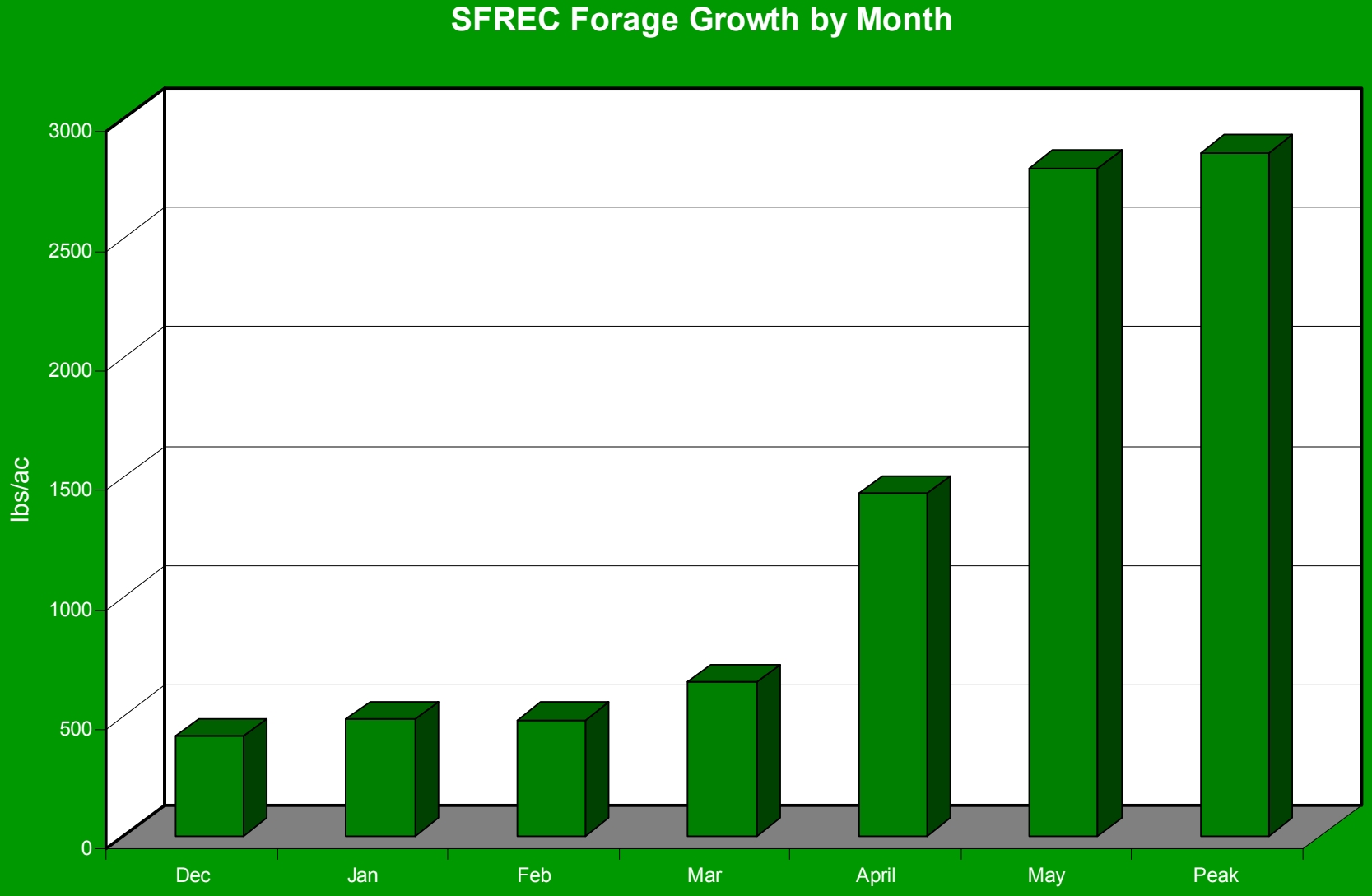
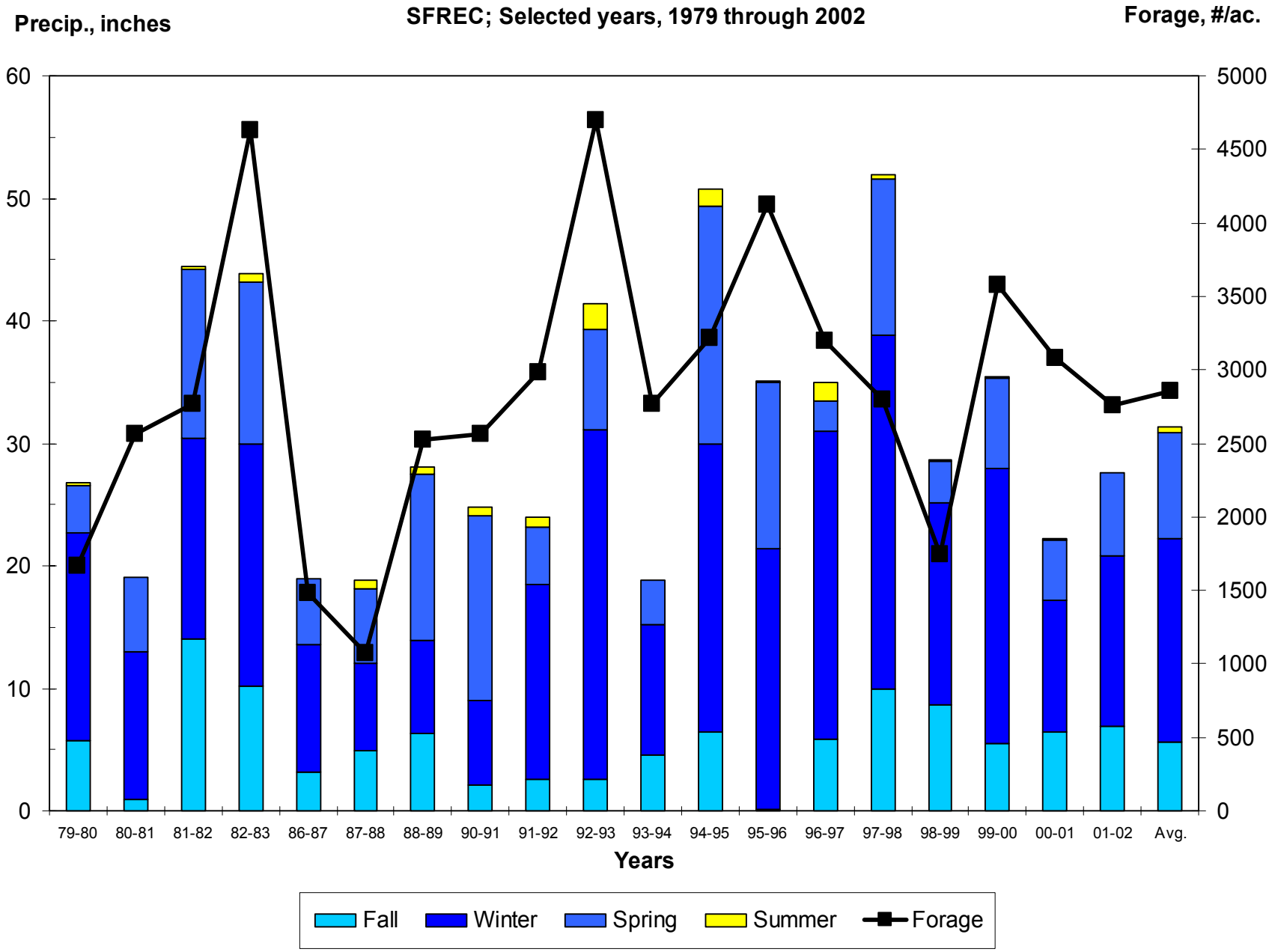

California Forage Quality–
From Grass to Poop

How Does the Grass Grow?

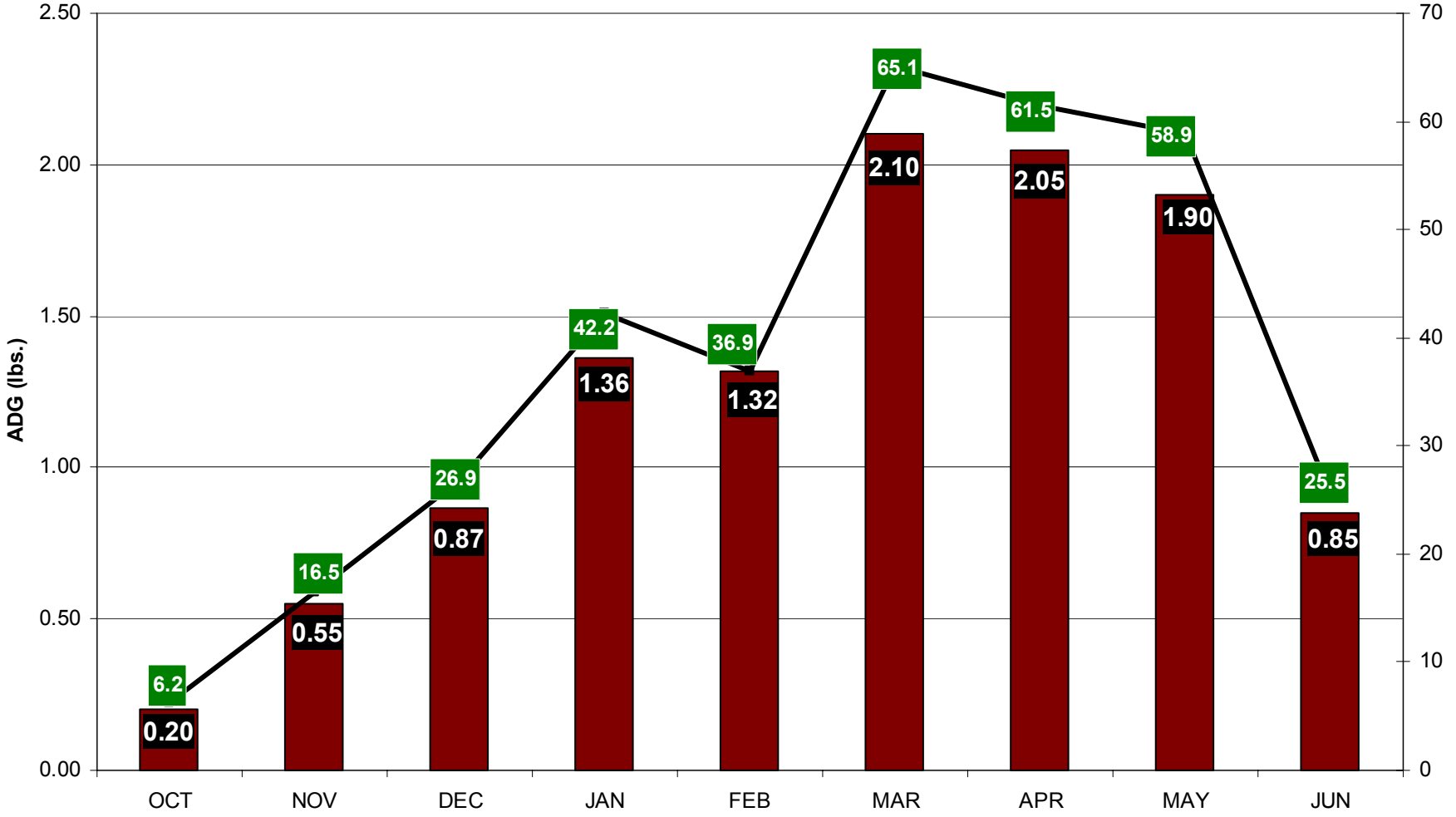


PRECIPITATION & FORAGE YIELD

SFREC; Selected years, 1979 through 2002



ADG ON ANNUAL RANGE
Stocker calves, avg. 4 years



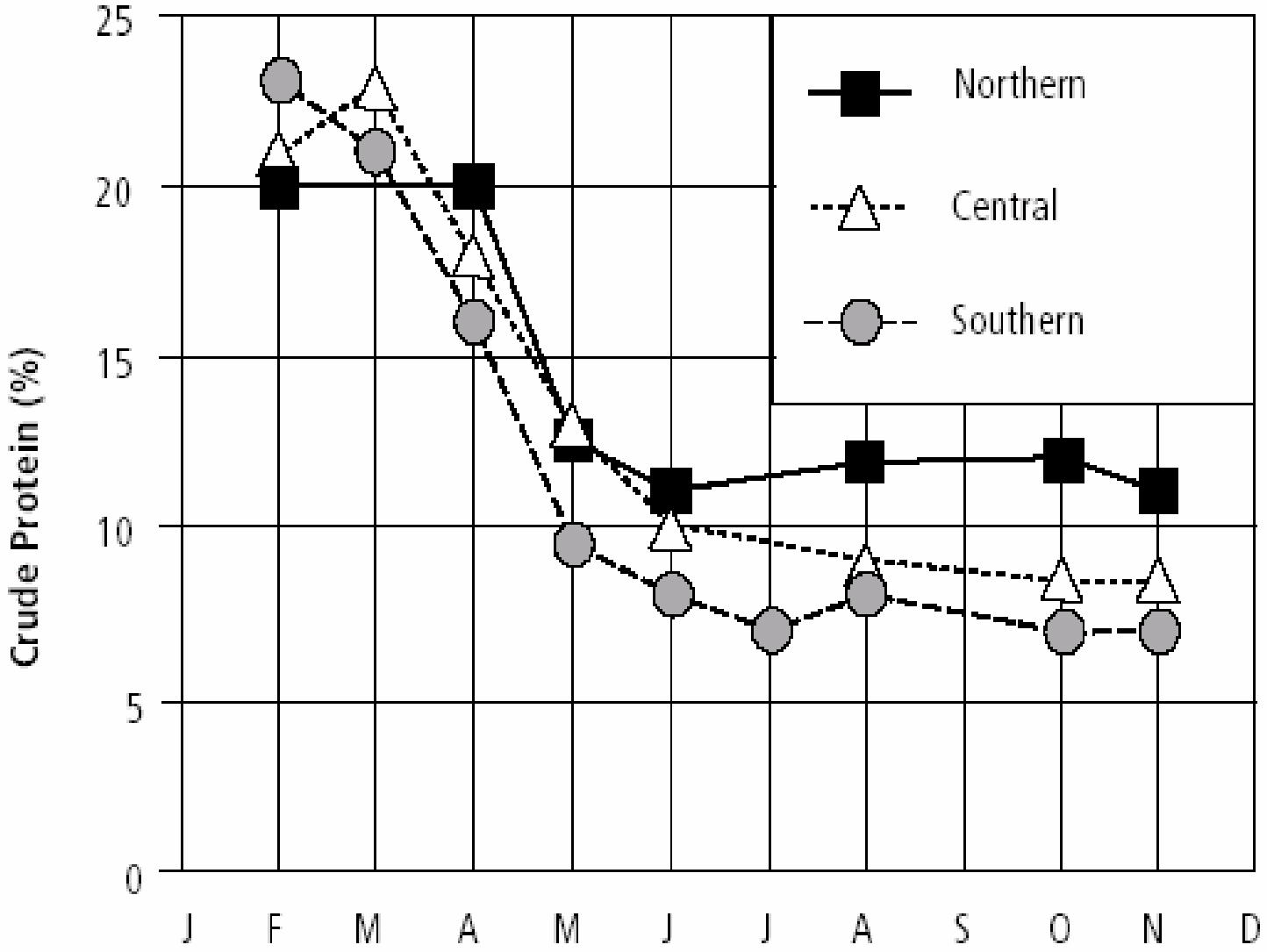
Protein Quality – the Grass Side

Table 1. Crude protein content of annual grasses, filaree, and bur clover at seven stages of maturity	Annual Grass	Filaree	Bur Clover			
Early vegetative	18	27	28			
Late vegetative	15	25	27			
Early flowering	15	22	26			
Late flowering	10	16	22			
Mature	6	0	19			
Dry	5	7	18			
Dry, leached	3	5	17			
Source: Hart et al. 1932; Gordon and Sampson 1939						

Energy Quality – the Grass Side

Metabolizable energy (Mcal/kg)				TDN (%)		
Stage of maturity	Annual grass	Filaree	Bur clover	Annual grass	Filaree	Bur clover
Early vegetative	2.8	3.5	3.3	77	97	91
Late vegetative	2.7	3.4	3.2	74	94	89
Early flowering	2.6	3.3	3.1	72	91	86
Late flowering	2.4	3.0	2.9	67	84	80
Mature	2.2	2.6	2.6	61	72	72
Dry	2.1	2.5	2.5	58	69	69
Dry, leached	2.1	2.4	2.4	58	67	67

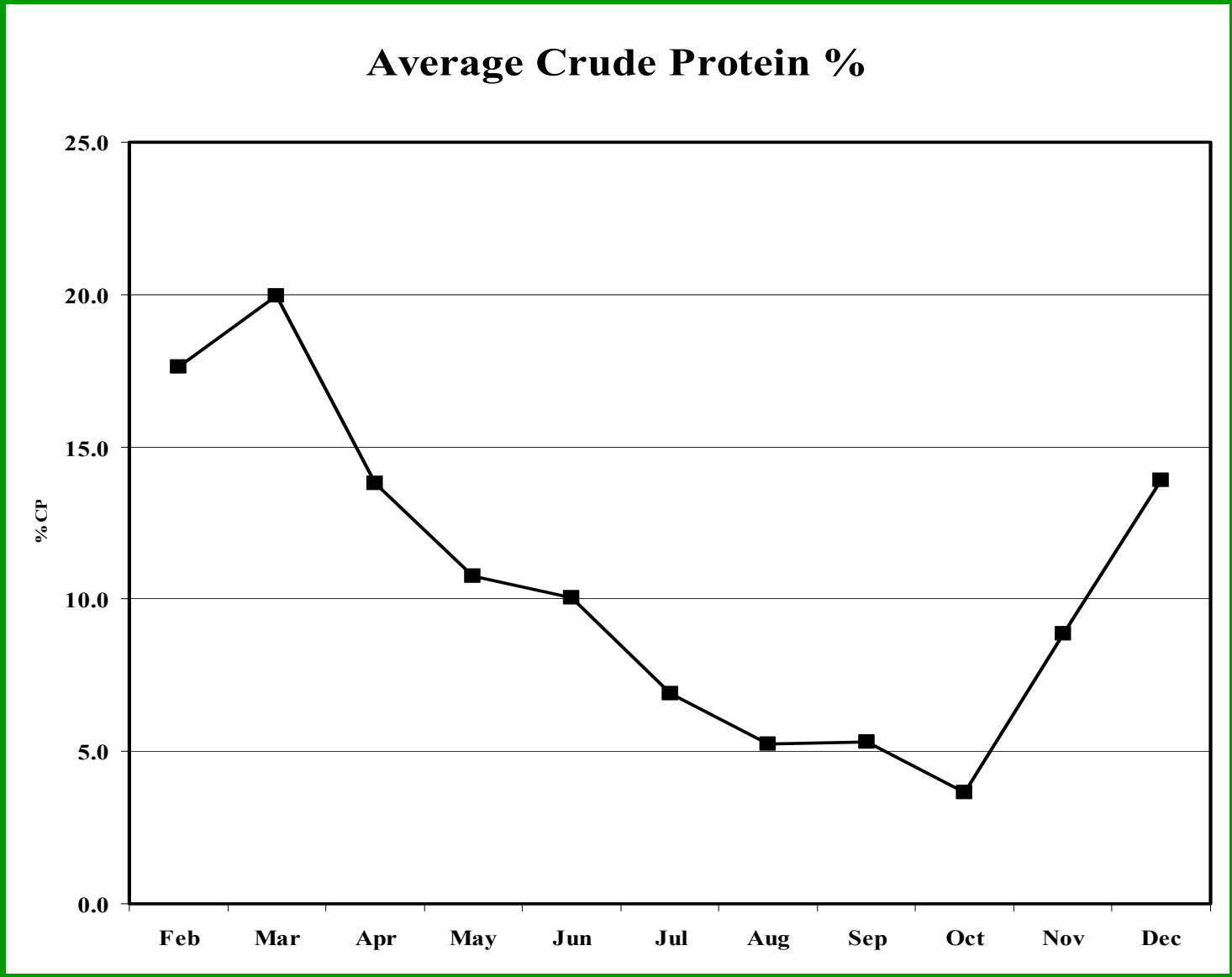
Quality – The Grass Side



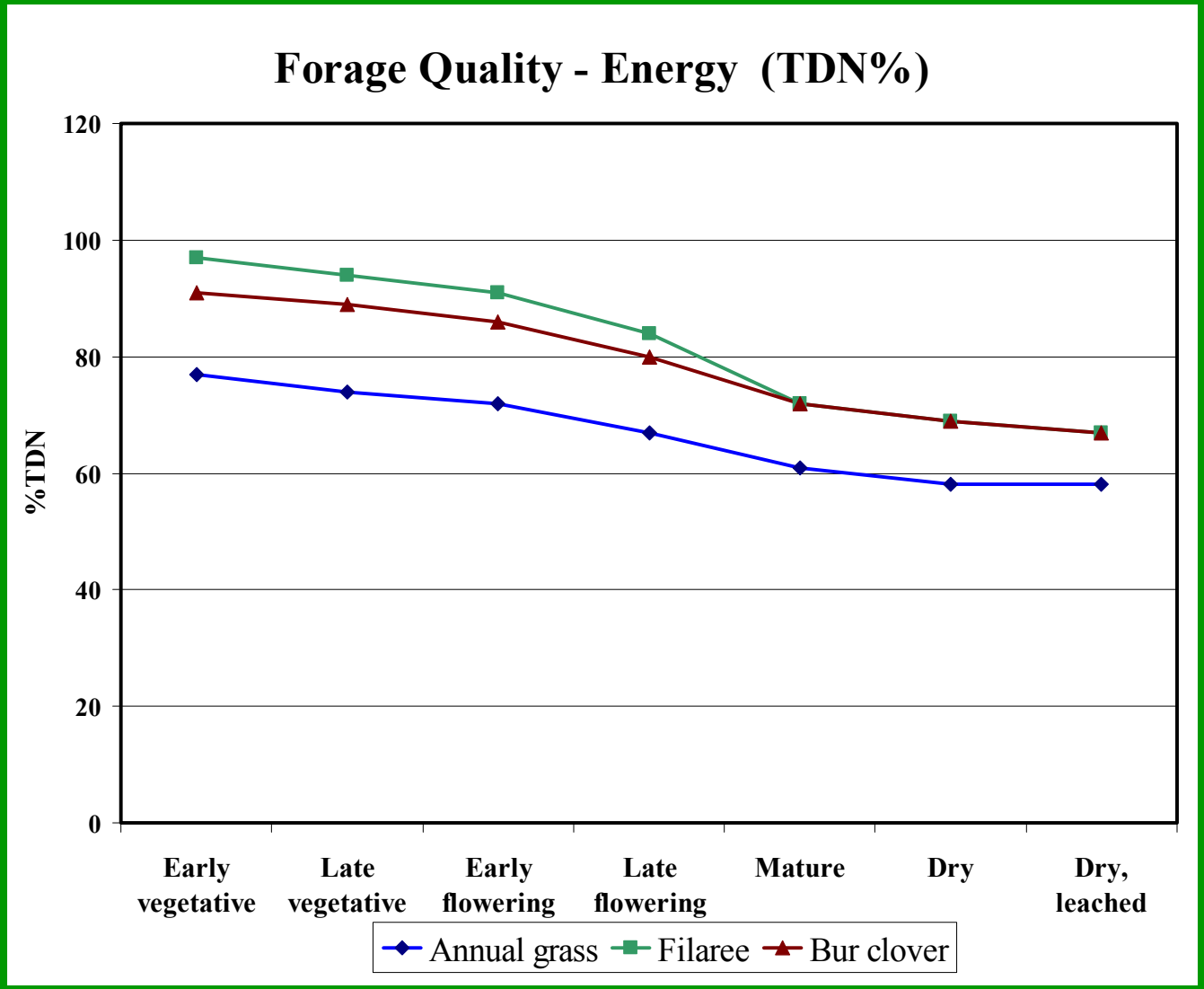
Water Content

	Jan	Apr	Aug
Rose Clover	77-83%	21-28%	0-4%
Annual Grass	72-79%	32-40%	0-5%
Filaree	75-84%	22-25%	

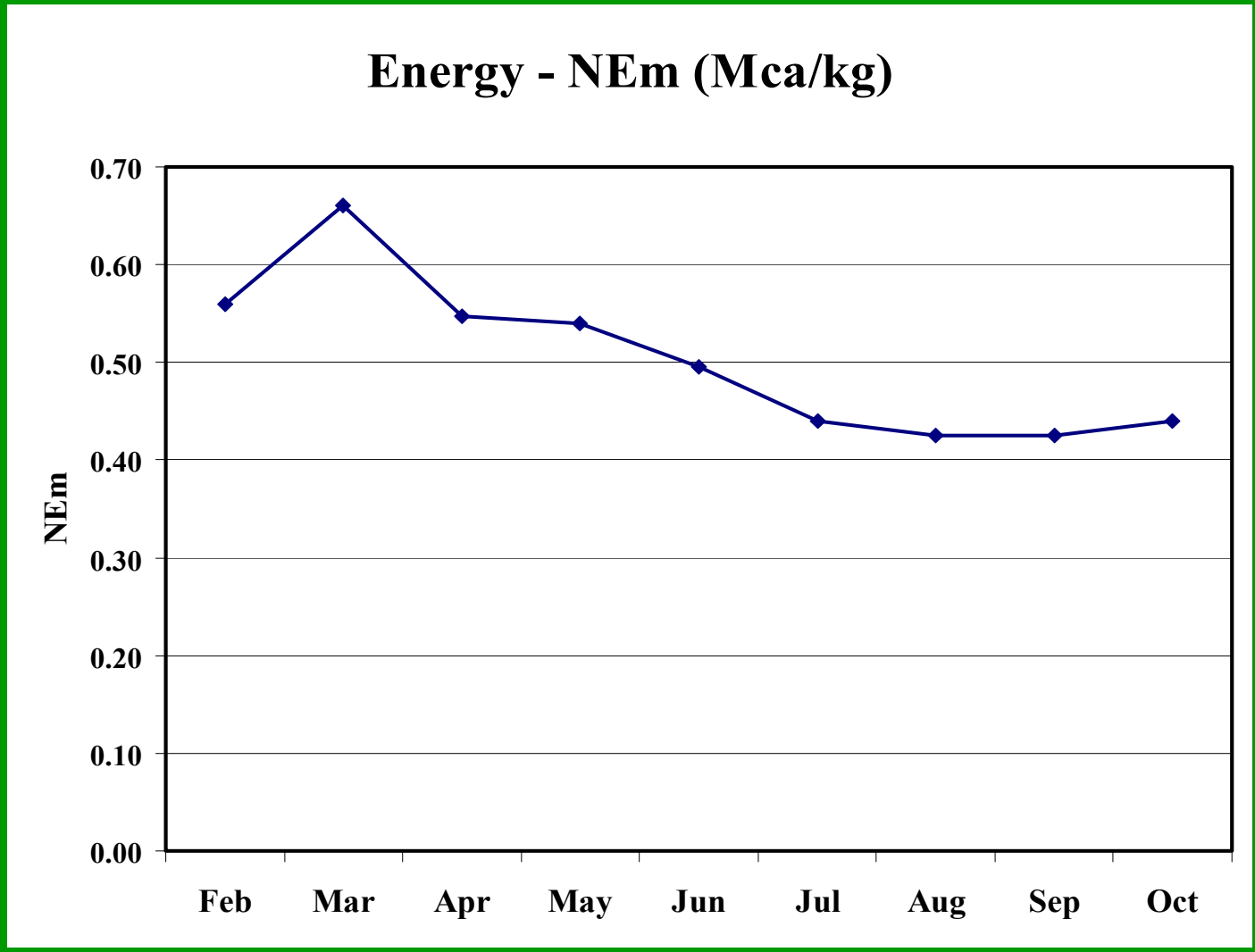
Forage Sampling 1996-1999
Campbell Pasture - SFREC



Forage Quality - Energy



Forage Quality – Energy – Campbell Pasture 1996-99



NIRS/NUTBAL Nutritional Management System

Detection

Prediction

Action

Follow-up

HANDPLUCKING…Human Perception of an Animal's Diet

Visit all the major grazing sites within the landscape

Select the proper proportions of the different plant species

Get the plant parts selected correctly

Mix the various components of the diet in the proper sequence to get the proper associative effects

Fecal Chemistry

=CH2, =CH3, =C=O=C=,

Amide, Amine, Aromatics,

Protein Bonds, Peroxides,

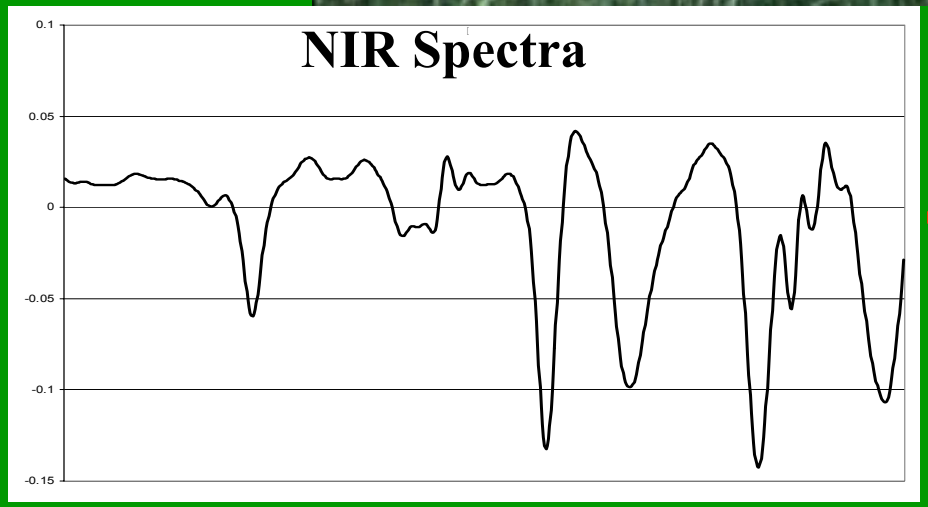
=CH3-N, Alphatics

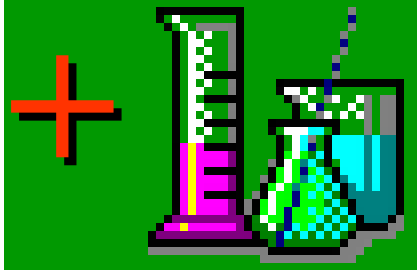
Diet Quality

Crude Protein

Dig. Org. Matter

Phosphorus, etc





Predicted Diet
Crude Protein
Digestible Organic Matter
Phosphorus, etc

Waveform transformation
and statistical analysis
is used to create a calibration
equation to predict components

Sample Arrives and is assigned id #

Insulated mailer, ice pack, sample envelope, drying trays

Fresh feces placed in oven overnight

Dried feces is ground in cyclone mill next morning

NIRS Fecal Profiling Laboratory Procedures

NIRS quartz lens sample cups are packed

Sample scanned with NIR spectrophotometer

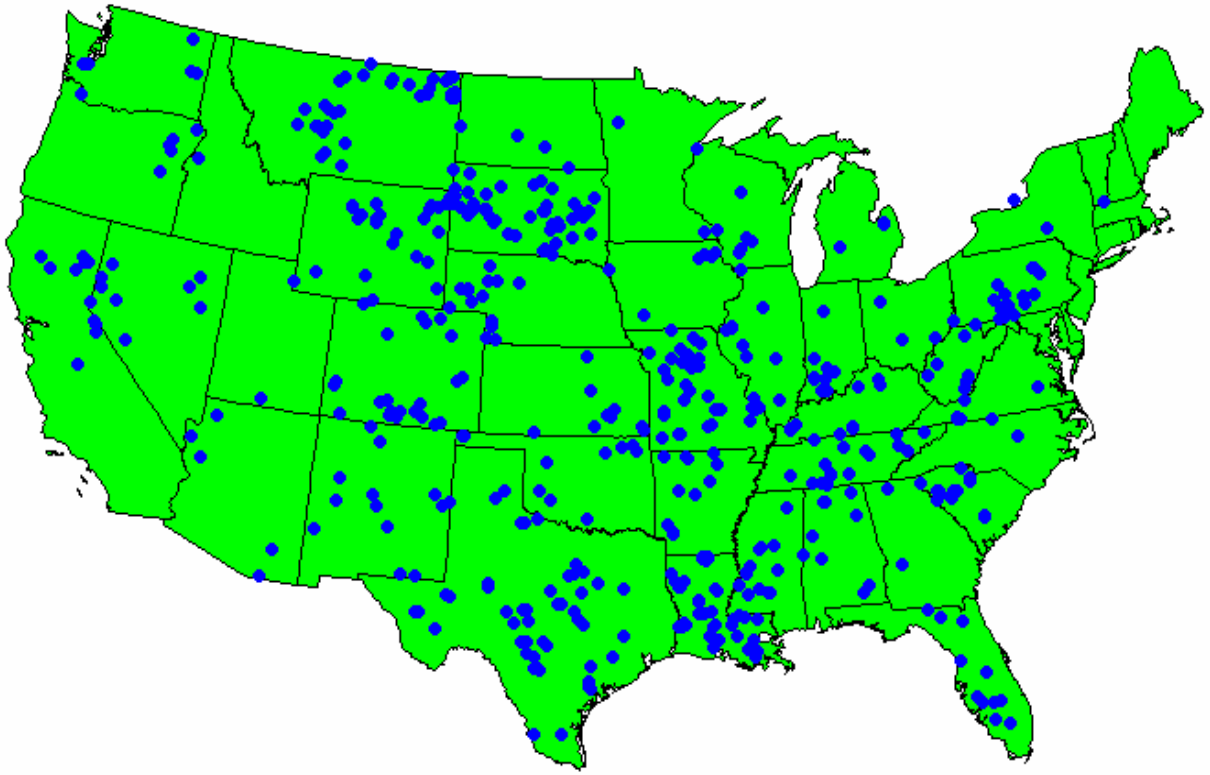
Results logged in database and spatially referenced in ARCVIEW

Calibration Reference Sets Used in the USA System:

Subtropical savanna of South Texas
Mixed hardwood/grasslands of East Central Texas
Mesquite-mixed grass savanna of North Texas
Tall and mid-grass prairie of Oklahoma
Derived cool-season pastures in west-central Missouri
Sandhill uplands and meadows of Nebraska
Mixed grass prairies of eastern Montana/ Central Dakotas
Derived cool-seasons pastures in south-central Canada
Other calibrations sets have been selectively used as well:

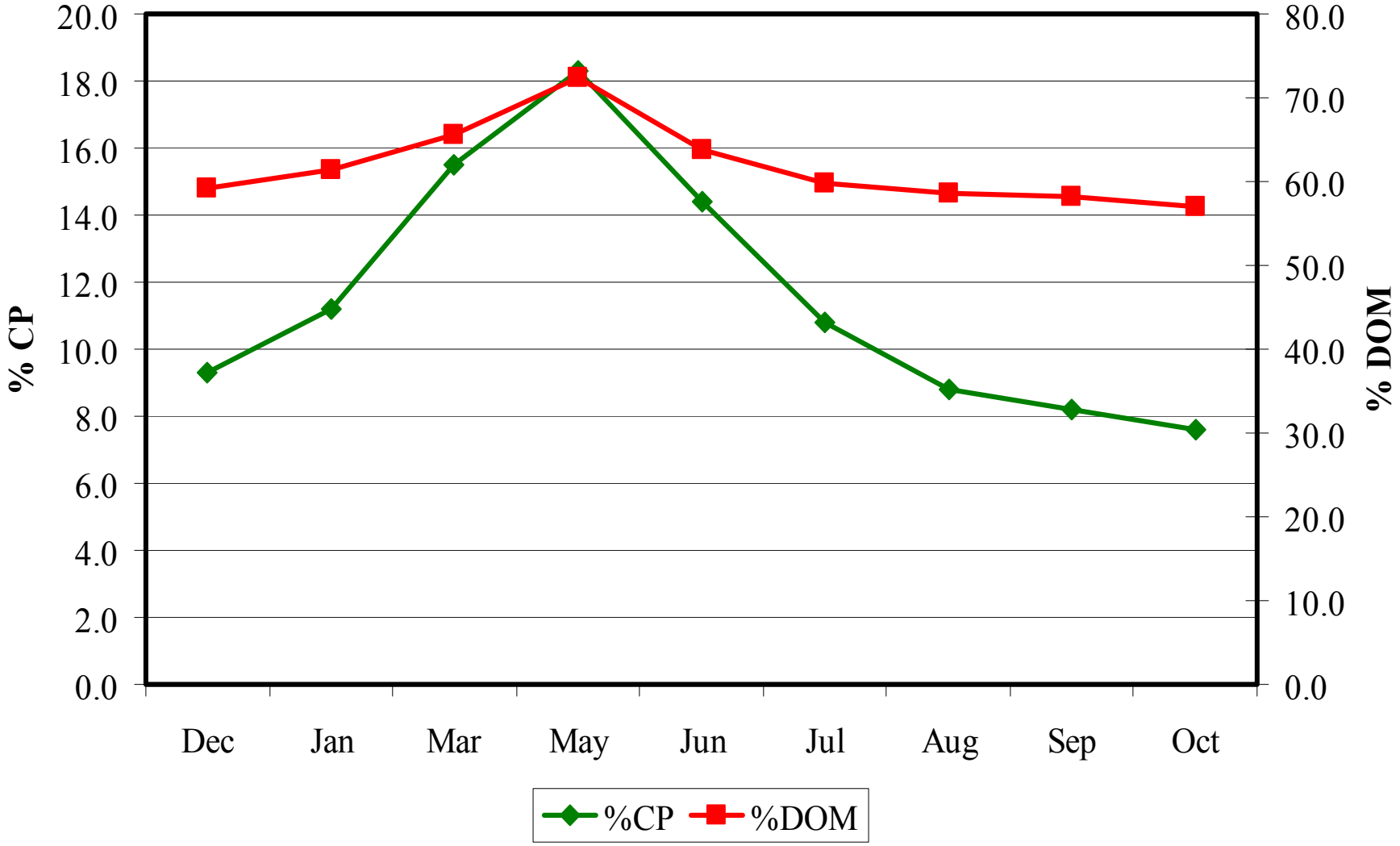
- Argentina grasslands and shrublands
- Sub-sahelian Africa (East and West)
- Australian tropical woodlands

Ranches Participating in NIRS/NRCS National Nutrition Project

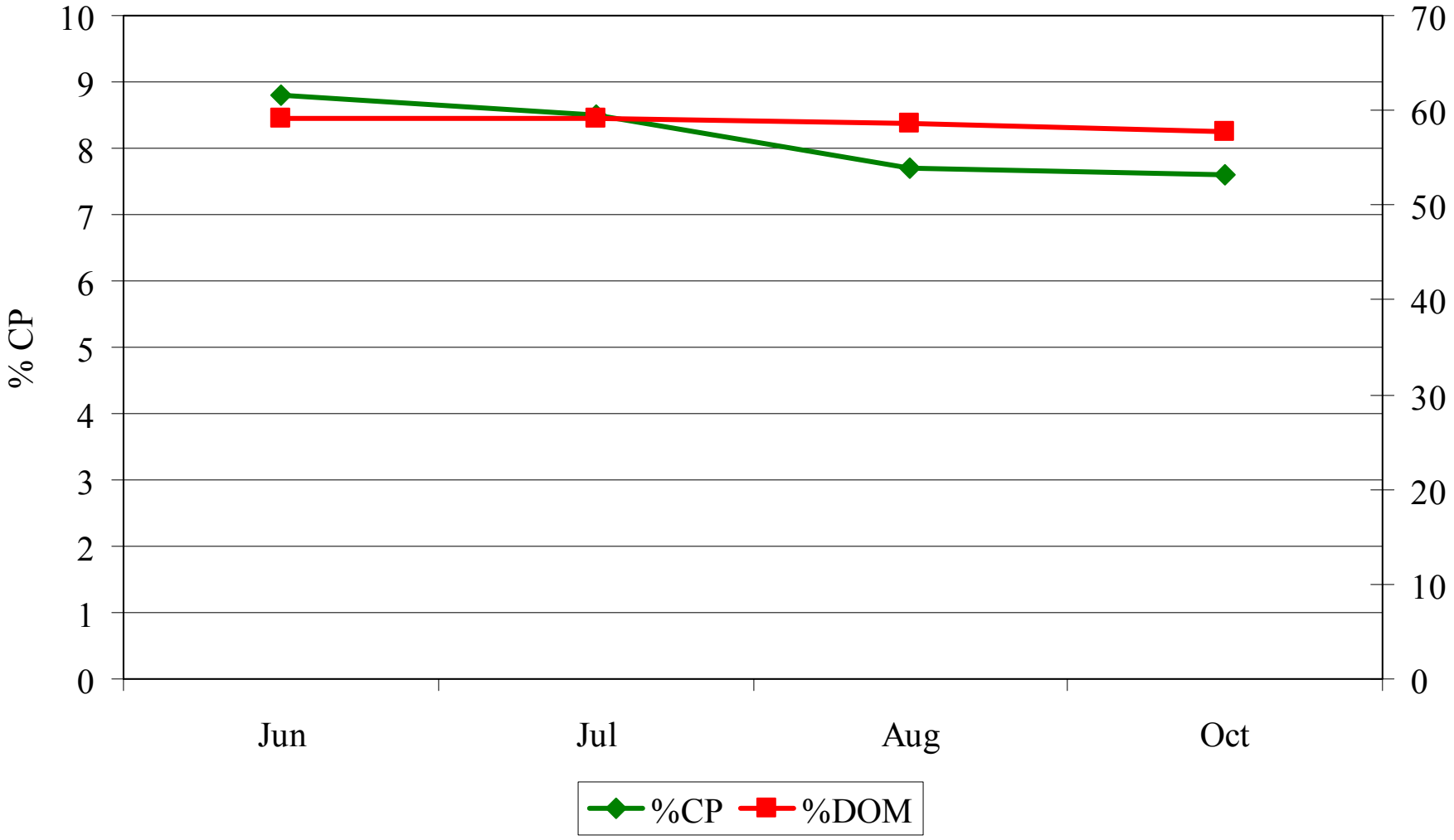


April 1997 - December 1998

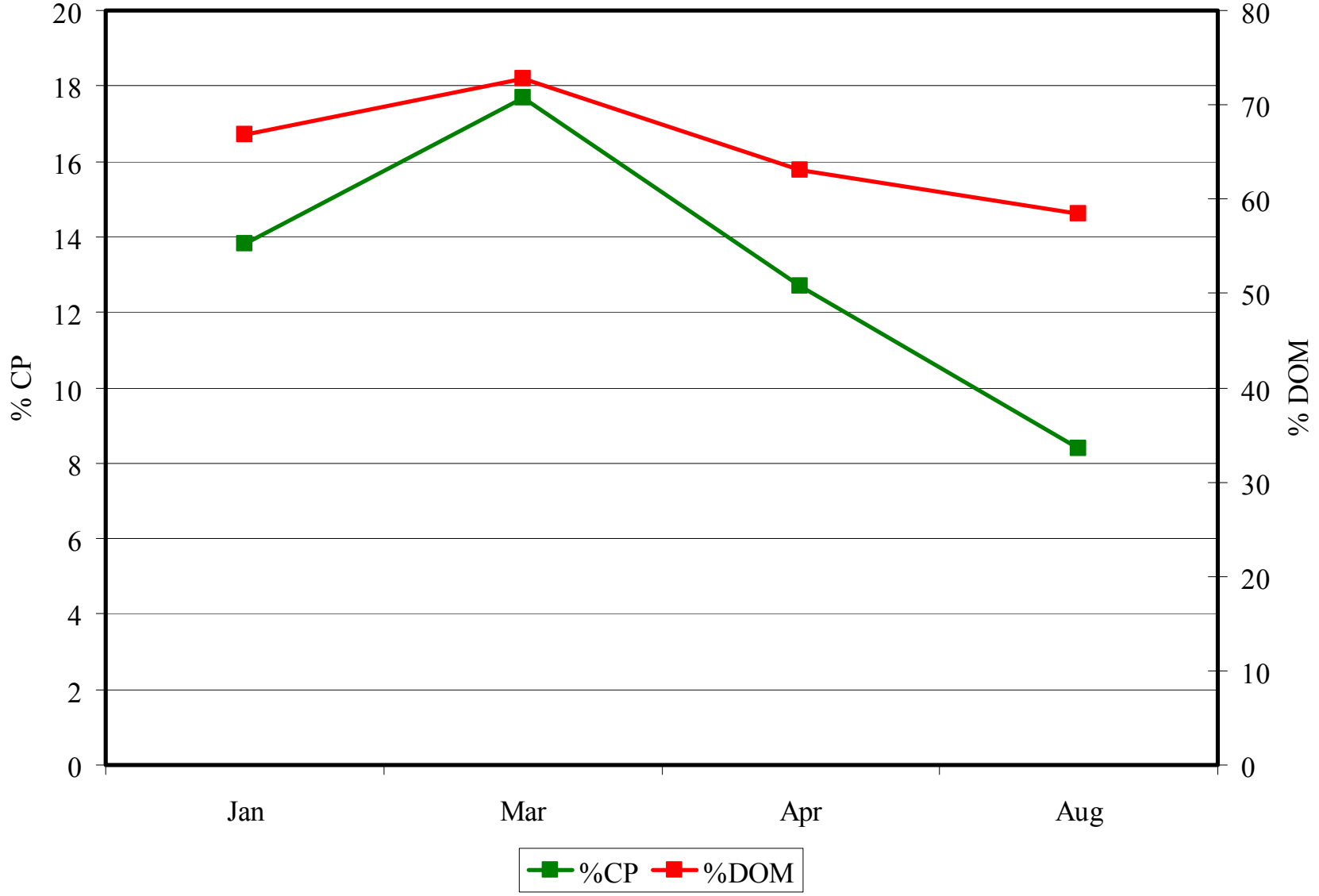
GAN Results - Coast Range



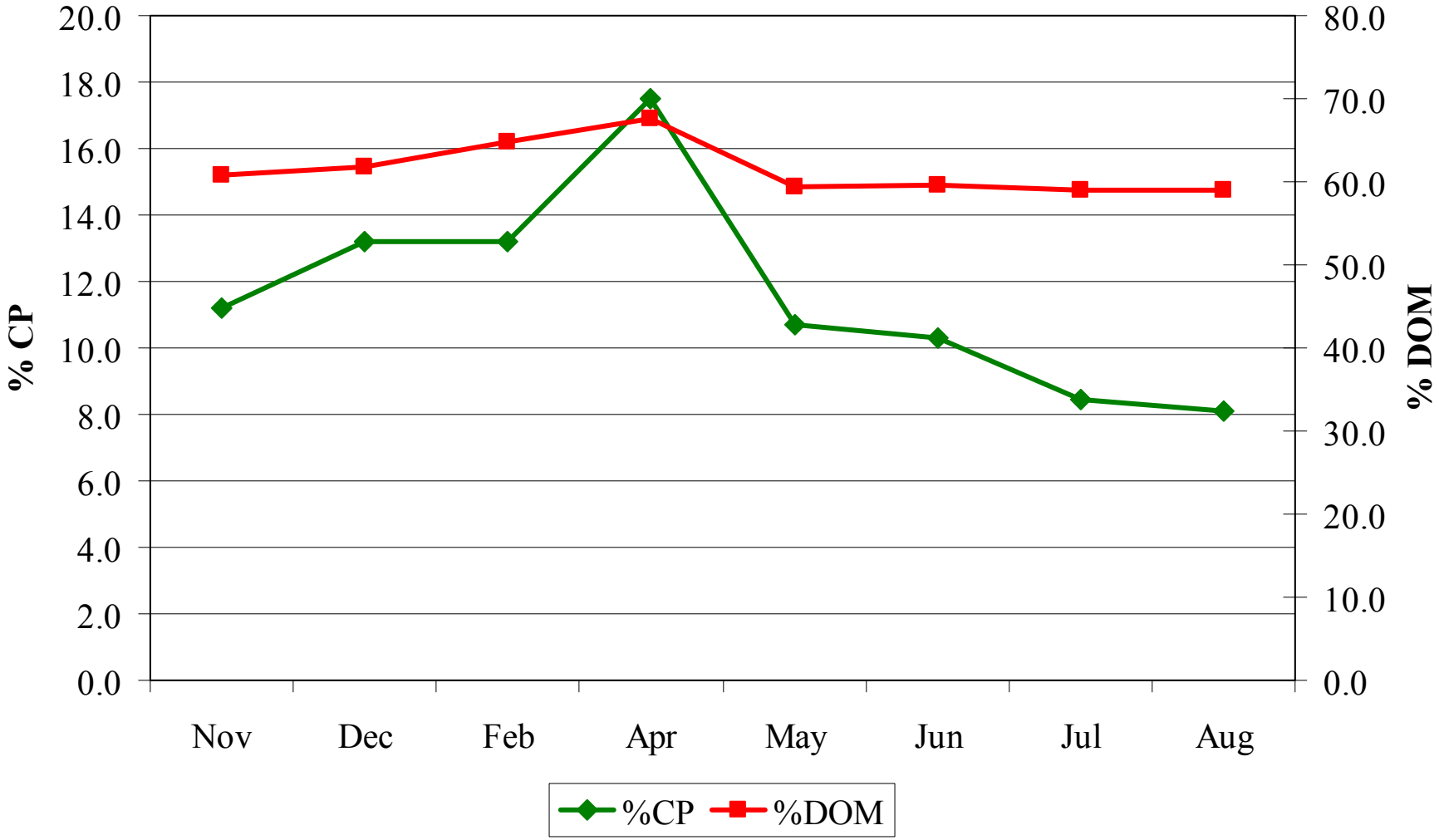
GAN Results - Petaluma



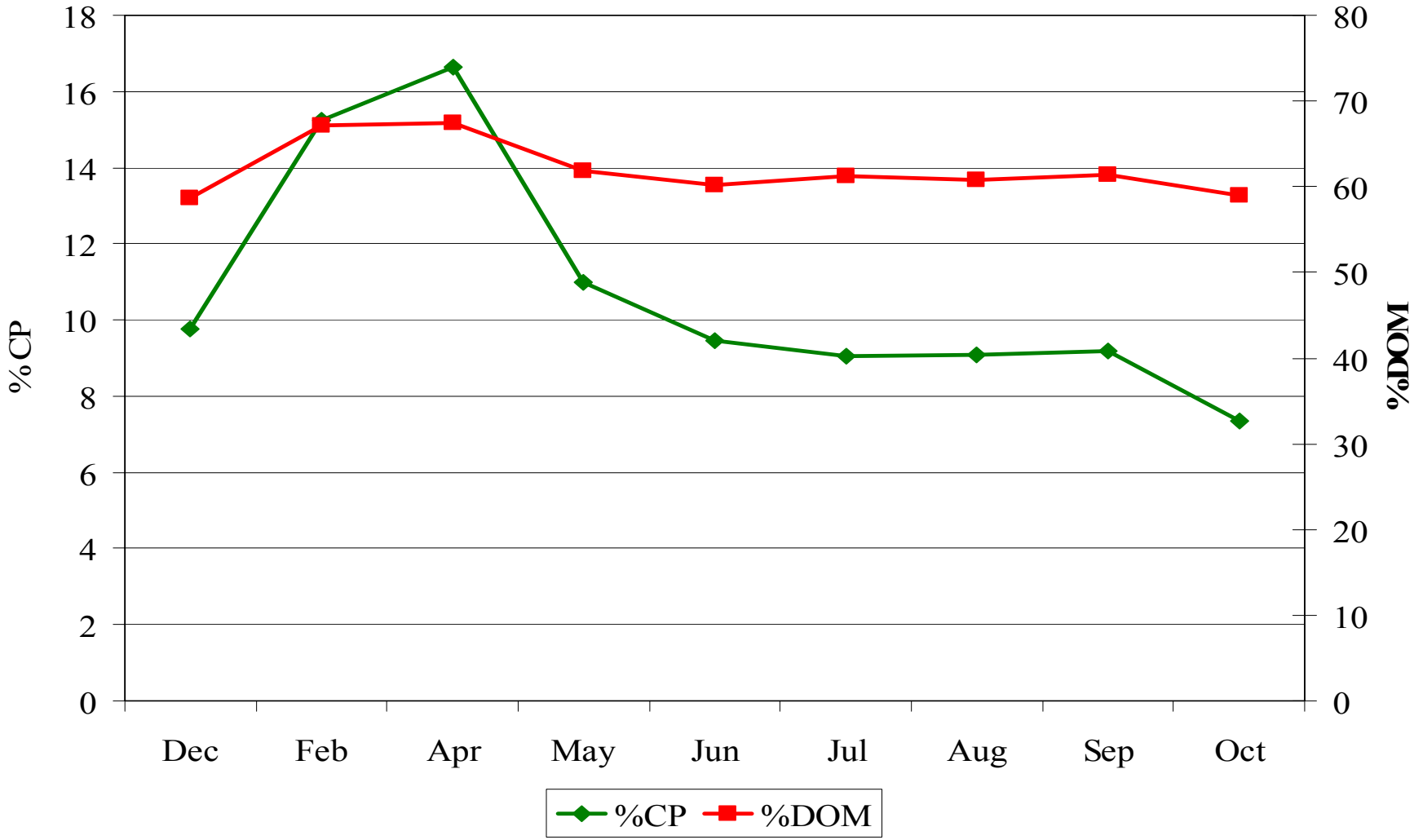
GAN Results - SFREC



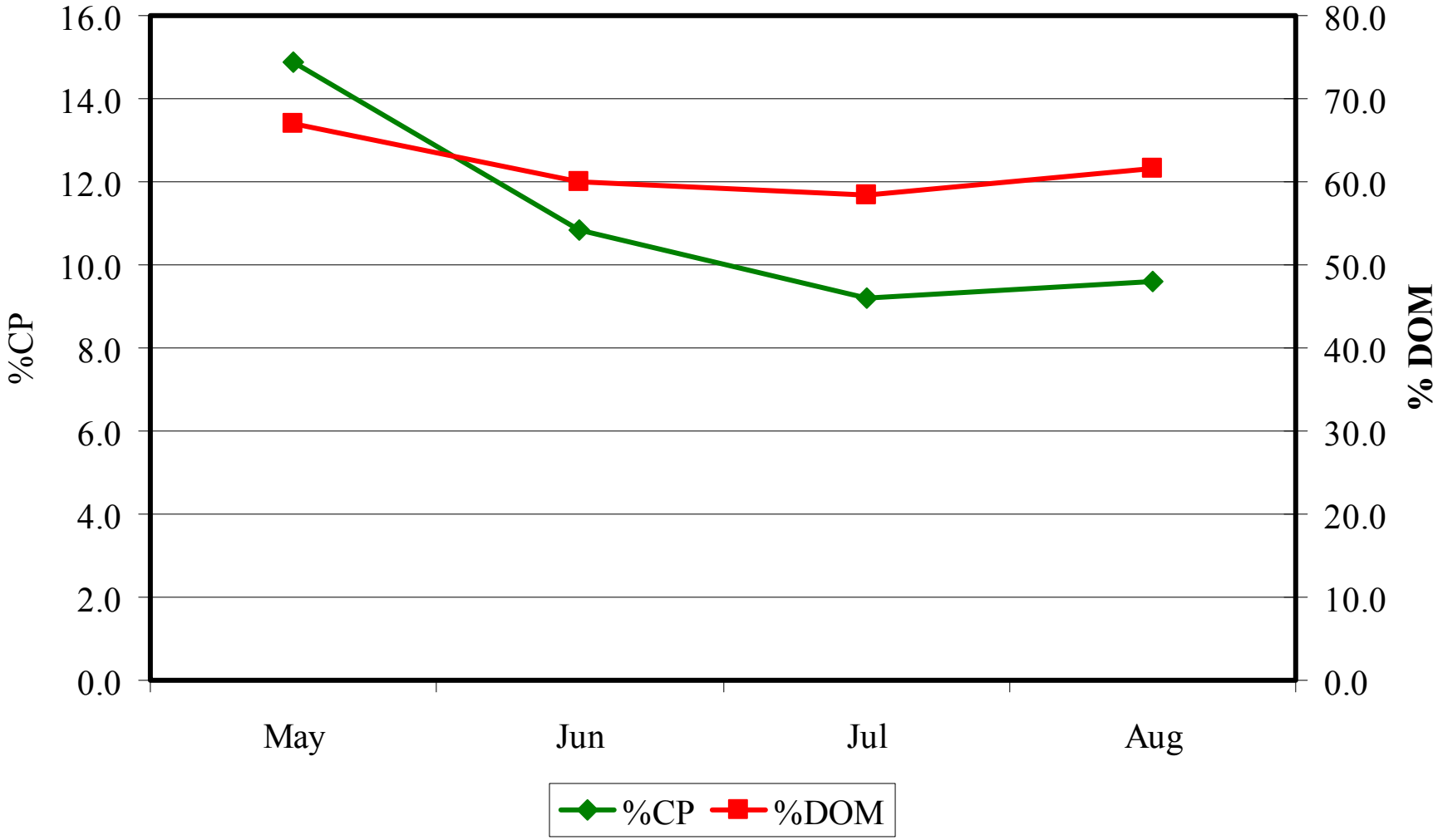
GAN Results - Madera Annual Range



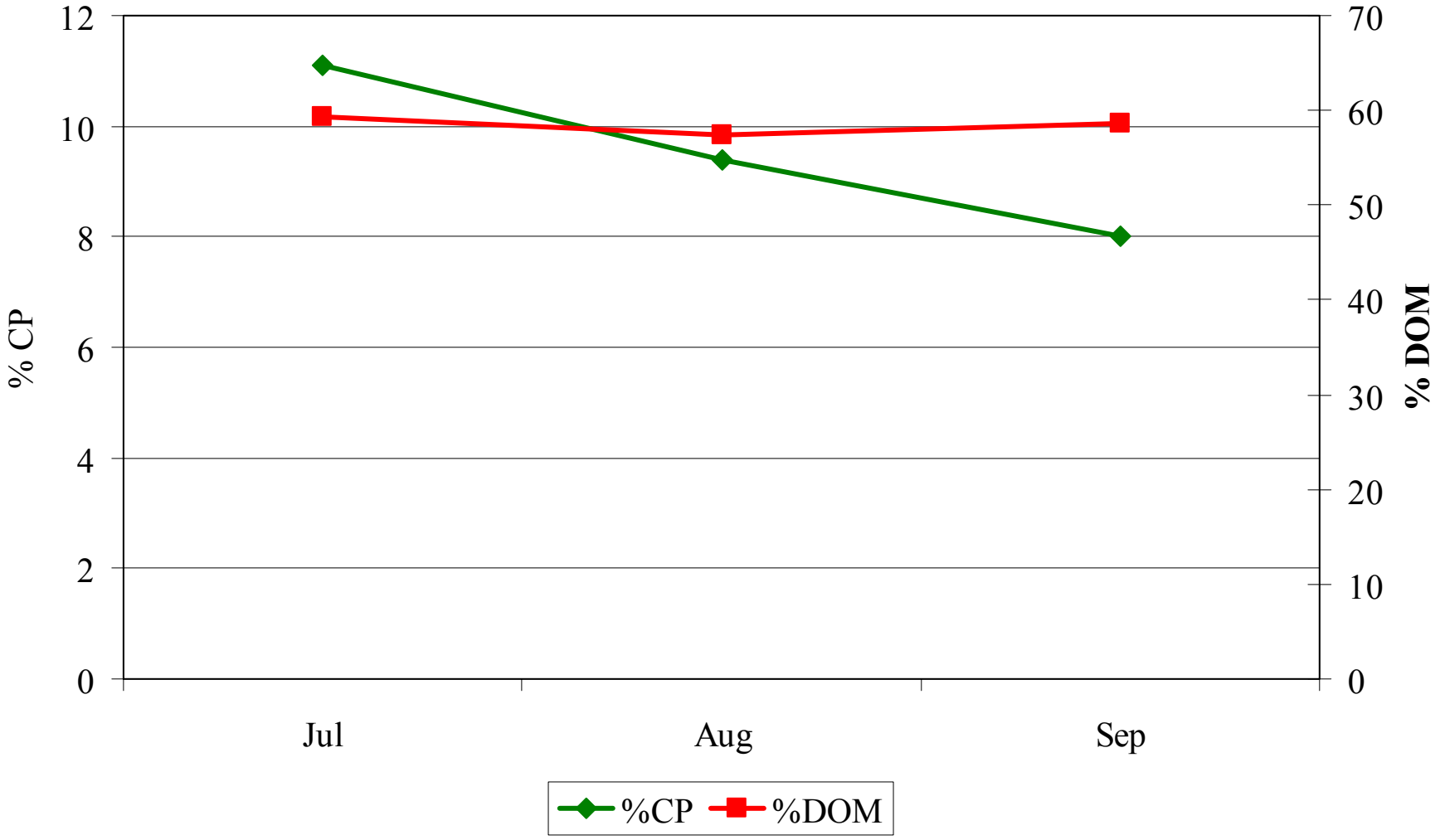
GAN Results - Lancaster Annual Range



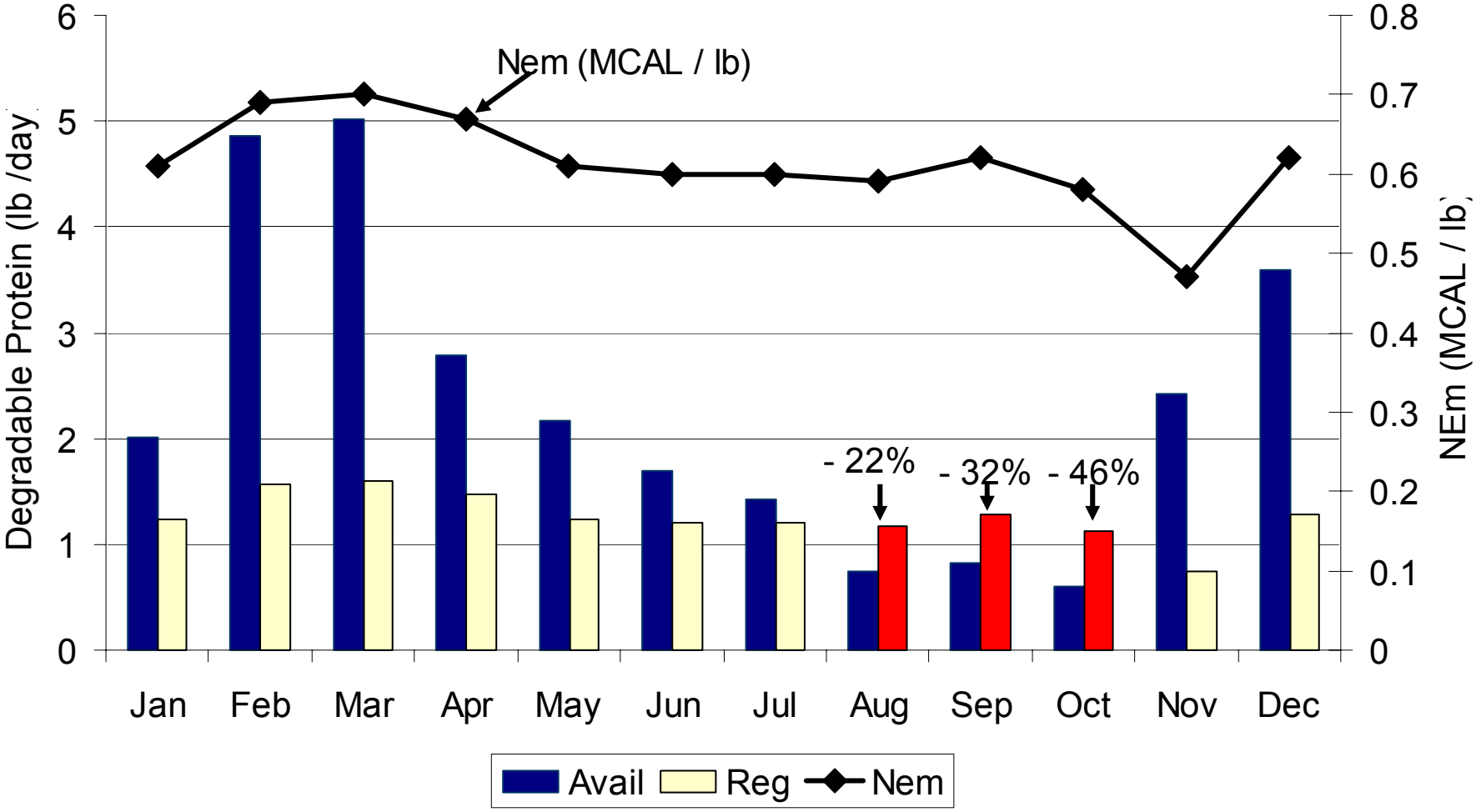
GAN Results - Susanville Annual Range



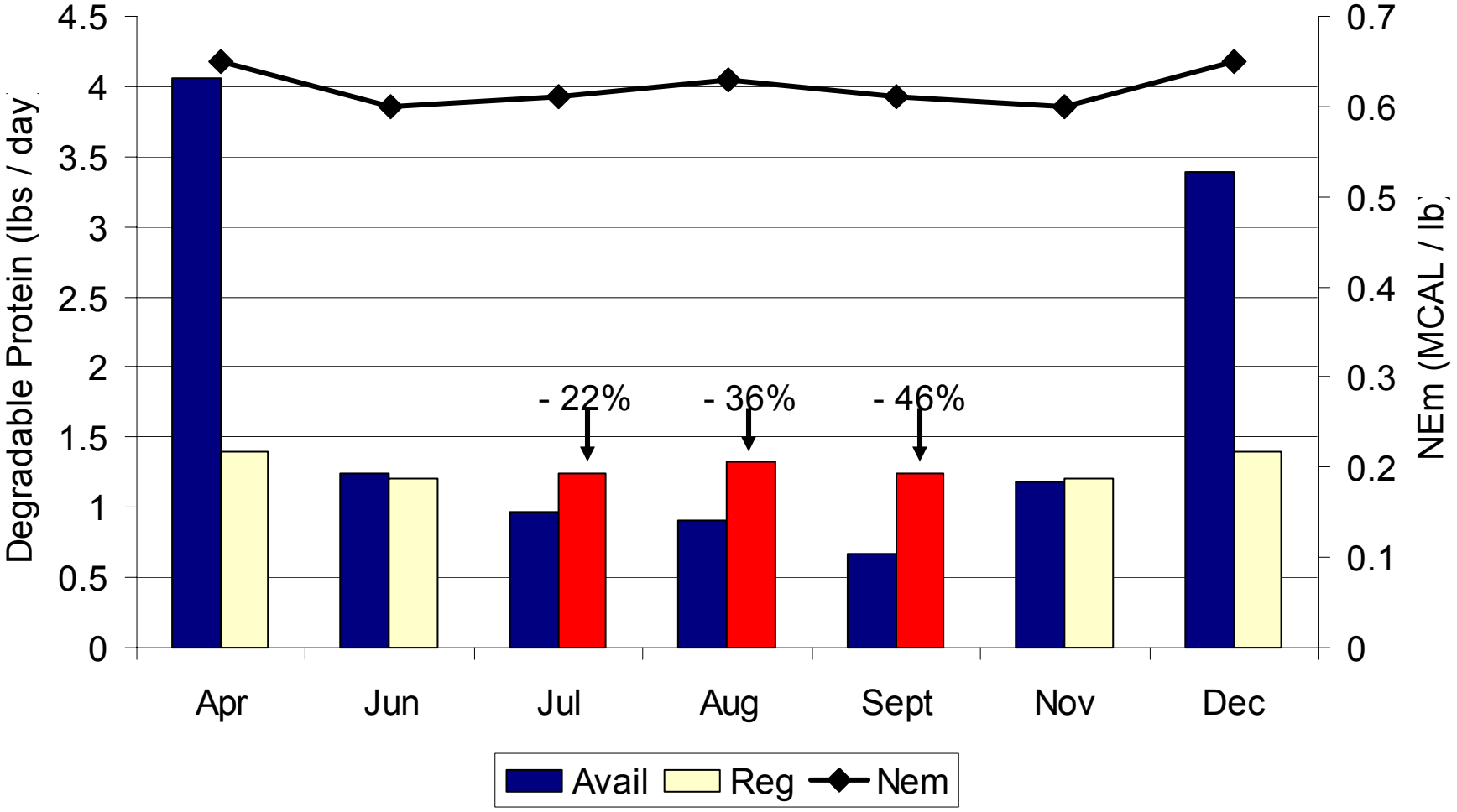
GAN Results - Susanville Meadow

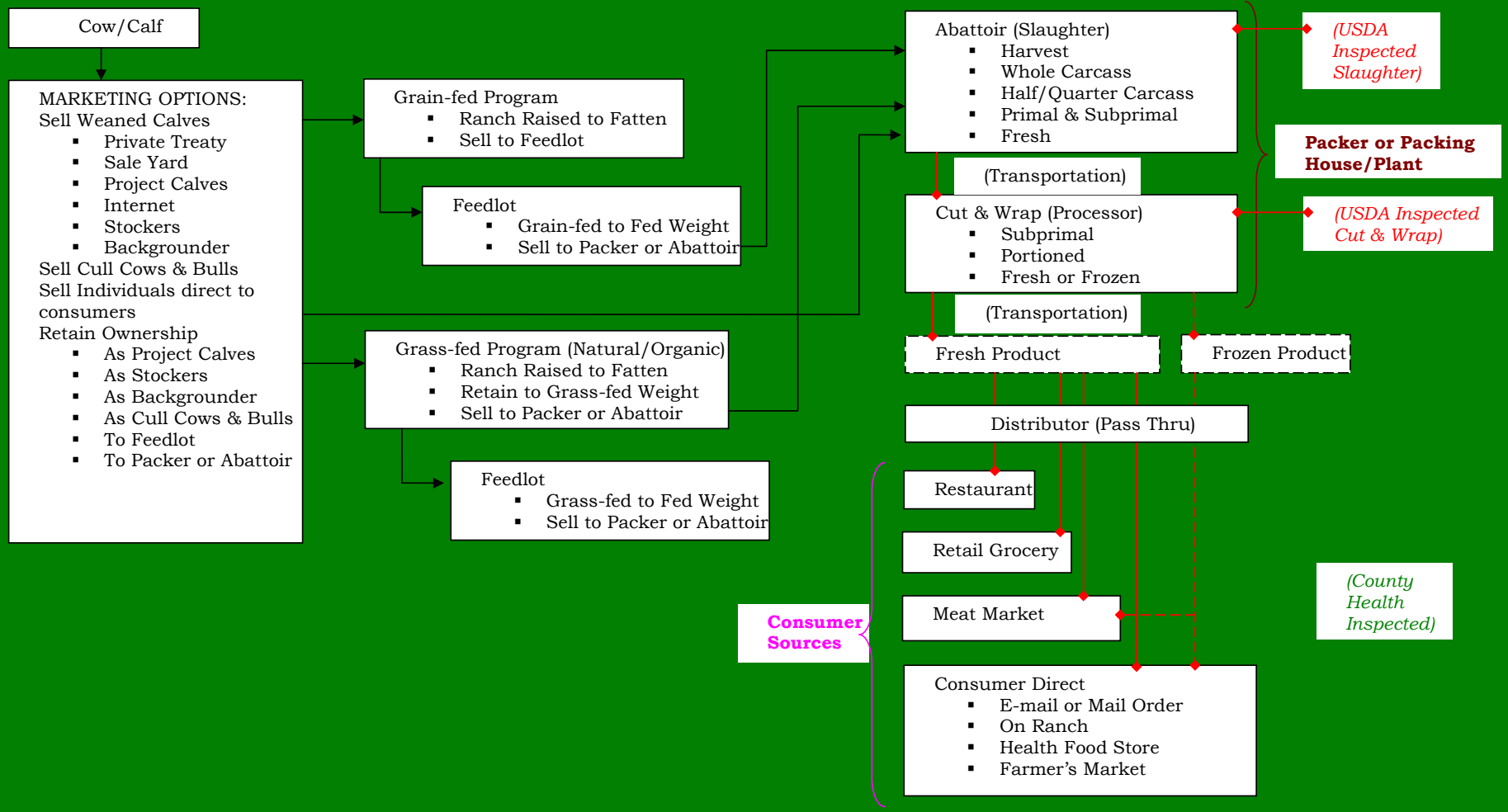


Relationship of NEm To Required and Available Degradable Protein - Campbell Area



Relationship of NEm to Required and Available Degradable Protein - Tehama County




Cow/Calf
MARKETING OPTIONS:
Sell Weaned Calves
Private Treaty
Sale Yard
Project Calves
Internet
Stockers
Backgrounder
Sell Cull Cows & Bulls
Sell Individuals direct to consumers
Retain Ownership
As Project Calves
As Stockers
As Backgrounder
As Cull Cows & Bulls
To Feedlot
To Packer or Abattoir
Grain-fed Program
Ranch Raised to Fatten
Sell to Feedlot
Feedlot
Grain-fed to Fed Weight
Sell to Packer or Abattoir
Grass-fed Program (Natural/Organic)
Ranch Raised to Fatten
Retain to Grass-fed Weight
Sell to Packer or Abattoir
Feedlot
Grass-fed to Fed Weight
Sell to Packer or Abattoir
Abattoir (Slaughter)
Harvest
Whole Carcass
Half/Quarter Carcass
Primal & Subprimal
Fresh
(USDA Inspected Slaughter)
Packer or Packing House/Plant
(Transportation)
Cut & Wrap (Processor)
Subprimal
Portioned
Fresh or Frozen
(USDA Inspected Cut & Wrap)
(Transportation)
Fresh Product
Frozen Product
Distributor (Pass Thru)
Restaurant
Retail Grocery
Meat Market
(County Health Inspected)
Consumer Sources
Consumer Direct
E-mail or Mail Order
On Ranch
Health Food Store
Farmer's Market

Height of Manure Piles

August 2002
GAN Crude Protein % = 8.5%

Height of Manure Piles

January 2003
GAN Crude Protein % = 15.1%

Height of Manure Piles

March 2003

GAN Crude Protein % = 17.4%