

## Activity 3: Value Chain Assessment for each pilot site

### Value Chain Analysis of the French Pilot Site

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## 1) Introduction

Agriculture contributes to climate change. Especially contemporary agriculture is a contributory source of carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>), and the extraction of outputs is heavily dependent on the use of non-renewable resources. At the same time, traditional agriculture holds some of the solutions such as storing huge amounts of carbon dioxide in soils while offering the possibility of agricultural valorization. Peatlands are a good example for this. 3% of the world's land surface is covered by peatlands, which are large concentrations of organic matter having accumulated over centuries. They store twice as much carbon as all of Earth's standing forests. 14.5% of estimated carbon is stored in wetlands (Rabenhorst 1995: 96). A distinction is made whether it is tidal or permanent wetlands. Besides, wetlands support a unique biodiversity (Strayer & Dudgeon, 2010). The storage of carbon is primarily done by productive creation of organic biomass. By taking up carbon during photosynthesis and burying undecomposed plant litter in anaerobic soils, freshwater wetlands sequester 1.38–2.26 t C<sub>org</sub> ha year<sup>-1</sup> in soils (Carnell et al. 2018: 4173, Bernal & Mitsch, 2012).

These peatlands are greatly endangered, many are irrecoverably lost, due to agriculture or other forms of land use (IPCC 2014). Europe contains 265,000 km<sup>2</sup> of various peatland types. If the area is not valorized correctly or dried out, for example for the extraction of turf, the positive properties will turn negatively and these areas will be unstoppable carbon emitters in the future.

This value chain analysis is based on the French pilot site of Grand-Lieu of the Carbon Connects Project and is part of work package 3 “Transnational Low-Carbon Business Modelling”. This pilot consists of the semi-artificial lake, which was created by human water regulation. The main use of this area is a retention area for the Loire stream. This artificial habitat was endangered by pollution of agriculture and human waste, that caused severe nutrient-enrichment.

The analysis will show how wetlands are used for economic exploitation. Human activities are limited by nature conservation law to fishing, hunting, hay production and grazing. This value chain analysis will help to outline the creation of value on these types of soils. The aim is to promote an alternative practice of wet agriculture land use that reduces CO<sub>2</sub>. Furthermore, the findings will feed the farmer-2-farmer learning program which eventually allows land users to directly share and scale experiences. In addition, the further development of business models collected under Activity 1 of Work Package 3 will eventually enable widespread implementation and scaling-up.

## 2) Theory

Value chain analysis is suitable to illustrate economic processes. Value chain analysis explore business connections from a relational perspective (Dicken et al. 2001). Business connections, as well as links to non-companies, are at the heart of the economic process (Henderson et al. 2002). This results from the basic assumption that we live in a highly fragmented and work-sharing society (Coe et al. 2008). Another basic assumption is that sectors are controlled and coordinated by so-called lead companies (Gereffi et al. 2005). These companies can build a strong market power and enforce them along the value chain. In concrete terms, in food production, these would-be retail chains that can control coordination from production to consumption.

However, a value chain analysis can also do more than a macroeconomic analysis. It can also do market- and business analysis. Thus, those corporate connections are examined to the question out of what power arises, how companies are involved in a social network, and how values are generated or bound. The questions of the use of production factors as well as its transformation and upgrading are particularly important especially regarding a capitalist system (Gereffi et al. 2005). This is predominantly important in agricultural production systems, where specialization, fragmentation and concentration have led to a system, in many agricultural sectors, where agricultural products have extremely low prices for consumers and consequently low margins for the producers of raw materials.

The transformation processes of agricultural goods follow a mostly linear input-output structure, which is increasingly influenced by horizontal coordination mechanisms. Agricultural production factors are transformed and fed to the end-consumer through further upgrading processes. Here, retail dominates the sectors, as they have privileged access to the consumer. A common form to boost margins within the system are economies of scale. Another way to increase margins is to mobilize other values, such as social or environmental values. For example, the origin of a good from a particular region can bind many of these alternative values, which are defined by verifiable standards (Henson & Humphrey 2010). This increases consumer confidence and may thereby shift the purchase decision from the base of price towards the special value added for the consumer. Furthermore, the horizontal mechanisms mentioned have detached e.g. institutional coordination from market processes, which can contribute to the decline or promotion of a production system (Gereffi et al. 2005).

In summary it can be said, that it is possible to sell products which were produced in a special context or using special techniques. In traditional capitalist market processes, particularly aggravating production conditions and low margins would usually lead to market adjustment processes, consequently leading to concentration processes. However, alternative forms of value creation and direct forms of distribution can lead to a shift of corporate power in the value chain and thus eventually lead to a (new) rise of producers.

### 3) Methods

This analysis is the result of an international cooperation within an Interreg 4b framework funded by the European Union. The present analysis is the result of a qualitative primary data collection and evaluation. Prior to data collection, a baseline survey was conducted using pre-formulated data within the project consortium. Essential elements of the pilot site were collected. Based on the analysis of this data, a semi-structured questionnaire was created to collect all relevant complementary primary socio-economic data, which was analysed and transferred into a business case. Using qualitative data collection, the data was evaluated and theoretically embedded in the framework of the value chain analysis.

The interviews were conducted with producers who work within the pilot site and thus achieve an active economic revaluation. The aim was to show the feasibility but also identify barriers that accompany the economic use of wetlands.

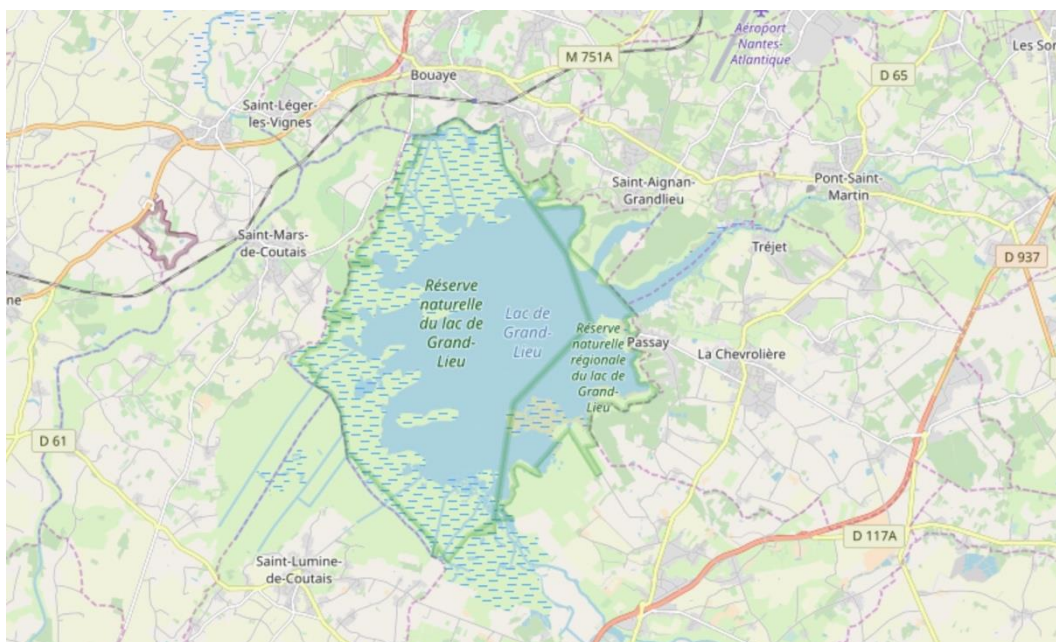


Figure 1: Lake Grand-Lieu (source OpenStreet Map)

The Lake of Grand-Lieu (Fig. 1) is located in the downstream part of the watershed of Grand-Lieu, with an area of 840 km<sup>2</sup>. From one season to the next, the flows of these two rivers are fluctuating. They are very low or even non-existent in larger parts of the area in summer. The lake receives, depending on the winter rainfall, between 50 and 300 million m<sup>3</sup> and plays an important role for flood control in winter. Between November and May, the locks of the lake are generally open to release waters to the Loire, while they are closed in summer.

Lake Grand-Lieu is fed by two rivers: Ognon to the east and Boulogne to the southeast. It empties into Acheneau to the northwest. This river, which flows into the Loire after 40 km, has a drop so low (40 cm from one end to the other) that its course can be reversed during sufficiently large tides. In order to better regulate the level of the lake, a lock was built on Acheneau. The bathymetry of the central part of the lake was only specified (and mapped) in the late 1990s.

In the region of Pays de la Loire, agriculture in marshlands and alluvial valleys is strongly related to cattle breeding. Thanks to its modalities of maintenance of the environment (mosaic of practices of mowing and grazing), cattle breeding is recognized as a guarantee of biodiversity in these sensitive territories with strong ecological patrimony. Farmers are therefore the prime managers of these wetlands.

#### 4) Assessment of farmers' businesses

Sustainable agricultural use of seasonal wetlands is limited to mowing and pasturing. Both, are agricultural processes of animal husbandry. Cattle husbandry is a specialized form of agricultural production. Cattle are used for both meat and milk production. The choice of cattle is a unique feature of the specialization of farmers as well as a key for understanding the economic analysis of the farmer. Dairy cows are used, after the intensive production of milk, for meat processing. Nevertheless, some breeds, such as the Holstein-Friesian, are characterized by their high milk yield, but have less meat than other beef breeds, which in turn have a lower milk yield. Limousin cattle, for example, is a typical beef breed. This breed is characterized by the fact that it quickly builds up muscle meat with additional high-energy food accelerating this process.

The profitability of that production depends on numerous factors. Herding sizes and other factors resulting from the economies of scale are very important parameters for the contemporary production.

Access to food, for example, has become a less relevant factor. One reason for this is that the cost of (subsistence) production of animal feed is higher than the cost of food from other sources (acquisition). Factors such as the global integration of processes and the internationalization of food demand have led to global sourcing of food. A prominent case is the soybean production in South America. However, the given climate change and the associated sensitivity to CO<sub>2</sub> transmission have promoted alternative production methods. They are increasingly important for the reduction of CO<sub>2</sub> emissions, but also for the storage of carbon. Economic profitability is still of high importance in capitalist systems, yet there is an increase in the importance of CO<sub>2</sub> neutrality.

## 5) The use of Grand-Lieu's wetlands

The use of the pilot shown here enables the reduction of CO<sub>2</sub> emissions, since a large part of the feed comes from regional sources. In addition, the cultivated areas shown provide a carbon storage. However, to ensure the carbon storage capability, the area must be left in a basically wet state. This study area is a marshland area with both permanent wet areas and seasonally wet areas. For this analysis, the seasonally wet areas of the wetlands can play an economic role for the producers.

Climatic flood periods alternate with agricultural management periods. The management periods are thus a central factor for the profitability analysis. Due to the limited management periods, the cost of land is relatively low. Prices vary and are approx. 1000 Euro per ha. No other agricultural crop, except of pasture, is permitted due to Natura 2000 restrictions. Furthermore, this area is partly under the French state protection *Réserves naturelles* and *Réserves naturelles regionale*. Moreover, this waterbody is subject to the Ramsar Convention.

The agricultural use of the area was historically structured differently and differentiated. Alternative forms of livestock were used for valorisation. In earlier times, for example, horses were kept in the meadows, because they were largely used in agriculture as draught animals. Sheep used to be kept as well, but in the lake region their husbandry was stopped 40 years ago as it was not economically viable. The neighbouring people of the lake used to keep birds, and rabbits in the meadows. But that has also stopped because this form of part-time farming has largely disappeared. The fishing activity only accounts for seven licensed professional fishermen in the lake.

What is left is primarily to production of raw milk, so that dairy farmers are among the primary users of the wetlands. Mowing, pasturing and grazing are core elements of the dairy production process. Most of the milk from the cows in Grand-Lieu is sold as raw milk. After the collectivization of the raw milk via cooperatives, further processing takes place at the dairies (e.g. Laiterie Saint Père). The greater share of value creation is therefore outside of the lake region, since the greatest share of value lies in the processing and distribution of milk and dairy products.

The short management periods mean that farmers use the marshland pastures only seasonally, with the farms located outside the marsh. The dairy cows use the pastures for exercise and feed and return to the farms for milking by themselves when they decide to.

*"I tripled my herd. That does not mean that expansion is imperative for valorisation. On the contrary. Large herds of cattle as grazing is difficult in this area. Actually, only the cows are suitable for the marsh in the dry phase."* Dairy farmer

The herd size is not necessarily a criterion for increasing profits, at least not in the marsh. But this is mainly to high demand for raw milk and therefore high milk prices.

These prices have been high after a devastating period since 2015. Strong concentration processes have eliminated most of the producers, which allowed prices to stabilize.

*“However, the trend is not that many “new” ones are founded here. On the contrary, the farmers who remain, grow.”* Organic farmer

The decrease of producers around Grand-Lieu is already leading to changes. The changes affect, on the one hand, the structure and constitution of biodiversity. The daily use of the wetlands by the producers means that the agricultural infrastructure is maintained and ways, paths and channels are repaired. For example, if the surfaces are only mowed once, this increases the risk that surfaces and paths will not be maintained. A further decrease of management or numbers of producers would thus lead to a greater desolation and lower productive use of these areas.

*“There is a common 274 ha in the community where I am, there was a great drought in 1976. In the time are about 600-700 animals. Today there are only 200 to 250 animals left. This causes the pastures to decrease and there is less hay. So, does the biodiversity in the lake (Grand-Lieu).”* Dairy farmer

The use of dairy cows in the protected zone of Grand-Lieu is made more difficult as the milking infrastructure is located outside the marsh areas. The areas in the wetland therefore serve only as a roaming area for the animals. The price for land is in comparison so low because the meadows are low in nutrient value for animals. Regarding the high-performance dairy industry, the permanent grassland is not sufficient for animal nutrition, so additional feed must be purchased. Furthermore, since tillage is not possible on this kind of sandy soils no other crop can be harvested.

*“We produce in an area that is heavily regulated. Here you cannot build things for the production you want nor desire. At Grand-Lieu alone, there are 13 different frames of protection. For example, 3 out of these falls on my production site, including Natura 2000. A building permit can take even 1.5 years. That's not flexible.”* Dairy farmer

Enhanced growth for dairy farmers is not an option in general as there are factors which appear not conducive to the intensive production due to the restrictions. The management of the marshland is subject to some peculiarities because of the seasonality. Thus, due to the artificially regulated water gauge, it is possible to alter the management periods. The water is regulated by a lock which dams up the water, before it outflows into Acheneau.

*“From our perspective it is annoying, because this system runs like this for, well, 25 years and does not pay attention thereby whether dry phases or wet phases are. That's what bothers us.”* Dairy farmer

The major part of the lake is therefore artificial. The watershed was determined by a committee of different stakeholders, such as environmentalists, farmers, hunters and governmental representatives of different levels.

The wishes of the producers collide with those of environmentalists, hunters and fishermen. Fishermen and environmentalists are in favour of extending the periods of flooding and raising the water level. Professional fishermen and hunters would like to delay the alluvium phase until July. Farmers, in contrary, want to shorten this phase and lower the overall water level. The difficulty lies in finding or maintaining the level that simultaneously reduces emissions and allows management. A project idea proposed by the water committee for the regulation of the water level was to replace the lock with a stone ceiling. Climatic factors would then decide on the water levels. In dry weather, the water levels would fall below the artificial maximum level and in wet phases, the water would flow through this base, thus the water level would be regulated unilaterally.

The management of water is currently done by a lock. The lowering of water, for example, takes place successively. The water level is lowered by 1.5 cm per day until May. A longer alluvium phase would have a significant impact on the economical exploitation of cattle and dairy farmers.

*"A production barrier, that bothers us the most is that water levels are too high. That in fact impacts us negatively for the pasture periods. It has an influence on the flower (pasture grass). (...) So this is a worry also of tomorrow (future)." Dairy farmer*

The pasture develops only after the water levels have dropped. Only then will the grasses have the opportunity to flourish. Shorter periods would make the production of pasture nearly impossible.

*"I would wish that our own management period would be extended. But it is so. However, this time should not be shorter, because the pasture has no time to develop. So, I would be happy if I had more permanent grassland, so in return I would have to grow less corn and buy soy to feed my cattle. " Dairy farmer*

Some producers use drainage systems to influence the management period. Nevertheless, these periods cannot be significantly influenced substantially. The level is thus influenced by two factors: the anthropogenic influence on the waterbody and climatic conditions. The latter is becoming increasingly extreme and incalculable through climate change. Extreme weather events happen more often and become a big problem for the producers.

Other forms of climate change become visible as invasive species such as neophytes expand into the ecosystem. In the case of Grand-Lieu, a species called *Ludwigia peploides* grows. On the dairy industry, this plant has little influence. On the contrary, the cows also use this plant as food, but prefer other plants. Nevertheless, the expansion of this plant ensures a higher competitive pressure between the other aquatic plants. Consequently, this can lead to a change in the food chain of downstream fauna.

However, with subsidies becoming an essential production factor, producers in and on marshlands are not under special protection. Farmers receive higher land subsidies for permanent grassland than for arable land. Because of the size of land owned by farmers, more subsidies can be claimed than in regions



with high costs for pastures and therefore smaller areas of land owned by farmers, for example in mountainous areas. In the plot case, however, farmers can only use the land to a limited extent due to the Natura 2000 regulations.

This business disadvantage has a strong impact on the production process. Intensive production patterns are often limited by the guidelines. However, this is also because there has been a lot of concentration in the dairy sector. This applies to the conventional sector. The use of fattening animals in the lake area offers the advantage over the use of cows for raw milk production that no additional costs arise, e.g. for energy feed. On the other hand, the feeding of the cattle on the marshes is sufficient on the marshes to build up enough fat for the winter. Typical breeds in the production of meat are Lac de Grand-Lieu cattle breeds Charolaise, then Limousin. Another typical breed of cattle is Blonde d'Aquitain, which does not occur in the lake region. In the following, an organic meat producer is considered closer, which comes to a different result, as the milk producer.

## 6) The case of organic farming in Grand-Lieu

Using the example of the milk producers, it becomes clear that the value-retaining processes predominantly take place outside the marshland and the farm. Another example of a meat producer with direct sales shows how more values can be mobilized.

*“Of course, the only thing that complicates our work is the water level. Especially when there are rainy summers, then the management period shrinks. The marsh is used from 4.5 to 5 months a year“* Organic farmer

In the production of meat, the predominant processes are similar, as with the dairy farmers. The management periods of the marshland are between May and September.

*"A typical business year looks like this: The calves are born with us between January and April. Then we will dedicate ourselves to the silage until the end of May. And hay (...), we're on the marsh in June, July through August. For example, we can only use our marsh from June to November. That's because of the weather, so we have not a lot of choice."* Organic farmer

The selection of the breed for the meat production is a central factor for the specialization of the producer. Charolaise cattle are often used for the marsh region, which is considered a popular breed for meat production in France. Charolaise cattle can adapt quickly to new conditions and are capable of producing satisfactory production characteristics for the farmers. Often Charolaise breeds are more resistant to disease than comparable cattle breeds, so it is widely used by extensive producers.

*"There has always been the Charolaise here. I settled here in 2005. And in 2010 we switched to organic. Although I have an agricultural education, I have not been a farmer before. I have acquired everything new. I owned no land and did not inherit anything. We now have 75 cows."* Organic farmer

The change from conventional breeding to organic breeding has some advantages for the farmers in the marshland. First, the farmers receive so-called conversion aid for the implementation time. The farmers receive the help for a period of 5 years. Thus, the change leads to production adjustments that affect the output of the producers. As a rule, the output is lower for extensive producers and compensation compensates for loss of income.

*"We sell all bulls out of our 75 cows every year and keep the females for further offspring. That's how we get about 30 males a year, which are then sold."* Organic farmer

In particular, given the aggravating production conditions, organic labelling is a way to enhance the production context for the customer. In the production of conventional milk, which is produced, processed and distributed in an integrated production process this context is of less importance, where production parameters, such as volume, play a bigger role. The values based on scales can only be mobilized for products from the marsh by making use of the particularly favourable and therefore large areas for the management of large herds. For extensive producers this is different as the production context counts, as well as the label.

*"The cost of land in the marsh is low. So, costs in the marsh one hectare 1000 euros and all around, if not in the marsh then the prices start only with approximately 2000 euro."* Organic farmer

This also benefits the organic meat farmers. Since the large areas supplies enough to feed the herds even though their energy densities are low. On the other hand, large areas usually yield a higher premium for the farmer, which he receives for his permanent grassland from EU funds.

*"Nowadays we do not buy any more food. We can meet our own demand for what the marsh gives us. Especially regarding irrigation. The soils of the marsh are very sandy, so they dry out quickly. This is great for prairies. For everything else it is rather unsuitable."* Organic farmer

An important parameter is the income diversification for organic meat producers in the marshland. Income is either differentiated by different premiums and direct payments or through production of other products.

*"We use the lake by using it as a water supplier for our corn. Yes, we do maize, but very little. We'll do the corn to sell to the farmer's cooperative."* Organic farmer

These can be complementary by being integrated into the production process, but also completely different. In the case of the French organic farmer, maize is sold to a cooperative. Here, the negative characteristics of the lake turn into positive, as it is used for irrigation. These fields are located outside the lake area and are partly dispersed due to the need to rent land.

Using the example of organic meat, the production context (i.e. extensive grassland) becomes an advantage, and existing nature conservation regulations and protection categories even reinforce the

production context. Thus, the same factors of production are on the one hand inhibiting conventional producers and of an advantage for extensively-operating producers. An example is that conventional producers often have the problem of not obtaining building permits, in order to increase their herds. This is different for the extensive producers, who get a certain public image through the imposed protection categories, which is finally demanded by consumers.

*"Conservation is clearly an advantage for us. For commercialization, this is important to revalue our products. These frameworks create an image for our consumers, which we also live. The customer is reassured. So clearly it can only be one of our goals to communicate this framework."* Organic farmer

Although the butchering is taken over by a third-party, the distribution is via own distribution channels. The direct distribution of goods, such as off-farm, is essential for maximum value retention in the marsh.

*"We disassemble the meat and then sell it from the farm. We let the animals pick up and pick up then the meat itself. Delivery contracts do not exist here. Most of the cows are sold in this way."* Organic farmer

The distribution system is multi structured. The most important distribution point is the off-farm sale, plus farmers-, producers- and weekly markets, which increases the market expansion.

*"Direct contact with customers is essential for us. The short production chains are just as important as the quality of the meat. (...) The direct sale of goods is a mean to mobilize most of the value. That was clear to us from the beginning. It was evident to us. That was the project of us. Otherwise, we would have to sell much more volume to live a similarly good life."* Organic farmer

The communication during the sales process is essential, because in this way the production context and the associated revaluation of the marsh can be emphasized. Direct contact with the customer leads to a bilateral exchange. On the one hand, this leads to confidence and appreciation for the production context. On the other hand, this close contact also leads to process adaptation upstream. For example, a demand-driven production adjustment was adapted to customer requirements for the production and sales concept.

*"We also have a pig farm attached. These are kept open air. We have 12-15 animals. (...) our customers have requested it."* Organic farmer

The demand-driven adjustment and the expansion lead to further revenues for the producer. In addition, the sales infrastructure will be better utilized. This example shows how extensive farmers value their own land by anchoring further downstream value-added processes. It turns out, however, that many processes can be relocated with difficulty or only with great effort into the marsh. From the perspective of the farmers, further structures should be created so that the actual protection of carbon storage areas would be economically enhanced. Farmers see great potential in emissions trading if certificates were

awarded among farmers in the marsh. This kind of certification would enhance the production context in monetary terms. The question is only when and if these certificates will be granted for the Grand-Lieu region. For a profitability analysis, these certificates are not yet significant.

*"If I could change something, then I would shape a brand. A brand for products from the marsh. Or an AOC Grand-Lieu. So, in any case, I would like to send stronger signals to the outside. What would be interesting for valorising the products even more. (...) The framework conditions are missing, because quite a lot of actors would have to be brought on board. That's not the case right now."* Organic farmer

Another important potential element in commercialization would be a protected indication of origin for Granlieu producers. An indication of origin such as the AOC would also be a means of regional upgrading. A specific Grand-Lieu brand would enhance the production context beyond its regional origin. Here it would be quite conceivable that a logo or a brand can convey a strong external image to the outside. A prerequisite here would also be that many different actors would join. It is still questionable to what extent the various actors could also reach an agreement on water regulation.

A prerequisite for a brand would be that further processing and sales were anchored more strongly in the region. For example, for conventional milk this is not the case, whereas short product chains in the region could benefit from it.

## 7) Conclusions

The analysed case has exemplary character for the agricultural use of marsh areas. The value chain analysis should also serve as an approach to upgrade already drained marshes without farming. This example has shown that it makes economic sense to use such land for livestock farming. The primary advantages are a potential for reduction of CO<sub>2</sub> emissions in food production. However, the example also reveals the difficulties of implementation because of differing interests.

The short cultivation periods in marshlands means agricultural production patterns must be adapted to the local conditions. For an economic upgrade to take place, value-binding processes must be activated in addition to production, processing and commercialization. This shows that large farms can achieve a partial revaluation of these areas. For smaller businesses, this only takes place by anchoring further processes. The example of the organic meat producer makes this very clear. The construction of their own short supply chains also means that the marshland is being upgraded by the commercialization. This example is important because it shows a compatibility between CO<sub>2</sub> storage and agricultural use of the marsh.

Basically, *conventional* agriculture on the land is both possible and economically viable, yet it was shown that the marshland areas and the economic periods are not sufficient to be self-supporting. *Extensive* areas have at least the advantage to produce enough food so that the animals are sufficiently

supplied. A complete independence from areas outside the marshland was not found, because of the seasonal variations.

The case study shows that the storage of CO<sub>2</sub> is by no means the goal of the producers, but rather a barrier, especially for conventionally operating businesses. There is also a highly controversial view emerging between the farming businesses and those of the conservation groups. Only the organic meat example an approach in terms of protection through use. It is therefore a valuable example of the appreciation of the marshland for the cultural area.

Another step in integrating conventional farmers into this protective function would be emissions trading. This would protect the actual production context and at the same time greatly enhance it, so that also the management would be permanently rescued here. Another form would be to create a trademark for a protected indication of origin, possibly even for peatlands in general rather than just the lake region, but this would only make sense if the processing and sale of the goods were more integrated into the local business custody. Without such measures, the farmers are subject to the same market dynamics as those outside the marshland and those without the short economic periods.

## 8) Literature

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