this reason, Task 5.1. "Incentives and barriers to the engagement in dendromass production" is dedicated to investigating the acceptance of short rotation cropping systems from the farmers' perspective. This task is important to the project sustainability because short rotation cropping systems (in contrary to annual crop production) may face drawbacks due to limited attractiveness as perceived by farmers.

Challenges linked to the aforementioned are twofold. First, information on the perception of dendromass production is essential in order to create opportunities for value creation in rural areas. Second, limited adoption by farmers is a limitation to the security of raw material supply and with that to the economic sustainability of the manufacturing operations.

Therefore, it is planned to identify possible incentives and barriers to the engagement in dendromass production in a short rotation cropping system. Building on a literature review, primary data collection in the selected rural areas and methods from empirical social research (e.g. in-depth Interviews, Delphi, Laddering, Conjoint-analyses) a set of criteria was developed that describes incentives and barriers to the engagement in dendromass production. This information is used to derive possibilities to increase the acceptance of short rotation cropping systems and to facilitate and sustain enhanced supplier-buyer relationships.

3 Theoretical background

According to scientific literature (e.g. Wolbert-Haverkamp & Musshoff, 2013), the most frequently mentioned benefits of SRP for farmers are related to economic and environmental aspects. However, a recent study (Warren et al., 2016) found that cultural identity and societal background play a crucial role in decision-making processes regarding adoption of sustainable agricultural practices such as SRP. Moreover, policy frameworks and market situations were found to impact farmers' decision-making to engage in SRP as well (Lindegaard et al., 2016).

The most present legal forms of Slovak farms are agricultural business companies and agricultural cooperatives that farm about 80% of the agricultural land (Green Report, 2015). However, in Slovakia 90% of the agricultural land is leased. Church, private persons, state & military and municipality represent the major landowners in Slovakia. According to §18a of Slovak Law 220/2004 about protection and use of agricultural land, the landowners' consent is required prior to planting of SRP. The landowner needs to sign the agreement for SRP and only afterwards the farmer is allowed to grow SRP. This situation is depicted in the Figure 1.

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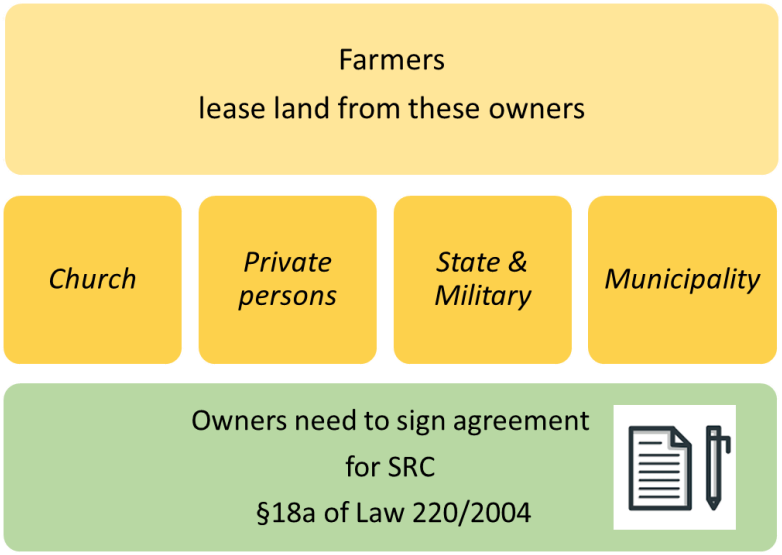

Figure 1: Ownership structure of agricultural land in Slovakia which requires the landowners consent before a farmer can grow SRC on leased land (own illustration).

This study undergone in this task of the project aims to identify factors impacting farmers' decision-making to engage in SRC. More precisely, this study describes factors that incentivize and/or prevent farmers to engage in SRC. The concept of SRC production is very recent in Slovakia and therefore represents a research gap which should be addressed by this study. Potential barriers and incentives as recognized by other studies are given in Table 1. In order to meet the goals of bioeconomy, the concept of SRC has been further developed. In this context, biomass from SRC is an attractive option and supplies the desired sustainable raw material in a short time. To avoid conflicts with food production, marginal lands are considered eligible for the cultivation of this SRC biomass. The special case in Slovakia legally allows growing SRC only on these soils.

Table 1: Incentives and Barriers to the engagement in SRC derived from literature review (references are indicated in the table).

Incentives	Barriers
Employment opportunity (Lindegaard et al., 2016)	Financial risk (Lindegaard et al., 2016)
Low labour input (Buchholz et al., 2010)	Lack of skills and infrastructure (Volk, 2004)
Low site requirements (Tubby & Armstrong, 2002)	Low yields (DTI, 2004b)
Farm diversification (Lindegaard et al., 2016)	„food versus fuel" (Berndes et al., 2011)
Phytoremediation (Dickinson & Pulford, 2005)	Degradation of soil (Rowe et al., 2009)
Flood prevention (Adams & Lindegaard, 2016)	Lack of societal will & interest (Alker et al., 2001)

4 Method and research design

In order to identify incentives and barriers to engage in SRC among farmers in Western Slovakia, semi-structured interviews in form of face-to-face interviews were used as a method to understand famers' decision-making to engage in SRC. This qualitative method places the interviewed person in the centre of attention and allows flexibility to encompass individual cases (Lamnek & Krell, 2016). The interviews were conducted with the help of a semi-structured questionnaire that consisted of two parts. The first part contained general questions regarding current farm management such as types of agricultural

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activities pursued, size of farm, relationship to land and to fertilizers. The second part contained questions on the perception of and experience with SRC, its benefits and disadvantages as well as on farmers' view about the usefulness of produced SRC biomass.

Within the project, all the farmers who were contacted to be interviewed for the purpose of this study were situated within a radius of approximately 100 km from Malacky, mainly in the Zahorie region. Furthermore, they farmed land of soil quality 5-9 (worse soil quality, since it is legally allowed to grow SRC only on these soils in Slovakia) with a maximum of four landowners. The last condition was required due to multi-person land ownership caused by expropriation in 1945 and consequently by consolidation starting from 1991.

Farmers, fulfilling the above-mentioned criteria were already contacted as a result of the land acquisition activities carried out in WP1 IKEA Industry Malacky offered them cooperation contracts (Task 1.1) to engage in SRC. Based on the farmers' responses they provided a contact list that was used for the purpose of this study. This contact list contained 14 farmers already engaged in SRC and 25 farmers not engaged in SRC.

All the individuals in the list were contacted by phone. Those willing to participate in the study were visited personally on their farms, where interviews were conducted from January to March 2018. The farmers interviewed for the purposes of this study consisted of two groups. The first group of farmers were farmers already engaged in SRC activities (10 farmers), while the second group consisted of farmers not engaged in SRC (9 farmers). The majority of interviewed farmers manage mostly leased land, owned by the church, municipality, state and military, as well as private persons. Usually famers manage 20% state owned land, which was aimed for to grow SRC in WP1. Farmers interviewed are illustrated in Table 2, in relation to their legal form and land ownership. The interviews took 30-100 minutes and were recorded.

Table 2: Overview of the sample by legal form, ownership and engagement in SRC.

Farmers already engaged in SRC	Farmers not engaged in SRC
Agricultural cooperative (mostly leased)	Agricultural cooperative (mostly leased)
Agricultural cooperative (mostly leased)	Agricultural cooperative (mostly leased)
Agricultural business company (self-owned)	Agricultural cooperative, (mostly leased)
Agricultural business company (self-owned)	Agricultural cooperative (mostly leased)
Agricultural business company (mostly leased)	Agricultural cooperative (mostly leased)
Agricultural business company (mostly leased)	Agricultural business company (50% leased)
Agricultural business company, (mostly leased)	Agricultural business company (mostly leased)
Agricultural business company (mostly leased)	Agricultural business company (mostly leased)
Agricultural business company (mostly leased)	Agricultural business company (mostly leased)
State & military organization (state owned)	

After the interviews were completed, they were transcribed and analyzed in the statistics software MAXQDA where a code system was built to systematically group the information collected in the interviews. The code system was built from the transcribed text directly while using a combination of

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deductive and inductive approaches for qualitative data analysis. First, condensed meaning units were created. Second, codes were built and finally the codes were grouped into a category system.

5 Results

On the one hand, this study identified factors for SRC cultivation that are commonly perceived as barriers by farmers (chapter 6.1). On the other hand, this study found economic aspects to play an important incentivizing role (chapter 6.2). However, there are several reasons overruling the incentivizing role of economic gains from SRC (chapter 6.3). An overview on incentives and barriers identified in this study is provided in Table 3. It is crucial to mention at this point that environmental impacts and the use of biomass may alternately work either as incentive or as barrier. This group of factors is perceived as a barrier mostly by farmers not engaged in SRC and on the other hand as an incentive especially by farmers engaged in SRC.

Table 3: Incentives and Barriers identified in this study

Incentives	Barriers
Economic benefits	Land fragmentation
Low labor input	Landowner's consent
Use of low quality soils	Food versus Fuel debate
Societal benefits	Long-term contracts / long-term commitment to the multi-annual crop
Environmental benefits	Environmental costs
Usefulness of SRC biomass	Non-usefulness of SRC biomass
	No tradition of SRC in Slovakia
	Non-suitable soils available
	Lack of clear policy

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5.1 Commonly perceived barriers

Table 4 illustrates the factors identified as barriers affecting farmers regardless whether they engage in SRC or not. Note the last two barriers listed in the table were expressed only by farmers not engaged in SRC but are considered to be equally relevant to all farmers. Barriers are arranged in the table in order of frequency of occurrence.

Table 4: Perceived barriers to the engagement in SRC from the farmers' perspective (n=19).

Land fragmentation	Due to historical events and character of laws the agricultural land in Slovakia is vastly fragmented. This resulted in complicated landownership when parcels of land belong to numerous landowners and sometimes not even the landowners know which parcels belong to them precisely. The current situation is perceived as an immense obstacle making it very difficult for farmers to engage in SRC.
Landowner's consent	Previous to planting SRC the landowners' consent is required according to current law. This represents a significant barrier according to the interviewed farmers. Some farmers reported they were willing to engage in SRC, yet they were not able to get landowners' consent. This issue is further complicated due to above mentioned land fragmentation because the potentially interesting parcels belong to multiple landowners. There is however, a case of one farmer who was convinced by the environmental and societal benefits from SRC and managed to persuade the landowner – the municipality - to obtain its consent. He attended a meeting with the city council for which he prepared himself in order to receive the consent. Figuratively speaking, he painted the picture of SRC he believed in and which was positive. Apart from that, he already planted one SRC before on his own land, which made the case stronger for him.
"Food versus Fuel" debate	Farmers emphasize the dilemma regarding fuel production on the fields where food and/or feed could be produced. "Agricultural land should be used for food and feed production", "those who have relationship to land would not grow trees on it", "farmers should engage in agricultural activities" – these are a few examples of farmers' views on SRC. Interestingly enough, some farmers however grow rapeseed and when asked how the oil from rapeseed will be used after rapeseed is sold, one farmer could not exclude the possibility that it would be used for biofuels. So the reluctance to grow SRC seems to be higher than the reluctance to grow oilseed used for biodiesel production. This indicates that farmers might be more reluctant to engage in new crop system, rather than to produce new product types.
Long-term contracts	The project partner offering the option to engage in SRC requires signing contract for at least 10 years, however ideally contracts are signed for 20 years. Thus, the SRC cultivation takes 10-20 years and therefore this agricultural option is considered overly committing among some farmers and represents a further barrier, especially since the landowners' consent is needed.
Environmental costs	Some of the farmers expressed certain concerns about the impact SRC can cause on soil quality. Fear about future recultivation, root-system breakdown, potential soil exhaustion, future soil use and even water loss regarding SRC were mostly addressed during the interviews. Furthermore, the fact that the clones of poplars grown in Slovakia are of non-native origin is considered a potential risk for the environment and health of people as well. Possible gene transfer regarding poplars is an issue declared

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	by two farmers who are however, surprisingly involved in SRC despite this concern. Those farmers, who engaged in SRC despite perceiving the above mentioned environmental costs, did so mostly due to the economic benefits but also as a result of eagerness to experiment. For example, one farmer was convinced that fallow land has a more positive impact on environment than SRC does, however he estimated that SRC would generate more income, so in spite of the worries he decided to engage in SRC with a small sized parcel.
No tradition of SRC in Slovakia	Growing SRC has almost no tradition and is mostly perceived as a new agricultural concept in Slovakia. Only two farmers had some previous experience (in both cases unsuccessful) regarding fast-growing trees, specifically willows, prior to establishing SRC with IKEA. Fast-growing trees are mostly familiar to Slovaks in the form of willows. However, there is a tradition of growing pine trees on sandy soils in the Zahorie region. Lack of experience explains reluctance to grow SRC in some cases. There are farmers who are uncertain about the environmental impacts of SRC, who lack knowledge on SRC regarding possible (dis)advantages, and/or farmers who do not know anyone who already grows SRC. When these farmers face obstacles such as required landowners' consent the probability, they are going to be able to get it is low, since they themselves are not sure what kind of outcome might come out of engaging in it.
Non-usefulness of SRC biomass	Several farmers believe that IKEA is the only party who benefits from the biomass produced on SRC. Some believe the SRC biomass is only used energetically, which is negatively perceived. Some farmers feel the material produced from this woody-biomass will be of low quality resulting in a short life span. Overall, the use of SRC biomass for energy and material purposes was rather critically perceived even among some farmers engaged in SRC. In spite of these beliefs these farmers decided to engage in SRC because of economic benefits and/or out of curiosity.
Non-suitable soils available	There are farmers who would however like to engage in SRC, but due to non-suitable soil conditions on their parcels they cannot grow fast-growing trees. Lands used for SRC in Slovakia need to be of lower quality. However, it does not mean that any type of soil presents a sufficient condition for successful future yields of SRC biomass. Soils that have very low ground water are not considered appropriate for these activities and are being excluded from consideration instantly. Three out of nine farmers (all of them were agricultural cooperatives) not engaging in SRC stated that they were planning on growing SRC but due to lower groundwater level could not pursue this goal. Some of them could engage in SRC on other parcels of land, however, in case these were of better quality, farmers were not willing to offer those for the sake of fast-growing trees and so the negotiations stopped.
Lack of clear policy	Several farmers expressed their doubts about the EU policy and its goals regarding alternative sources of material and energy production. One farmer refers to the case of alternative energy policy while expressing his concerns about the usefulness of SRC: "I have sometimes a feeling that these alternative energies are just some shout in the dark made by the policy". Furthermore, the political situation in Slovakia regarding SRC biomass production was also mentioned. One interviewed farmer felt that politics does not communicate its goals with farmers and that there is no clear vision concerning SRC biomass production introduced by the policy makers either.

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5.2 Incentives

Table 5 shows the incentives observed among those farmers who engaged in SRC or are interested in SRC but not engaged, due to the reasons listed in the Table 4.

Table 5: Perceived incentives to the engagement in SRC from the farmers' perspective.

Economic benefits	Profit-maximization plays an important role for engaging in SRC. Agriculture in Slovakia has found itself in a continually worsening situation over recent decades and farmers mentioned the need for economically viable agricultural activities. Since the prices of wheat are that low, farmers tend to consider new options that could be more economically viable for them. The economic aspects encompass solutions for low quality soils and low labor input activities. Hence, the farmers decided to engage in SRC because they found it more economically attractive, as it provided a higher income or at least incurred lower financial losses on certain parcels they currently farmed.
Use of low quality soils	A prominent group of farmers interviewed for the aims of this study manage areas in Zahorie region. This region is mostly known for its sandy soils that are not especially productive. Apart from sandy soils, there are also acidic soils, stony soils, sloppy soils, undercultivated soils present, and they were introduced to SRC as stated by the farmers. These properties make them not very productive and so when farmers are not able to produce food crops and/or not even feed crops on them, they decide to switch to SRC for instance. Some of the farmers mentioned they would only be able to grow low quality feed crops on these areas, so they rather engage in SRC. Basically, they converted soils that were economically unattractive to them (or hardly approachable) to SRC since SRC represented a better alternative when compared with previous agricultural activities. SRC has been recognized among few of the farmers as an alternative to overproduction as well. The Slovak agriculture suffers from almost absent agricultural processing industry and therefore some of the farmers complain about the difficulties regarding sale of food and feed crops. The worse the soil quality, the higher the probability that farmers would invest it into SRC.
Low labor input	Regarding low labor input activity, SRC is not only able to generate additional or higher income on undercultivated areas but it also spares costs for production factors such as labor, and also for fertilizers or other chemicals. Low labor input as a part of economic incentives is mostly mentioned by agricultural cooperatives. The percentage of people working in agriculture in Slovakia is decreasing from year to year which results in a higher share of older generation active in agriculture. Therefore, the low labor input plays an incentivizing role to engage in SRC. However, also fallow land is a commonly used practice in agriculture being able to generate income due to offered subsidies with low labor input.
Environmental benefits	The environmental benefits that SRC is able to generate when properly designed were recognized among several farmers. These represent an additional factor influencing farmers' decision to adopt SRC as an extensive practice on low quality soils. Mostly declared are benefits related to soil properties such as soil recovery, better future yields by cause of growing SRC, nutrients from leaves and from grinded tree roots in the end, and excess water retention. Moreover, some farmers found it beneficial that SRC needs lower amounts of fertilizers and other chemicals than conventional agriculture. The increase in biodiversity, advantage of SRC as windbreaker, possible use for waste water treatment facilities, a positive impact on microclimate were further listed as positive impacts during the interviews. A state & military owned organization engaged in SRC is managed by foresters. They stated that for them it is natural to engage in SRC since they are in contact with wood on a daily basis anyway. Those foresters

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	recognized the environmental benefits of SRC when compared to conventional farming and therefore are open to SRC.
Societal benefits	Societal benefits were only recognized when resulting from environmental improvements. For instance, one farmer decided to grow SRC in order to separate a landfill from the village to minimize odor emissions that were negatively influencing the residents. By using the argument of better living conditions, the farmer was able to receive the landowners' (i.e. municipality) consent. Additionally, some farmers believe SRC offers higher benefits to society than growing grasses for instance do since SRC produces more oxygen. One farmer expressed his concerns about the loss of forest cover in Slovakia and by engaging in SRC he wishes to contribute to reversing this unfortunate trend.
Usefulness of SRC biomass	Another aspect defining willingness of farmers to engage in SRC is to what extent they recognize the usefulness of produced SRC biomass. Farmers who recognize the material or energetic benefits of wood produced through SRC tend to be more open to SRC. The resource self-sufficiency that IKEA aims for is also positively perceived by one farmer. Furthermore, the fact that SRC biomass is fast-growing and renewable is considered a positive aspect by some farmers. Moreover, some believe that SRC spares higher quality wood and is therefore beneficial to the environment and to society as well.

5.3 Reasons overruling economic benefits

Economic aspects regarding SRC were not necessarily positively perceived among the interviewed farmers. They either play a role of economic benefits as explained in the previous chapter, or they play a role of non-incentives, meaning there are reasons that overrule the potential economic gains. Factors overruling economic gains and turning economic aspects into non-incentives are listed in the Table 6.

These factors are either related to agricultural structure in Slovakia or to farmers' personal preferences. Classic crops in Slovakia consist mainly of cereals. Winter wheat, spring barley and maize cover 59% of the agricultural land (Nemethova & Civan, 2017). Agricultural business companies are mostly the ones concentrating on fewer agricultural 'mainstream' activities as mentioned above to maximize profits. One interviewed farmer mentioned: "Agriculture is a very profitable business. However, if you want to make profit in agriculture, you must not grow what everyone else grows. You must not grow wheat." This raises the question why not all the farmers (also agricultural cooperatives) try focusing on less agricultural 'mainstream' activities in order to increase their income.

One of the possible answers is the fact that the financial resources in the Slovak agriculture are mostly located in agricultural business companies. These are also more indebted since they demonstrate higher economic solvency and, even more importantly, they profited from the higher volume of investment support (Vozarova, Kotulic, Vavrek, 2016). It means that agricultural business companies have achieved higher capital levels as a result of higher investments and therefore dispose of more options regarding agricultural activities nowadays. Furthermore, agricultural business companies achieve higher economic performance and higher creation of added value in comparison to agricultural cooperatives as well. Employment rate is lower in agricultural business companies as stated in Green Report (2011) which indicates higher efficiency of those companies.

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Moreover, it can be stated that those interviewed farmers who did not engage in SRC and were not interested in SRC tended to concentrate also on less 'mainstream' agricultural activities such as vegetable production – potatoes, onions, cabbage, etc., asparagus production, or biological production. Others aimed for prestige, were interested in other forms of farming such as intensive agricultural practices or saw the agricultural production as a side business only, when compared to farmers engaged in SRC and farmers not engaged but interested in SRC.

Table 6: Factors turning economic aspects into non-incentives

Legal entities	The legal form of interviewed farms is another factor determining the farmers' motivation to engage in SRC. This study found farmers of agricultural business companies to be less open to SRC and more skeptical compared to famers of agricultural cooperatives. Note that it does not mean that farmers from agricultural businesses who are not interested in SRC are generally not financially stimulated. On the contrary, it can mean they are able to earn profits elsewhere and more importantly these profits are higher than profits coming from SRC production and/or they already accrue enough profits that they can afford making a decision upon other aspects than pure financial performance (subjective preference, for instance). Agricultural business companies engaged in SRC recognize mostly at least one other incentive next to economic benefits (environmental or societal benefit) compared to agricultural cooperatives, which in some cases decide only upon the financial benefit offered by SRC. There were seven interviewed conventional agricultural cooperatives (or at least their legal form used to be agricultural cooperative in the past) and they all were either already engaged in SRC or would like to be engaged in SRC or at least tried already to look for suitable lands for SRC production. It seems that SRC is a favorable option mostly for agricultural cooperatives, even though the majority of farmers engaged in SRC consists of agricultural business companies.
Rent paid to landowners	The next reason making SRC less economically attractive to some farmers is the fact that prior to planting SRC they had to offer higher rent to landowners in order to get the needed landowner's consent. This lowered their potential amount of profit or at least would have lowered it in case the landowners did take the offer. There was also one farmer who admitted he only engaged in SRC so that IKEA would not go directly to his landowners to make business with them instead. The same farmer considers himself a traditional farmer and believes farmers should grow food and feed, however, at the later stage of the interview he admitted that at the end of the day it is all about the business and so in case he would be able to earn more money on SRC than he does today, he would engage in it despite the fact he does not consider it an optimal agricultural solution.
SRC in competition with other land-use – organic farming	As previously mentioned, Zahorie region has very sandy soils and therefore the agricultural production cannot achieve high yields in certain areas. This is the reason why some farmers switched to organic farming after Slovakia entered the European Union in 2004, enabling access to EU subsidies for organic farming. The amount of environmental subsidies has been a powerful driver to some of them. Interviewed farmers involved in organic agriculture claimed that the sandy soils make it impossible to earn profit when farmed conventionally and therefore they decided to start growing crops organically. These sandy soils are suitable for SRC

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	production but because of the environmental subsidies farmers have fewer reasons to engage in SRC. One farmer – engaged in SRC – also mentioned that the soil quality of their organic production areas is even worse than is the soil quality where SRC has been planted.
Farmers not purely financially motivated	It must be stated at this point that two non-engaged farmers also declared that economic aspects are not primary when making decisions. Some of the decisions are made instinctively or emotionally instead. "It's about the feeling. I have to feel it in there" said the hobby farmer. Another farmer said: "I would have to see deeper meaning to it in order to engage in it… I am guided instinctively when making decisions." It seems however that decisions made with gut instinct are more present when the economic side of the business is already taken care of anyway. Furthermore, some farmers prioritize other agricultural production than SRC. "I enjoy other agricultural production more", "we are more interested in the intensive agricultural practices" – these are examples showing that farmers can have other interests in which case the potential economic gains will not be sufficient in making them to switch to SRC.
Loss of independency	Another possible aspect influencing farmers' motivation regarding SRC production was mentioned by a hobby farmer. He considers SRC a relatively stable crop, however at the same time he believes it is not so profitable that he would be willing to lose his independency by engaging in the business with IKEA. In this case, the economic benefits of SRC are not high enough to offset the value of independency he as hobby farmer cherishes much.

6 Deviations and next steps

No deviations occurred.

7 Conclusion and recommendations

The study has identified land fragmentation, landowner's consent, long-term contracts, no present tradition of SRC in Slovakia, food versus fuel policy, non-suitable soils available and no clear vision among policy makers in EU and Slovakia, to be the barriers for farmers to engage in SRC on marginal lands. Economic aspects were found to play an incentivizing role, however only in some cases. Lastly, environmental aspects and farmers' perception of the usefulness of SRC biomass were found behaving either as barrier or incentive. Moreover, the study found that several barriers and incentives as listed in scientific literature apply also to marginal lands in Slovakia, and not only to lands of good quality more easily suitable for annual crop production.

Due to the fact that SRC is a new cultivation concept in Slovakia, uncertainty has been observed among farmers regarding mostly economic and environmental aspects. An ambivalent character of SRC's impacts on soil properties and the environment in general was identified. Particularly land fragmentation in Slovakia in combination with the landowner's consent represent tremendous structural barriers. The study shows that agricultural cooperatives tend to be more open to SRC in comparison to agricultural business companies due to different financial backgrounds and are more easily motivated by

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economic aspects. Agricultural businesses usually need to recognize more than merely economic incentives in order to be interested in SRC. Furthermore, farmers not engaged and also not interested in SRC tend to focus on less 'mainstream' agricultural activities, they prioritize other agricultural activities such as intensive agricultural practices or organic farming and/or they are part-time farmers. Some of them are also skeptical about the environmental performance and/or the usefulness of SRC biomass.

This study is based on a limited number of semi-structured interviews. Thus, the qualitative research design does not allow to generalize the results. Instead, it provides an in-depth view into the spectrum of farmers' motivations to engage in SRC and influencing structures. Moreover, the results of this study are based on famers' experience and perceptions. Thus, the identified incentives and barriers are only covered from a personal and/or firm-level perspective.

As a result, following conclusions and recommendations are drawn relevant to the project:

- Economic aspects are an important and very relevant driver. However, they do not seem to be enough to persuade all farmers to engage in SRC. Therefore, to increase farmers' engagement, WP1 should focus on other motivators in their land acquisition such as environmental and social benefits derived from SRC.
- Therefore, it is considered crucial for WP1 to provide farmers with science-based facts (e.g. directly from the project) about the possible impacts of SRC on soil and environment, since the study identified conflicting views on such aspects (e.g. nutrient deprivation, root system breakdown, difficult cultivation, gene transfer and habitat fragmentation were mentioned as risks). This aspect should be also acknowledged in WP6 for communicating the project to relevant stakeholders such as the farmers, land owners, and the general public.
- As the study shows that agricultural cooperatives tend to be more open to SRC in comparison to agricultural business companies, they could be specifically targeted in WP1 to strengthen their identity as farmers (e.g. some agricultural activity instead of having fallow land was preferred).
- As there is a lack of policy and tradition regarding SRC, it is of value to communicate best practice results to the farmer community in form of testimonials (e.g. video of a farmer reports his/her experience with SRC) or information desk at agricultural fairs, implementing a workshop with farmers to answer their questions and concerns as well as promote SRC, and media presence in a local newspaper.

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