

Cultivated bedding in Loose Housing Sheds (Bedded Pack Barns).

The quality of the bedding area in loose housing systems depends on many basic parameters, but its proper management is more than crucial. In this article I will try to focus also on the technical and the management aspects, following field experiences in Israel and what I have seen in the Netherlands in cooperation with Wageningen UR Livestock Research.

How much square meter per cow?

Much has been written about the space requirements per cow, however some studies have shown that there was no increased milk production in sheds where cows did have more space. Based on personal experience in the design of such sheds over many years, in a well-managed shed with a feeding alley – around 15 sq.m. per cow of net bedding area seems to work. More could add marginally to productivity, but for sure increases the cost of the shed per cow.

In the new ideas for sheds which we are developing & implementing in our designs, where cows are being fed out of mobile feed wagons and there are no feed alleys and cow lanes – the space per cow should be increased. This is because in these sheds 100 % of the manure will be managed inside the shed itself – as compared to the 50% in the traditional sheds with a feed alley and cow lanes.

In Israel we suggest 25 sq.m. per cow whereas in Holland this number should be tested and might be slightly higher - if we implement the same operational systems. However with new systems which are being integrated, the space requirement might be similar as in Israel.

The additional investment in the shed because of the higher space requirement per cow, is easily set off by the lower construction costs per sq.m. – as there are no more concrete feed alleys and cow lanes. Furthermore there is no need to build storage space for manure and construct manure collection / transfer systems – major savings in investments.

Management of the bedding

With all the manure to be handled inside the shed, the correct management of the bedding area becomes even more important, but before describing some aspects of this management, we have to understand what we would like to achieve – which actually is a dry and soft resting area for the cows.

Of course site specific climatic conditions have a great influence – in hot and dry climates it is quite easy whereas in cold and humid climates (like in the Netherlands)– it will take more to achieve this.

The treatment of the bedding area does enable it to absorb the urine / feces of the cows, spreading it evenly across the space and depth of the bedding material – which in turn will facilitate the efficient drying of the bedding area. The depth of the treated layer is crucial as it should provide enough volume so that the bedding can act as a buffer – initially absorbing mainly liquids and after this providing enough drying capacity – to evaporate these liquids.

The urine will be absorbed into the bedding material, however when the top layer will dry – the liquids at the lower level will go upwards by capillary movement. If we keep the whole system " fluffy " and the top layer dry, it does work.

When discussing the many aspects of this bedding area, we should have a common understanding / definition of this material. Basically it is dry manure (Israel) and in some cases, organic material could be added to create a more workable structure and composition (Netherlands).

Create several layers (meerdere lagen creëren in de bodem)

Our idea is to create several layers in the bedding, which will increase the absorption capacity but still provide the cow with a comfortable area to rest but which will enable her to walk around comfortably.

The depth of the treated layer should be around 50 cm. – the lower part being partially " cultivated ", the second layer should be treated more intensively with a " rotokop " or similar equipment, the top layer should be rolled and pressed so the cows can walk comfortably without " sinking " too deep into the treated bedding.

The treatment of the bedding area is based on the use of various existing agricultural equipment's and can be done either in one pass across the bedding area – which needs a heavy tractor OR cultivate first and in the second pass use the rotokop & roller (Wiersma). The use of heavy tractors actually backfires as it will increase the level of compaction of the bedding, which we want to keep as fluffy as possible

The cultivator should have only few " teeth " as this layer is to be treated on a low intensity. On one farm I have seen that the cultivator teeth were facing side wards and not to the front (Havermans). This is a remarkable improvement, as now the soil will be " lifted " slightly and air will be entered into the open space during this lifting.

With the more traditional cultivators (goose teeth), the soil will be broken up and create open many open spaces which will reduce stability. The teeth should be installed at two / three different heights (perhaps 10 cm. difference), creating a more significant lower layer.

The treatment of the bedding area should be done at least on a daily basis, not only to keep it dry but also to keep the bacteria in the different layers happy and friendly. Experience has shown that when we suddenly change the environment of bacteria in the bedding material, these can become " violent " and create health problems.

Composting process

In order to improve the drying capabilities of the bedding, some farmers installed an aeration system below the layer of bedding material. Blowing air through the bedding layers will increase the efficiency to evaporate the liquids and to increase the dryness of the bedding area. Some farmers are testing the use of a vacuum system below the bedding layer, which sucks the air out of the bedding itself, with the idea of capturing gasses in additional systems.

In cold and humid climates, we have added another aspect into the management of the bedding area. Initiating composting in the bedding will further add to the drying capability of the bedding material. First of all, the microbes absorb liquids and secondly they create heat – which adds to the drying capabilities.

In order to achieve an efficient composting we need to improve the C/N ratio, create a favorable relative humidity in the bedding and add some organic material which will create the workable structure. But are we really looking for the optimal composting – YES - if we want to define the material at the end as compost.

But field experience has indicated that real composting might even create a problem, as the milk of cows housed on this bedding system might contain heat resistant bacteria, according to NIZO research.. Therefore we introduced the concept of Semi Compost, which is not an academic definition and does not " force " the farmer to achieve high temperatures.

When we keep the temperatures in the bedding below 30/40 degrees – there should be no new problems with bacteria and still we have the benefits of additional drying capabilities. Initial studies have shown that the material (semi- compost) still can be applied safely to fields.

How to distribute the manure? (Gate system, location of water troughs)

Farmers are developing ideas which will improve the equal distribution of the manure and eliminate problems created by cows concentrating in specific areas, as this will create a stress on the bedding in those areas.

In the more traditional sheds which have feeding alleys and cow lanes, some farmers have installed a simple gate system, which enable the farmer to control the locations where the cows move from the feeding area into the resting area (see pict. Hoogland).

Not only does the system solve the problem of the relative wet area at the edge of the concrete lanes, it also increases the efficiency of the resting area. Cows will be lying comfortably behind / along the closed gates – in an area where no cows would be able to rest, if there would not be any fencing / gate system – as dominant cows would remove cows resting along this line.

The location of water troughs and additional elements such as cow brushes, will increase the equal spreading of the manure by the cows, over the bedding area itself.

Sometimes the farmer can opt to add some dry organic material to wet areas to improve the quality of the bedding. Using his front loader, the farmer can also mix dry / wet material and eliminate the wet areas.

Ventilation

As ventilation is crucial to remove humidity from the bedding and the shed, it is important that the design of the shed will provide natural ventilation at the zero level. The main obstruction to this are the walls around the sheds – which block natural ventilation.

To improve this ventilation, sheds should have HVLS fans – blowing air downwards.

Prospective

The loose housing sheds with cultivated bedding, require additional attention by the farm manager, to keep the system well balanced. He should watch his cows / their behavior in the shed and check the condition of the beddings.

Animal welfare, increased milk yields, lower operational costs, all these and far more will be his rewards.

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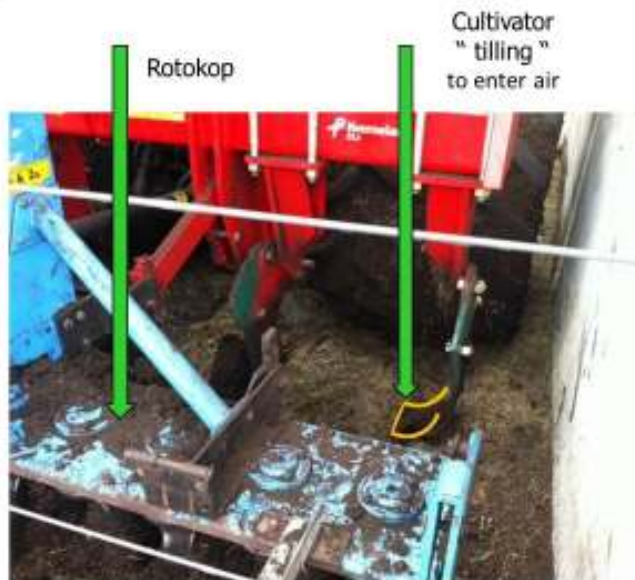
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