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LOW CARBON



MONITORING REPORT

HELMOND & AARLE-RIXTEL, NL CARBON CONNECTS PILOT SITE (PEAT SOILS)

MONITORING PERIOD: SEPTEMBER 2020 - FEBRUARY 2022

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7 Introduction on the pilot sites

In The Netherlands several pilot sites for paludiculture are present now. In the framework of the INTERREG project Carbon Connects the sub-partners Waterboard Aa & Maas, Staatsbosbeheer and Radboud University started with the pilot site Deurnsche Peel, consisting of two sub plots: one with cattail (Kaasweg) and one with willow (Eikenlaan). As the cattail planted at the location Kaasweg did unfortunately not survive the dry summers of 2018 and 2019 and it appeared to be not possible to maintain a high water level in dry periods, we did our utmost to find an alternative site in the region. Finally we were able to realize a new pilot site on land owned by Ms. Swinkels, situated in the estate Groot Overbrugge, on the border of the municipalities Helmond and Aarle-Rixtel. Here cattail was planted in September 2020, after the preparation of the site. Additional planting and sowing of cattail was done in 2021 (See figure 1). To collect additional data and gain more experience with paludiculture crops we contributed to the monitoring and maintenance of some other pilot sites: Ankeveen, Zuiderveen, Bûtefjeld.

2 Overall objective of the monitoring

The objective of the monitoring is to collect data to monitor the expansion of the crops after initial planting or sowing and the environmental conditions and biodiversity on the site. Based on the monitoring the management is adjusted, including additional planting and sowing of cattail and management of the water table in 2021 (See Figure 1).

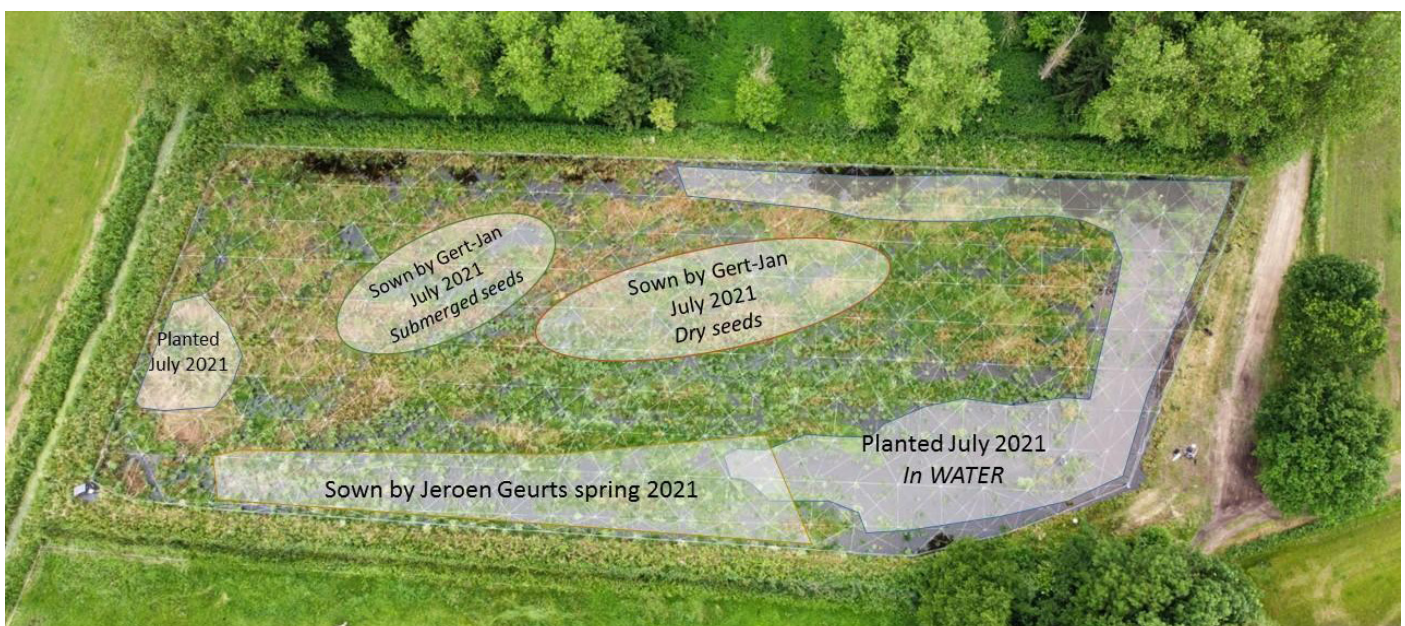


Figure 1. Aerial photo of the pilot site in Helmond. The locations of additional planting and sowing in 2021 are shown.

Monitoring and management actions performed in the pilot site in Helmond

Tubes and divers to monitor the water table were installed by Jeroen Geurts (KWR/RU, in the framework of the KLIMAP project) in the end of June 2021. The owner of the site carries out an almost daily visual monitoring of the water table and growth of cattail. The water table was raised to on average 5 cm above the soil surface in September 2020 immediately after planting the cattail. In the subsequent period it appeared that the soil surface was not completely flat. This may be partly due to uneven swelling of the peat soil. In the eastern edge no swelling took place, as here there is no or just a very shallow peat layer. On the parts where the peat soil was not inundated anymore, but a few centimetres above the water table, weeds and grasses grow up.



Figure 2. Situation in the central part of the pilot site in May 2021. Weeds and grasses dominate in this area where the water table was at or just below the soil surface and the cattail planted in September 2020 was still small.

The cattail was planted in September 2020 with one plant per m². As it took rather long in spring 2021 before the first green shoots appeared Jeroen Geurts sowed cattail seeds in part of the area in spring 2021 (Figure 1). In addition, it was decided to plant 5000 cattail plants in groups at the eastern

fringe and another spot at the western edge. This was done in July 2021, after removal of weeds and grasses in these areas.

The water table was raised with 15cm (as can be seen in Figure 3) to inundate the whole area with at least 1 cm. In the end of October 2021 the water table was lowered, just before the first harvest of cattail during the Farmer 2 Farmer meeting on the 2nd of November. Subsequently, the water table slowly raised again until February 2022, when the water table was again lowered for the harvest of the remaining part of cattail. Based on the responses of cattail and experience elsewhere, we decided to install a water table that would result in an inundation of the highest parts within the pilot site with at least 1 cm.

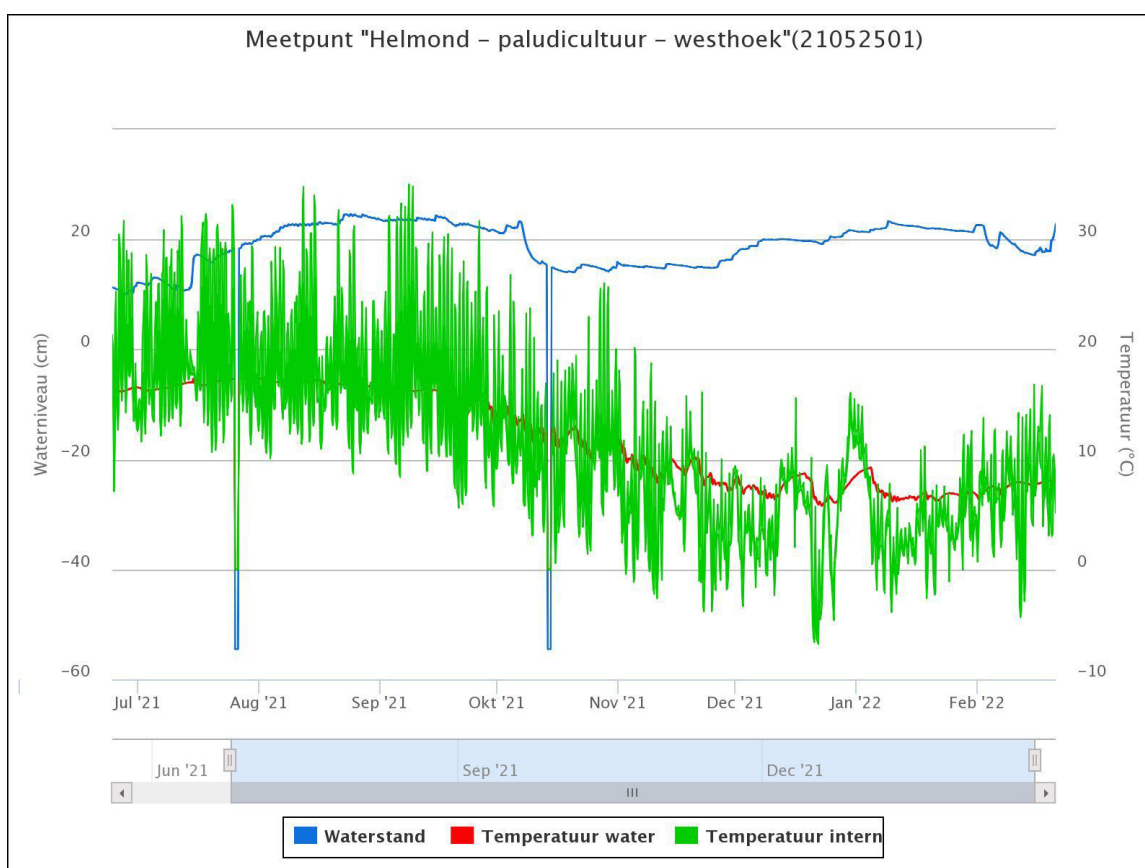
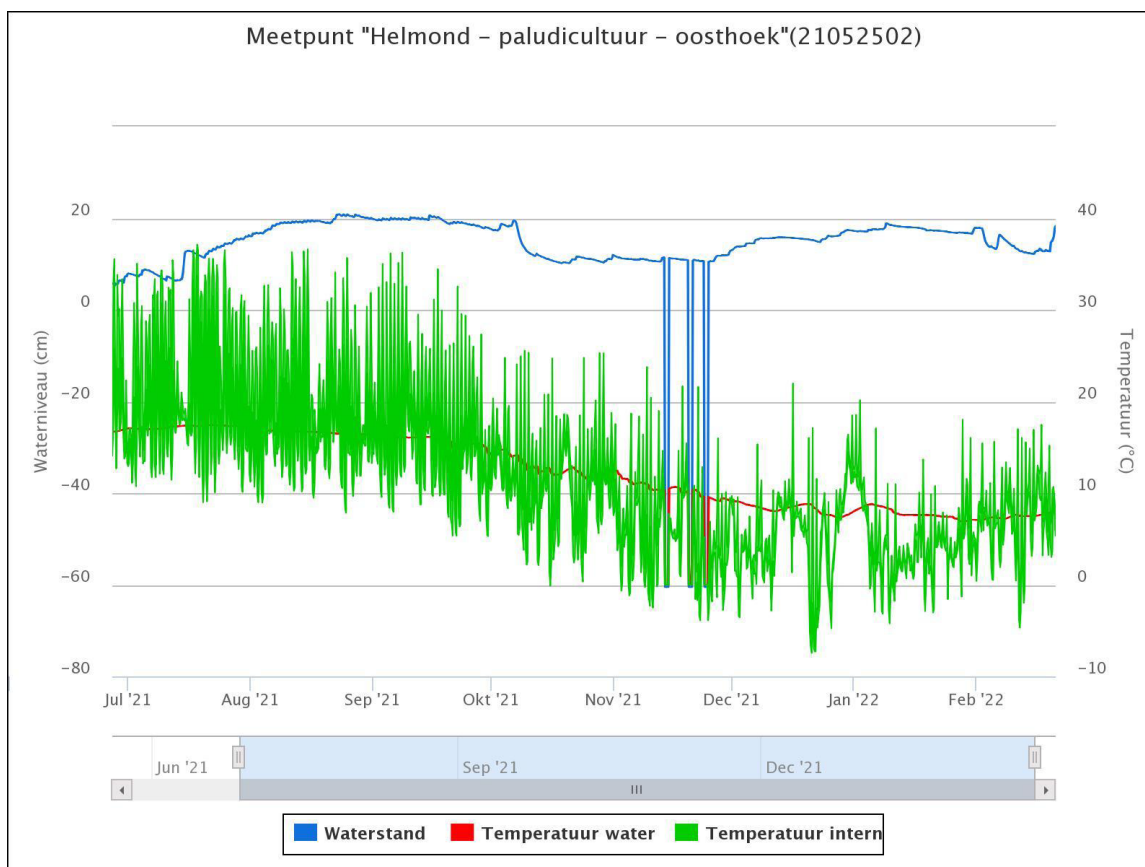


Figure 3. Water table monitored with divers in the two tubes in cm above the soil surface in the pilot site near Helmond.

Water samples (pore water and surface water) were taken in June and September 2021. Four sampling points for surface water were situated within the pilot site and a sample was taken in the Schevelingseloop, next to the pilot site. Surface water from the Schevelingseloop is used to add water in the pilot site in case of lack of precipitation. The pH of the surface water is between 6.8 and 7.9 (Table 1). There seems to be a gradient in the water quality from the Schevelingseloop and the inlet to the eastern edge of the pilot site, maybe due to influence of some seepage from the higher landscape in the east, or the influence of rain water dominating in the eastern edge. Although the subsurface irrigation system and pump are meant to bring water via the soil into the pilot site or let it out, this system seems to respond rather slow and therefore the option to pump water directly into the pilot site from the Schevelingseloop or let it flow out into the Schevelingseloop is used as well. Element analyses of the water samples is planned for the year 2022.

Table 1. pH in the surface water and pore water in the pilot site near Helmond and the surface water in the Schevelingseloop next to the pilot site.

Surface water	24 June 2021	16 September 2021
Schevelingseloop	7,15	7,27
site 1 (near inlet)	7,20	7,05
site 2	7,66	7,10
site 3	7,69	6,87
site 4 (eastern edge)	7,91	6,97
Pore water		
Site 1 open water	7,14	7,15
Site 1 Typha	7,02	6,91
Site 4 open water	7,05	-
Site 4 Typha	7,10	6,80

Biodiversity of invertebrates was assessed in summer 2020, before the site was prepared for paludiculture with cattail. Then the site was still a moist grassland.

In 2021 invertebrate biodiversity as assessed with the same sampling method (emergence trap, Figure 4) in the pilot site and in a nearby moist reference grassland.



Figure 4. Emergence traps in the pilot site

near Helmond to assess the invertebrate diversity.

In addition soil samples were taken in both the paludiculture pilot site and the reference grassland by Bioclear Earth to assess microbiota diversity (in the framework of the international LANDMARC project, Figure 5). Students of the High school in Den Bosch and Venlo (Applied Biology) participated in the biodiversity monitoring. The number of invertebrates was higher in the paludiculture site than in the reference grassland, but the taxonomic diversity was higher in the grassland. From the water and submerged soil in the cattail site a high number of non-biting midges emerged. The data are still to be analysed in more detail.



Figure 5. Collection of soil samples to assess the biodiversity of soil microbiota in May 2021.

Biomass of cattail was collected in 7 plots within the pilot sites in September 2021. The plots 1-4 included older plants and here the cattail was more productive than in the plots 5-7. The number of shoots and fresh and dry weight are shown in Table 2. It is clear that the biomass is much higher in the part of the southern edge where the cattail is growing well and more older shoots are present, originating from the planting action in September 2020.

Table 2. Biomass of cattail in the pilot site near Helmond.

Plotnr.	Number of shoots	Max. Height cm	Fresh weight ton FW/ha	Dry weight ton DW/ha
1	16	217	23,5	4,7
2	48	252	40,9	7,9
3	55	279	55,5	10,3
4	32	229	26,2	4,4
5	38	208	12,1	2,3
6	40	193	12,2	2,3
7	27	162	11,3	2,0