

A rural landscape with a rainbow in the sky, a green field, and farm buildings in the distance. The rainbow is positioned on the left side of the frame, arching over the scene. The field is lush green, and there are several farm buildings, including a red barn and a white silo, visible in the background. A wooden fence is in the foreground.

# Environmentally Sustainable Livestock Development

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# Environmentally sustainable livestock production

Is:

- Economically feasible
- Socially acceptable
- Environmentally responsible

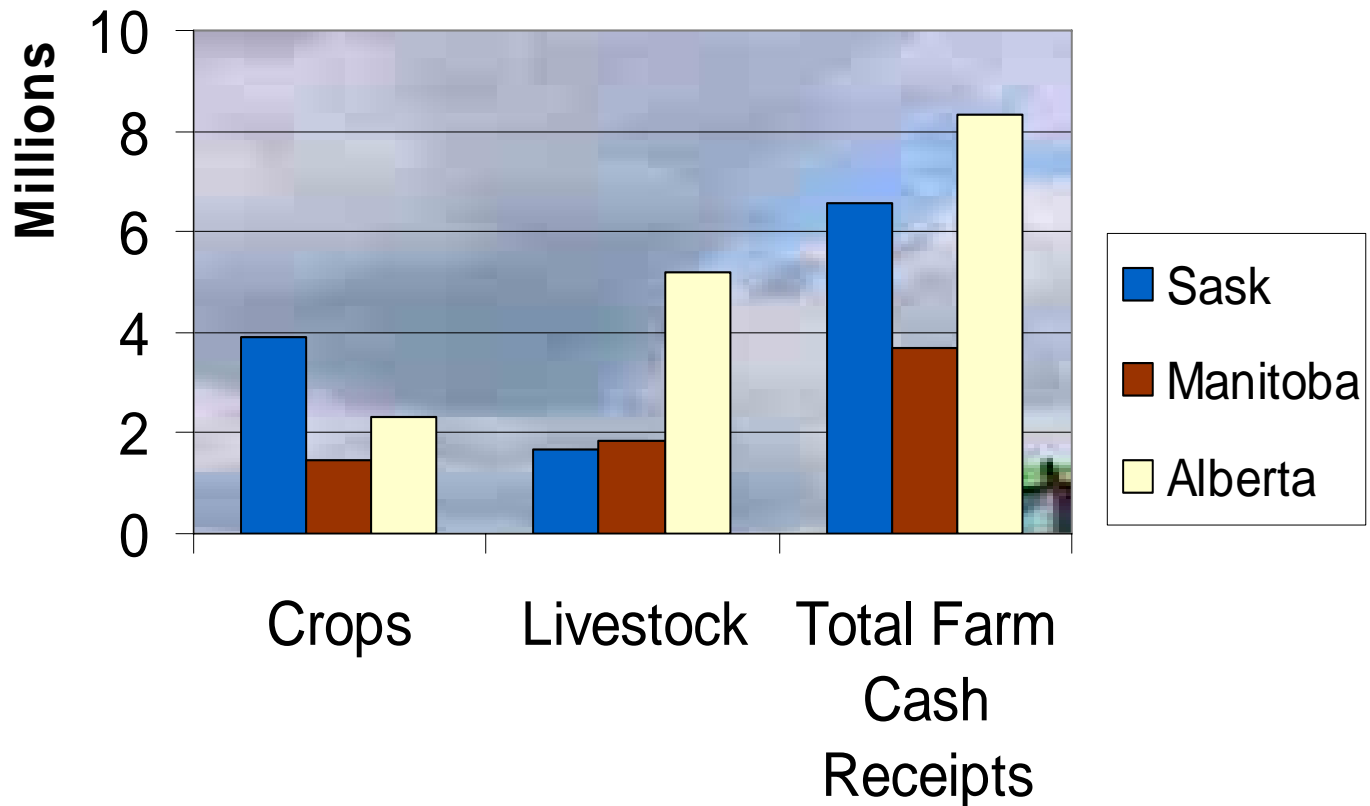
# Economics

## Saskatchewan Today

- Wide open spaces
- Low land prices
- Competitive cost of production
- Low farm and animal densities
  
- Environmental Regulations
- Production and Technology Expertise



# 2001 Farm Cash Receipts



# Provincial Targets - 2005



# What does this mean on the ground?

## 2025 For Beef:

- 2.625 Million slaughter cattle
- 71 feedlots
- 2 slaughter plants to kill 100% of cattle
- Facilities to process 50% of product from slaughter



# For Pork

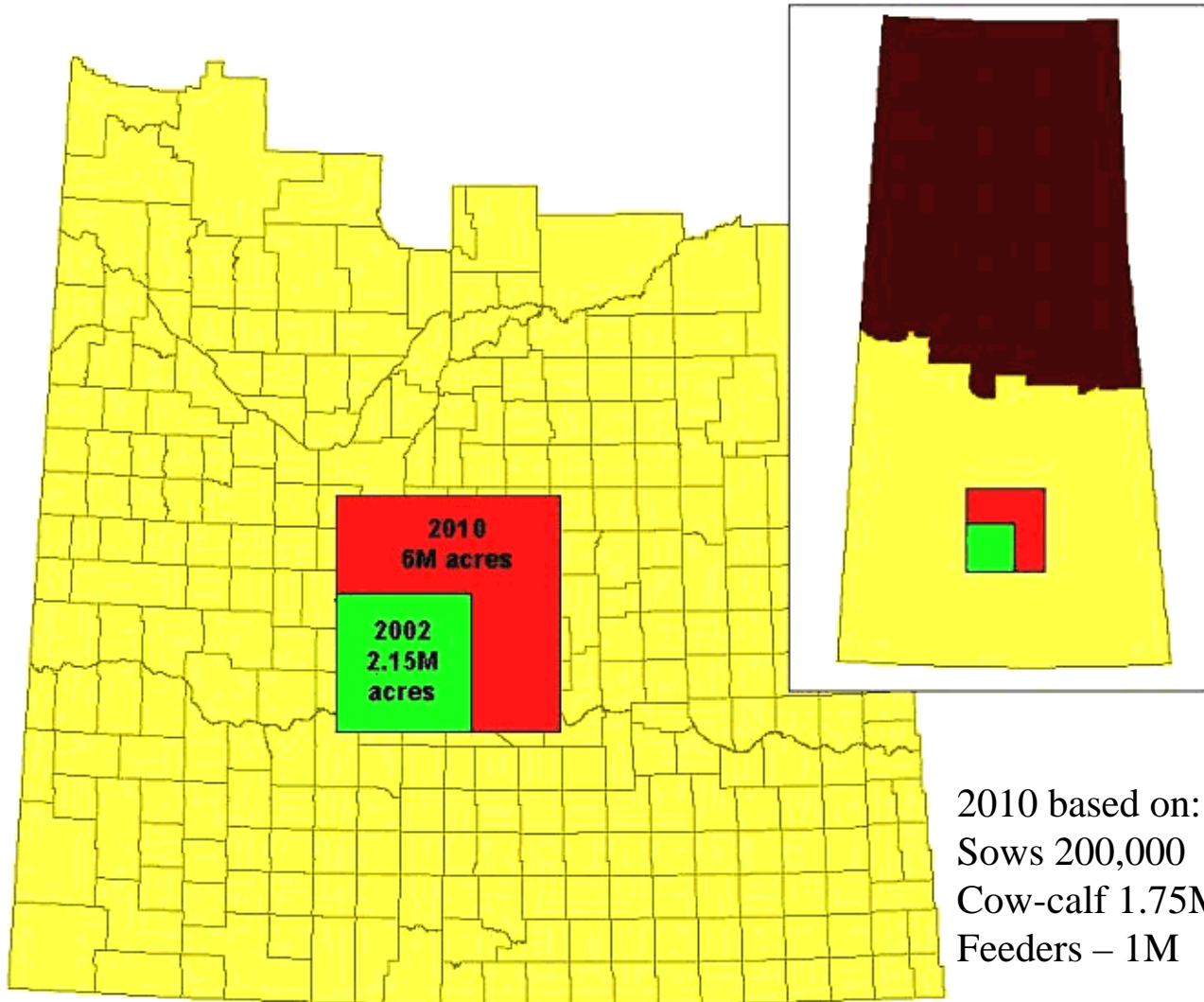


Moo-shoe pork

2025

- 20 million market hogs
- 5 slaughter plants to kills 100% of hogs
- facilities to process 50% of product from slaughter

# Current vs. Projected Land Requirements





# Manure – A fertilizer

Approx 52,200 tons of manure is produced by 5,000 feeder cattle.



# This represents

- 350,148 lbs of N @ \$.30/lb    \$105,444
- 377,410 lb P<sub>2</sub>O<sub>5</sub> @ \$.30/lb    \$113,223
- 457,170 lb K<sub>2</sub>O @ \$.10/lb    \$ 45,770
- **Total            \$264,437**

• In the brown soil zone, growing cereal silage and wheat, you could fertilize approx 2,600 acres @ 20 ton/ac (incorporated), applying once every 3 years.

## So...What's it all worth/acre

- N                            \$ 41.00
- P<sub>2</sub>O<sub>5</sub>                        \$ 43.00
- K<sub>2</sub>O                         \$ 18.00
- Total value/acre \$ 102.00



# Irrigation can be integrated into this production cycle

- To increase production of forage and feed crops
- Use liquid manures for fertigation



# Socially Acceptable?

***“Manure and urine pollute soil and water, fumes defile the air “***

Tom Spears, The Ottawa Citizen and The Gazette From Federal Report - March 2002

***“Huge pig farms are health menace”***

- ***Industrial hog Factories are a bigger risk to America than Asman Bin Laden***

Robert F. Kennedy Jr.

- Odour, air quality, water, human health -

# Livestock smell, like...livestock!

## Sources

- **Barns, Pen Areas,  
Manure Storages,  
Manure Spreading  
areas**

Odour is composed of over 160  
potential aromatic compounds

## Odour Factors

- Frequency
- Intensity
- Duration
- Offensiveness



# BMPS for Reducing Odour

➤ consider neighbours during agitation, cleaning and application



Shelterbelts



Storage Covers



Injection



Low  
Disturbance  
injection  
into forage





# Air Quality

- **Gaseous emissions**
  - Ammonia, Hydrogen Sulfide, Methane



# Managing Air Quality

Outdoor air quality is related to concentration and transport

- Natural Processes: Dilution
- Management Activities: Shelterbelts, storage covers, barn and lot management, application methods

# Air Quality/Odour Studies in Western Canada

VIDO – Airborne microbial DNA and endotoxins  
downwind of swine facility

U of S – Odour and GHG emissions from barn,  
storage and field spreading

PAMI – Nasal Rangers

Good Spirit Creek: Odour monitoring survey

U of A, Alberta Agriculture, Alberta Research  
Council: Siting tools (modelling), Odour  
monitoring procedures, Community Odour  
evaluations



# Environmentally responsible

## Historical testimonials

- Circa 45 A.D, Columella: The earth neither grows old or wears out if it is dunged
- 1940, Sir Albert “Mother earth never attempts to farm without livestock... “

# Soil Quality

- All nutrients applied, regardless of the type of fertilizer....end up somewhere
- Ideally manure nutrients should be applied to meet crop needs
- Manure Management should be planned to minimize nutrient losses from volatilization, leaching and run-off
- Sampling, planning and record keeping all contribute to good manure management

# BMP's to ensure Soil Quality

- Monitor salinity and sodicity values
- Match manure applications to crop requirements
- Test manure for nutrient conc (macro and micro)
- Reduce field traffic with use of drag hose injectors
- Reduce compaction by restricting field traffic, applying when weather is favorable, minimize axle weights
- Reduce the application footprint with the use of lower tire pressures, larger tires, radial tires, more tires, front wheel assisted or four wheel equipment or track vehicles

# Irrigating with Manure

## 5 year study U of S

2003 CPS Wheat At Riverhurst



# General observations for CPS sites

- pH decrease – due to lower buffering capacity of the soil (less clay) and greater leaching under irrigation
- EC increases insignificant, no salinization
- OC – not significantly affected (due to crop type, tillage, straw baling)
- Total N significantly increased in top 15cm (but only a small proportion in nitrate N – so organic N is increasing)
- Total P significantly increased (but P removal was high)
- Total K increased Yield responses were excellent
- Excellent increases in grain yield with lower annual rates – up to 3X yields
- High rates of manure annually – reduced yields



# 2004 Seed Potato sites at Riverhurst



# General Observations

- High annual application rates increased nitrate N in top 15cm.
- Soil available P increased in top 15cm
- Unmanured check - highest yields
- High rate of swine manure - lowest yield
- Despite lower tuber yield, manured plots had lower occurrences of rhizoctonia disease compared to check



# Surface Water

A group of approximately seven cows of various colors (black, brown, and white) are standing in a shallow, clear body of water. The background shows a grassy field and a line of trees under a bright sky. The water reflects the surrounding environment.

**Manure nutrients or bacteria can impact surface water through runoff, erosion or because of an accidental spill**

**Excessive nutrients in surface water can affect quality and may result in eutrophication**

# Groundwater

- Nitrates are the primary concern
- Manure nutrients and/or pathogens can enter groundwater through either a direct route (eg. runoff, access to unprotected wells), leaching or from recharge areas
- Prairies have a history of high nitrate groundwater - 1940's 20% of prairie wells surveyed had nitrates in excess of 10ppm

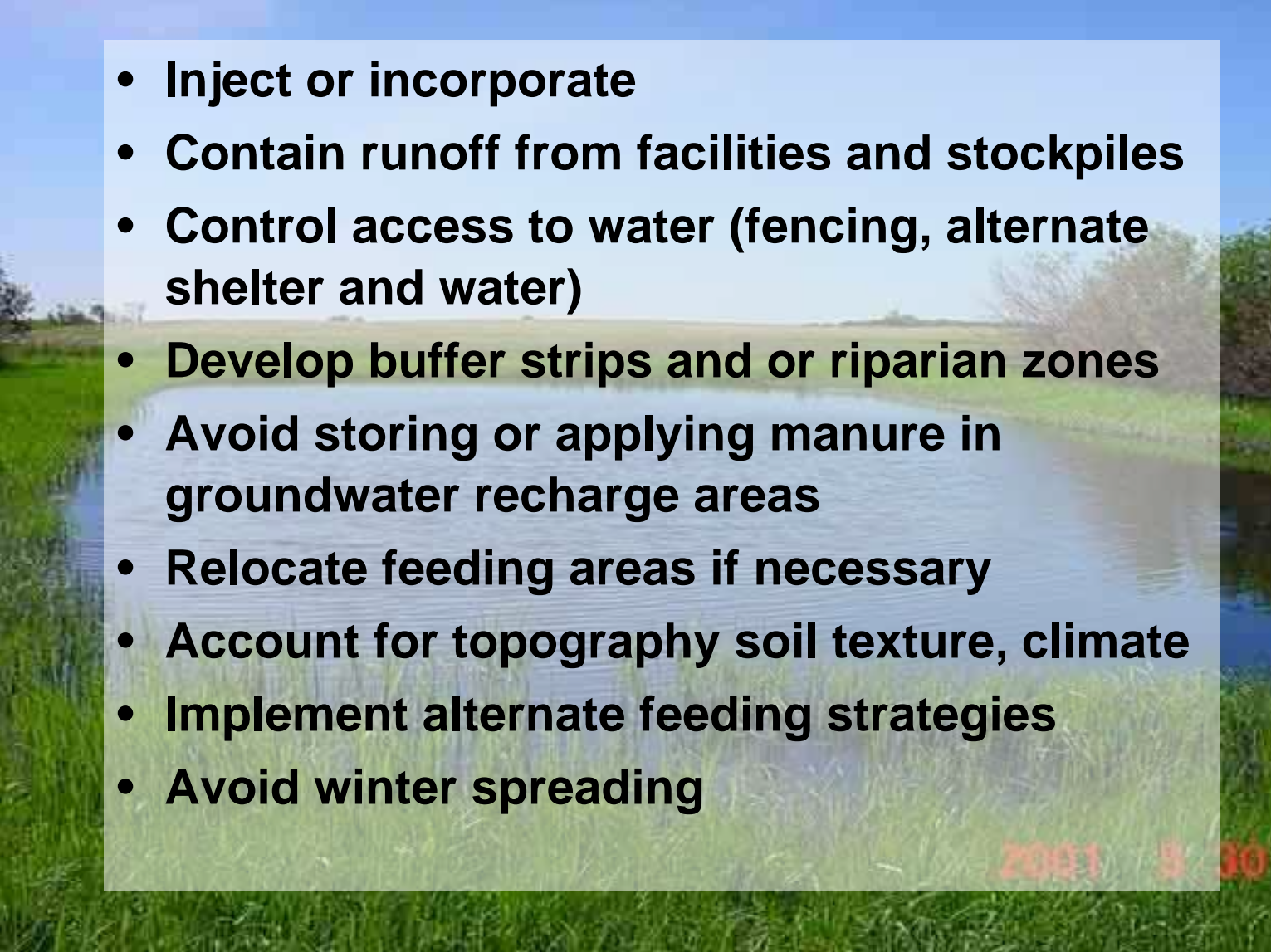
# Human Health



- Manure from warm-blooded animals, (including humans) contain micro-organisms including bacteria, viruses, parasites and fungi. Some are pathogenic - disease causing
- Fecal Coliform bacteria are an indicator of animal manure
- Of concern recently are *Giardia*, *Cryptosporidium*, *E-coli* H157

# BMP's for Minimizing the Risk of Nutrient and Pathogen Loss to Surface and Groundwater

- Site new facilities appropriately
- Develop a nutrient management plan
- Minimize nutrient losses during collection, handling and storage
- Test soils and manure for nutrient concentrations
- Balance manure nutrients with crop requirements
- Apply manure uniformly and at agronomic rates
- Optimize the N:P ratio of manure to more closely match the N:P requirements of the crop
- Manage with reduced or zero tillage
- Maintain adequate cover on the soil surface with crop residue or cover crops
- Establish deep rooted crops, like alfalfa to remove nitrate that is below the root zone

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- **Inject or incorporate**
  - **Contain runoff from facilities and stockpiles**
  - **Control access to water (fencing, alternate shelter and water)**
  - **Develop buffer strips and or riparian zones**
  - **Avoid storing or applying manure in groundwater recharge areas**
  - **Relocate feeding areas if necessary**
  - **Account for topography soil texture, climate**
  - **Implement alternate feeding strategies**
  - **Avoid winter spreading**

Treatment  
can be an  
option

CPIG Project - October 21, 2003.







**So...We understand the value, the issues and the loss mechanisms. What's changed???**

- Scale
- Documented environmental impacts
- Reactive regulatory approaches
- Awareness of Regional differences
- Growing public awareness
- Expectations for accountability

## Provincial Initiatives

- Focused and Informed Research
- Education and Extension
- Risk Based Approaches that incorporate Consistent Guidelines recognizing regional differences
- Watershed Planning

## Regionally Developed Guidelines

- Tri-Provincial  
Guidelines for:
- Manure Storage
  - Site Characterization
  - Manure Application and Use

# Watershed Planning

- **Focus: Understanding activities and potential sources of risk rather than detailed measurement and analysis of data**
- **Application of management practices that have proven to mitigate impacts from manure to soil, water and air irrespective of scale**



# Municipal Support

A tall, red brick tower stands against a cloudy sky. The tower has two levels of text: 'SILVERCROWN' on the upper level and 'PONTEIX' on the lower level. The tower is situated in an open field with some dry grass and rocks in the foreground. The sky is filled with soft, white clouds.

- Bylaws relating to livestock should be developed with social, environmental and economic objectives in mind before livestock developments are proposed
- RMs can address setbacks, odour and nuisance issues through bylaws and planning statements

**As scientists become more knowledgeable and more honest about what they don't know and what may be unknowable, citizens of our democracy, in relentless pursuit of a zero-risk society, increasingly demand that nothing bad ever happen to them, and if it does, someone else should pay for it."**

**Tom Hanks, U.S. Geological Society**