Large Square Baled Silage Storage Systems

Frank Mickan
Fodder Conservation and Pasture Specialist
DEDJTR, Ellinbank Centre

Large square (actually rectangular) bales of silage can be stored successfully above ground in small stacks/modules under sheets of plastic, in-ground in slightly larger modules or can be sealed in stretch-wrap plastic either individually or continuously in-line sausage. However, no matter which storage system is used, it must be sealed airtight at harvest and remain so until opened.

If air enters aerobic deterioration occurs and the silage breaks down into carbon dioxide, moisture and heat, eventually becoming compost. Moulds, aerobic bacteria, yeasts, etc. will set up camp and multiply profusely in these ideal conditions of moisture and warmth and actually "feed" on what you were trying to preserve for your animals, i.e. the plant's energy and proteins.

If mouldy silage is present on/in the bale or stacks of bales, the cause must be identified and avoided or prevented in future. Mouldy silage represents a loss in dry matter and silage quality and will be lower in palatability to stock. The bales will begin to heat and the hotter the bales, the higher the proportion of dry matter and nutritive value being lost. The end result will be increased cost per unit weight or energy.

Storage Systems

1. Above ground stacks (modules/compartments)

For stacks above ground, build small stacks each holding about 14 – 16 days feed in each compartment (Figure 1).

Figure 1. Well sealed, air tight stack

Using dirt to seal at the bale-ground interface can ensure an excellent airtight seal. Dig a trench before or after the stack is built. Place the plastic sheet into the trench, folded so that the edge sticks back up out of the ground trench (Figure 2). Dirt is then placed into this trench against the plastic. The jutting plastic sheet edge is then easily pulled up when unsealing the stack. An alternative is to lay the edges of the plastic sheet on the ground and cover it with dirt, ensuring the edge of the sheet is well covered.

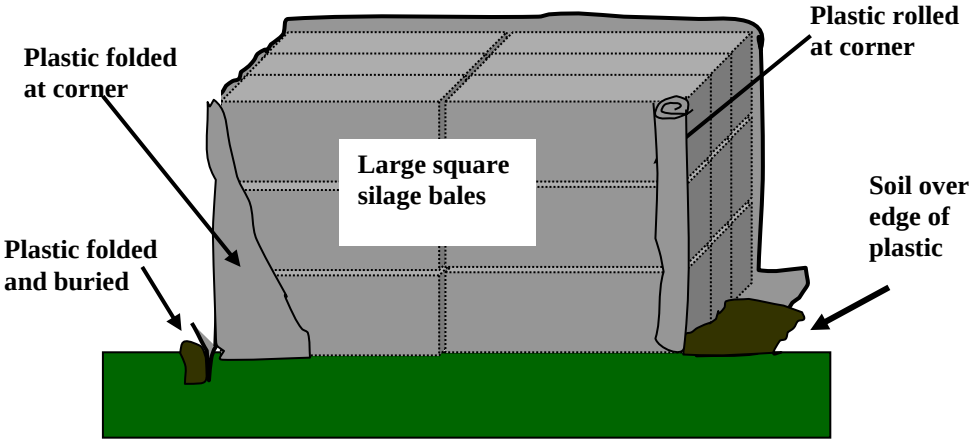

Figure 2. Well sealed stack showing ground sealing techniques

If the plastic is billowing in windy conditions, too much air is entering somewhere! Placing tyres or soil on top of each stack will minimise the flapping and if not, the plastic will eventually crack allowing air to enter the stack, a common disaster for this method of storage (Figure 3).

Figure 3. Well weighted, air tight stack

2. In-ground stacks

If stacking large square bales into pits in the ground (Figure 4), place the bales hard against the back of the pit and along one side. This then leaves only the front and opposite side of the stack to "expel" the air when sealing. The side "gap" can be either filled with soil to expel the air or, preferably a plastic sheet dropped down to the ground and then soil forced in between the plastic and the wall to expel the air. The top sheet must overlap the "gap" to prevent rain entering and seeping down to the stack base.

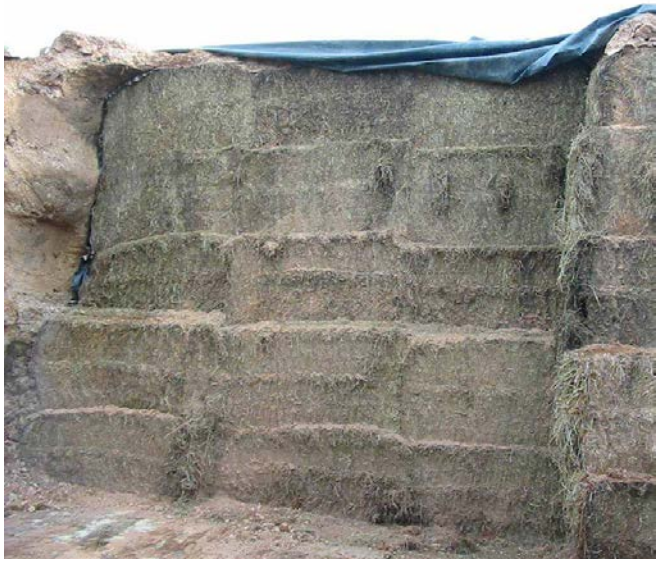

Figure 4. Large square bales in pit for drought storage.

Use plastic sheets to seal in-ground stacks into compartments containing 18 - 20 days feed (Figure 5. This is because when feeding out starts and the stack is opened, the air is confined to the current compartment.). Similarly, if the top of the sheet is holed by cattle, rabbits, dogs, kids, etc. then only the holed compartment will "go off", provided the seal between compartments is effective. Putting dirt around the edges of the stack and or down the pit sides will help to form a good seal.

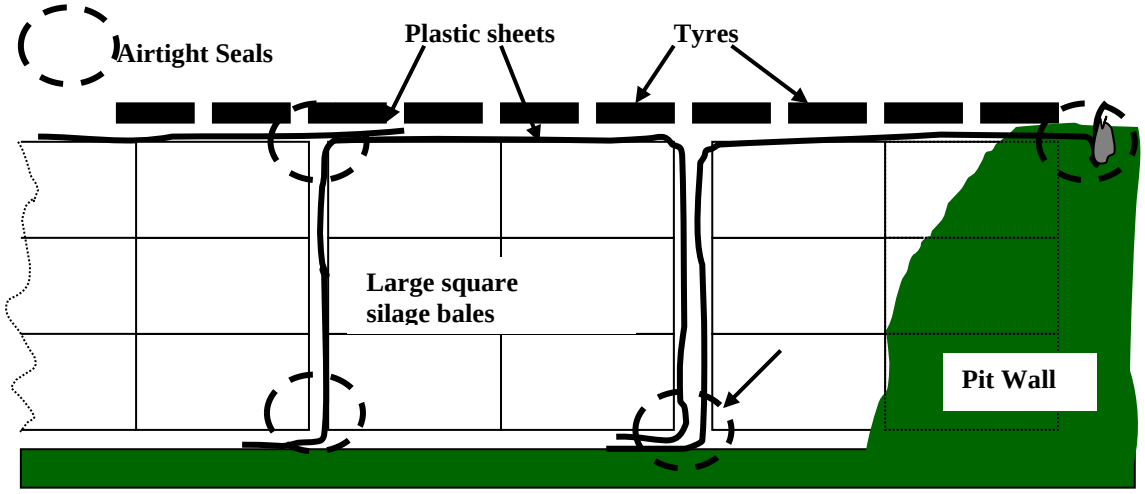

Figure 5. Large square bales in well-sealed compartments in pit.

Large squares are suited to drought storage if stored underground/pit storage provided the stack is sealed and remains airtight and watertight. Placing a layer of 0.5 – 1 m soil on top of the plastic will provide an excellent seal for long term drought. The plastic cover will prevent water/air from gaining entry as might occur if foxes/rabbits, etc. dig a hole half way through the dirt layer.

Before dropping soil onto the plastic, place about 10 – 15 cm of old straw or hay between the plastic and soil which will provide a "clean break" when removing the soil from the stack top at feed out.

For the reasons given above, the modules should be compartmentalised into about 2 – 3 weeks of feed with plastic separating the stacks. This will stop air penetrating too far back into the stack when feeding out.

3. Individually stretch-wrapped large square bales

Large squares bales can be wrapped individually in stretch-wrap plastic (Figure 6). The entire bale must be covered with at least four layers, preferably six layers, due to the sharp edges and sometimes slightly more difficult to wrap with some wrappers. Losses will be minimal provided the plastic is not holed and the bales are fed out within about twelve months. They should last another year if wrapped in an extra two layers.

Figure 6. Individually wrapped large square baled silage

If holed, the hole must be sealed as soon as noticed with tape specifically designed for stretchwrap plastic film. Ensure the area to be patched is clean, dry, cool and light coloured tape is used on light coloured film so that both heat and cool at similar rates. Make sure the patch is airtight and well applied. Figure 7 show a poorly sealed bale.

Figure 7. Poorly applied plastic sealing tape may still allow air entry into bale

4. Continuous in-line stretch wrapped large square bales

Large squares can also be wrapped continuously in-line by using a tube wrapping machine (Figure 8) but the bales must also have at least four layers over the entire bale circumferences with no windows.

Bales of even diameter are necessary to avoid over stretching of the plastic at the bale juncture of larger vs slightly smaller diameter bales. Over stretching often leads to the plastic stretching axially causing rips in the film and allows air entry and soon after, aerobic deterioration! To avoid this most manufacturers these days suggest applying at least 6 layers to bales wrapped with continuous in-line wrappers. This results in less savings in plastic than the 30 – 40% originally targeted as the bale ends are not wrapped..

Figure 8. Large square bales continuously in-line wrapped

A recent issue with large squares stacked and wrapped two bales high has been that once opened, air can move all the way to the end of the line at the juncture of the top and bottom bales. This results in aerobic deterioration (Figure 9) and as the longer the sausage, the greater the deterioration due to the extended period of exposure to air. An airtight seal or “plug” somehow should be placed at several sites along the sausage line to prevent air moving too far down the line. This could also be a handy “plug” at which to stop feeding out, if the entire line is not required to be fed out.

Figure 9. Silage deterioration between top and bottom bales

Silage Additives

Using an aerobic spoilage inhibitor in modules, in-ground stacks and for drought storage is recommended to delay spoilage at opening. This will delay heating and mould growth for several days after opening but won't be effective for long exposure to air due to holes nor where air can move down the sides/top of the stack.

Traditional silage fermentation enhancing additives, of which inoculants are the majority but not exclusively, will improve fermentation and usually results in slightly less dry matter and quality losses during fermentation and is particularly useful where the silage is slightly below or above the target dry matter content for the silage form.

Both silage additive types are applied at harvest preferably at the throat/pick-up of the baler or harvester. Some products now contain the two groups of bacteria to do both jobs in one application. There are a few other products which will achieve the same outcome so please speak to your trusted supplier.

Applying inoculants onto the windrow ahead of the pick-up is very ineffective (not enough forage comes into contact with the bacteria), if applied too far ahead they may dry and die and dangerous for the person applying the product.