Forage Sample Collection/Protocols and Analysis for Dairy Rations

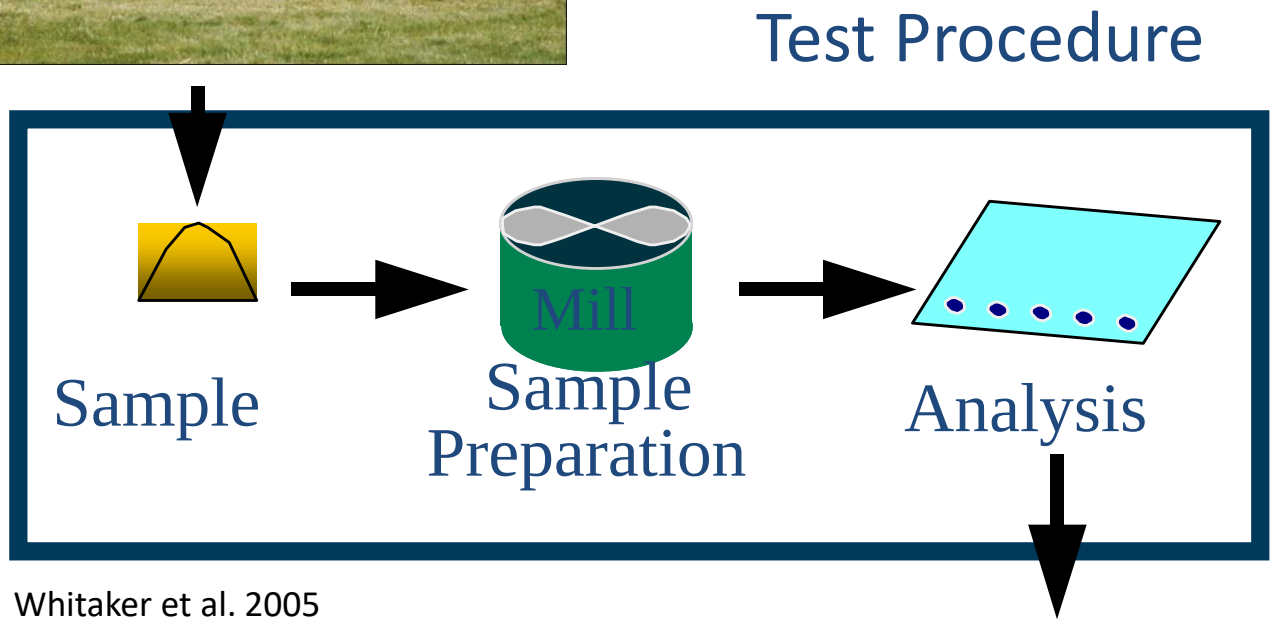
Duarte Díaz and Pedro Andrade

Cooperative Extension Service
University of Arizona

Sampling

- The most important step in the forage analysis process is the first one: taking a good sample

Sampling protocols



Whitaker et al. 2005

Accuracy vs. Precision

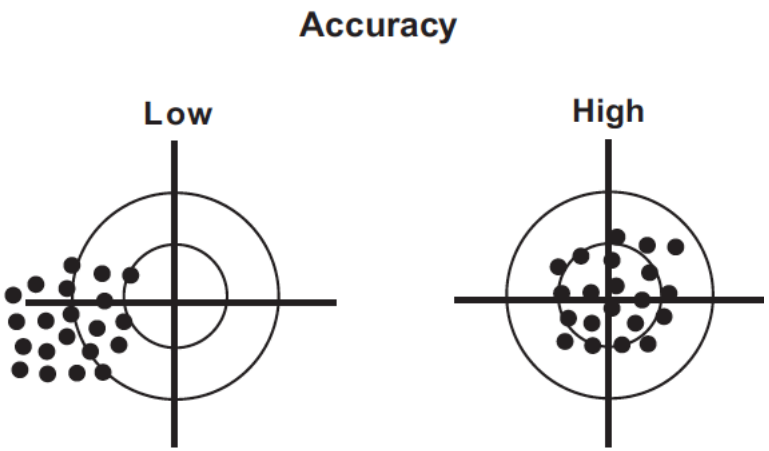


Figure 3. Low and high accuracy using target practice as an example.

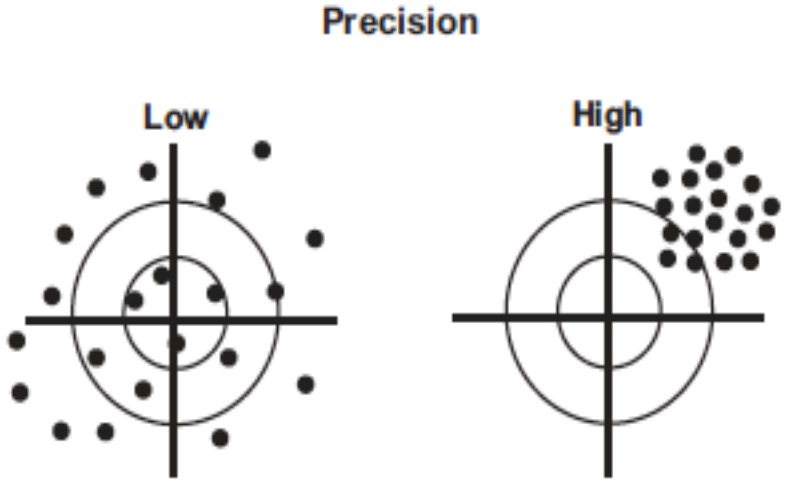
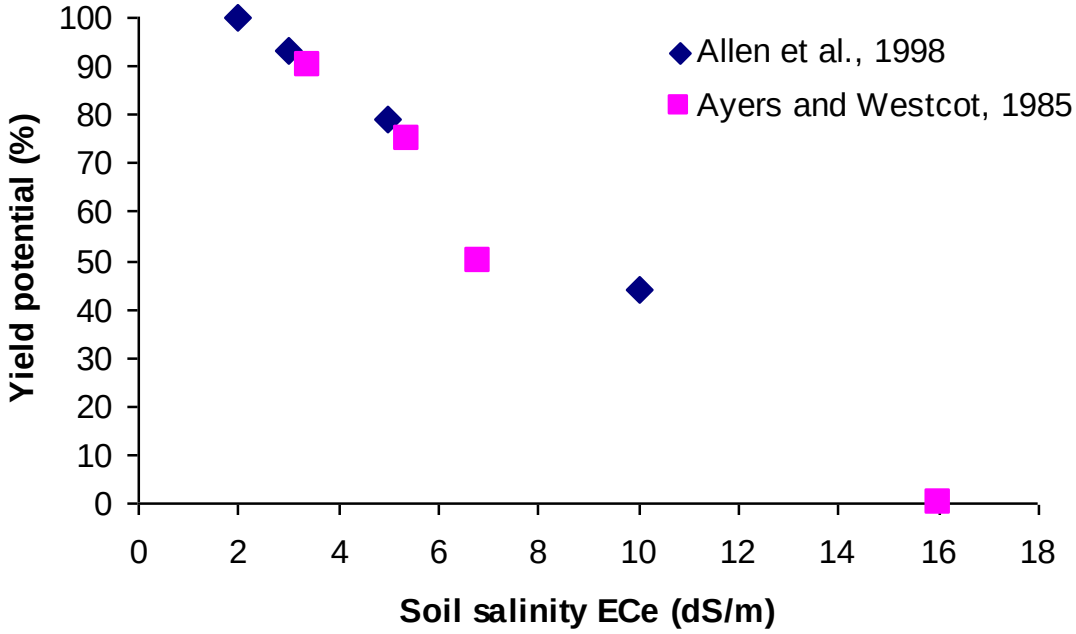


Figure 4. Low and high precision using target practice as an example.

- Mathematically, accuracy is the difference between the true value and the average of the measured values.
- Precision is defined as the closeness of the measured values to each other.

Soil salinity assessment in the low desert Alfalfa

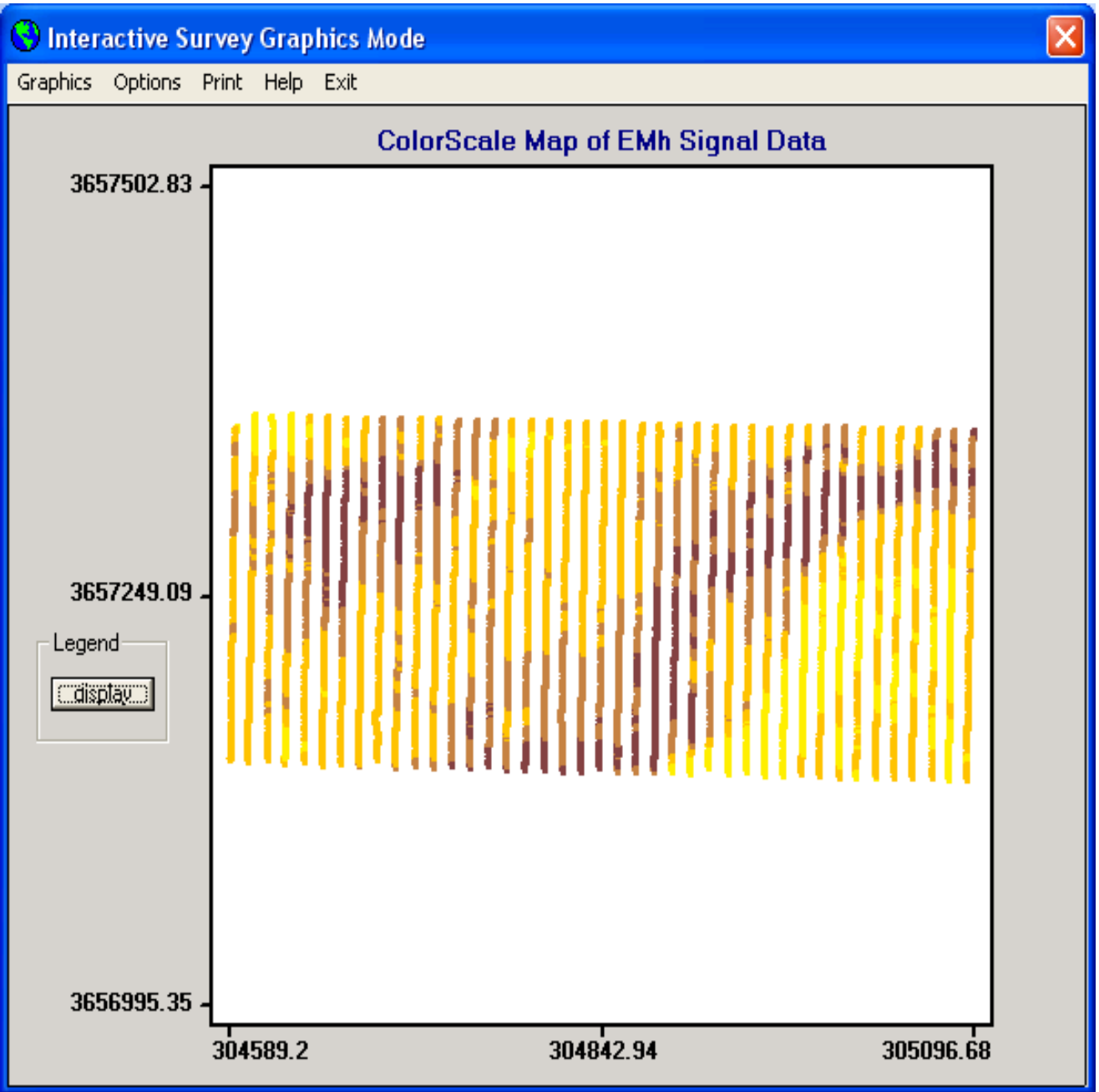


7.3 % yield decline per 1 dS/m of ECe

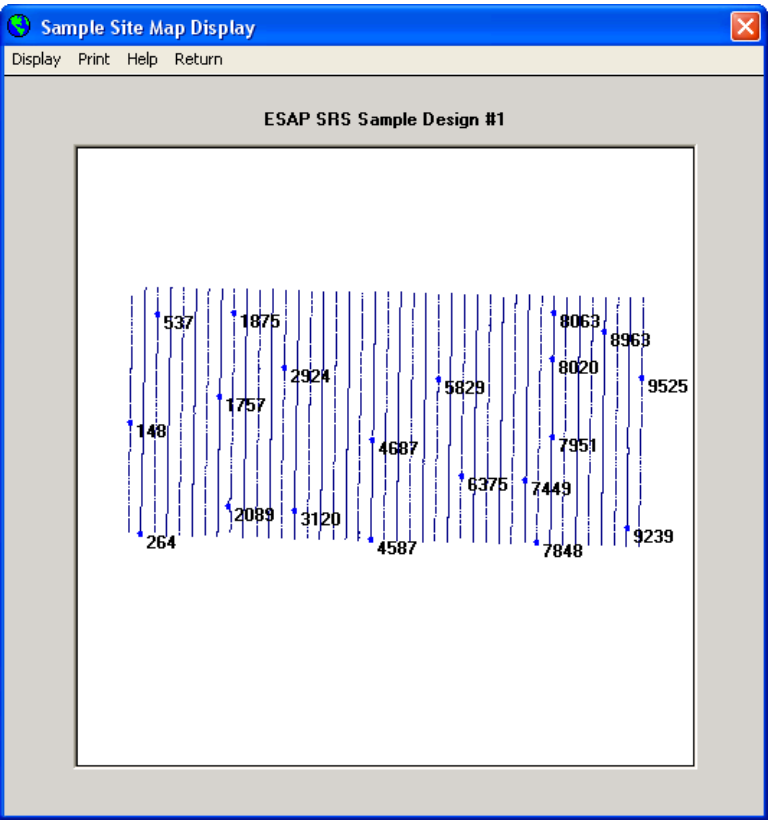
(ECe = electrical conductivity of saturated paste)

Most of the salts added with the irrigation water are left behind in the soil as water is removed by the crop. These may accumulate and reduce the availability of soil water to the crop.

ECa surveys w/ RTK-quality GPS



ESAP-based soil sampling



RFQ vs. RFV

- What do the numbers tell me
- Do they provide pertinent information
- Feed quality of alfalfa depends to a great extent on maturity of the stand.
- With increased maturity, plant structural carbohydrates, as measured by the ADF and NDF fractions, increase.

- Relative Feed Value (RFV) has been used for years to compare the quality of legume and legume/grass hay and silages.
- Having one index to price hay and predict animal performance has been very useful for both sides.
- RFV estimates forage DM digestibility and filling capacity. Relative Feed Quality improves on RFV by accounting for NDF digestibility.

Relative Feed Value (RFV)

- RFV estimates the digestibility dry matter from the ADF (cellulose and lignin), and calculates the DM intake potential (as % of BW) from NDF (total cell wall portion ADF+ hemicellulose)
- This index ranks forages relative to the digestible DMI of full bloom alfalfa (assuming 41% ADF and 53% NDF). The RFV index at this growth rate is 100
- Example
  - Alfalfa hay or haylage with 32% ADF and 40% NDF
  - DDM = 88.9 – (0.779 x32) = 63.97
  - DMI = 120/40=3
  - RFV = (63.97 x 3) / 1.29 = 149

Limitations of RFV 1) DDM and DMI are assumed constants for all forages 2) ADF and NDF are the only laboratory values used 3) CP concentration of forages is not used 4) RFV cannot be used in ration formulation or evaluation

SAMPLE HEADER

Table 1. Forage quality values of some forages at different growth stages.				
Forage type	CP	ADF	NDF	RFV
	%			
Alfalfa-prebud	22	28	38	164
Alfalfa-bud	20	30	40	152
Alfalfa-early bloom	18	33	43	138
Alfalfa-full bloom	16	41	53	100
Alfalfa-seed pod	14	43	56	92
Alfalfa + grass	13	39	54	101
Bromegrass-late vegetative	10	35	63	91
Bromegrass-late bloom	7	49	81	58
Corn silage-well eared	10	28	48	133
Corn silage-few ears	8	30	83	115
Sorghum silage	8	32	52	114

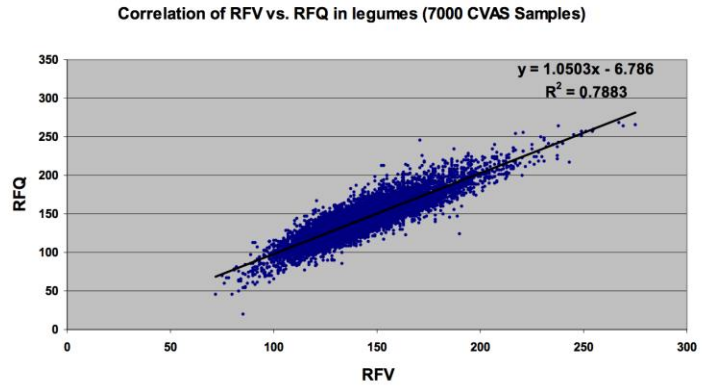
Source: Dunham (1998)

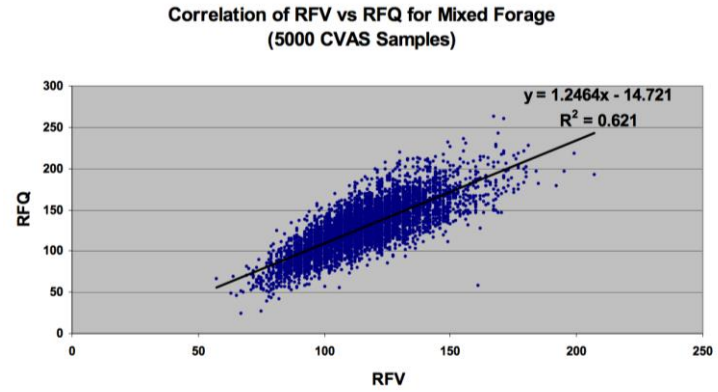
Higher RFV values indicate higher forage quality. Since the RFV system was developed using legume forages and intake responses of lactating dairy cows, it works best when applied to that situation

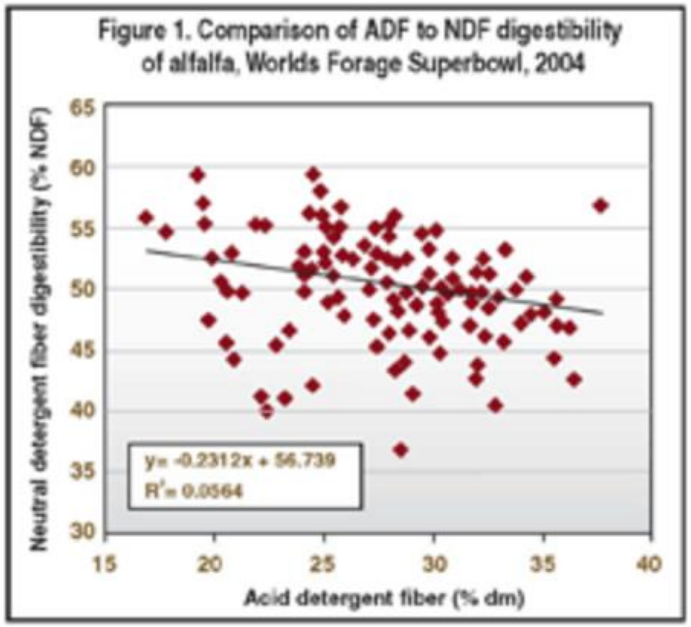
Relative Forage Quality (RFQ)

- Fiber from grass and legumes naturally differs in digestibility, as it also grown under different ambient temperatures.
- RFV of first-cutting alfalfa will be similar to that of second and third cutting harvested at similar stages of maturity.
- However fiber fraction digestibility could vary as it is influenced by ambient temperature at the time of growth and development.

- RFQ was therefore designed to account for fiber digestibility to estimate intake as well as the total digestible nutrients (energy) of the forage.
- RFQ Index is and improvement over RFV index for those that buy and sell forages because it better reflects the performance that can be expected from the cattle (It also differentiates legumes from grasses)







RFV and RFQ are closer for alfalfa when fiber digestibility is average. They differ primarily as fiber digestibility varies from average

Table 3. Forage quality needs of cattle by relative forage quality.	
Relative Forage Quality	**Suggested Cattle Type**
100-200	Heifer, 18-24 mo Dry cow
115-130	Heifer, 12-18 mo Beef cow and calf
125-150	Dairy, last 200 days Heifer, 3-12 mo Stocker cattle
140-160	Dairy, 1st three months of lactation Dairy calf

Source: Undersander (2003)

The intent of this graph is not to show the recommended RFQ values (those change from nutritionist to nutritionist) but to show that within a dairy operation different quality forages are utilized throughout the operation. Not all cows are fed the highest RFQ hay