



Background

A **freewalk** housing system is a barn without cubicles. In the past, deep litter systems with straw as bedding material was developed. The freewalk systems are in development with various bedding material and ample space per cow, about 10 to 15 m<sup>2</sup> per cow in the bedded area where cows can walk and lie down. The aim of the freewalk housing system is to create more movement space for the animals, as well as to provide manure fractions, or manure products that can improve soil quality. To this end, feces and urine may be separated on a permeable synthetic floor or a sand bedding, or composted organic material, such as sawdust or wood chips, can be used.

How does the strategy work?

Freewalk barns provide more space compared to the cubicle barn housing and thus enable the animals to move around more. In addition, this system provides manure products that serve to improve soil quality or provides separated manure streams. Reducing emissions in the various types of freewalk barns requires further research.

Types of bedding

**Woodchips bedding** barns have a composting bedding of wood chips where urine and feces both fall onto the bedding. Organic material is added regularly, and the top layer is cultivated daily. Composting is slower at lower temperatures compared to composting biomass in a composting plant, so it can be called semi-composting (Galama et al., 2011). Only at the feed manger is the floor slatted, where slurry is collected. If necessary, a low emission floor (20-50% less ammonia emission/cow/year compared to slatted floors) can also be used at this location. Most research in North America and Europe is done on bedding with wood chips or sawdust, in North America the system is called compost bedded pack barns. In the European project Freewalk ([www.freewalk.eu](http://www.freewalk.eu)) 20 freestall barns with cubicles were compared with 20 freewalk barns with compost. A comparison of the economics are based on the study is given in appendix.



Bedding with wood chips



Synthetic floor in a cow garden

**Permeable synthetic floors** consist of a soft liquid-permeable floor that quickly separates urine from faeces. The faeces is picked up by a manure robot. The first version was applied in 2010 in combination with a system called "Cow Garden". In addition, several more cow gardens were developed, and the floor was also installed on a farm in Slovenia (see photos). The floor was studied from 2016 to 2019 in terms of cow behavior and emissions (Galama et al., in prep. 2023). The study was stopped at the end of 2019 due to disappointing reductions in ammonia emissions.



Synthetic floor in a Dutch farm

**Sand bedding** (floors) in a freewalk barn is also called 'Free-Living Barn'. Urine sinks through the sand to a drainage pipe, where it is drained and centrally stored. Faeces remains on the sand and are picked up by a BeddingCleaner. Wet parts are panned (a form of filtering) by the BeddingCleaner and dry sand partly falls back onto the bedding. The floor is only slatted at the feed fence, where slurry is collected. If necessary, a low-emission floor can also be used at this location. (<https://vrijlevenstal.nl/en>)



Freewalk barn with sand bedding (Free-Living Barn) and BeddingCleaner that picks up feces from sand bedding



General advice

The choice of bedding material depends on weather conditions, soil type, farming system and the farmer's preference for manure type (organic manure versus fractionated manure). For the composting process to work a larger area per cow is required. Large amounts of bedding are required in cold and humid weather conditions.

Positive features

1. Nature-inclusive solution, as stackable faeces applied above ground fits well into a nature-based farming system. Therefore, it's important that feces content of mineral nitrogen is low to prevent emissions.
2. Cooperation with arable farms or horticulture to be considered, as the various manure fractions from the barn systems fit, or can be made to fit, for application with different crops on arable farms or horticulture.
3. Animal health and welfare friendly solution, due to the larger space allowance per cow enabling cows to move more. Compared to cubicles compost bedding provides cows with improved lying comfort, enhanced claw health and a lower prevalence of lameness (Borchers, 2018).

Challenges

Challenges of compost-bedded pack systems are reduced cow cleanliness and udder health problems. Adequate bedding management is essential to maintain cow cleanliness and to reduce the risk of mastitis. Also, poor bedding management may reduce walkability of the surface.

Be mindful on these points

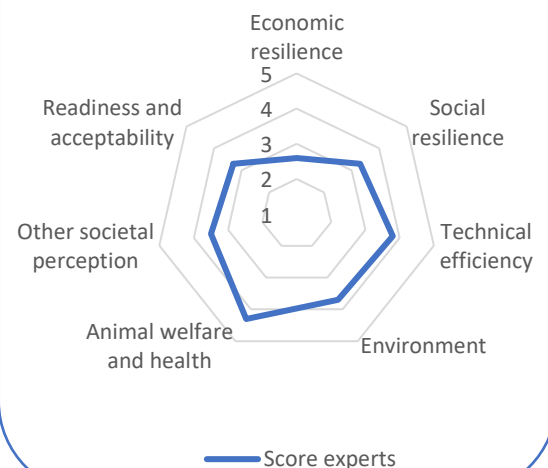
In **Freewalk barns with woodchip bedding**, woodchips are composted over a year into an organic-rich fertilizer product, compost. Nitrogen is organically bound and therefore has a slow action. The compost is suitable as a soil improver. Ammonia emissions in the barn are 30% lower, however, methane emissions are 30% higher (<sup>1</sup>Dooren et al., 2019).

In **Freewalk barn with permeable synthetic floor**, urine is separated from feces. Ammonia emissions from the barn were disappointing because of the slow passage of urine through the floor. The intermediate layer retains too much moisture (sponge effect). Meanwhile, the floor has been further developed with a more permeable intermediate layer, but no emission measurements have been made yet.

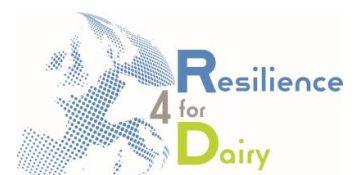
In **Freewalk barn with sand bedding**, urine is separated through a drainage system under the sand package and stored centrally. The feces with sand is collected by the *BeddingCleaner*. The sand could be reused by using a sand separator, but this large investment is only profitable on large farms with roughly more than 250 to 300 cows.

<sup>1</sup>Dooren, H. J. C. van, J.M.G. Hol, K. Blanken, and P.J. Galama. 2019. Gasvormige emissies uit vrijloopstallen met houtsnipperbodems. Ammoniak-, lachgas en methaanemissie op stalniveau. Wageningen Livestock Research

Assessment of method



Quote of the farmer:  
**"Animal welfare and manure quality are the main reasons for choosing freewalk housing"**





## Background

The cost of a **freestall** barn is higher than a cubicle barn because of higher building costs and because of costs for bedding material (bedding in freestall area). There can be cost savings in a freewalk barn due to lower cattle replacement (longer life span) and fewer claw problems. The risks for mastitis seems somewhat higher in a freewalk barn but are mainly related to management of the bedding material so that the top layer remains dry and hygienic throughout the year, even in the damp winter months.

## Economic comparison between cubicle barn and freestall barn

(Freewalk, Anders Hovstad et al, 2023, in prep.).

	Compost bedding	Cubicle
Building costs, annual, €	63 396	47 132
Bedding material costs annually, €	15 323	4 586
Energy costs, €	1 406	-
Labor costs, €	1 842	4 170
Manure application costs, €	5 935	3 348
Cattle replacement costs, €	55 106	68 438
Cattle replacement %	0.248	0.308
Health costs, €	2816	2186
Subclinical mastitis per 100 cows	18.9	12.9
Mastitis, €/case	128	128
Claw problems % per 100 cows	9.69	13.05
Claw problems, €/case	41	41

This (**Freewalk**) study also interviewed 3693 consumers in 8 countries. They gave the freewalk barn a significantly higher rating than the cubicle barn (score 7 vs. 4). It should be noted that grazing and organic is a more important issue for consumers than the housing system.

It should also be noted that freewalk barns are still very much under development, while the cubicle barn has already had over 60 years of development.

