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## OWC 2020 Paper Submission - Science Forum

*Topic 4 - Innovation in Organic farming: "thinking out of the Box"*

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### RUMMAGING AT THE BOTTOM OF THE BOX: REVISITING THE USE OF REEDS ON ORGANIC FARMS IN THE ATLANTIC MARSHES

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**Abstract:** This study focuses on a practice and know-how that was once commonly used in marshes of Charente-Maritime, namely the use of the common reed (*Phragmites australis*) a tall grass that naturally grows in wetlands. Livestock farms formerly used it as bedding for cows and as fodder in the summer. A comparative test of straw and of reed bedding was carried out at the experimental farm of INRAE (French National Research Institute for Agriculture, Food and Environment) of Saint Laurent de la Prée, in an organic farming context. We demonstrate that reeds make good bedding material for cows at a lower cost than purchasing straw. Moreover, a test of summer grazing on a reed bed by a herd of cows demonstrates the appeal of this type of fodder and its beneficial nutritional qualities compared to natural prairie hay. This study shows the advantages of this natural resource for the successful operation of marsh livestock agriculture, provided that the reeds are cultivated sustainably.

**Introduction:** The Atlantic marshes, located between the Loire and Gironde estuaries, extend over a surface area of 300,000 ha. They are composed of a network of natural grasslands and farmed land surrounded by canals and ditches. Beef cattle farming is the predominant activity in the region.

The common reed *Phragmites australis* is a tall grass that grows naturally in wetlands. It used to be collected as a bedding material for cows and less commonly as coarse fodder, among other uses (Köbbing et al. 2013). We believe that reeds could be given a place on organic livestock farms that wish to make better use of natural resources, while also preserving them. The purpose of this study is therefore to test whether reed could be used as litter and as an additional quality fodder source in the summer. To do so, an experiment comparing three types of litter material was conducted on an experimental farm. Measurements of the nutritional value of reed for grazing were also taken at reed beds located on the farm.

**Material and methods:** The Saint Laurent de la Prée experimental farm (Charente-Maritime department) is testing an organic mixed crop-livestock farming system in the Rochefort-sur-mer marshes (45°North, 0°02'28"West). The farm spans 160 ha and includes 115 ha of fodder areas, with 103 ha of wet grasslands and 45 ha of crops. It runs a suckler cow operation consisting of 60 Maraîchine breed cattle that graze grasslands from early April to early November, and are

stabled for the rest of the year (free stalling). Since 2009, the farm has been operating almost completely free of inputs, except for straw, which implies external purchases.

## 2.1 Testing reed as a bedding material

In September 2018, a reed bed (~1 ha), external to the farm, was harvested. The cut reeds were swathed, and after a week of drying in the sun, bundling was carried out with a round-baller. In total, 20 t of reed were harvested. For straw, two types were used: a relatively brittle barley straw and a better-quality wheat straw.

### *Assessment of the water absorption capacity of bedding materials*

This allows one to estimate its absorbency. It was measured for the two types of straw: 200 g samples of straw, reed, and straw-reed mixture were placed in metallic cages (which were wrapped in a mosquito net-like fabric to retain blades of straw/reed) and submerged in a water tray in the laboratory for increasing durations of 3, 6, 22, 27, 44, 66, and 138 hours (protocol adapted from Gasser, 2007). This process was repeated three times per type of bedding material, on a total of nine samples. During each submersion in water, the samples were drained for one hour and then weighed.

### *Test under real-life conditions*

The following stage of the experiment took place at the experimental farm's stable over the course of three periods of 36, 39, and 27 days each, from November 2018 to February 2019. The three types of litter material were tested on 4 herds of cows in 4 enclosures with the same surface area: enclosure 1 (straw) vs. enclosure 3 (reed), each with a herd of 12 cows without calves; and enclosure 2 (straw) vs. enclosure 4 (reed + straw), each with a herd of 11 cows with calves. Bedding was replaced three times per week. Assessments of animal cleanliness were made twice a week, using a chart with photos of cows (Bastien et al., 2006) in seven categories (see Figure 1). An ANOVA for repeated measures (=days of cleanliness observations) was used to explore whether animal cleanliness was different from one enclosure to another. Temperature and humidity in the stable were measured using two sensors. The temperature of litter was also verified with a thermometer probe.

## 2.1 Testing reed during grazing

In August 2018, when the grassland was very dry and feeding had commenced 3 weeks prior, we allowed a herd of cows along with their calves to graze a small reed bed (< 0.5 ha) located on the farm. Six simulated bites of reed (reproducing parts of the plants consumed by the cows) were hand-sampled. The reeds were sorted by separating the leaves, stems, and ears, dried at 60°C for 72 hours, and then analysed to determine their composition (nitrogen, fiber, digestibility).

**Results:** Regarding the two measurements of water absorption capacity, we found that reed became saturated with water slightly more quickly than straw or than the straw + reed mixture: saturation took place at 27 and 22 hours of submersion (measurements 1 and 2, respectively), whereas it took place at 44 hours of submersion for straw or straw + reed. On average, across the two measurements, straw absorbed 63% more water than reed (Mann-Whitney U test:  $U = 5.12$ ,  $p \leq 0,001$ ), and 25% more than the straw + reed mixture ( $U = 5.12$ ,  $p \leq 0,001$ ).

With respect to measurements in the stable, the litter temperature remained stable, averaging between 20 and 25°C, and was similar from one bedding area to another. Monitoring of animal health did not reveal any specific pathology in any of the enclosures. The state of animal cleanliness was more satisfactory with reed than with straw (Figure 1; ANOVA – “litter

effect”:  $F = 250.3$ ,  $df = 1$ ,  $p \leq 0.001$ ), regardless of the frequency with which the litter was changed and the type of straw (Figure 1). On the contrary, the litter made from the straw + reed mixture was slightly less satisfactory than with straw alone ( $F = 54.8$ ,  $df = 1$ ,  $p \leq 0.001$ ).

Figure 1: state of cleanliness of cows in the enclosures of “Straw” and “Reed” (average of the 2 first periods).

The cost price of reed litter was approximately €50/t (cost of transportation across ~ 10 km between the reed bed and the farm not included), which is 50% less expensive than purchasing straw at the current price of €100/t – which may moreover be higher during periods of shortage and high demand.

As regards grazing, the animals appreciate reed. A few days after opening the fence, the reed bed had been almost entirely consumed. The simulated bites contained reed as well as other bulrush (*Typha latifolia*) and sedge (*Carex divisa*). The percentage of leaves in bites amounted to 58% of the dry weight of the sample, with 28% sedge leaves. The average composition of bites in terms of fodder unit (UFL), crude protein and clutter unit (UEB) was respectively 0.61, 108 g/kg DW, and 1.54. By comparison, that of hay from the farm’s natural grasslands was 0.61, 60 g/kg DW, and 1.29, respectively.

**Discussion:** Here, we looked for practices and know-how that have since been lost in marshes, in order to test them out on an organic farm. We demonstrated that a reed bed could be used as litter at a competitive cost price compared to grain straw. Reed bedding allowed for better animal cleanliness than straw, despite a lower water absorptive capacity. Reed also constituted a good additional fodder in summer, and this plant has interesting nutritive value. The exploitation of reed beds must nonetheless respect the biological cycle of the plant, while harvesting late in the season enables them to retain their role as a habitat for many animal species (Ostendorp 1993).

The modernization of livestock farms has contributed to the disappearance of know-how related to regional particularities, and has convinced livestock farmers that reed beds are not productive. This study contributes to demonstrating the benefits that these natural resources can have for livestock farming in wetlands.

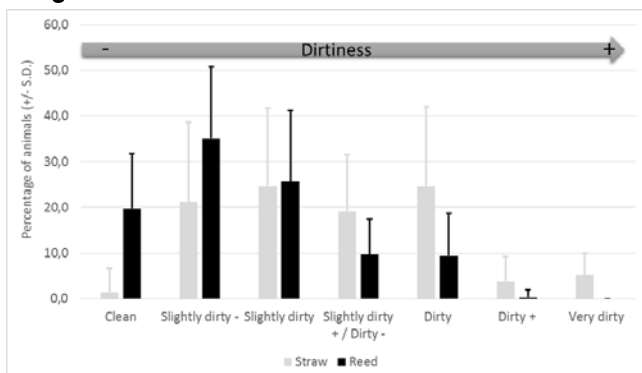
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**Image:**



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