Forage Properties And Advantages Of Grain Amaranth Following Wheat In Midwestern Rotational Forage Production Systems

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Why use amaranth as a animal feed?

- Agricultural Sustainability
- Low input crop (N, Water)
- Certain animals need high quality feeds (dairy)
- Amino acid profile high in limiting (essential) amino acids.
- Many wheat producers cannot effectively double crop.
- Reduce off-farm inputs

Problem Statement

- Producers in the Northern Midwest have few grain crop options that can successfully follow wheat.
- Many of these producers choose to grow soybeans, for the off chance that they will have a substantive yield.
- Forage producers who grow wheat as a part of their crop rotation need more tested options that can follow wheat and produce reasonable amounts of biomass.

Rational

- Summer annual crops have many qualities that match both specific needs of forage producers, and can successfully fill the open niche following wheat grain harvest.
  - Silage and green chop crops
    - Amaranth (Amaranthus spp.)
    - Sorghum (Sorghum Bicolor)
    - Pearl millet (Pennisetum gluacum)
  - Hay and pasture crops
    - Foxtail millet (Setaria italica)

Rational

Hay and pasture crops

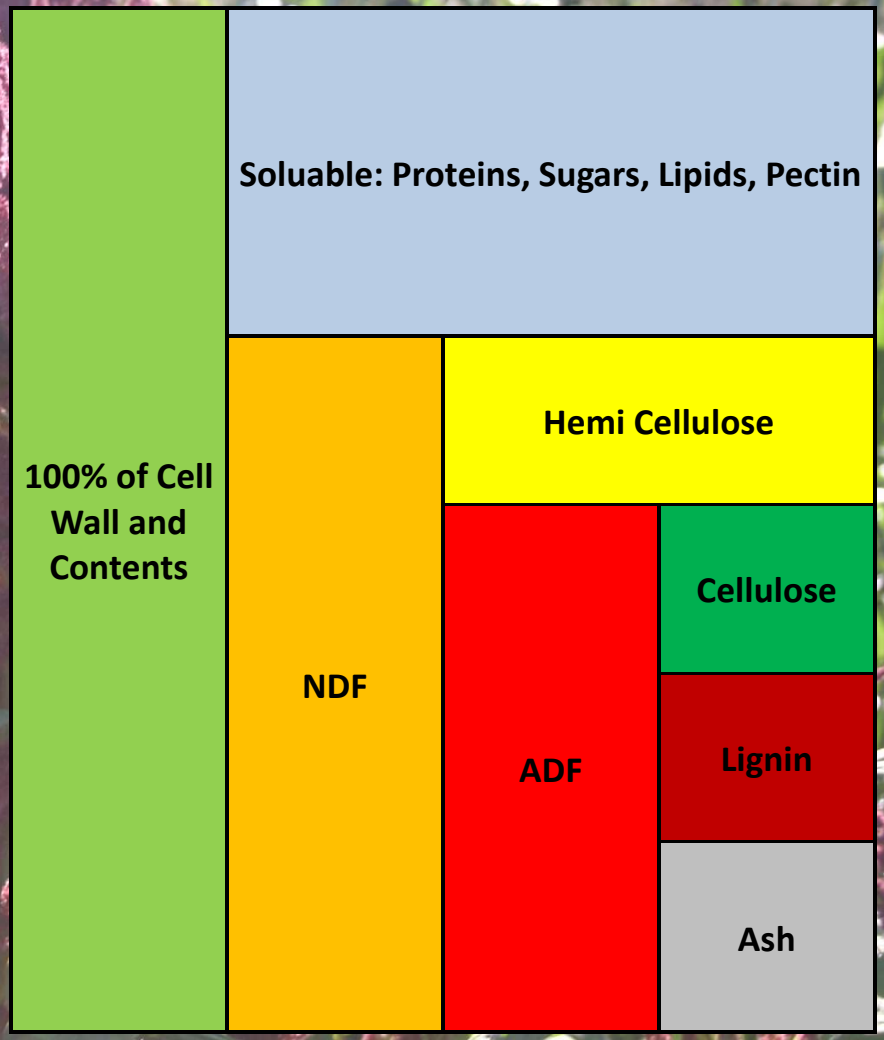
- Foxtail millet (Setaria italica)

Objectives

- Determine which of these crops is the best fit for the after wheat niche in the Midwest.
- Determine how amaranth compares to other more common annual forages.
- Determine the advantages and limitations of an amaranth silage system.

Forage Terminology

- Neutral Detergent Fiber (NDF)
- Acid Detergent Fiber (ADF)
- Crude Protein (CP)
- Acid Detergent Lignin (ADL)
- Percent Moisture and Percent Dry

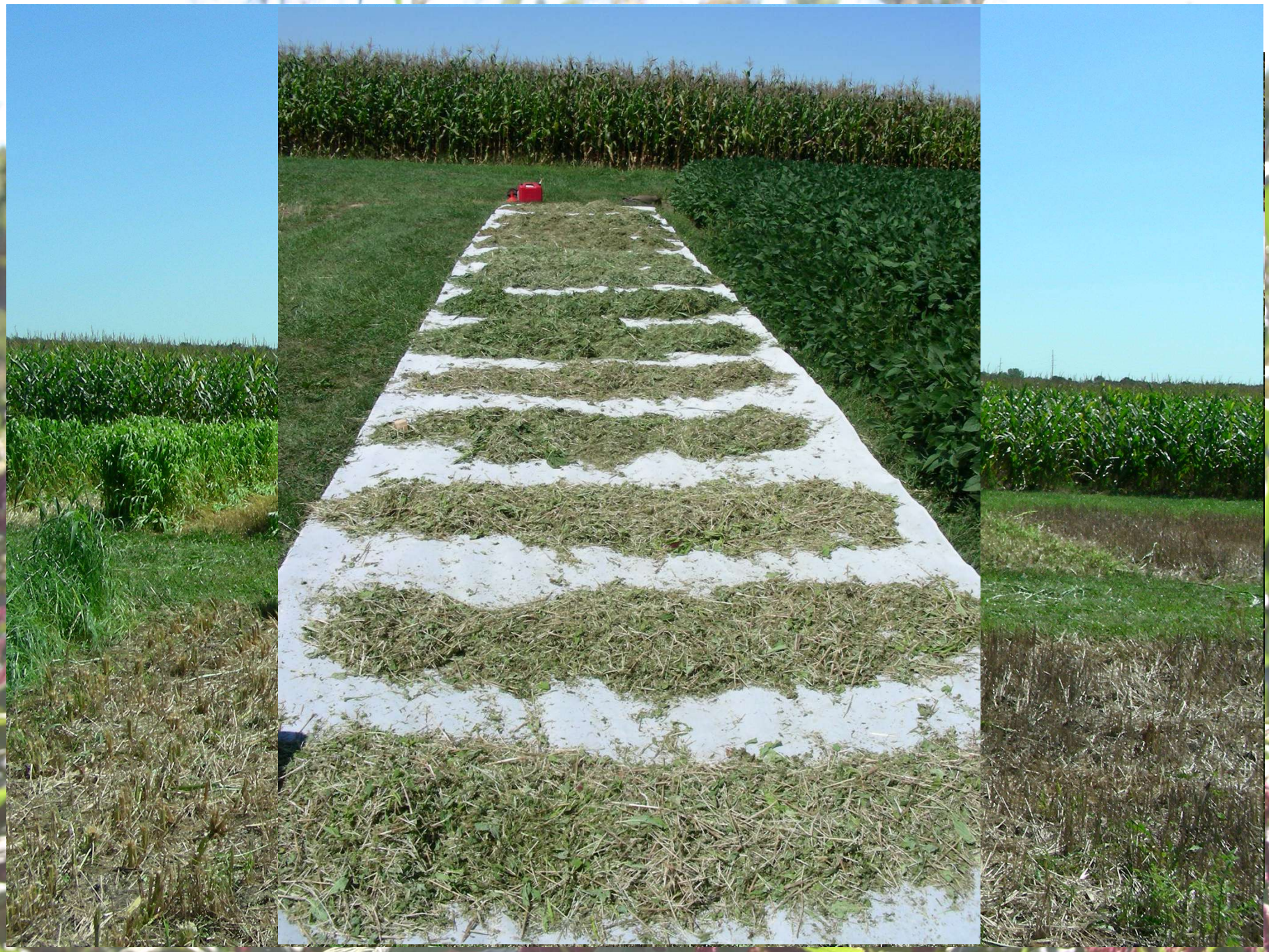


Summer forage comparison trial

- Nine crops
- Two planting dates
  - Early July - Amaranth, teff, pearl millet, foxtail millet, Brown Mid-Rib (BMR) sorghum sudangrass,
  - Mid-August - forage turnip, oil seed radish, oat
- Two Nitrogen rates
- Four replications

Plant assessment

- Plants were harvested at maturity or 45 days after planting.
- Hand cut samples were taken before machine harvest.
- Using a flail chopper, plot centers were harvested.
- Biomass harvested from the 50 and 100 lbs N/acre Amaranth plots, and the 100 lbs N / acre plots of pearl millet and sorghum sudangrass were ensiled.

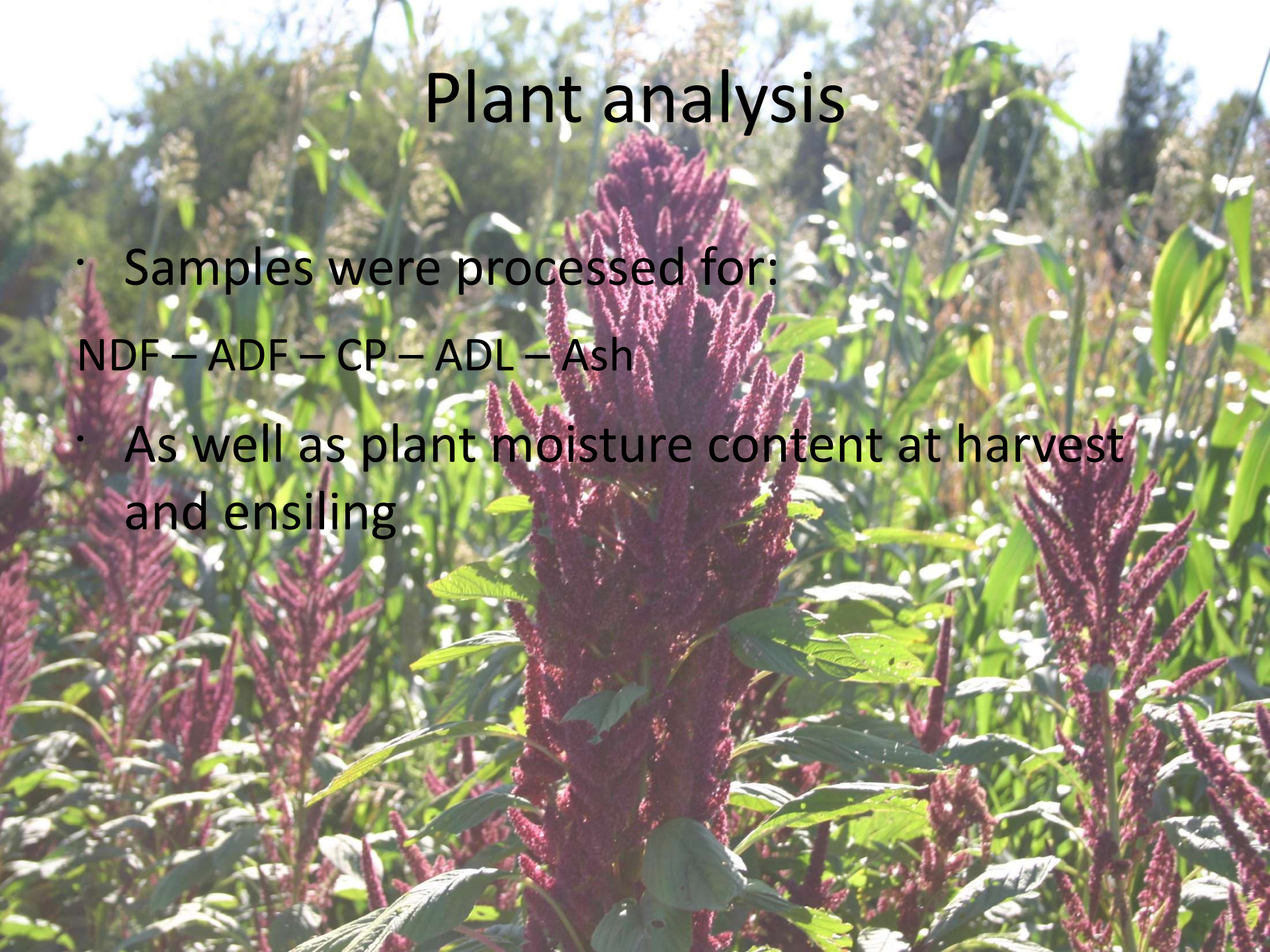


Plant analysis

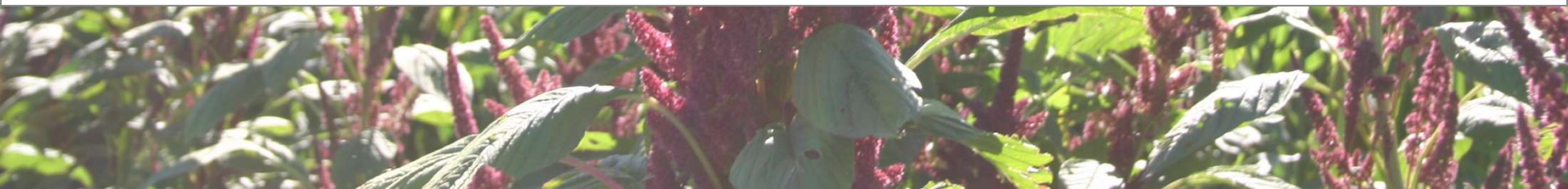
- Samples were processed for:

NDF – ADF – CP – ADL – Ash

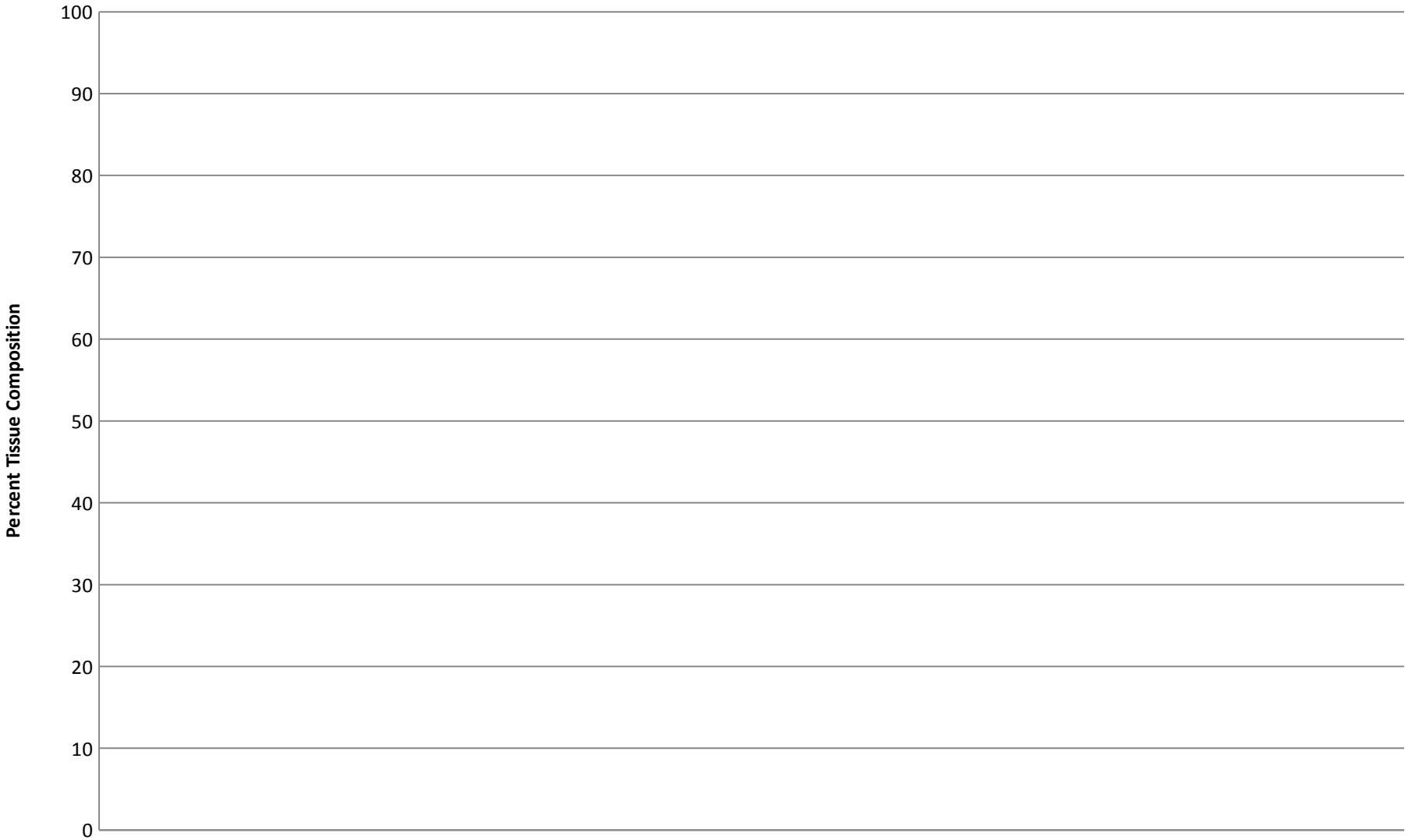
- As well as plant moisture content at harvest and ensiling



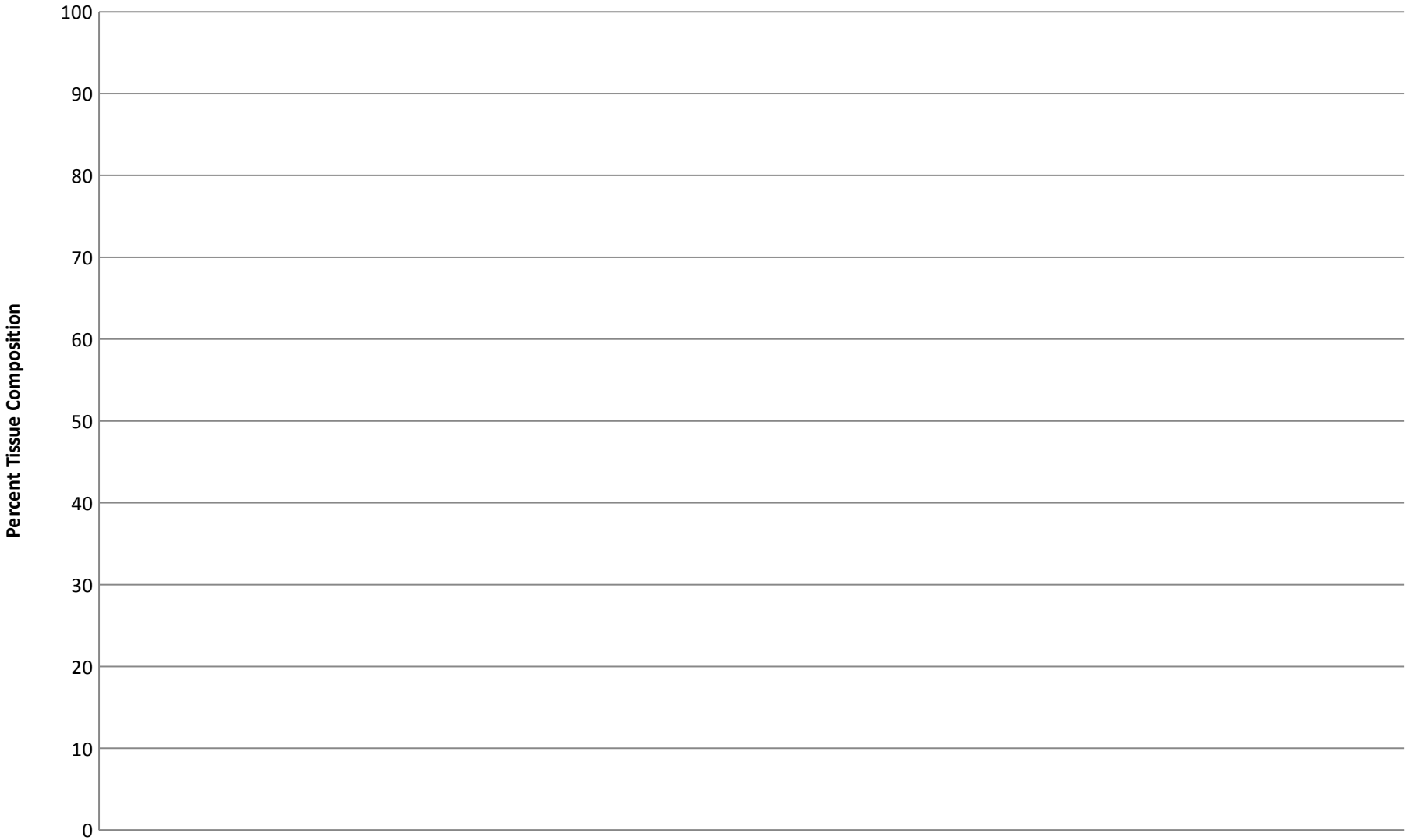

kg Dry Matter / Hectare
12
10
8
6
4
2
0



Silage Crop NDF

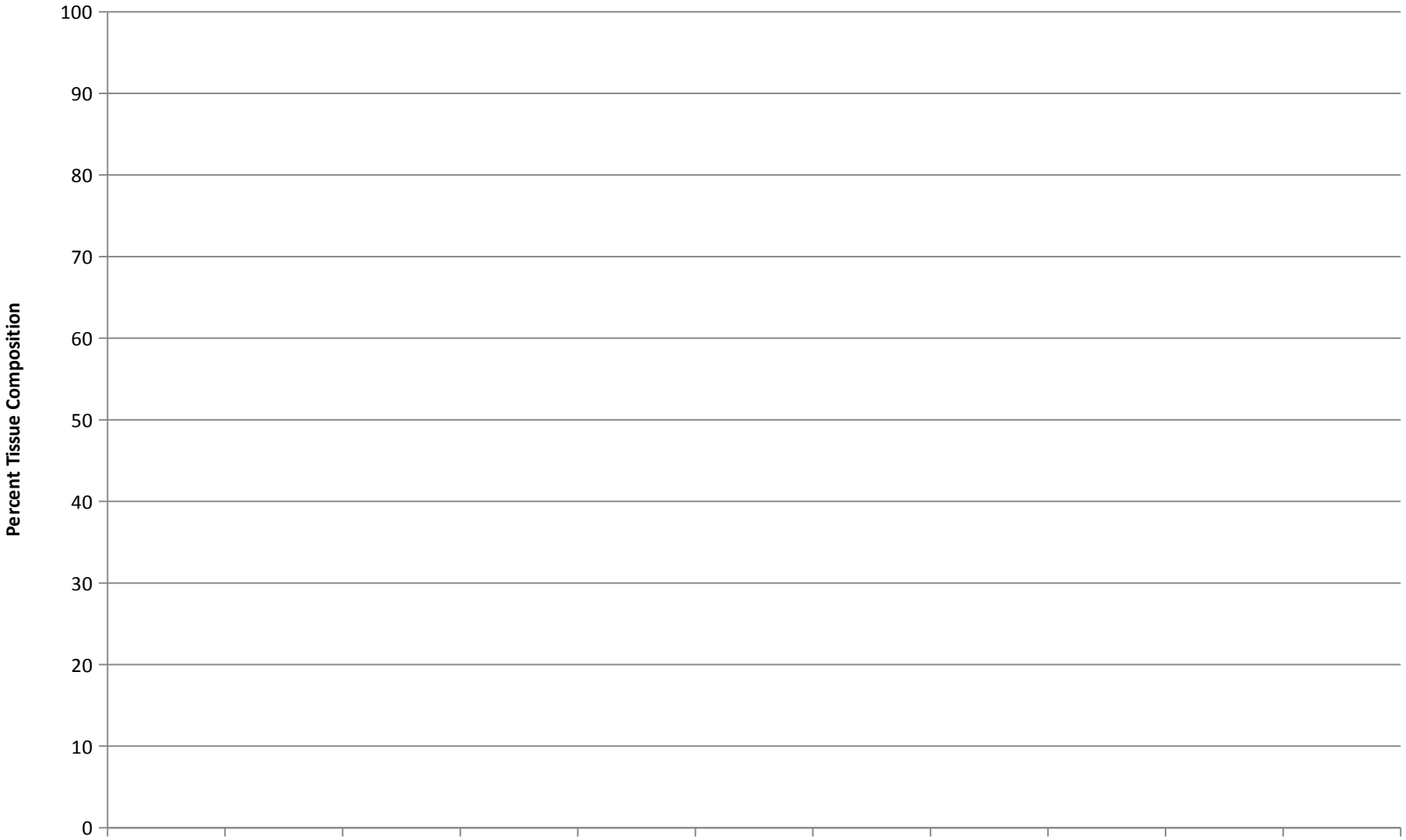


Silage Crop ADF



Hay Crop NDF

Hay Crop ADF

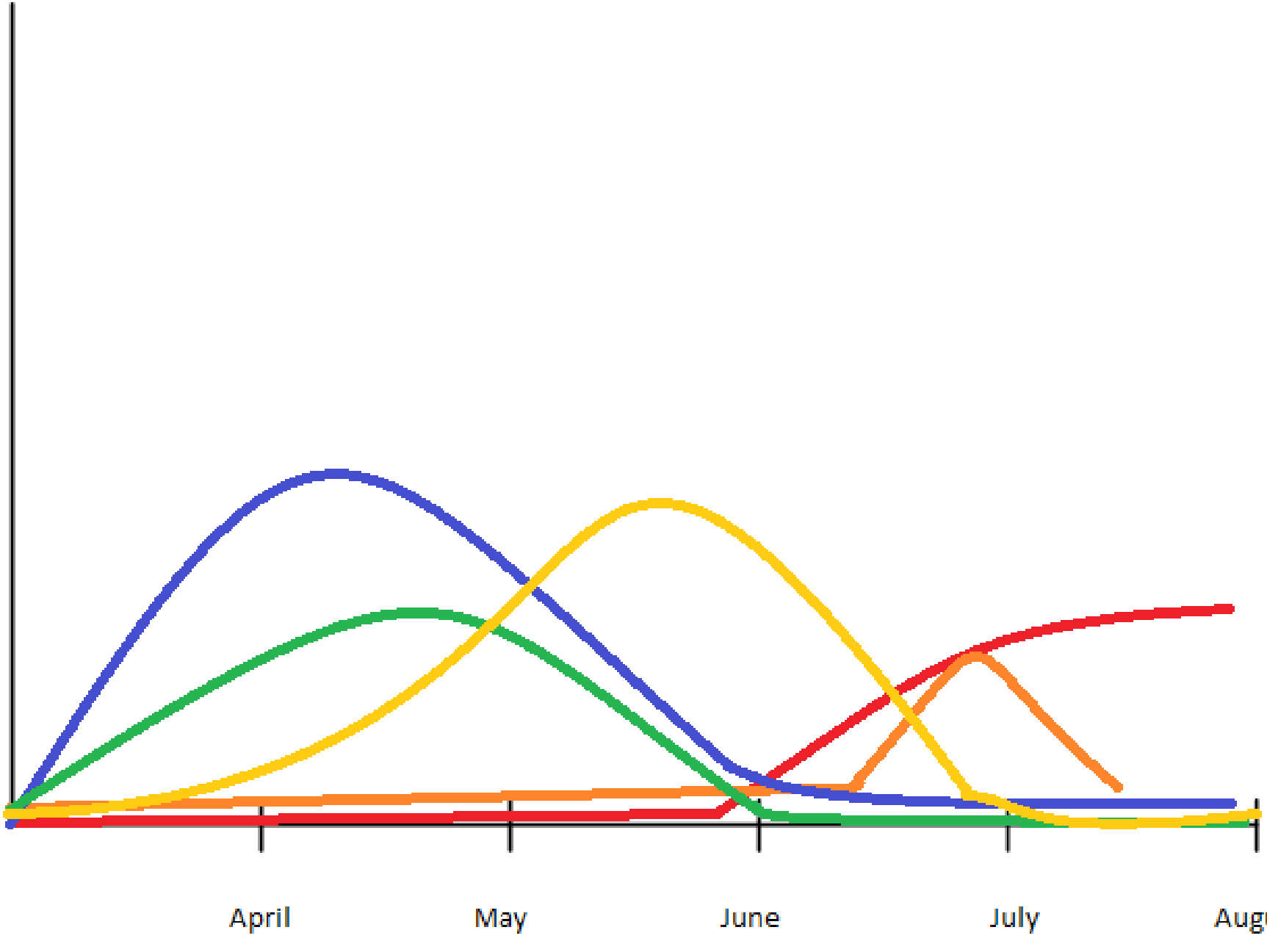



Grazing Crop NDF
Percent Tissue Composition
100
90
80
70
60
50
40
30
20
10
0


Grazing Crop ADF
Percent Tissue Composition
100
90
80
70
60
50
40
30
20
10
0

Advantages to Midseason Planting

- Warmer soil
- Crop land available
- Midseason Manure application.
- Amaranth can handle dry spells and heat.
- After July, most weeds are past their time of germination

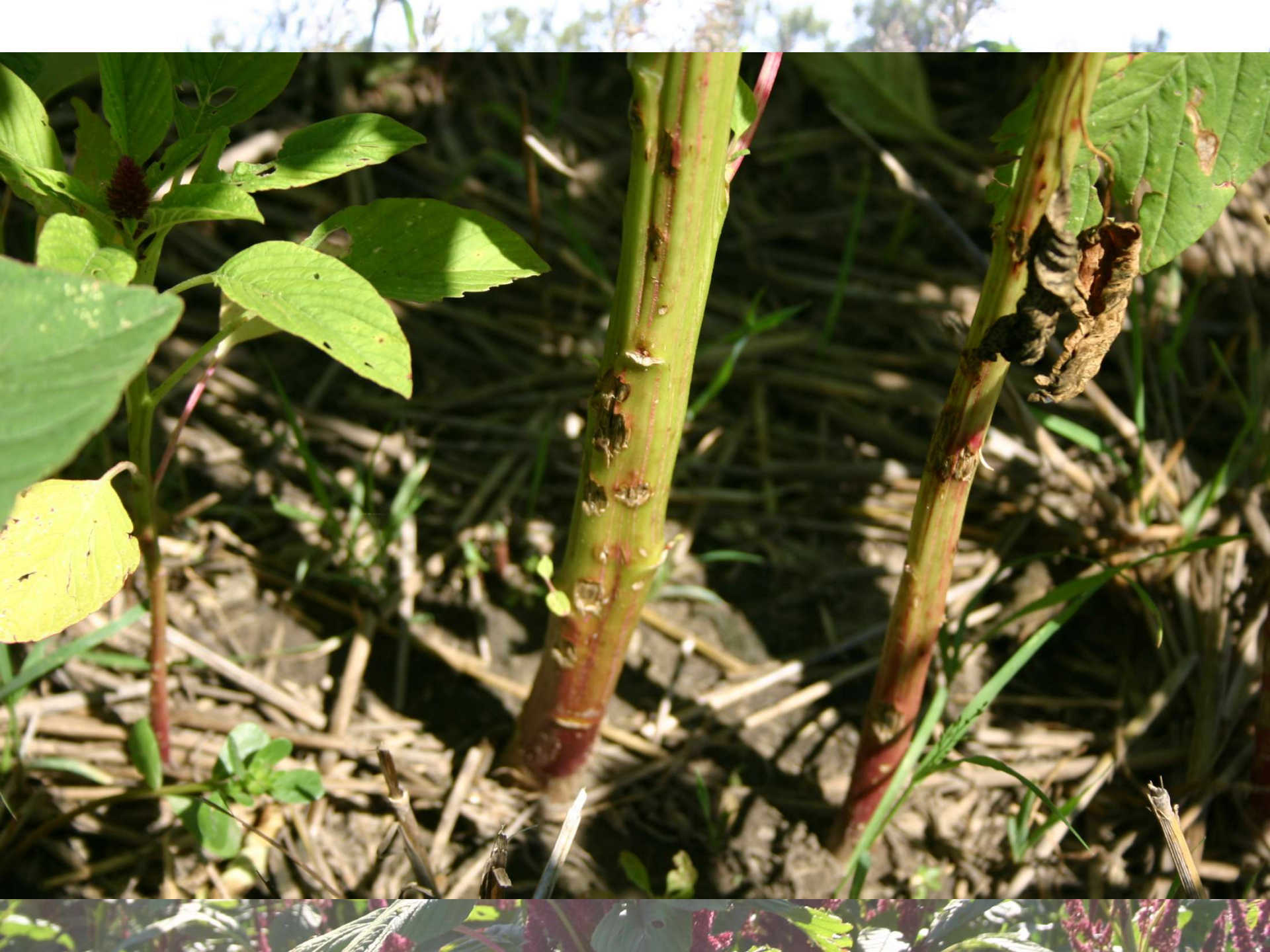

April
May
June
July
August

Amaranth Weed Control

- Difficult in early planted systems
- Selective herbicides not an option
  - Clomazone “command”
- Advantage of July planting, the weeds are not as much of a problem.

2011 trials

- Trials
  - Amaranth Forage quality by density trial
  - Nutrient management trial
- Problems affecting these trials:
- Weather
  - Too much rain early spring
  - Not enough rain in July
  - Hail damage in August



Insect Pests

Preference Study

Thank you for your time

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