

A Guide to Making Soybean Silage

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Adverse weather such as drought or early frost sometimes raises the issue of harvesting soybean fields for forage due to forage shortage and/or low yield grain yield potential of the soybean crop. Soybean forage can be harvested as either silage or hay. Harvesting as hay requires much longer field drying times, increases shattering losses, and can be very dusty. No information was found concerning production and feeding of soybean silage. Therefore, eight farmers who had made soybean silage in Wisconsin during the fall of 2005 were surveyed and the silage was sampled for analysis. Following are recommendations for making soybean silage as reflected by the farmer experience.

Soybean should be harvested for silage at the R3 stage [when one of the four top nodes with a fully developed leaf has a 3/16 inch long pod (1)] for dairy animals.

It is possible to harvest as late as R7 stage (one pod on main stem has reached mature color; 50% of leaves yellow; physiological maturity, no more dry matter accumulation). Yield at the later stage is increased compared to R3 and R4 stages and plant dry matter is near to that required for ensiling (2,3,5). While overall forage quality at the R7 is similar to the R3 or R4 stage and to alfalfa, the plant is significantly different as far as the animal is concerned. The R3 and R4 stage soybean have high forage quality from green leaves and much more digestible stems. The R7 stage soybean has high forage quality because of seeds in the pods while having fewer leaves and much lower quality stems. Therefore, seed shatter during harvesting at the R7 stage, resulting in loss of forage quality, is a significant issue. Secondly, the high oil content of the beans at the R7 stage may cause erratic fermentation in the silo, reducing palatability and forage intake. Most of the farmers surveyed had harvested the forage at the R3 to R4 stage.

Standing soybean forage at the R3 to R4 stage was generally at about 80% moisture and needed to be mowed and wilted to dry down to 65% moisture for ensiling (Table 1). Farmers were able to mow and condition with their standard mower/conditioners, though they often needed to go slower than normal. Farmers also noted that flail conditioners caused more damage to the soybean than roller conditioners. Drying time to 65% moisture generally took 2 to 3 days in the late fall.

Table 1. Forage quality of soybean silage not mixed with other crops.

Component	Mean	Minimum	Maximum
	(% , dry matter basis)		
DM	37.1	30.8	45.8
CP	20.7	18.1	24.0
ADF	31.9	29.7	36.2
NDF	39.0	33.0	47.5
NDFD	44.3	42.0	48.4

Forage yield averaged 1.5 ton/acre, ranging from 1.0 to 2.25 ton/acre. This is significantly less than many published reports but reasonable when the soybean is stressed from drought or late planting. Silage was made in oxygen limiting silos, plastic bags, and bunkers. Forage should be chopped with a 3/8-inch theoretical length of cut for good packing. Silage produced by the farmers surveyed was generally in the correct moisture range (Table 1) and fermented well. Forage quality was similar to alfalfa haylage as reported by others when soybean is harvested at the R3 stage (2,4).

Some farmers mixed the soybean silage with other crops including 3rd crop alfalfa, corn silage, sorghum-sudangrass, and triticale. Alfalfa mixed with the soybean silage had no effect on forage quality. Sorghum-sudangrass, corn silage, and triticale all lowered the quality of the silage by reducing crude protein content and increasing fiber content (*data not presented*).

The farmer has the choice of mixing forages when ensiling or ensiling forages separately and mixing them when feeding. Forages should only be mixed at ensiling if the mixture will have better fermentation characteristics (proper moisture, better substrate for bacteria, etc.) than either silage alone. When forages are mixed at ensiling, often one is not at the optimum stage for ensiling which reduces overall silage quality and/or yield. Further, ensiling the two forages separately, gives the operator has more flexibility balancing the ration according to needs of the animals being fed and quality of the ensiled material.

Farmers generally fed the soybean silage as 15 to 20% of the ration. They were asked how animals consumed and performed on soybean silage. Of the farms surveyed (Table 2), in only one case was feed intake decreased. Thus, while soybean silage is less palatable than alfalfa or corn silage, it can be used as a significant portion of the ration without influencing animal intake. There was no problem with sorting stems from leaves, likely due to the fine chop used. Most importantly, in no case was there any discernable difference in performance when animals were fed soybean silage. Dairy cows are particularly sensitive to their ration, so feeding soybean silage to other category of animals should be no problem in a balanced ration. Some reports of feed intake problems may have been caused by ensiling soybean at later stages, when high oil content from the seed may have affected palatability.

Table 2. Effect of soybean silage on feed intake and milk production from eight Wisconsin farms.

Number of farms surveyed	Type animals fed	Feed intake	Effect on milk production
6	Milking cows	Stayed same	None
1	Milking cows	decreased	None
4	Dry cows and heifers	Stayed same	N/A

In summary, making soybean silage may be a good opportunity for farmers short of forage due to drought. The following recommendations will provide successful soybean silage experience:

- Talk to your crop insurance adjuster before harvesting any insured soybeans for forage to make sure that all requirements for insurance are met.
- Make sure any herbicides used on the soybeans are cleared for feeding to cattle.
- Harvest soybeans at R3 stage, when one of the four top nodes with a fully-developed leaf has a 3/16-inch-long pod.
- Wilt forage to 35% dry matter before ensiling. Note: producers felt soybean whole-plant moisture was difficult to judge in the field, therefore testing is well worth the expense.
- Chop at 3/8-inch theoretical length of cut, pack well, and seal in airtight, covered pile, tube, bunker, or vertical silo.

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