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North-West Europe
HydroSoilWise

Survey report:
Farmers practices & knowledge survey: soil, water and erosion

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1. Introduction and aim of the survey

In North-West Europe, periods of drought and heavy intense rainfall occur more frequently due to climate change, threatening crop production systems, impacting both urban greening and food security. To address these challenges, farmers need to be supported on:

1. Enhancing soil sponge capacity and water infiltration through soil organic matter increase
2. Improving water use efficiency through smart irrigation and water management practices
3. Reducing erosion

The HydroSoilWise project focusses on these three challenges by providing easy accessible knowledge to farmers and encouraging the adoption of sustainable practices. An innovative, user-friendly toolbox for farmers will be developed in which knowledge about different techniques will be summarized.

To develop the toolbox, a survey was conducted to gather information on the challenges farmers face and the measures they are already implementing in the field, ensuring that the toolbox is tailored to the needs of the farmers in addressing the above mentioned challenges. Based on the answers gathered in this survey, the project partners can continue the course of the project in a relevant way for farmers.

2. General information about the target group and their operations

The main target group for this survey were farmers in the North-West Europe region, with a focus on the growers of soil grown ornamental trees, fruit trees, annual vegetables and potatoes. A total of 84 farmers contributed to the survey. At the beginning of the survey, some general question to gather information on the target group and their operations were asked.

Country

Figure 1 shows the distribution of the target group by country, with most answers coming from farmers in France (42%), followed by Belgium (23%), Germany (18%) and The Netherlands (17%). 1% (Other) of the farmers that filled in the survey were from a country outside the targeted region.

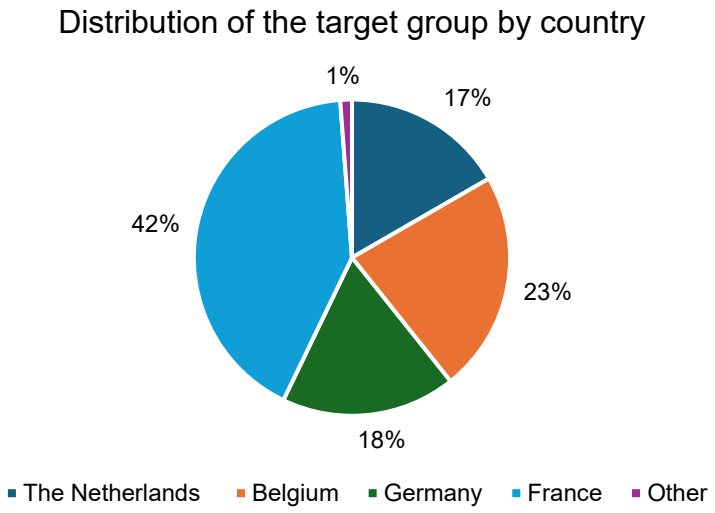

Figure 1: Distribution of the target group by country.

Crop production type

Most of the farmers who completed the survey focus on fruit tree cultivation (27%), and the cultivation of ornamental crops (27%). 10% of the farmers cultivates annual vegetable crops and only 4% grows mainly potatoes. Several farmers indicate that they combine different cropping systems. The 4% of farmers growing potatoes combine this mostly with vegetables or fodder crops. 13% grows potatoes in rotation with annual vegetables. About 6% cultivates both fruit trees and ornamentals on the same farm. 1% grows ornamentals in combination with annual vegetables and 1% grows both fruit or ornamental trees in combination with annual vegetables. The remaining 11% cultivate other crops, primarily fodder crops.

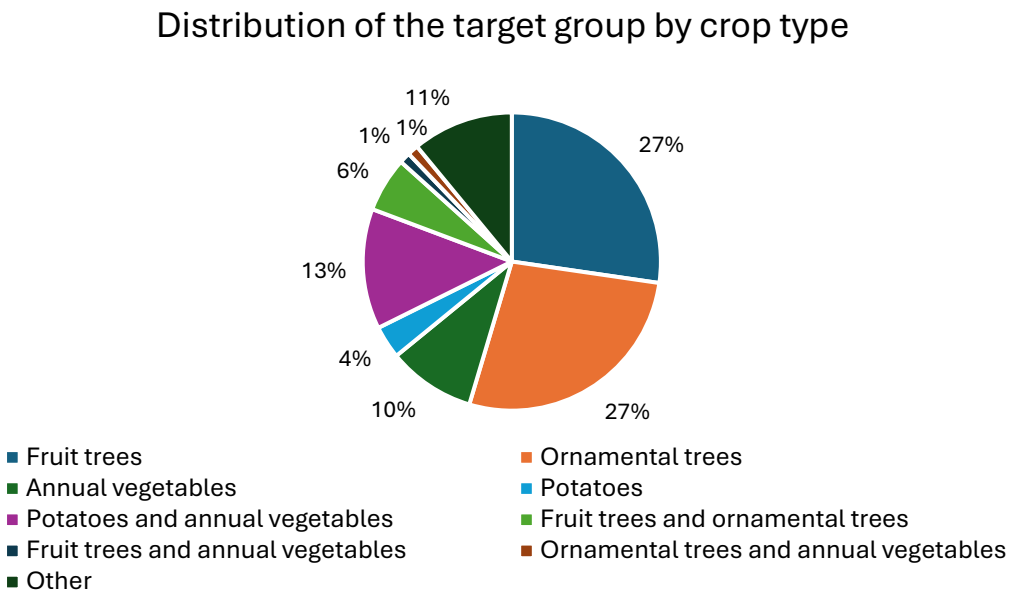

Figure 2: Distribution of the target group by the main crop type they cultivate at the farm.

In Belgium, mostly farmers of ornamental trees filled in the survey (46%). Also in the The Netherlands, mostly farmers of ornamental (40%) and fruit trees (53%) filled in the survey. The French farmers who completed the survey also mainly grow fruit (39%) and ornamental trees (27%), but a large proportion of them also grow annual vegetables. In Germany, the growers surveyed mainly indicated that they grew annual vegetables (39%) or other crops (fodder crops; 39%). Figure 3 shows the distribution of the crop types over the countries. It has to be mentioned that this graph does not represent the common distribution of crop types per country. This distribution represents the network that is reached by all of the consortium partners.

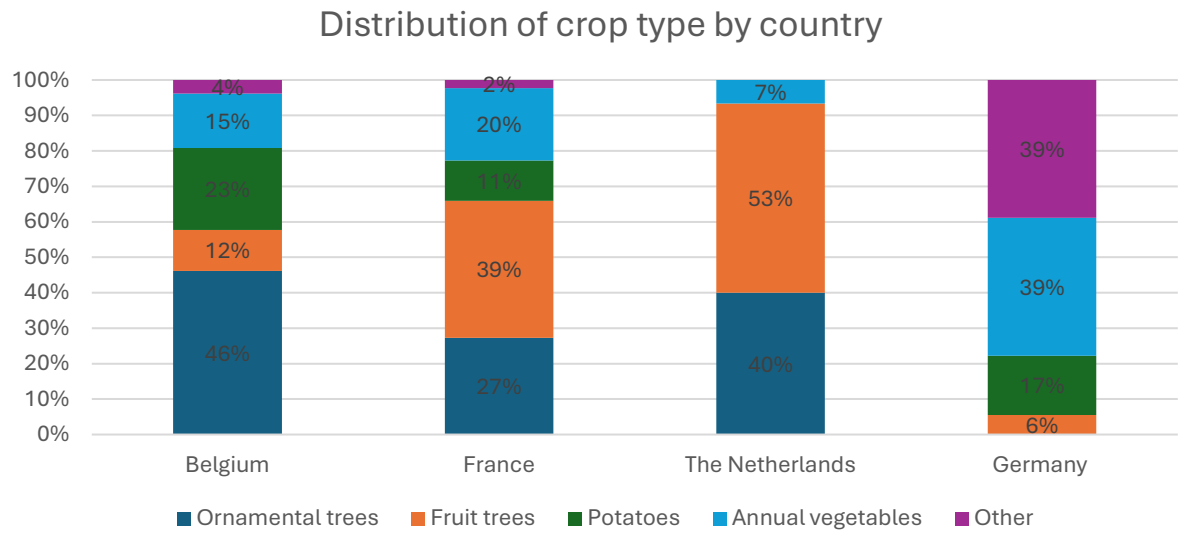

Figure 3: Distribution of the crop type by country.

Soil type

Figure 4 (left) illustrates the main soil types on the farms of the reached target group in each country. In Belgium, most farms have a loamy soil, with sand being the second most common. In The Netherlands, clay is the predominant soil type, also followed by sand. In France, clay and loam are the dominant soil types, while in Germany, the soil types are more evenly distributed across the farms. These distributions are as to be expected.

The same analysis was done for the distribution of the soil type per crop sector. Fruit trees seem to be cultivated more on heavier soils, both clay and loam, while potatoes are mainly cultivated on loamy soils. Ornamental trees are cultivated on a wide variety of soil types, with a preference for loamy and sandy soils.

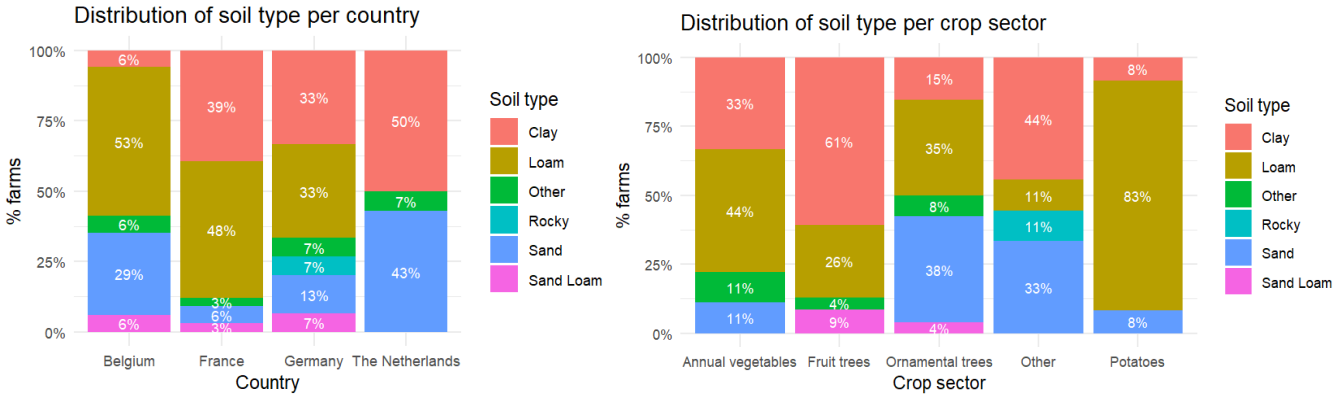

Figure 4: Distribution of soil type on the farms over the different countries and different crop sectors.

Farm size

The most common farm size of the farmers that filled in the survey was between 21 – 100 ha (40%), followed by farms of a size between 5 – 20 ha (31%). 17% of the farms consisted of less than 5 ha and 12% consisted of more than 100 ha (Figure 5).

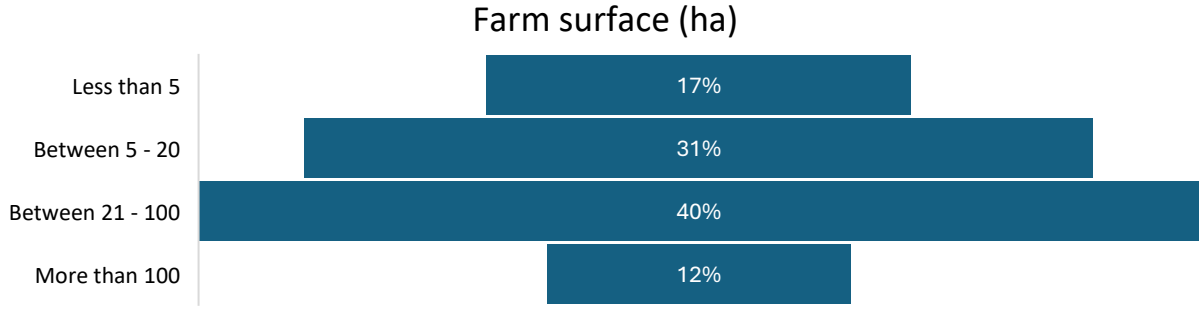

Figure 5: Distribution of farm size.

3. General challenges concerning soil and water management on the farm

Table 1 shows the main challenges faced by farmers as reported in the survey. Water availability is the most frequently mentioned issue, concerning 21% of the respondents answers, followed by soils with low organic matter content (14%). The problem of water availability seems to be an 'equally' significant problem in the 4 countries, Belgium, The Netherlands, France and Germany. The low organic matter content is mainly a challenge reported in France and Belgium. Drought periods and excessive water due to heavy rainfall were each mentioned in 12% of the answers, this shows the dual challenge of periods with water scarcity and periods with excessive amounts of water. In percentages, it are mainly Dutch and German farmers who raise these climate change issues, although this is certainly also a problem in Belgium and France. Other soil-related challenges are acidic soils low in nutrients (10%), soil compaction, reduced infiltration and water retention (7%), lack of soil structure (5%), risk of erosion (4%) and access to land (1%). Another challenge that is often mentioned is administrative and regulatory issues (10%), a challenge that is mainly cited by Belgian farmers.

Table 1: Challenges faced by farmers concerning managing soil and water at the farm as reported in the survey.

Challenges concerning soil and water management on the farm	
Water availability	21%
Soils with a low organic matter content	14%
Drought periods	12%
Excessive water due to periods of heavy rain	12%
Legislation, permits and administration	10%
Acidic soils and soils low in nutrients	10%
Soil compaction, reduced water infiltration and reduced water retention	7%
Lack of soil structure	5%
Risk of erosion	4%
Other	3%
Access to land	1%
Total amount of answers	**105**

The results from the survey confirm that the initial challenges identified in the project also reflect the real issues farmers face in the field, combined with the increasing number of regulations and administrative tasks.

4. Soil organic matter

Knowledge on the concept of soil organic matter

15% of the farmers that answered the survey, mostly Belgian farmers, are convinced of their knowledge on the concept of soil organic matter and already implement a variety of practices to maintain and increase the soil organic matter content in the soils of their field. 49% of the farmers are also already implementing different kinds of practices, but are seeking for improvement of their practices and feedback. Only 4% says not to be familiar with the concept and does not intentionally implement practices to maintain and build up soil organic matter. This 4% mainly consists of German farmers. The other 32% says to have basic knowledge and understanding of the concept, mostly answered by French and Dutch farmers. These results show that there is still room for improvement of knowledge, both for farmers that are already managing their soil organic matter and for farmers that are not yet very familiar with practices that build soil organic matter.

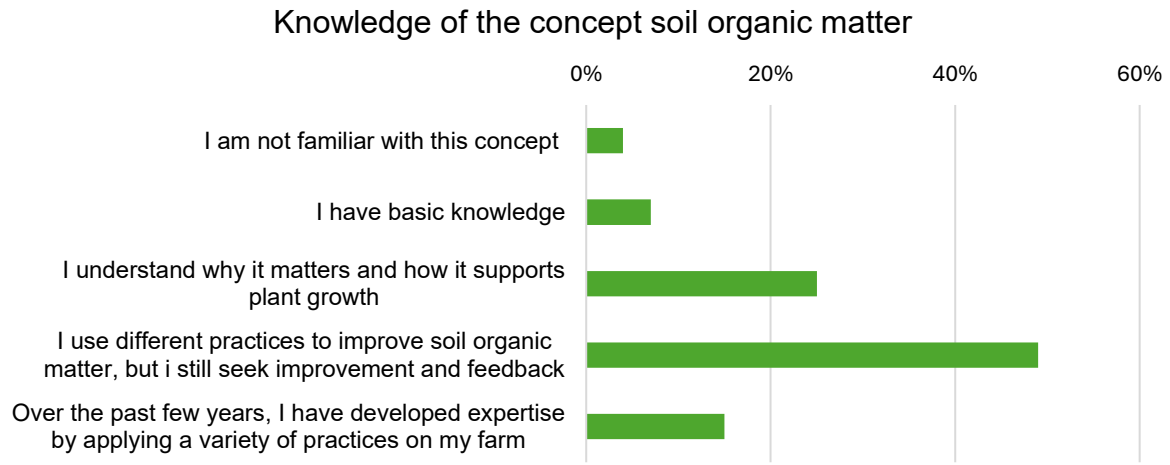

Figure 6: knowledge of famers on the concept of soil organic matter as reported in the survey.

Use of practices that maintain and build-up organic matter

The farmers were questioned about their knowledge and use of 8 practices that maintain and build up organic matter in the soil: application of compost, application of soil improvers, cover cropping, soil cover with organic mulch, crop rotations, application of organic manure, transferring to less heavy machinery to reduce compaction and reduced tillage. The most used practice in the field, as reported in the survey, is using organic manure for fertilization, followed by cover cropping. Practices such as covering the soil by mulching and applying soil improvers are less frequently implemented.

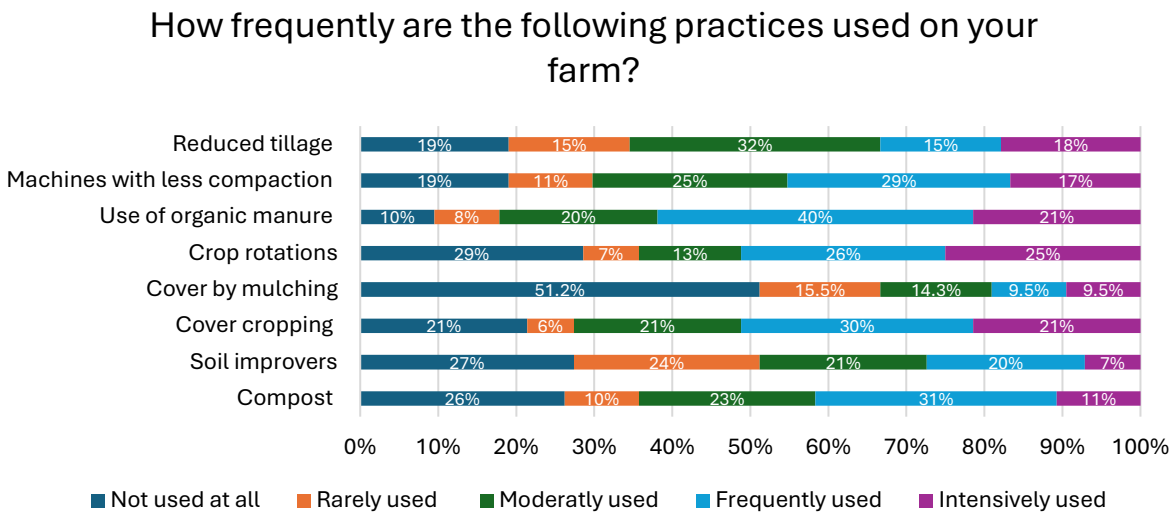

Figure 7: Adoption level of soil organic matter management practices on the farms of the respondents of the survey.

Statistical analysis (Kruskal-Wallis test for non-parametric data) showed that for some practices, the implementation is significantly related to the country and/or crop type. The use of compost and the soil covering by mulching are the only techniques that doesn't seem to be related to either the country or the crop type. The use of soil improvers is only related to the country, not the crop type. The other techniques are both related to the country as well as the crop type.

Table 2: Influence of country and crop type on the adoption level of the techniques questioned in the survey. P-values were obtained with the Kruskal-Wallis test for non-parametric data. If the p-value is less than 0.05, it is considered as significant.

	Compost	Soil improvers	Cover cropping	Soil Cover by mulching	Crop rotations	Use of organic manure	Less heavy machinery	Reduced tillage
~ Country	0.1348	0.017	<0.0005	0.0700	0.0200	<0.0005	0.0020	0.009
~ Crop type	0.1300	0.090	0.0030	0.9317	<0.0005	0.0200	<0.0005	0.030

Figure 8 shows the distribution of adoption level for each technique across the different countries. The adoption of compost application is similar in all countries and will depend heavily on the availability. The use of soil improvers is significantly higher in Belgium compared to Germany, with France and the Netherlands showing intermediate adoption levels. A possible explanation for this difference in adoption rates is hard to explain, but it could very well be due to differing interpretations of the term 'soil improvers' depending on the country and/or the authorization of soil conditioners in organic farming. Belgium also has the highest adoption of cover cropping, followed by Germany, while France and the Netherlands adopt it less frequently. Although in all four countries, the adoption level is relatively high. This is as expected, since the use

of cover cropping in winter to not leave the soil bare is often obligated. A similar pattern is observed for the use of organic manure. The adoption of less heavy machinery is higher in Belgium and Germany than in Germany and France. Adoption levels of organic mulching and crop rotation are fairly consistent across all countries. Reduced tillage is most widely adopted in Belgium, followed by Germany and the Netherlands, and is less common in France. The adoption of organic mulching is relatively low in all four countries.

This analysis shows that some practices, such as compost application and crop rotation, are widely adopted accros all countries, while other practices show clear differences between countries. This may reflect differences in policy, availability of resources or different challenges across countries.

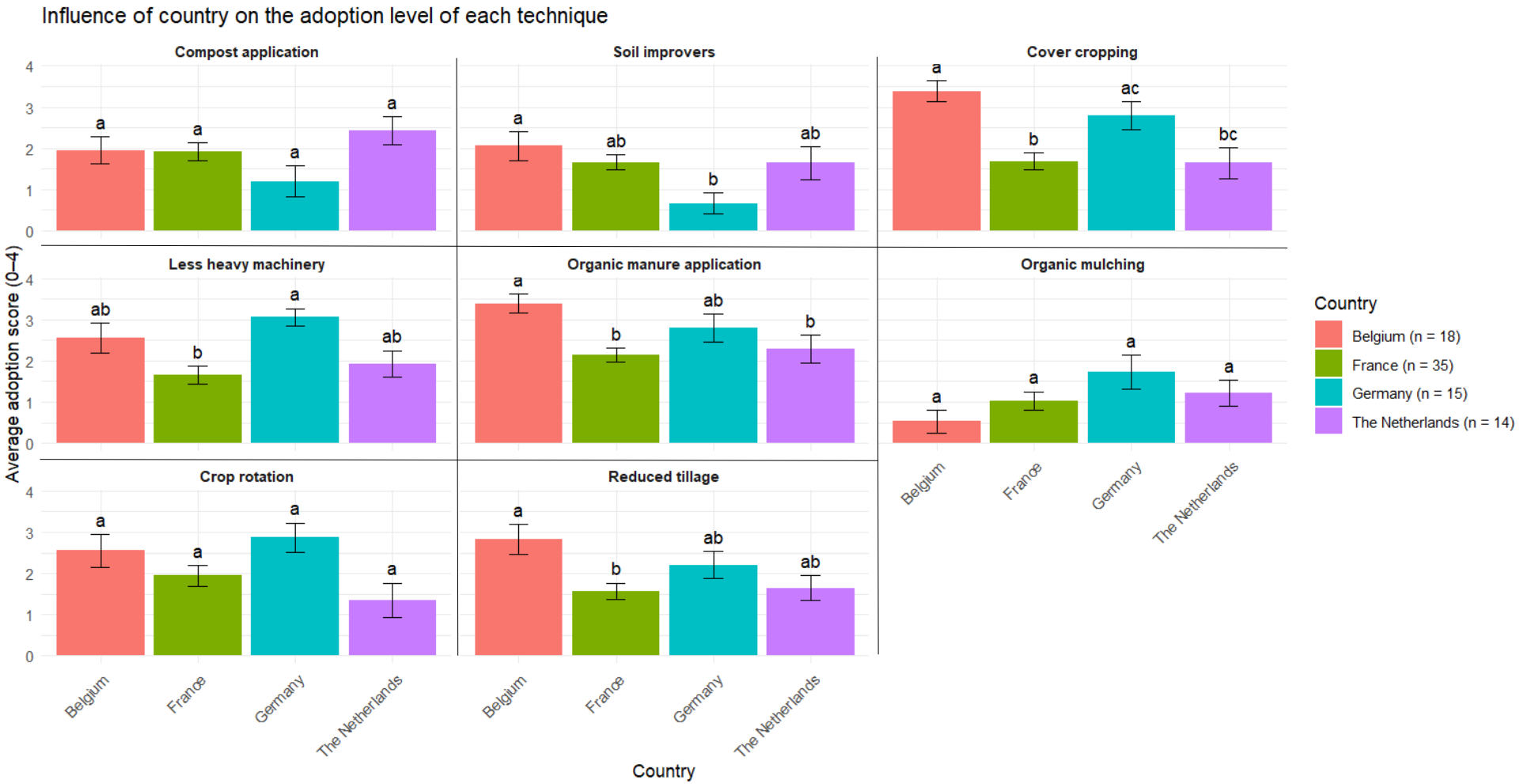

Figure 8. Adoption level of each technique to maintain and improve soil organic matter per country as reported in the survey, with n = number of respondents. Adoption level was measured on a scale from 0-4. (0 = Not used at all; 1 = Rarely used; 2 = Moderately used; 3 = Frequently used; 4 = Intensively used).

A similar analysis was done for each crop sector, the distribution of adoption level for each pratice over the different crop sectors is shown in Figure 9. Compost application and soil improvers are adopted equaly over all crop types, with no significant differences. These practices are generally compatible with a wide range of cropping systems and are well known to improve soil structure and organic matter content. Organic mulching is also evenely adopted across all crop types.

Cover cropping shows some variation: adoption is lowest in fruit trees. This is an unexpected result, since cover crops can be easily implemented in between tree rows without interfering with the crop, which is also something that is seen in practice with e.g. grass. This result may be explained by the fact that there are different interpretations of the term ‘Cover cropping’. Cover cropping is used intermediate in annual vegetables, ornamental trees and other crops, and the most in potatoes. In the case of annual vegetables and potatoes the cover crop is often sown after the cultivation period to not leave the soil bare in the winter. In fruit trees and ornamental trees, cover crops can be sown in between the rows. Crop rotation adoption varies between crops: it is intermediate used in annual vegetables, ornamental trees and other crops, highest in potatoes, and lowest in fruit trees. This was to be expected, since potatoes require a crop rotation schedule of minimal three years to minimize disease pressure, and fruit trees are productive for many years and are not removed from the field as muchs as other crops in other cropping systems.

Organic manure application is generally high, with fruit trees scoring lowest, potatoes the highest and annual vegetables, ornamental trees and other crops slightly lower. Use of less heavy machinery shows more variation: fruit tree growers adopt it, in ornamental trees and annual vegetables the adoption levels are intermediate, other crops are variable, and potato growers adopt it more often. Potatoes usually require a lot of machinery for planting and harvesting, so there is room for improvement in this cultivation system. In the survey, a lot of farmers mentioned that when they can’t use less heavy machinery or reduced tillage practices, they try to reduce soil compaction by using fixed traffic paths in the field. Reduced tillage adoption is lowest in fruit tree cultivation, intermediate in annual vegetables, ornamental trees, and other crops, and highest in potatoes. Reduced tillage is less relevant to implement in perennial systems and in crops with already minimal soil disturbance requirements, while potato cultivation generally requires more intensive soil preparation.

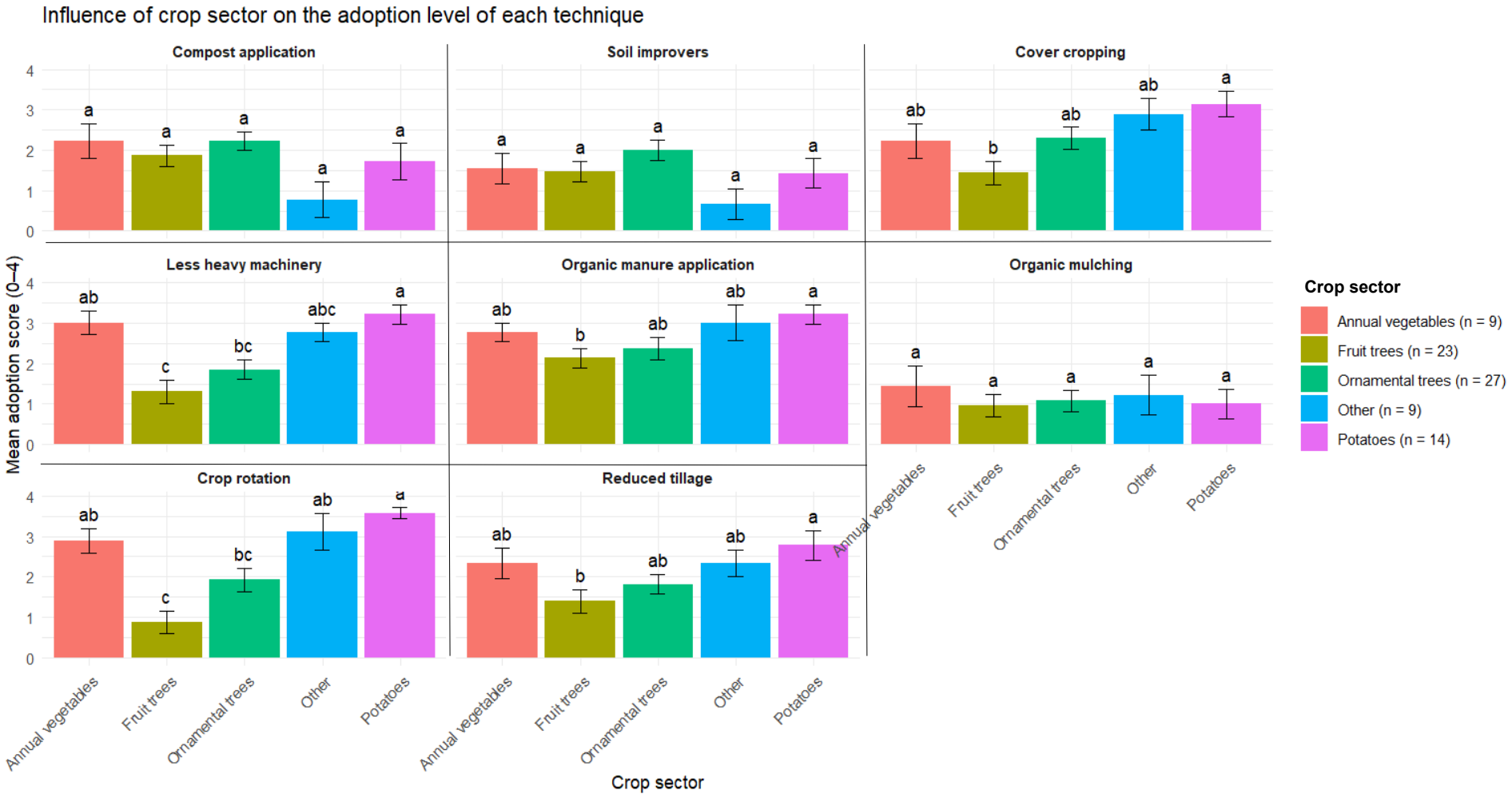

Figure 9. Adoption level of each technique to maintain and improve soil organic matter per crop sector as reported in the survey, with n = number of respondents. Adoption level was measured on a scale from 0-4. (0 = Not used at all; 1 = Rarely used; 2 = Moderately used; 3 = Frequently used; 4 = Intensively used).

Technical details of practices that improve soil organic matter

In the survey, the farmers could provide an overview of the technical details on how they implement practices that maintain soil organic matter. Figure 10 shows the different types of organic materials that are used in practice as reported in the survey. Almost 50% of the respondents indicated using green compost, suggesting it is the most commonly applied organic material, followed by organic manure (31%). In practice, we see that this is often not the case. This result could be explained by the composition of the reached target group. A lot of organic farmers and growers of ornamental trees filled in the survey, two groups of farmers that often use green compost in their cultivation systems. The use of green compost is mainly reported by French, Dutch and Belgian farmers and, to a lesser extent, by German farmers. In Germany, compost is mainly used by organic farmers, but the compost is often not available. The use of organic manner was mainly mentioned by Dutch and Belgian farmers. Other materials, including wood chips, champost, biochar, slurry, charcoal and sawdust, were mentioned less. This shows that these alternative organic materials, which are studied less and are less well known, are rarely applied in practice. It also suggests that there is potential to increase their adoption through the dissemination of knowledge of their benefits for soil quality.

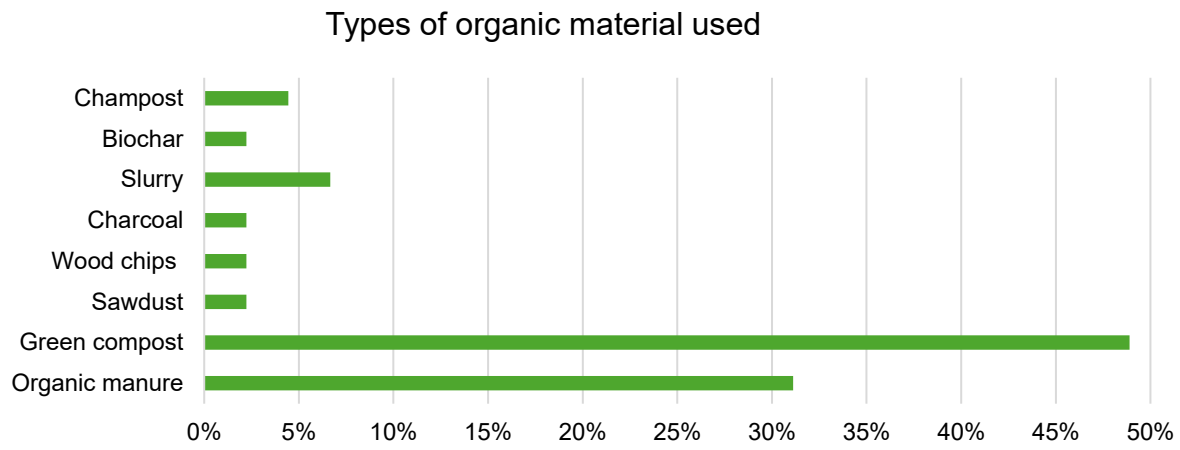

Figure 10: Different types of organic material and how often they are used by the respondents of the survey.

The most common duration of crop rotation cycles mentioned by the respondents was three years (38%), followed by a rotation of five years (31%) and six years (19%).

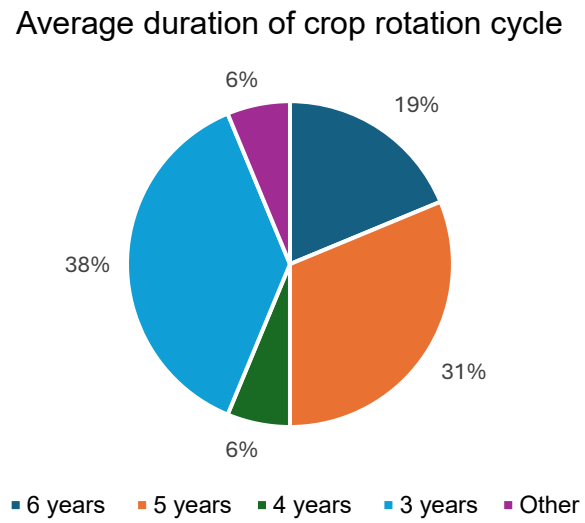

Figure 11. Average duration of crop rotation cycles as mentioned by the respondents in the survey.

As last, the respondents also frequently specified the type of green manure crop they use. Most often and most of the time in Belgium, a mixture of different crops is sown as green manure (22%). Other common mentioned crops are tagetes (9%), yellow mustard (9%), alfalfa (9%) and Japanese oats (9%).

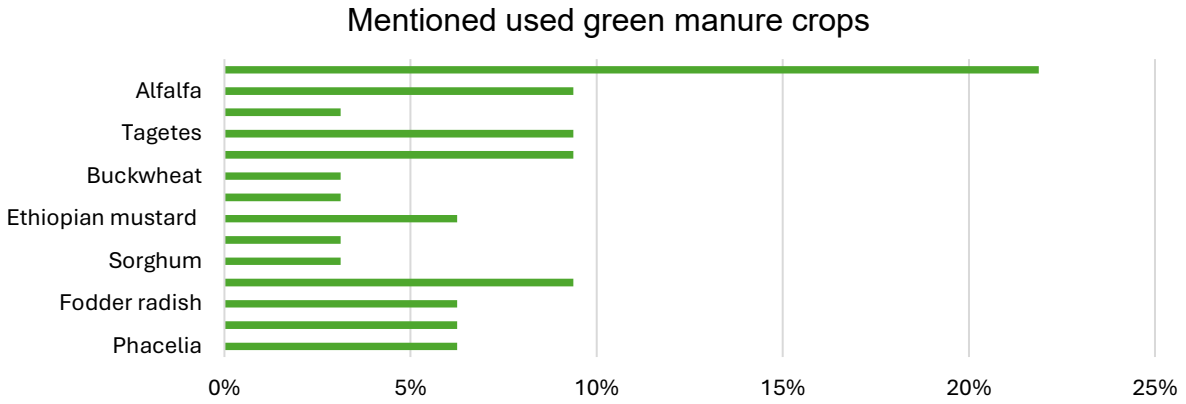

Figure 12: Types of green manure crops used by the respondents of the survey.

Main barriers for using soil organic matter management practices

The main mentioned barrier for implementing soil organic matter management practices is a lack of time for implementation, mentioned by 20% (mainly by German and French farmers), followed by regulations or policy restrictions (17%). A lot of the respondents mentioned that restrictions on the amount of organic matter and the timing in which organic matter can be applied form barriers to be able to implement these

practices. This is a constraint mostly mentioned by Belgian and Dutch farmers. The barriers and the number of respondents that mention them are presented in Figure 13. Only 1% of the farmers says that they don't receive benefits or a return of investment when they implement these practices, showing that all the farmers understand the potential benefits and can see the value of these kinds of practices. 5% mentions that they have insufficient knowledge or training on these kinds of practices, showing that these practices are already well known in the field by the farmers. The insufficient knowledge is mentioned by farmers of all countries.

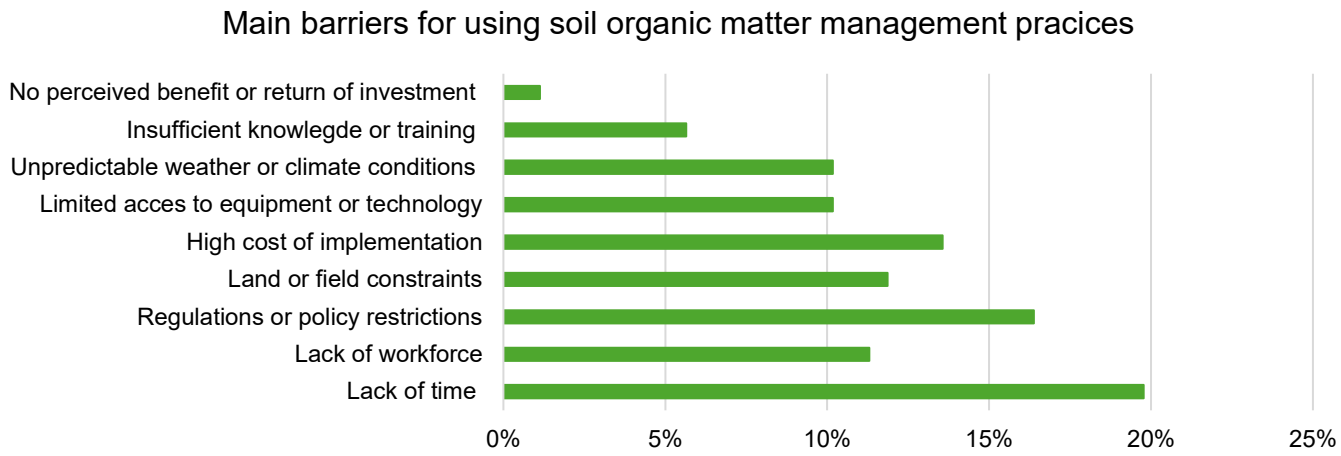

Figure 13: Main barriers for implementing soil organic matter management practices as reported in the survey.

5. Water use efficiency

Statement that best reflects confidence in water management

Most farmers (40%) that answered the survey understand the importance of water use efficiency and apply basic practices on their farm. This is mainly the case for German and Belgian farmers. 23%, mainly Dutch farmers, says to have developed effective strategies for water management and 27%, mainly French famers, use several water saving practices, but still seek advice to improve their results. 11% says that they need guidance to apply irrigation. Again, these results show that there is a need for guidance and information on water use efficiency practices in the field, most of the time mentioned by French and German farmers.

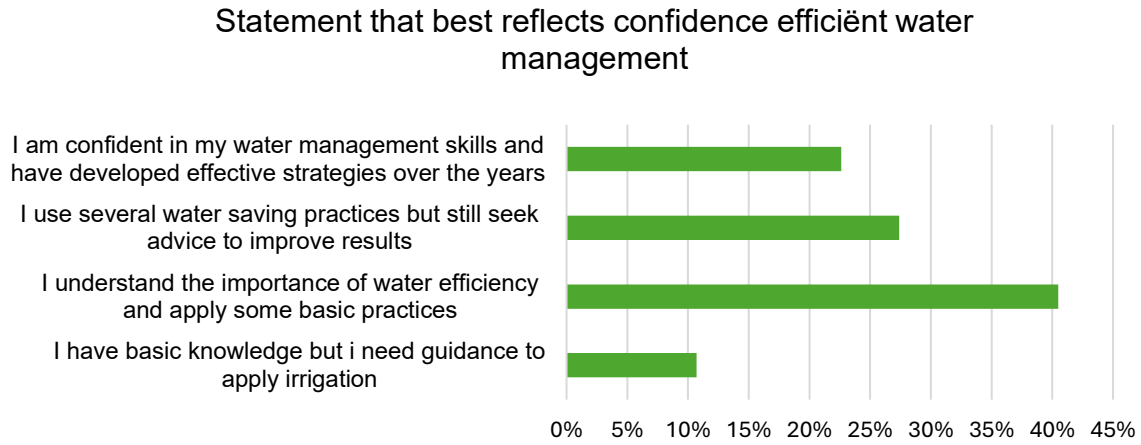

Figure 14: Statement that best reflects the farmers confidence on efficient water management, as reported in the survey.

Irrigation practices

All growers cultivating potatoes and annual vegetables indicate that they use irrigation, in these types of crops, this is already a standard practice. For fruit trees and ornamental trees, most growers use some kind of irrigation, but there are still growers that have only rainfed crop systems. The other crops mentioned by the respondents are mostly fodder crops, in which irrigation is not a common practice. This is also seen in the results in Figure 15.

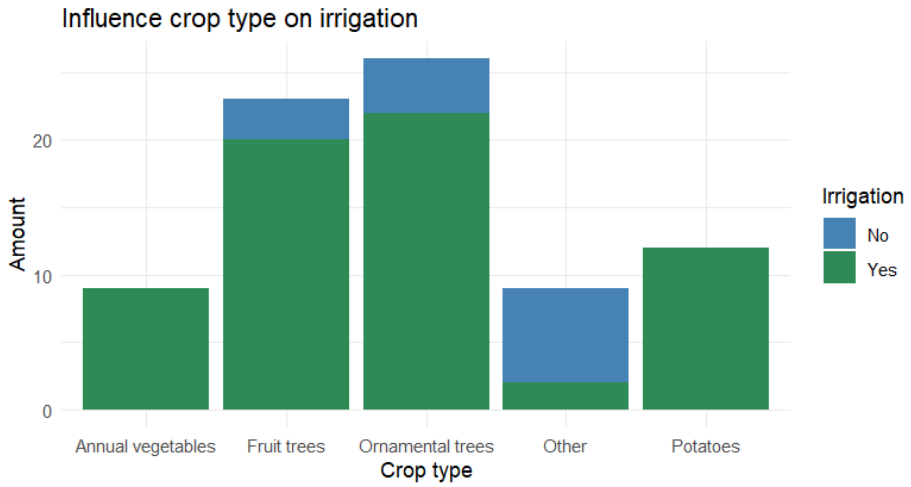

Figure 15: Influence of crop type on irrigation as reported in the survey. For each crop type, the amount of farmers that answered the survey were counted.

The most common irrigation strategy is the use of drip irrigation (41%), mostly in ornamental and fruit tree orchards, followed by reel irrigation (23%) and sprinklers (18%). Subirrigation is less frequently used. In addition to ornamental trees, reel irrigation is also suitable for annual vegetables and potatoes. (Micro)sprinklers are mostly used in fruit orchards, ornamental orchards and annual vegetable crops.

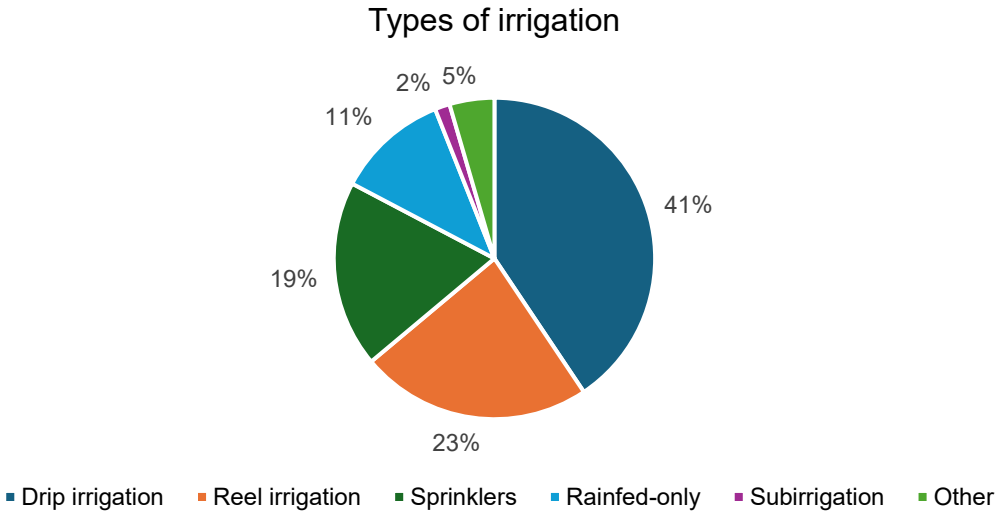

Figure 16: Types of irrigation systems used by the farmers as reported in the survey.

Use of practices that promote efficient use of water

A first observation that can be made, is that water management practices are in general less used than the previous mentioned soil organic matter management practices. Biostimulants are already used by ~60% of the farmers, but only 20% uses them frequently. Practices such as organic soil mulching, wetting agents, drought tolerant crops and smart irrigation control are used by ± 50% of the farmers that filled in the survey, while practices such as level-steered drainage & sub-irrigation, intercropping (plant associations) and the use of biofoil for soil mulching are not commonly used by farmers. This shows that in water use management, there is room for improvement and there is a need to guide farmers to implement these practices.

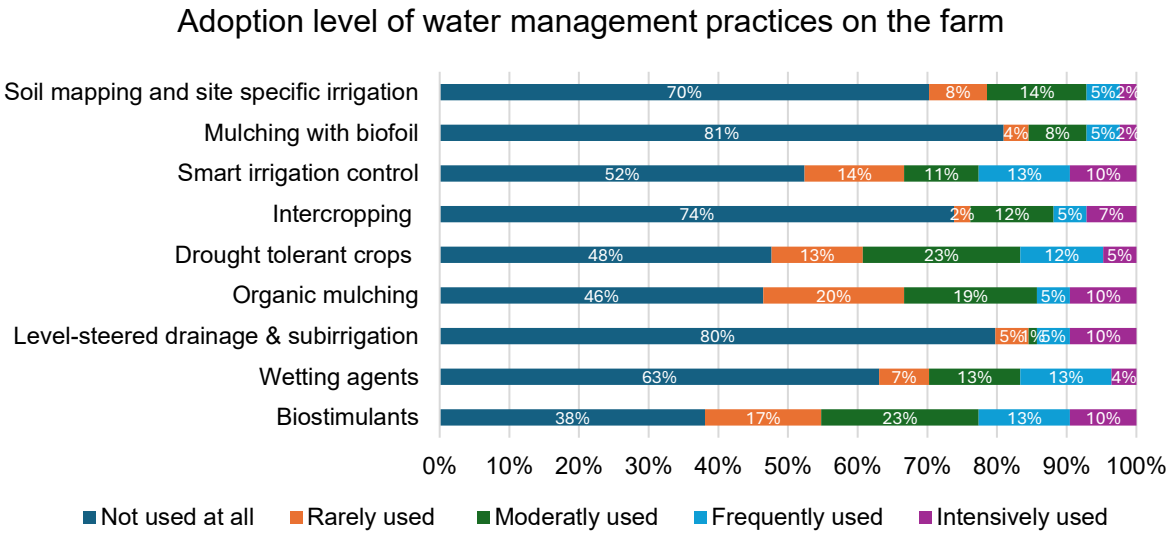

Figure 17: Adoption level of several water management practices on the farms of the respondents of the survey.

Statistical analysis showed that for some practices the implementation is significantly related to the country and/or crop type. Intercropping and organic mulching are the only techniques that are not related to the country or the crop type. The use of biostimulants, wetting agents, level-steered drainage and subirrigation, and soil mapping and site specific irrigation are techniques that are only related to the country where they are used. The use of drought tolerant crops and mulching with biofoil are only related to the crop type. Smart irrigation control is the only technique related both to the country as the crop type.

Table 3: Influence of country and crop type on the adoption level of the techniques questioned in the survey. p - values obtained with the Kruskal - Wallis test for non-parametric data. If the p-value is less than 0.05, it is considered as significant.

	Bio stimulants	Wetting agents	Level-steered drainage and sub-irrigation	Organic mulch	Drought tolerant crops	Intercropping	Smart irrigation control	Mulching with biofoil	Soil mapping and site specific irrigation
~ Country	0.0025	0.001	0.015	0.060	0.2583	0.4106	<0.0005	0.950	0.04
~ Crop type	0.2645	0.080	0.553	0.282	0.0030	0.1364	0.019	0.048	0.288

Figure 18 shows the distribution of adoption levels for each technique across the different countries.

The adoption level for biostimulants is equal in Belgium, France and the Netherlands, while it is less used in Germany. The same can be said about soil mapping and site specific irrigation. Wetting agents have an average adoption level in France and in The Netherlands, but are generally not implemented in Belgium and Germany, with the exception of a few farmers. The technique of level-steered drainage and subirrigation is mostly used in The Netherlands, although the use is not intensive, while in the other countries, when used, the level of adoption is high. Drought tolerant crops are used consistently over all the countries, the same can be said for intercropping and mulching with biofoil.

Overall, the techniques that require a more technological approach are less frequently used in general, although it seems that the use of these techniques is more widespread in The Netherlands and France.

Figure 19 shows the distribution of application level of the techniques over the crop types. Biostimulants are frequently used in all crop types, compared to wetting agents, that are not only less used in general, but also not at all used in the cultivation of fodder crops. Wetting agents are mostly used in the cultivation of fruit trees. It is not surprising that this technique is not used at all in fodder crops, since wetting agents are mostly combined with irrigation. Level-steered drainage is on average not widely used all crop types, which is not surprising since this technique was mentioned to be used least by all respondents in the survey. Drought tolerant crops are used more frequently in the cultivation of vegetables, potatoes, ornamental trees and fodder crops.

Intercropping is not significantly used more in one of the crop types, as is mulching, soil mapping and site specific irrigation. Smart irrigation systems are significantly used less in fodder crops, which is as expected, since those crops are mostly only rain-fed crops.

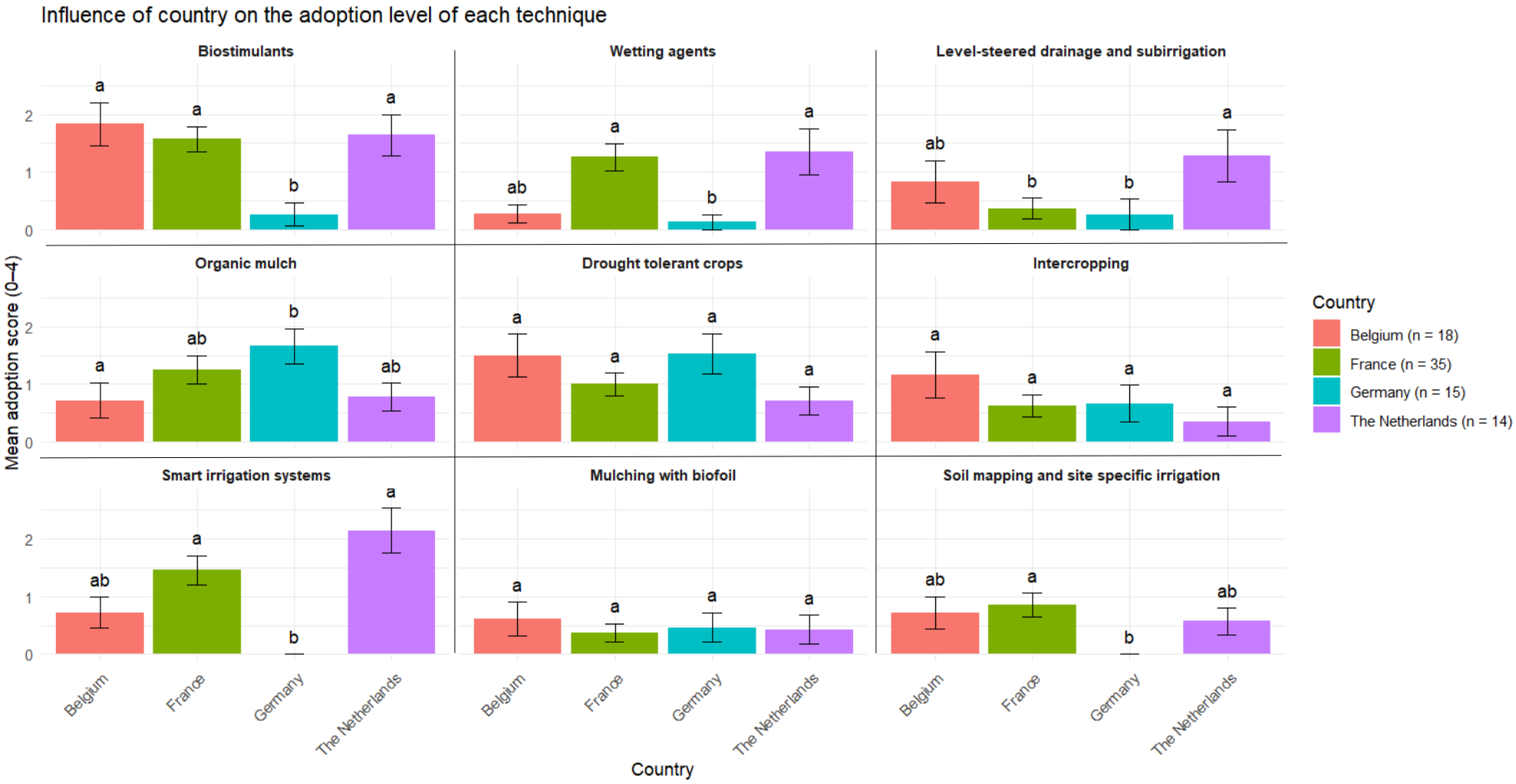

Figure 18: Adoption level of each technique to manage water and increase water use efficiency per country, with n = number of respondents. Adoption level was measured on a scale from 0-4. (0 = Not used at all; 1 = Rarely used; 2 = Moderately used; 3 = Frequently used; 4 = Intensively used).

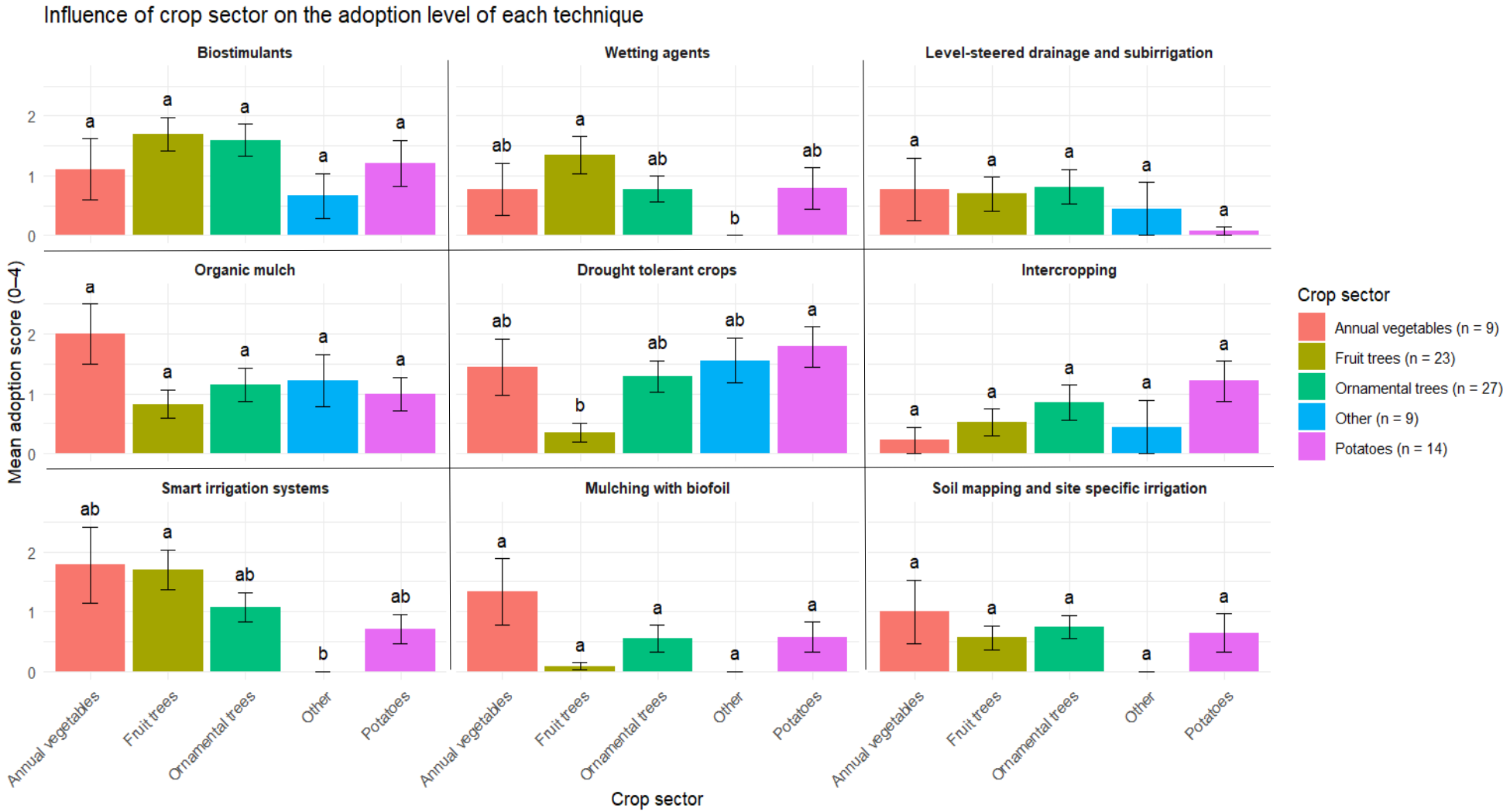

Figure 19: adoption level of each technique to manage water and increase water use efficiency per crop sector, with n = number of respondents. Adoption level was measured on a scale from 0-4. (0 = Not used at all; 1 = Rarely used; 2 = Moderately used; 3 = Frequently used; 4 = Intensively used

Main barriers for water management practices at the farm

The main barrier that prevents growers from investing in irrigation systems seems to be the hight cost of implementation (25%) combined with limited access to equipment and water (15%). Belgian, Dutch and French farmers in particular are struggling with the high implementation costs, while all countries except The Netherlands report limited access to equipment and water. Also strict regulations and policy restrictions on the use of water, mainly mentioned in Belgium and The Netherlands, are often frequently mentioned (14%). Systems such as smart irrigation strategies based on for example sensor data and soil mapping and site specific irrigation could result in a more efficient use of water resources, but for this, the implementation costs are rather high. Showing that the solution isn't always easy. Insufficient training and knowledge on these subjects are also mentioned as a barrier, showing again, that information on irrigation and water management strategies should be easily accessible to farmers. Smart irrigation systems should also help in reducing the workload of irrigation and the lack of time for farmers.

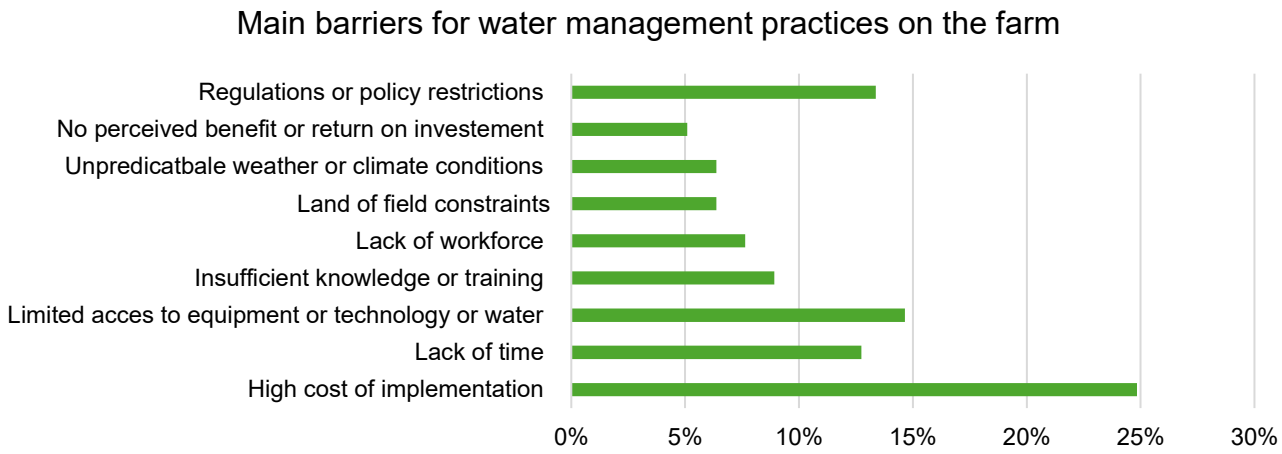

Figure 20: Main barriers for water management practices on the farms as reported in the survey.

6. Erosion control

Experiences with erosion on the farm

69% of the farmers that filled in the survey answered that they don't experience erosion on the farm, 22% does, and 9% is not sure.

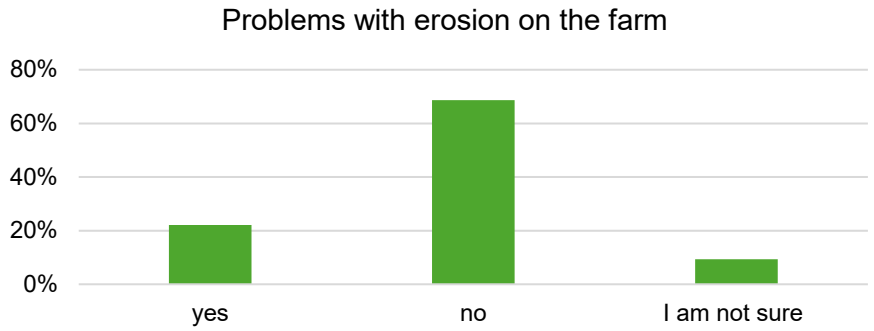

Figure 21: Percentage of farmers that does or does not experience problems with erosion on their farm.

Adoption level of techniques that reduce erosion on the farm

The farmers that filled in the survey were questioned on their use of three practices that help to reduce erosion. The practice most used in all cropping systems is the implementation of buffer zones, this technique is implemented by 80% of the interrogated farmers. 57% of these farmers use the technique frequently or intensively. We should keep in mind that not all buffer zones indicated by the farmers will be designed specifically to reduce erosion. Obligated cultivation free zones besides rivers/streams are also referred to as buffer zones. Vegetation zones specifically designed to reduce the impact of erosion are used on 61% of the farms, frequently and intensively on 44% of the farms. The technique of micro-ridging is used least frequently of all the techniques covered in the HydroSoilWise project, and only used by 25% of the surveyed farmers. The farmers that use this technique, mostly use it moderate (7%), and not frequently or intensively. This technique can only be used on fields with crops on ridges, which are often crops that are cultivated in rotation. This could explain the low level of adoption.

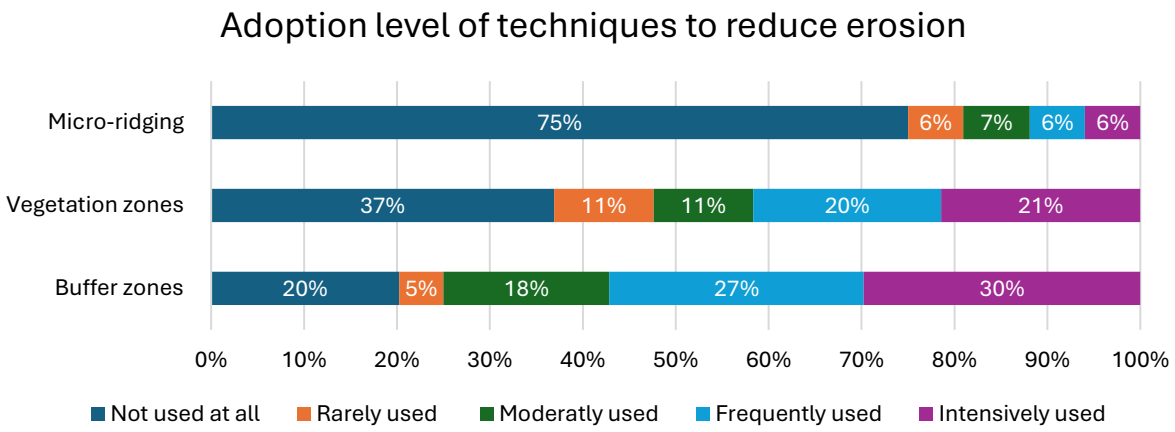

Figure 22: Adoption level of techniques used to control erosion as mentioned by the respondents of the survey.

Statistical analysis showed that the use of practices that reduce erosion are not significantly influenced by country, crop type and the presence of erosion. Except for the technique of micro-ridging influenced by the crop type.

Table 4: Influence of country, crop type and the presence of erosion on the adoption level of the techniques questioned in the survey. p - values obtained with the Kruskal - Wallis test for non-parametric data. If the p-value is less than 0.05, it is considered as significant.

	Buffer zones	Vegetation zones	Micro-ridging
~ Country	0.0900	0.1434	0.0775
~ Crop type	0.3440	0.2230	0.0200
~ Problems with erosion	0.1517	0.3042	0.1747

Figure 23 and 24 shows the influence of country and crop type on the adoption level of the techniques to control erosion. There is only a significant influence of crop type for the technique micro-riding. The adoption level is highest in the cultivation of potatoes, which is to be expected, since this technique is known to be effective to control erosion on potato fields cultivated on ridges. But this technique is also observed in the cultivation of annual vegetables and at a lower adoption rate in the cultivation of ornamentals.

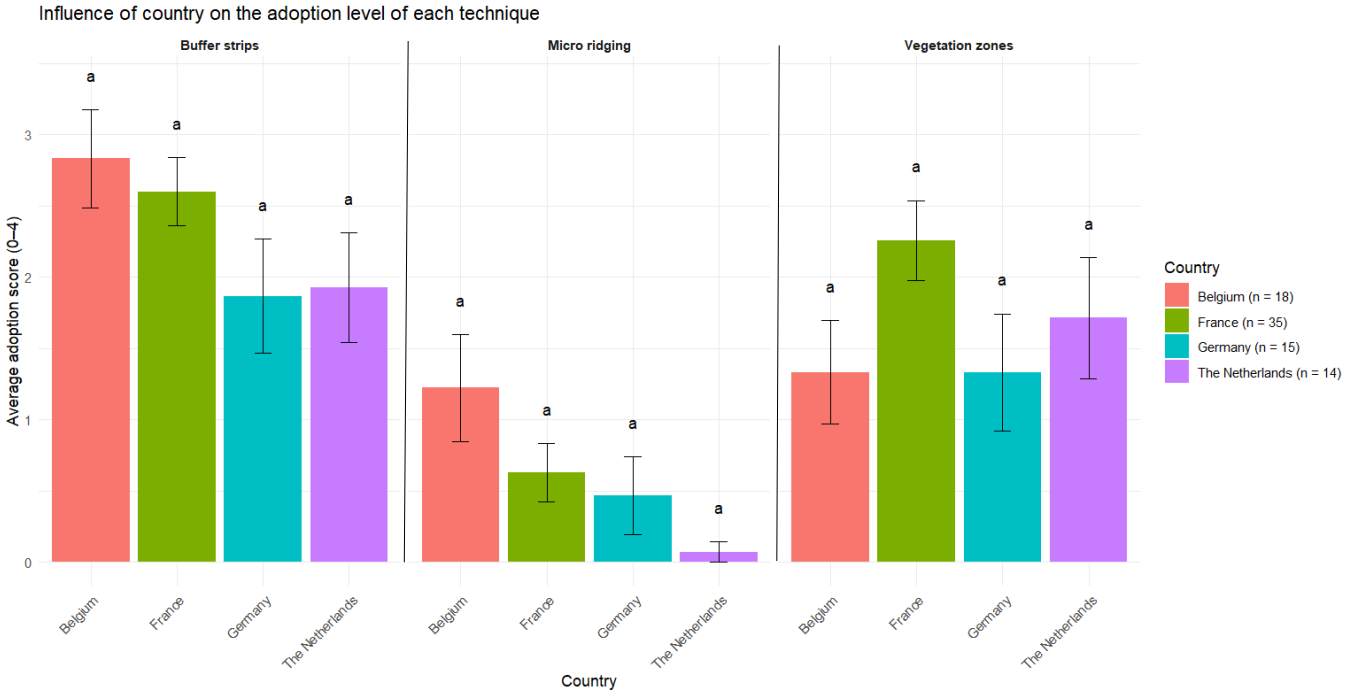

Figure 23: Adoption level of each technique to reduce erosion per country, with n = number of respondents. Adoption level was measured on a scale from 0-4. (0 = Not used at all; 1 = Rarely used; 2 = Moderately used; 3 = Frequently used; 4 = Intensively used).

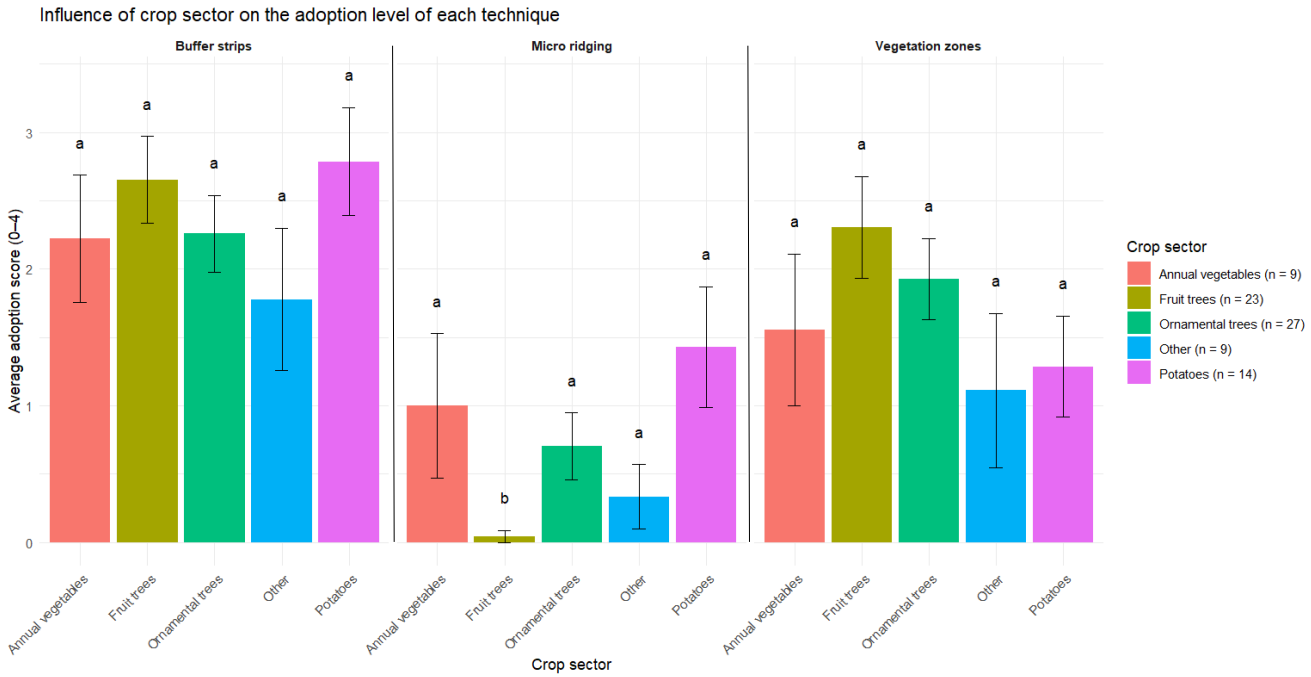

Figure 24: Adoption level of each technique to reduce erosion per crop type with n = number of respondents. Adoption level was measured on a scale from 0-4. (0 = Not used at all; 1 = Rarely used; 2 = Moderately used; 3 = Frequently used; 4 = Intensively used).

Most farmers that implement erosion control techniques, are convinced of the effectiveness of their practices (43%), a part of the interrogated farmers, also answered not to be sure (21%) (Figure 24). This shows it is important to spread information and results of trials on these kinds of techniques.

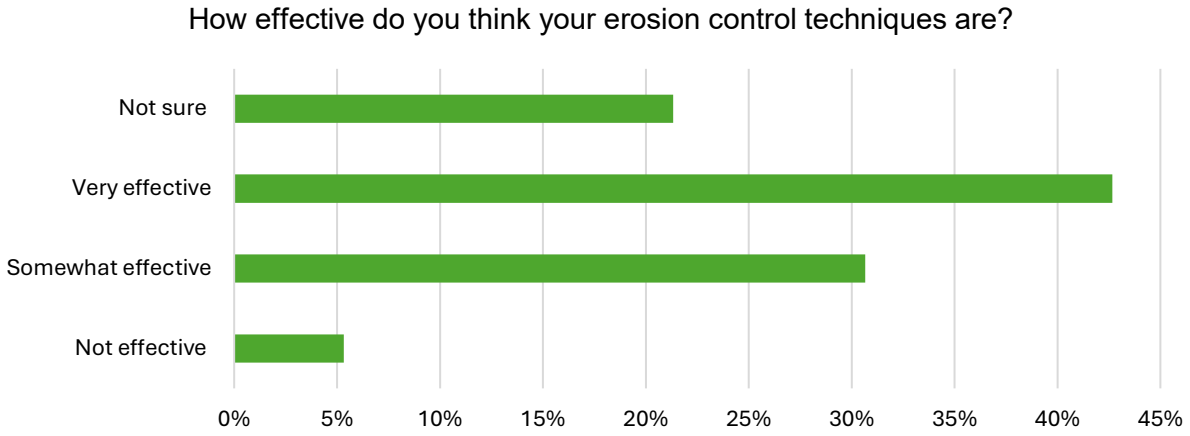

Figure 25: Answers on the question, how effective do you think your erosion control techniques are, as reported in the survey.

Other techniques to reduce erosion mentioned by farmers are listed in Table 5. Those techniques are in general closely linked to or are sub-techniques of the general techniques considered in the HydroSoilWise project. Within the survey, techniques

were classified as techniques to increase soil organic matter, techniques that improve water use efficiency and techniques to reduce erosion. It is however important to mention that most techniques influence all three aspects. Effects are also often linked to each other.

Table 5: Alternative techniques to reduce erosion mentioned by some of the farmers in the survey.

Alternative techniques to reduce erosion	Amount of farmers that mentioned the technique
Permanent land cover	13
No-tillage	6
Green manure crops	9
Increasing soil organic matter	7
Direction of workflow across the slope	6
Terras fields	3

Main barriers to implement erosion control practices

The main barriers for implementation erosion control practices are the lack of erosion sensitive field (18%), unpredictable weather conditions (20%), regulations and policy restrictions and the high cost of application (14%).

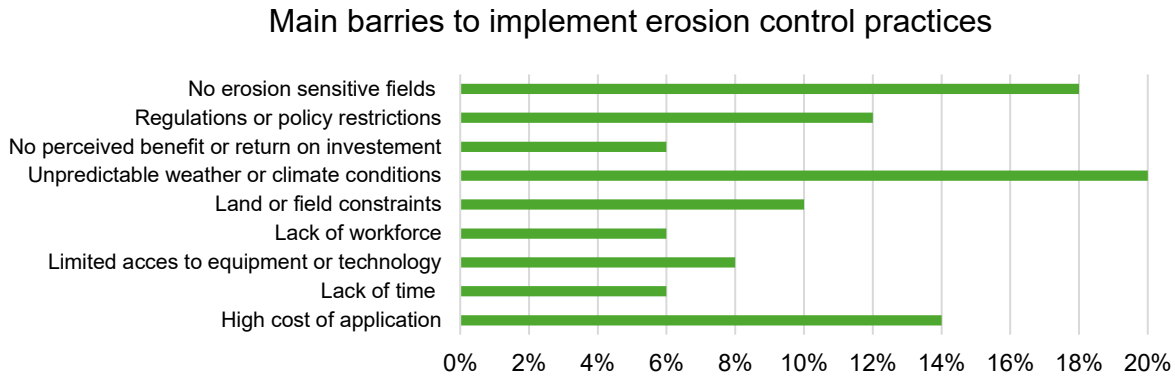

Figure 26: Main barriers for implementing erosion control practices as mentioned by the respondents.

Looking to the barriers mentioned above and those mentioned in the previous sections, we see that overall, regulations, high costs, limited time and changing weather conditions form challenges for the growers.

Since most farmers that filled in the survey indicated that they do not experience erosion, some additional data on farmer's experiences with erosion coming from a study in Belgium - 'Brongerichte aanpak bovenstrooms bufferen van sediment én water in het Denderbekken' - carried out by the Soil Service of Belgium and Tractebel on behalf of the Flemisch Government, Departement of Environment is added in the annex of this report.

7. Feedback from respondents

At the end of the survey, the growers were asked to give some insights into how they receive their information and knowledge on the development of new technologies and what kind of support they would like to receive in the future, this is summarized in Figure 26. The most used source of information are advisory services, both public and private (28%). Showing that public research institutions that provide advice are valued by the farmers. It was striking that French, Dutch, and Belgian farmers in particular make use of advisory services, compared to German farmers. This is followed by online resources such as websites, videos and forums (18%), mostly used by German and French farmers. The toolbox that will be developed within the HydroSoilWise project will also provide easily accessible online information, so this fits within the commonly used information sources. Technical magazines (15%) and workshops or training sessions (15%) will also be available within the project. Nevertheless, it is remarkable that it are mainly Belgian and Dutch farmers who acquire knowledge through workshops and training sessions. As expected, scientific articles (5%) are used less frequently by farmers, these kinds of articles are more intended for research purposes and academics.

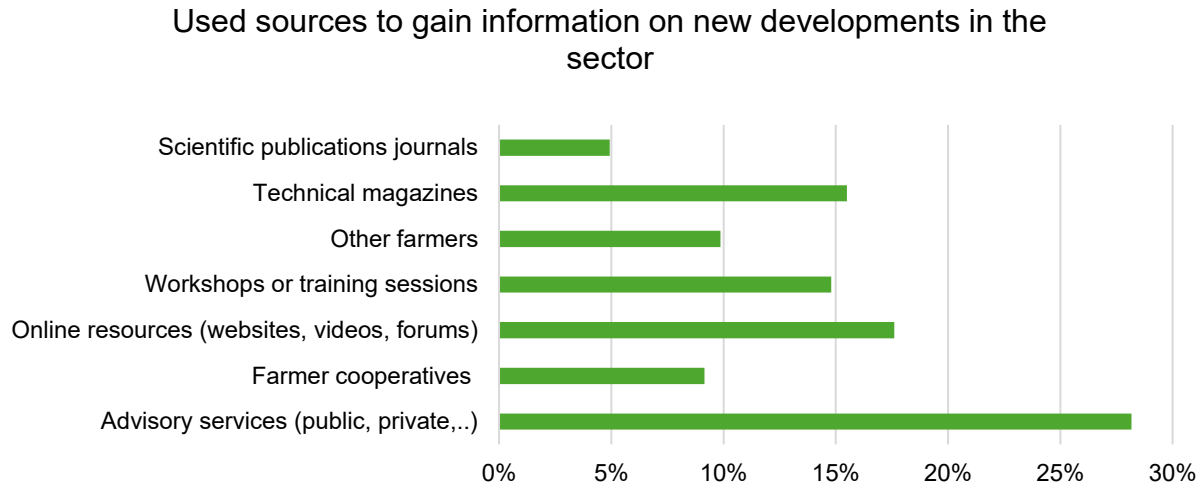

Figure 27: Most frequently used sources by farmers to search for information on new cultivation techniques.

The farmers were also asked to share how they would like to be supported in the future. Again here we can see the issue of the regulations and policies being mentioned quite often (26%), mainly by Dutch and Belgian farmers. Farmers would really like to see policy adapted to current practices, and easily accessible with less administrative work. Also financial support for investments is something they want to see (21%), especially in the early years after implementing a new technology or sustainable practice when the benefits of the practice are not always yet visible but the implementation costs are high. This appeared to be less pronounced or non-existent among German farmers, at least among those surveyed. Tailor-made advice is also mentioned (21%), mainly by

German farmers, as well as practical tools for measurements and monitoring (9%) and labels and recognition (3%). In Germany, advisory services are publicly provided, whose budgets have been cut. As a result, the number of advises handled has declined. Research results are also valued by the growers (12%).

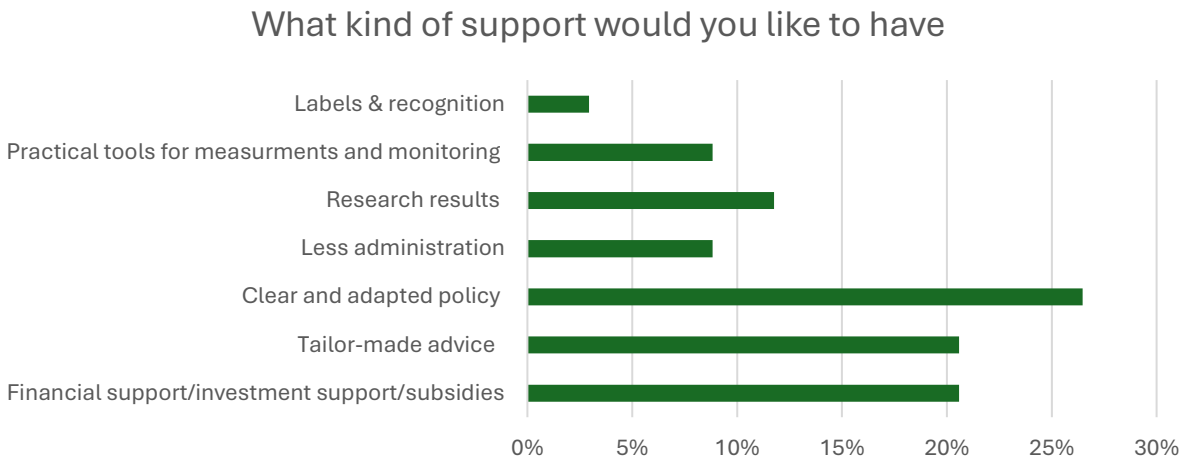

Figure 28: Types of support that farmers would like to receive in the future.

8. Discussion

The survey was made to gain information on the challenges farmers face and the measures they are already implementing in the field, ensuring that the toolbox is tailored to the needs of the farmers.

In the beginning of the survey, the farmers were asked to define the biggest challenges that they are facing concerning their soil and water management on the farms. This was an open question. The results from the survey confirm that the initial challenges that are defined in the HydroSoilWise project, increase soil organic matter, increase water use efficiency, and reduce erosion, also reflect the real issues farmers face in the field, combined with the increasing number of regulations and administrative tasks.

In the following sections, the farmers were asked about their knowledge and use of different techniques that increase SOM, increase WUE and reduce erosion. When asked about their knowledge on the concepts, the results show that farmers are usually familiar with the concepts, and are already implementing a lot of techniques on their farms to manage water and soil health. However, the majority of the farmers that filled in the survey, says that they are still looking for advice, feedback and more knowledge. This confirms the initial idea behind the HydroSoilWise project, as the project is designed to gather and spread information about soil and water management practices to the farmers.

In general, the results show that the techniques that improve soil organic matter are more widely used than the techniques that improve water use efficiency and reduce erosion. A lot of the techniques that build up soil organic matter are well known and studied for their benefits to the cropping systems, while we see that techniques that require more technology, have a high cost, are time consuming and less well studied, are implemented less frequently in practice.

Analysis of the distribution of the adoption of techniques over country and crop type, show that some techniques are used more or less frequently depending on the country and/or crop type. This may reflect differences in regional policies, availability of resources, different challenges depending on region and different challenges depending on crop type. This is, as expected, since different cropping systems face different management challenges and strategies.

The growers also mentioned different challenges that prevent them from investing in new techniques. The most mentioned barriers are regulation restrictions, high costs, limited time and workforce and changing weather conditions with more extremes.

When asked how farmers mostly access information, the two most mentioned ones are the use of advisory services and online information from websites, videos and trainings. This confirms our idea in HydroSoilWise that developing an online toolbox containing information sheets and demonstration videos and organising an online course is a good strategy to spread the knowledge gained in the project to the farmers.

Annex 1: Additional data on erosion control practices

As most farmers that filled in the survey from the Interreg HydroSoilWise project do not experience erosion, some additional data on farmers' experiences with erosion is added below. The results are taken from a survey held in Belgium, the study 'Brongerichte aanpak bovenstrooms bufferen van sediment én water in het Denderbekken' was carried out by the Soil Service of Belgium and Tractebel on behalf of the Flemisch Government, Departement of Environment.

24 farmers who operate in a landscape that is prone to erosion were questioned on how they experience erosion and measures they take to reduce it. 15 of them have a mixed farm (animals and arable crops), 8 of them have only arable crops and one has arable combined with horticulture (Figure 1). Out of them, 87.5% have fields that are classified as high or very high risk for erosion. In Flanders every field is classified by the government on its risk for erosion.

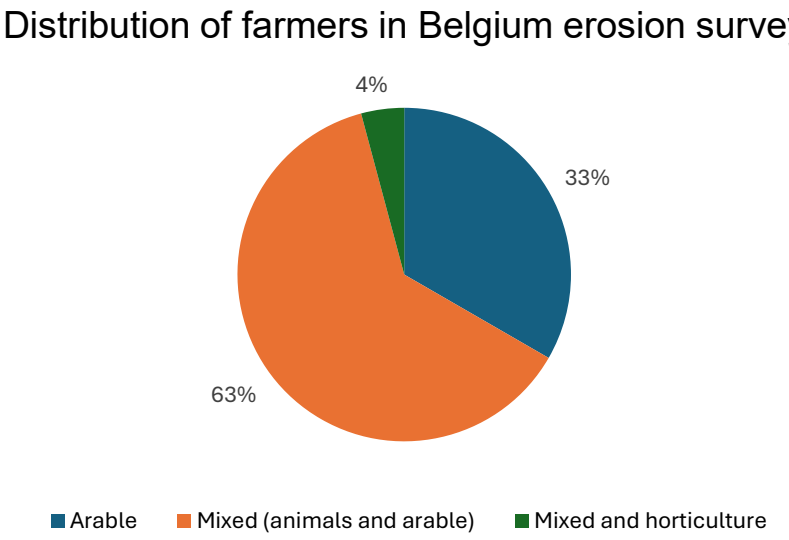

Figure 29: Distribution of type of farmers that filled the survey on erosion held in the study 'Brongerichte aanpak bovenstrooms bufferen van sediment én water in het Denderbekken' carried out by the Soil Service of Belgium and Tractebel on behalf of the Flemisch Government, Departement of Environment.

The main purpose of the survey was to investigate if the farmers take measures against erosion and if so, which measures they are most likely to take. All the questioned farmers implement practices to reduce erosion, even the farmers that don't have fields with a high risk for erosion. This can be explained by the measures against erosion that are taken into account in this study. One of these measures is the use of cover crops, which has been mandated by the Flemish government on 80% of agricultural fields in Flanders. Therefore, all farmers do to some extent cover crops on their field.

For 16 measures with a direct or indirect impact on erosion, farmers were asked to indicate how likely they would be to implement each measure on a scale from 1 to 5. In addition, they were asked whether financial compensation, such as a subsidy or

other form of financial support, would influence their decision. In Figure 2 on overview of how likely farmers are to take these measurements, with and without compensation.

As mentioned before, cover crops are the most liked measure, almost every farmer is very likely to implement is. The least liked measure is agroforestry, no one would change their production system as they deem it is less productive and not useful for their farm. Measures that reduce the amount of productive land are generally less favoured by farmers, as they can lead to lower production levels.

Receiving a compensation does not greatly increase how much farmers are willing to take measures. It will only influence a couple of farmers but the main conclusions stay the same. A compensation could help but the main factor for implementation is to maintain or increase the productivity of the farm.

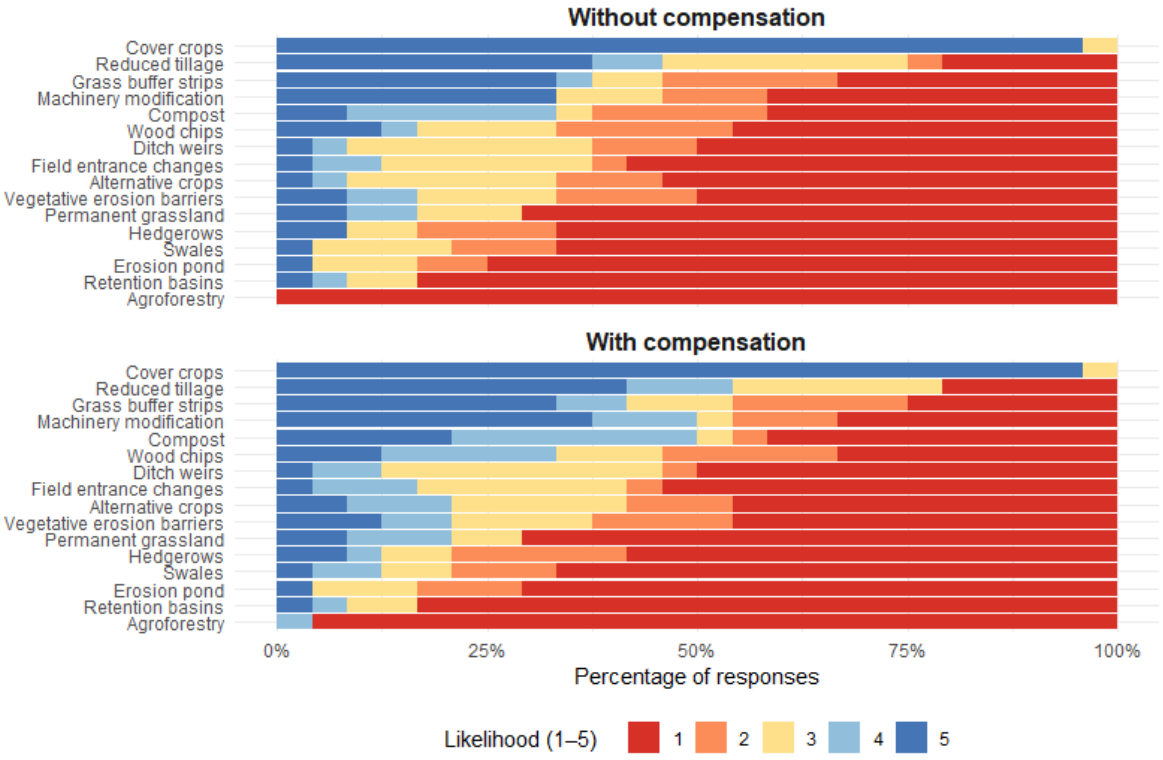

Figure 30: Distribution of Likert-scale responses (1 = very unlikely, 5 = very likely) for the adoption of different erosion control and land management measures, comparing responses without compensation and with compensation. Bars represent the percentage of respondents selecting each response category for each measure. Results taken from the study 'Brongerichte aanpak bovenstrooms bufferen van sediment én water in het Denderbekken' carried out by the Soil Service of Belgium and Tractebel on behalf of the Flemisch Government, Departement of Environment.