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## Alternatives for Drought-damaged Soybeans—Bean Crop or Forage

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# Alternatives for Drought-damaged Soybeans—Bean Crop or Forage

## **Abstract**

As people reflect on the reasons for the irregular development and poor soybean production in Iowa this year, the next important questions relate to evaluation of crops in individual fields and planning when and how to harvest them to the greatest economic advantage. This evaluation involves reviewing normal crop growth and development, assessing the condition of the crops in individual fields relative to normal and to think through several harvest scenarios. Will this field have a harvestable soybean crop? Are there concerns about the crops? What use or management alternatives do I have?

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### Alternatives for Drought-damaged Soybeans – Bean Crop or Forage

By Stephen Barnhart and Andy Lensen, Department of Agronomy

As people reflect on the reasons for the irregular development and poor soybean production in Iowa this year, the next important questions relate to evaluation of crops in individual fields and planning when and how to harvest them to the greatest economic advantage. This evaluation involves reviewing normal crop growth and development, assessing the condition of the crops in individual fields relative to normal and to think through several harvest scenarios. Will this field have a harvestable soybean crop? Are there concerns about the crops? What use or management alternatives do I have?

Soybeans are primarily grown for oil and protein in the Midwest. However, soybeans were first introduced to the United States as a forage crop and still have that potential. In a season such as this, when poor establishment and drought stress may have limited the potential as a bean crop, when is it appropriate to abandon hope of profitable grain yield from a soybean crop and look to it as a possible forage source? The critical decision should be based on whether it will produce an economic bean yield

Iowa research shows that 100,000 to 125,000 soybean plants per acre at harvest typically produces 95 percent or more of maximum yield. At lower plant populations, soybean plants compensate with increased branching, producing more pods per plant. Bean yields remain relatively constant until populations drop below about 64,000 plants per acre at harvest. Bean yield estimate methods have been developed for stands about three weeks prior to combine harvest, so their usefulness is of limited value when drought-stressed soybeans are being assessed in mid-summer for harvest as beans or as forage.

#### Soybeans as a forage crop

If the decision is made to abandon a bean crop and instead harvest the soybeans as forage, the decision should be made before the soybean plants reach developmental stage R6 (full green bean stage). Soybean forage may be more valuable in a dry growing season when traditional hay production is limited.

#### What is the quality of soybean forage?

When in 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. The feed value of soybean stems alone is lower than that of corn stover. However, the feed value of soybean hay containing leaves and mature pods is greater.

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

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

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

R3 - At least one pod is 3/16 inches 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 inches 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.

<sup>2</sup> 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 nearly full bloom alfalfa.

### Managing soybeans for dry hay

Immature soybeans will have some of the same field curing challenges as other forage legumes, primarily due to stems drying more slowly than leaves. Soybean leaves become 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 roller-type conditioners. If windrows are raked, it should be done when relative humidity levels are higher and leaves have absorbed some moisture, conditions that occur during early morning, late evening or nighttime hours. 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

Producing good soybean silage requires techniques more similar to those used for silage produced from alfalfa than for silage produced from corn. Better feed value retention from soybean dry matter will occur if soybeans can be stored as silage than hay. The target range for moisture content when ensiling soybean is 60 to 65 percent, so green 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 of increased dry matter loss from excessive respiration and heating during ensiling. Excessively dry haylage may represent a fire hazard.

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. High-moisture forage legumes, likely soybeans too, usually have lower concentrations of soluble carbohydrates than does chopped corn. Adequate concentrations of soluble carbohydrates are necessary for rapid pH decrease during the ensiling process.

It is difficult to estimate the moisture content of immature, standing soybeans. Sample several representative plants from the field and have moisture determinations made at a nearby feed testing laboratory. Alternatively, check plant moisture with a home check using an accurate scale and a microwave oven or heat lamp to dry the sample. Use caution when drying forage at home with a microwave oven or heat lamp. As the plant material dries, it becomes more combustible. Special precautions should also be taken to avoid permanent damage to microwave ovens.

### **A few additional cautions about using soybeans for forage**

Review your fungicide and herbicide labels for any restrictions regarding preharvest intervals. Soybean forage being stored as silage often will ferment more favorably and attain a lower pH if inoculated with a lactic acid bacteria inoculant applied at the chopper or at the silo. Several animal nutritionists 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.

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