BRITISH COLUMBIA | Ministry of Agriculture

Nutrient Management in Forages

BC Forage Council seminar

Outline

- Introduction to nutrient management
- Soil testing
- Determining nutrient requirements
- Cattle manure as a fertilizer
- Nutrient management tools

What is nutrient management?

- To optimise forage yield and quality, we are considering the 4 R's:

1. Right source
2. Right time
3. Right place
4. Right rate

What is nutrient management?

- To optimise forage yield and quality, we are considering the 4 R's:

1. Right source
2. Right time
3. Right place
4. Right rate

Try to balance rate requirements with available nutrients, particularly manure

Soil testing

- First step in any nutrient management decision process
- Should be done on hayfields as well as poorly producing pastures
  - ~ 3 years
- Focus on areas that are more intensively managed

Soil testing

Soil testing

- Recommend sampling in fall
  - Soil not yet frozen
  - Want to apply any nutrients as soon as possible next year
  - Don’t have to worry about time lost waiting for results
  - Spring flooding - sample before application

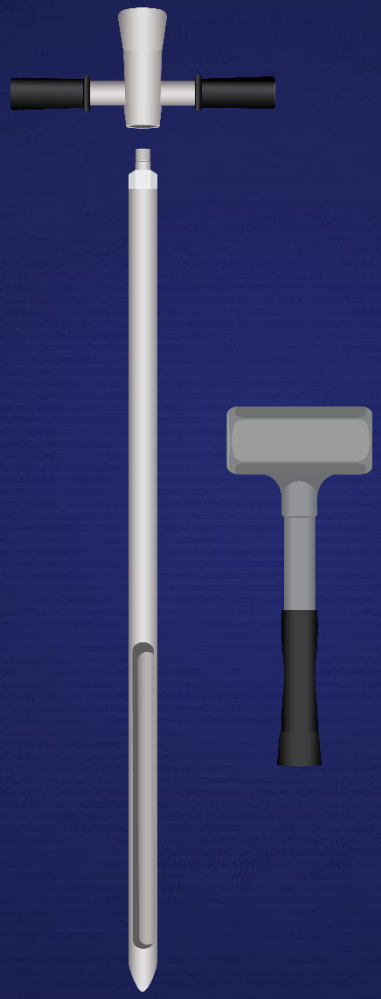
Soil testing

- Fall sampling
  - P and K values lower in fall samples than in spring samples
  - Post-harvest nitrate
- Spring sampling
  - Test results closer to what will be available to plant

Soil testing

- Important to sample at the same time every year
  - Results are more directly comparable
  - Field conditions, availability dictate when you can sample

Soil testing



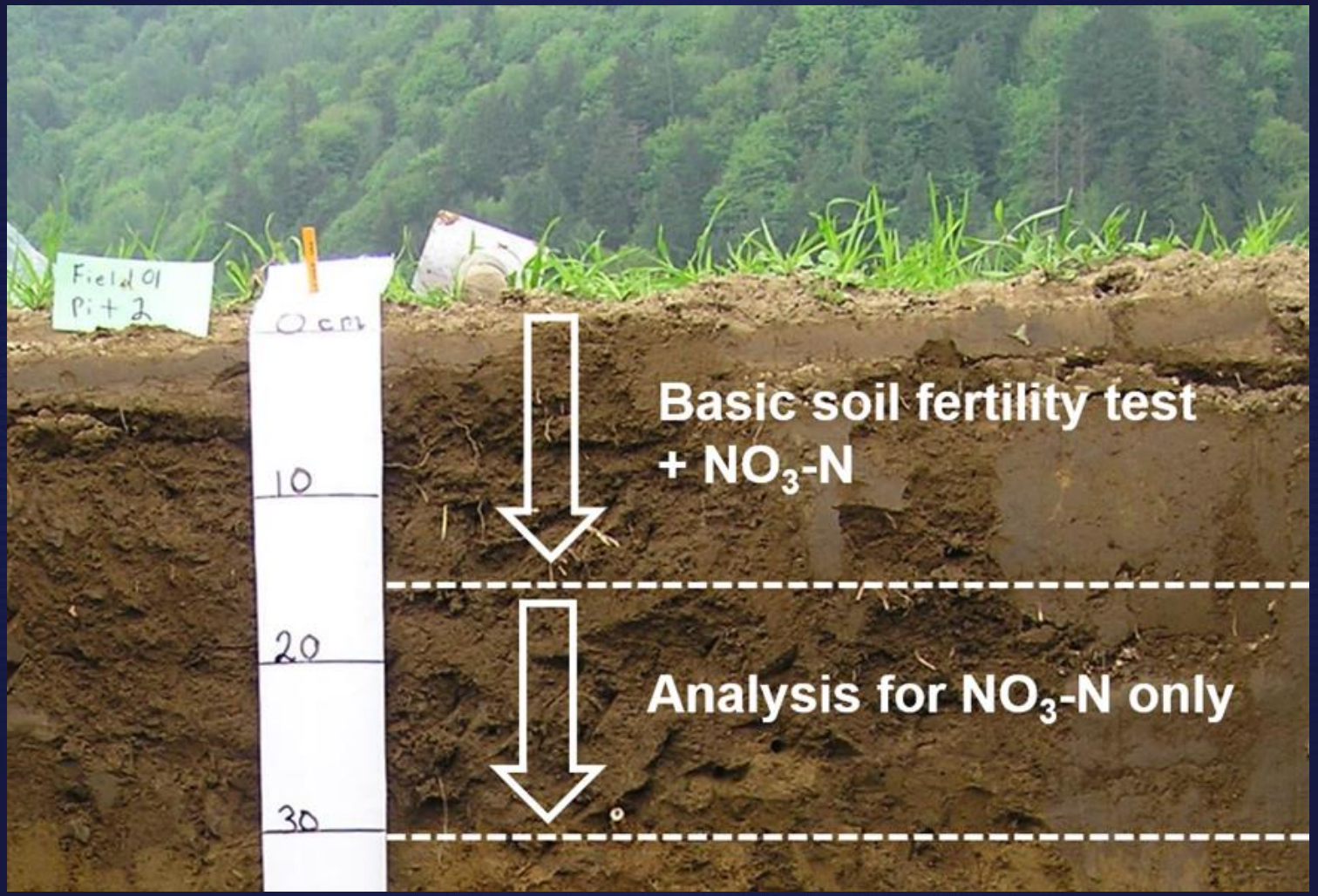
Soil testing

Random composite sampling

Soil testing

- What is a field?
  - Not always the borders of an area
    - Can be non-contiguous
  - You can group similar areas together
    - Same forage or crop
    - Same nutrient applications
    - Same soils

Soil testing



Soil testing

Report Date:2019-04-05 Print Date:2019-04-06

SOIL TEST REPORT

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Sample Number	Legal Land Descpt:	Depth	Lab Number	Organic Matter	Phosph Bicarb	P ppm Bray-P1	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	pH	Buffer	CEC meq/100g	Percent Base Saturations % K	% Mg	% Ca	% H	% Na
WEST 15		6	79526	9.2	108 H	144 H	115 M	305 H	1970 M	6.4	6.9	15.0	8.6	17.0	65.9	7.8	0.7
FRON 15		6	79527	6.6	38 L	52 M	85 L	260 H	1530 M	6.2	6.7	12.3	9.8	7.6	62.1	8.9	0.7
BF-1 15		6	79528	5.8	44 L	60 M	104 M	260 H	1530 M	6.6	7.1	11.3	9.9	14.4	61.5	6.6	0.7

Sample Number	Sulfur ppm S	lbs/ac	Nitrate Nitrogen ppm NO3-N	lbs/ac	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts ms/cm	Saturation %P	Aluminum Al ppm	Saturation %Al *	K/Mg Ratio	ENR	Chloride Cl ppm	Sodium Na ppm	Molybdenum Mo ppm
WEST 15	35 M	63	4 L	8	10.9 VH	45 H	101 VH	1.6 H	0.6 M	0.4 L	61 H	416	0.1 G	0.51	105	28 M	25 M	
FRON 15	44 M	81	6 L	12	11.4 VH	55 H	93 H	2.1 H	0.5 M	0.3 L	49 H	404	0.2 G	0.49	114	23 M	19 M	
BF-1 15	26 L	49	1 L	2	9.7 H	48 H	112 VH	1.4 H	0.4 M	0.5 L	55 H	395	0.2 G	0.66	118	20 M	16 M	

OF VL = VERY LOW L = LOW M = MEDIUM H = HIGH VH = VERY HIGH * G = GOOD M = MARGINAL MT = MODERATE PHYTO-TOXIC T = PHYTO-TOXIC ST = SEVERE PHYTO-TOXIC

Soil testing

What the lab might report

What this means in kg N/ha

Interpreting results

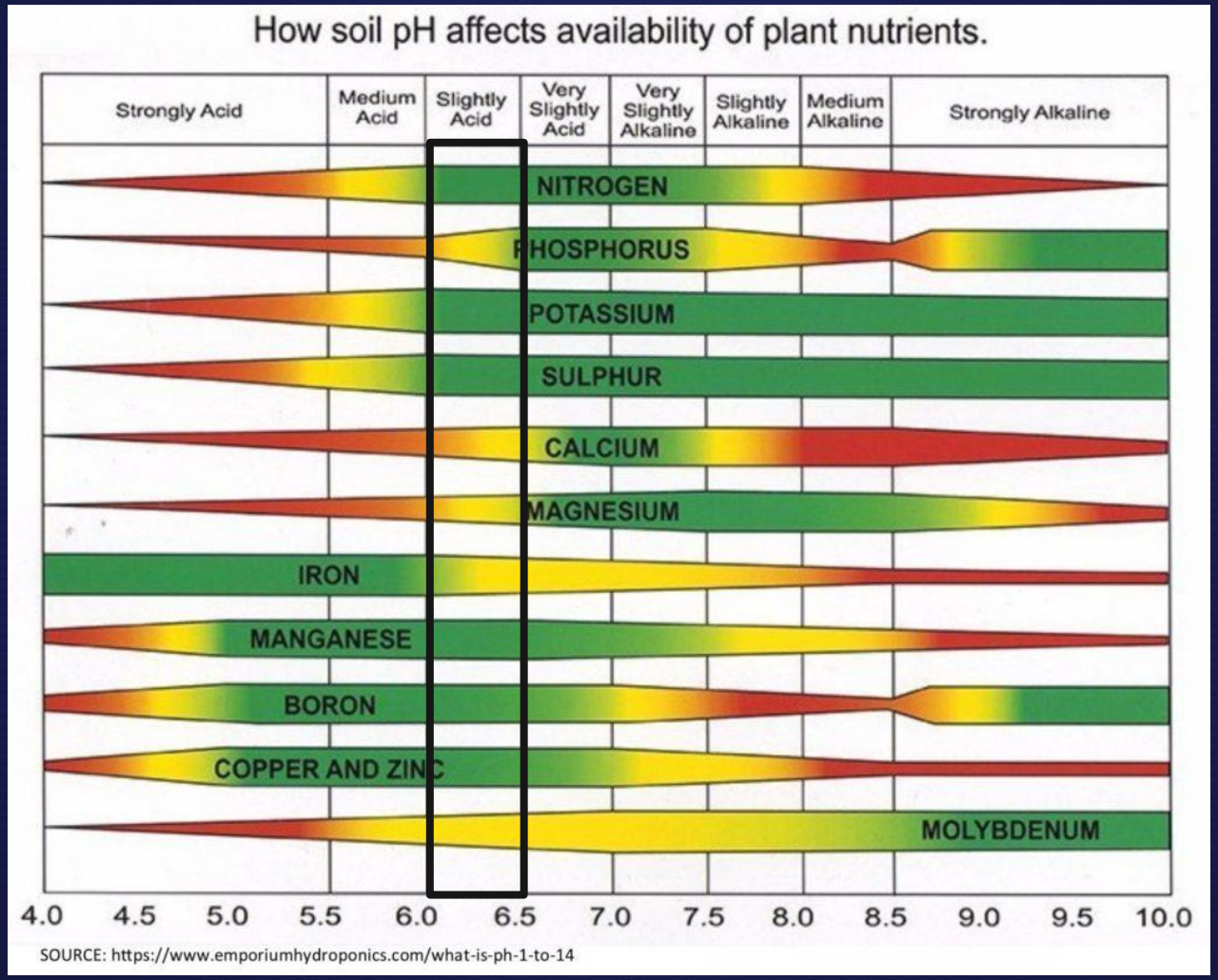
- Results from different labs are not comparable
  - They use different chemicals to determine available P and K
  - Same soil sample has different values from different labs
- Ask about the extractant the lab uses

Determining nutrient requirements

- Keep soil pH above acid tolerance limits

pH 5.0	pH 5.5	pH 6.0
Canola	Barley	Alfalfa
Oats	Bromegrass	Sweet clover
Alsike clover	Russian Wild Ryegrass	
Red clover	Tall fescue	
Timothy grass		

Determining nutrient requirements



Determining nutrient requirements

- What affects pH?
  - pH lowers if there are large amounts of urea or ammonium applied
    - Nitrification
  - Rainfall pH ~5.5
- Use NO_3-N fertilizers to prevent acidification

Determining nutrient requirements

- Can generalize needs based on crop
  - Silage corn > grass > grass/legume
- P and K rate recommendations based on soil test levels
- N is annual recommendation
  - More mobile than P and K

Determining nutrient requirements

P recommendations for non-legume, non-irrigated forages (using Kelowna extractant)

ppm P	lb P_2O_5/ac
0 - 4	125
5 - 9	107
10 - 14	89
15 - 19	71
20 - 29	54
30 - 39	27
40 - 100	18
> 100	0

ppm K	lb K_2O/ac
0 - 25	178
26 - 35	134
36 - 50	89
51 - 65	71
66 - 80	54
81 - 125	36
126 - 175	18
> 175	0

Moderate amounts of supplemental N can dramatically increase yield

	Yield (tons/ac)		
lb N/ac	Sandy loam	Silt	Clay
0	2.9	2.8	2.1
30	3.5	3.3	2.5
60	3.6	3.1	2.9
90	3.8	3.4	2.8
120	4.0	3.4	2.7
150	4.0	3.6	2.7

Clover/grass trials 1980-1982; courtesy Jim Tingle

Determining nutrient requirements

	Yield (tons/ac)
lb N/ac	Sandy loam
0	2.9
30	3.5
60	3.6
90	3.8
120	4.0
150	4.0

- More is not always better
  - Negligible yield increase
  - Extra cost of application > value of yield increase

Determining nutrient requirements

	Yield (tons/ac)			
lb N/ac	Bitner Kleena Kleene	Deer Park	Australian Ranch	Fridlington Ranch, Kersley
0	2.9	3.7	4.8	3.5
30	3.4	3.8	5.1	3.7
60	3.6	3.7	5.2	3.8
90	3.9	3.7	5.3	3.8

Irrigated alfalfa trials 1980-1982; courtesy Jim Tingle

Determining nutrient requirements

- Play with the rate to see what works best
- Non-irrigated
  - 30 - 60 lbs N/ac
- Irrigated
  - 60 - 100 lbs N/ac
- Alfalfa
  - > 30 lbs N/ac reduces nodulation

Determining nutrient requirements

Kg/ha			Yield	% ground cover			
N	P	S	t/ha	Coarse grasses	Fine grasses	Legume	Forbs
0	0	0	1.6	35	36	7	22
45	0	0	2.4	41	42	3	13
45	20	0	3.1	52	34	1.5	13
90	0	0	2.3	33	55	0.7	11
90	20	0	4.0	56	32	0.6	11
90	20	20	4.0	67	21	0.6	12

Manure

Manure as a fertilizer

- Benefits of manure
  - Material is less expensive than fertilizer (per unit of N-P-K)
  - Complete fertilizer
  - Readily available for some producers
  - Builds soil organic matter

Manure as a fertilizer

- Storage length and method can change nutrient concentrations
- Prioritize placement for fields that need nutrients

Manure as a fertilizer

- 'Book values' for manure nutrient concentrations
- Hard to know true nutrient value of manure
- Recommend manure testing to know true nutrient concentration of manure

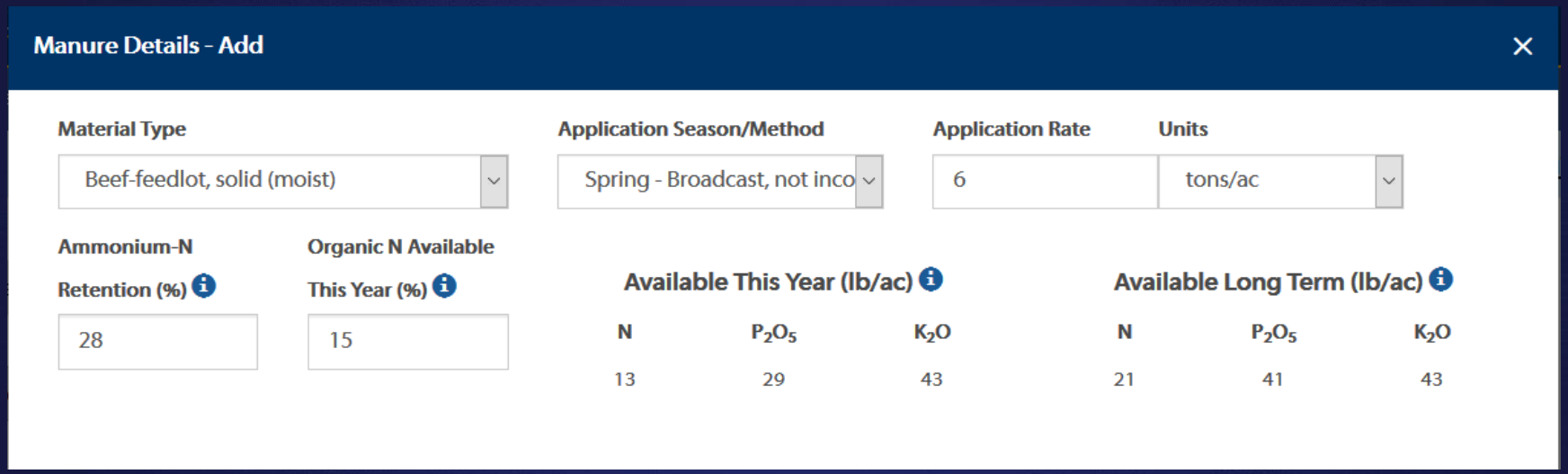
Manure as a fertilizer

- Take 5 - 10 samples from different areas in the pile
- Dig into pile to avoid very dry or wet areas
- Mix in a bucket and send to lab

Manure as a fertilizer

- Nutrient availability
  - Small amount of N
    - < 35% annually for solid beef manure
  - A little over half of P
  - Almost all K

Nutrient management calculator



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Manure as a fertilizer

- Drawbacks
  - Hard to meet N requirements
    - Great if P and K are deficient
  - Can cause P loading in some areas
  - Nutrients not immediately available

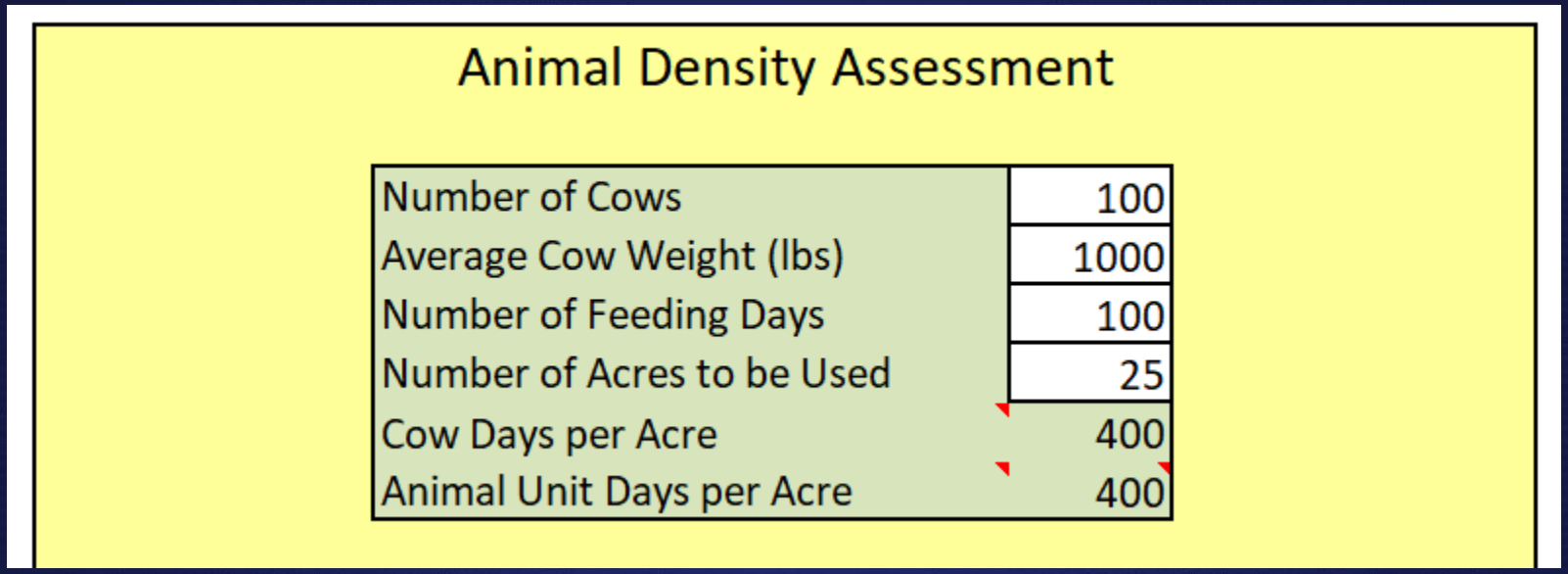
Manure as a fertilizer

- Cattle as mobile fertilizers
  - Use animal placement in winter feeding areas to deposit nutrients
  - Removes need for application equipment
  - Requires more active management than open grazing

Manure as a fertilizer

- Amount of nutrients placed by animals depends on
  - Type of hay or feed
  - Amount of feed
  - Size of feeding area
  - Animal numbers

Cow to feed calculator



Animal Density Assessment

Number of Cows	100
Average Cow Weight (lbs)	1000
Number of Feeding Days	100
Number of Acres to be Used	25
Cow Days per Acre	400
Animal Unit Days per Acre	400

https://www1.agric.gov.ab.ca/$Department/softdown.nsf/main?openform&type=NLC&page=information

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QUESTIONS