Interpreting tissue and soil analytical data for irrigated pasture

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The most common nutrient deficiencies on irrigated pastures are nitrogen, phosphorus and sometimes sulfur. Very few require potassium applications and almost none require corrections of pH.

A soil test for phosphorus, potassium, and pH and a plant test for nitrogen and sulfur can help you determine the appropriate method for addressing pasture deficiencies.

Although commonly reported, nitrogen and sulfur results from soil samples are only moderately reliable methods for making fertilizer decisions. A nitrate nitrogen (readily plant available form of nitrogen) test can be of value for estimating nitrogen available for plant use in the soil at the current time. Nitrogen is a highly mobile nutrient. Content in the soil can easily change in a short time period due to factors such as leaching and denitrification. Soil results are only valid at the time they are collected so they present little value for distant future planning. It must also be realized that other forms of nitrogen, such as organic nitrogen, can mineralize and be available for plant use. These forms are not included in the nitrate nitrogen test and can be notable if manure was applied, clovers are well nodulated, or the pasture was previously in alfalfa.

Sulfur soil analysis is of limited value because plants can obtain sulfur from alternative sources besides the soil, such as rainfall. Even though outside sources offer small amounts of sulfur, the plant requirement for sulfur is low compared to nitrogen so it's easier to satisfy. A plant analysis captures uptake from the soil and alternative sources.

Soil sampling involves auguring at least 10 subsamples (preferably 20) to a depth of 6 inches across a representative section of the field. These subsamples can be combined to make one overall sample for laboratory analysis. One to two cups of soil is a large enough sample for lab analysis. Avoid including debris and plant material in your soil samples.

You can collect plant tissue samples at the same time as you collect soil samples. To collect plant tissue samples, pull the top four to six leaves from only vegetative grass plants. Do not allow any clover leaves or grass stems in the sample. Many soil analytical labs are available to test your samples. You can find most of them online. Call the lab in advance of sampling to obtain submission sheets and further information. The tables on the back of this page show low, moderate, and adequate test results and how much fertilizer you should apply to correct any deficiencies.

For further information see the ANR publication number 21628 "Irrigated Pasture Production in the Central Valley of California"

Soil testing critical levels

Nutrient	If soil test is . . .*	Suggested fertilizer rate
Phosphorus (HCO3 extractable)	< 5 ppm 5–10 ppm 10–20 ppm > 20 ppm	100 lb P2O5/acre 50 lb P2O5/acre 25 lb P2O5/acre none
Potassium (ammonium acetate extractable)	< 40 ppm 40–60 ppm > 60 ppm	200 lb K2O/acre 100 lb K2O/acre 0–50 lb K2O/acre
Zinc (DTPA extractable)	< 0.5 ppm (soil pH < 7.0) < 0.5 ppm (soil pH > 7.0)	5 lb Zn as ZnSO4/acre 10 lb Zn as ZnSO4/acre

Plant testing critical levels

Plant and growth stage	Part of plant	Nutrient	Nutrient range*		
			Deficient	Critical	Adequate
Grasses (tall fescue, orchardgrass, and others)	top 4–6 leaves, no stems	N %	< 2.0	2.0 – 2.8	> 2.8
		P %	< 0.18	0.18 – 0.24	> 0.24
		K %	< 1.5	1.5 – 2.5	> 2.5†
		S %	< 0.10	0.10 – 0.15	> 0.15†