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Deciding Between Grain and Forage Harvest for Late Maturing Soybeans

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Abstract

Irregular development and lateness of Iowa crops this year are cause for reflection as producers conduct late season evaluation of crops in individual fields, and plan when and how to harvest them for the greatest economic advantage. Late season evaluation involves reviewing normal crop growth and development, assessing the condition of the crops in individual fields relative to normal, and thinking through several autumn season scenarios such as: How will this field develop between now and the normal frost time? What are the concerns or alternatives if a frost comes one or two weeks earlier than normal?

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Deciding Between Grain and Forage Harvest for Late Maturing Soybeans

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Irregular development and lateness of Iowa crops this year are cause for reflection as producers conduct late season evaluation of crops in individual fields, and plan when and how to harvest them for the greatest economic advantage. Late season evaluation involves reviewing normal crop growth and development, assessing the condition of the crops in individual fields relative to normal, and thinking through several autumn season scenarios such as: How will this field develop between now and the normal frost time? What are the concerns or alternatives if a frost comes one or two weeks earlier than normal?

Soybeans

The Iowa soybean crop is intended for harvest as dry beans. The beans harvested from immature soybeans are often small, misshapen, off color and sometimes diseased. The normal grain markets generally do not want immature soybeans and will pay greatly reduced prices for them. The harvest or use alternatives for immature soybeans are usually livestock grain or forage. It is also useful then to closely follow the development of the soybean crop.

The normal development and maturation of a soybean plant can also be reasonably tracked by several identifiable plant characteristics. The key characteristics and plant parts are the development of the pods and the beans in the pods, particularly those near the top of the plant.

Are soybeans safe from frost?

Most soybeans will have developed to R5 or greater by mid-September. Stage R5 gives the first indication of bean seed development in the upper part of the plant. At stage R5 small beans (one-eighth inch long) can be found in a pod attached to one of the four uppermost attachment points (nodes) of a fully developed leaf. Substantial bean yield losses are likely from a killing frost of soybeans in early R5. A University of Wisconsin study showed that there was about a 75 percent yield reduction when soybeans were killed at R5 and may cause bean quality problems (green, odd shaped beans, etc.).

To escape significant bean quality problems, soybeans must reach developmental stage R6 before a hard killing freeze. Stage R6 is called the "full green bean" stage. A plant has reached this stage when there are full sized green beans filling the pod cavity of at least one pod at one of the four uppermost leaf attachment points (nodes) supporting a fully developed leaf. Even at stage R6 a freeze will cause some yield loss. In the Wisconsin study, soybean yield losses were 20 to 25 percent when the crop received a killing freeze at stage R6.

A critical time for late developing soybean crop is the two week period

required for the plant to develop completely through the R5 stage. If a killing freeze comes early in the R5 period, yield losses can be significant, but if the killing freeze comes late in the R5 period, yield loss risk is expected to be much reduced.

If one normal pod has attained its mature pod color (brown or tan) then the plant as a whole is considered to have reached complete pod fill and to be in the growth stage called physiological maturity (R7). At this stage, it is common to have green, yellow and brown, or tan (depending on variety) pods on the same plant. This describes the beginning of developmental stage R7. At stage R7 the plant is considered to be near enough to maturity that a hard freeze will have little influence on its yield.

Soybeans as a forage crop

When is it appropriate to abandon the little hope of much grain yield from the soybean crop and look to it as a possible forage source? The critical decision should be based on what developmental stage the majority of plants will reach by the time of a killing freeze. If the soybean plants will reach developmental stage R6 (full green bean stage) before a freeze, their value is far greater as a bean crop. If the freeze occurs when only small pods have formed near the top of the plant (pre stage R5) or there are only very small developing beans in upper pods (early stage R5), then harvesting of the crop for forage is more appropriate. By the time beans in the upper pods are about one-half to three-fourths full size (late stage R5), the advantage swings to harvest for beans but at a significantly reduced yield and the possibility that bean quality will be adversely affected.

The forage quality of soybean forage

When in its vegetative and early grain development stages, the soybean plant is very similar in feeding value and harvestable yield to that of more familiar forage legumes such as alfalfa or red clover. As with other forage plants, the developing stem becomes less digestible while the leaves, and in the case of the soybean, the pods and developing seed remain highly digestible. Data presented in Table 1 shows relative yields and nutritive characteristics of whole plant soybean forage at increasing stages of development. Note that while the protein and digestibility remain surprisingly constant over this range of harvest periods, the harvestable dry matter increases with maturity. Beyond R6, however, the leaf material will quickly be lost, leaving a forage material with a high proportion of high quality pods with beans and the remainder being very low quality, high fiber stems. The risk of pod and bean shatter loss also increases if soybeans are harvested much past R6.

Table 1. Yield and quality of soybean forage as affected by harvest maturity. (Univ. of Wisconsin).

Maturity Stage ¹	Dry Matter Yield (T/Ac)	Moisture %	% Crude Protein	Relative Feed Value Index ²
R1	1.1	81.1	20.1	160
R3	1.7	80.7	18.1	138
R5	2.5	79.7	18.2	128

¹ R1 - Any open flower at any leaf attachment point (node) on the main stem.

R3 - At least one pod is 3/16 inch long at one of the four uppermost leaf attachment points (nodes) on the main stem with a fully developed leaf.

R5 - Seed is 1/8 inch long in at least one pod at one of the four uppermost leaf attachment points (nodes) on the main stem with a fully developed leaf.

² Relative Feed Value (RFV) index. An RFV of 150 approximates the feeding value of mid-bud alfalfa. An RFV of 100 approximates the feeding value of full bloom alfalfa.

Managing Soybeans for dry hay

Immature soybeans will have some of the same field curing challenges as

would any other forage legume, with the stems drying more slowly than the leaves. Soybean leaves are very brittle when dry and can shatter excessively during raking and baling. While the use of a mechanical conditioner will speed the drying of stems, producers have found that flail conditioners lead to more leaf and pod losses than do roll-type conditioners. Frost will lead to leaf death and leaf drop within a few days, so if you are planning to use soybeans for forage be ready to cut, condition and windrow the crop. Soybean hay bales are subject to more rain and weathering loss if stored outside than are those of grass or alfalfa hay, so inside or covered storage is recommended.

Managing soybeans for silage

More soybean dry matter will be retained if soybeans can be stored as silage. The target moisture content for ensiling is 60 to 65 percent, so green soybean plants cut for silage may require some field wilting before chopping. Drying conditions will dictate how long the wilt period should be. If wilted too long, the silage will be more difficult to pack, and you increase the risk increased dry matter loss from excessive respiration and heating during ensiling. Soybeans chopped and stored at higher than 70 percent moisture may undergo abnormal or incomplete fermentation and will begin to lose dry matter as seepage (effluent) losses.

Use caution when locating a site for silage storage with potential for seepage losses, because off-site movement of silage effluent can become an environmental hazard as a ground or surface water contamination source. It is very difficult to estimate the moisture content of immature or frosted soybeans. The best method is to chop a few feet into the field and send a representative sample of chopped forage to a test lab or use some other reliable method for moisture determination.

Additional cautions about using soybeans for forage

Review your herbicide labels for any restrictions regarding residues on the crop and feeding limitations. Soybean forage being stored as silage may ferment more favorable and attain a lower pH if it is inoculated with lactic acid bacteria inoculant. Several animal nutritionist say that very immature, green soybeans with only small pods and no appreciable bean formation can be fed as you would feed other legume forage. However, as the whole plant fat content increases with bean development, these nutritionists caution producers to limit the amounts fed daily to livestock. Check with a nutritionist when formulating rations containing soybean forage.

For more information on determining the development and stages of soybeans, see ISU Extension publication PM 1945 [Soybean Growth and Development](#).

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