

Conversion to Continuous Cropping (or reducing incidence of fallowing in Cropping Systems in Alberta)

Alberta Offset System 5th Cycle Protocol Review
BlueSource / Alberta Agriculture

October 29-30th, 2009
Edmonton, Alberta



Features

- Historic Project-Specific Baseline (3 yrs prior to project) to demonstrate improved practice change
- Applies upstream fertilizer production emission coefficients
- Permanence addressed using incentive approach

Presentation Outline

- **Project Description**
- **Process Overview**
- **Applicability Criteria**
- **Project and Baseline Conditions**
- **Consistency With Alberta Offset System Criteria**
- **Flexibility Mechanisms**
- **Quantification Approach & Sample Calculation**
- **Questions**

GHG Reduction Activity

Objective is to increase the soil C sequestration sink by converting farm areas in fallow to annual crops (continuous cropping)

Fallow

- Land that is intentionally left idle or unseeded during a growing season, with all weed growth periodically terminated with tillage (summerfallow) or pesticides (chemfallow).
- Reduces amounts of soil C sequestered due to lower crop residue inputs and less oxidative environment

Continuous cropping

- Increases soil C sequestration, energy use and fertilizer use compared to the baseline condition

Process Overview

- Direction from AENV in early 2008
- Began August 2008
- Streamlined development of Technical Seed Doc
 - ClimateCHECK
- Science Coordination Workshop - Nov 15th 2008
 - Climate Change Central
 - 80% consensus on protocol elements by scientists representing AAFC, UofA, Industry
- Standardized into Template – March 2009
 - Bluesource
- First Round of Technical Review - April 1, 2009
 - Address upstream emissions, on-farm energy emissions and permanence

AB Offset System Eligibility Criteria

- 1) Demonstrable / Quantifiable
- 2) Real
- 3) Verifiable

1) Demonstrable / Quantifiable

Science to quantify GHG removals from summerfallow is well established

Campbell, C.A, H.H. Janzen, K. Paustian, E.G. Gregorich, L. Sherrod, B.C. Liang, and R.P. Zentner. 2005. Carbon storage in soils of the North American Great Plains: Effect of cropping frequency. *Agron. J.* 97: 349-363.

Environment Canada. 2008. National Inventory Report, Greenhouse Gas Sources and Sinks in Canada (1990-2006). Greenhouse Gas Division

Little, S., J. Lindeman, K. Maclean and H.H. Janzen. 2008. Holos. A tool to estimate and reduce greenhouse gases from farms. Methodology and algorithms for version 1.1.x.

2) Real / Additional

- Based on the reduced proportion of land area (total managed) from summerfallow or chemfallow management as compared with a baseline
- Farm/project-specific historic baseline is required to demonstrate improved practice change is justifiable and verifiable over a consistent area
 - Project developer determines average fraction of summerfallow acres for 3 consecutive yrs
 - Minimum project reporting length is 5 consecutive yrs
- Shows incrementality at the Project Level
- Captures reductions resulting from a general trend towards reduced summerfallow activity
- Anticipates increasingly rigorous requirements

Barriers to Implementation

Investment	Significant. Summerfallow is used to conserve moisture, allow plant- available nitrogen to accumulate and control weeds. Reduced areas of summerfallow create income risks
Technological	None. Technology is available
Institutional	Yes. Practice is part of a traditional and tested farming practice. Summerfallow reduction represents a cultural shift to many producers.
Not common	Although practice is decreasing on the Canadian Prairies, it occurs on over 2 M ac in AB
Surplus to regulation	Agriculture is largely unregulated in Canada

3) Verifiable

Key data to be monitored:

- Portion of land area cropped in Baseline and Project (ha)
 - Satellite imagery/GPS
- Date-stamped farm records plus affirmation from land manager
- Proof of practice - farm resource inventories such as
 - tractors or machinery
 - production accounts of crop operations
 - crop / field records including chemicals purchased, farm maps, or crop rotations
 - income and expense records for land, labour, or machinery
 - transaction journals, general ledgers, etc.

Applicability Requirements

- Actions after 2002 – Project-Specific Baseline
- Project (not Baseline) must be co-implemented with Tillage System Management Protocol
 - Acknowledges importance of Reduced Till to support reduced summerfallow since moisture levels are higher
 - **Decreases risk of reversal**
 - Uses data monitoring and data management tools developed for Tillage System Protocol
 - Provides incentive to adopt Reduced Tillage
- Proof land is in No-Till or Reduced-Till (date-stamped farm records and attestation)

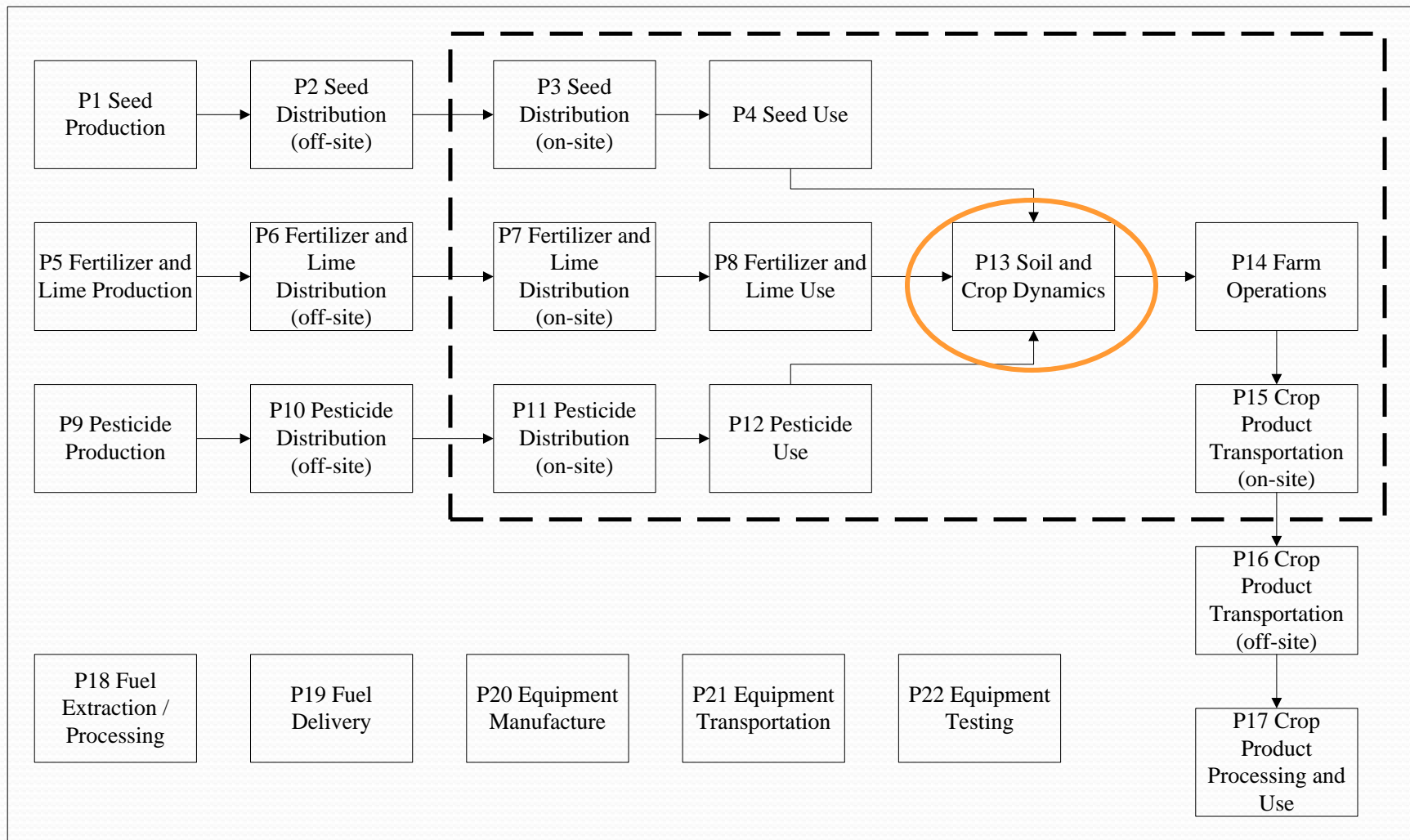
Flexibility

- If the 3 years of historical data prior to implementation has a year that was atypical in terms of summerfallow frequency (due to extreme weather or other conditions) the next consecutive year(s) back may be used in its place.
- The project developer must provide the necessary data and trending to establish the year(s) as atypical and thus eligible for exclusion.

Applicability Requirements

- Crediting Period – minimum of 8 years (3 baseline, 5 project)
- Project can generate offsets for 10 yrs with an extension for another 10 yrs
- Crediting Duration Sequestration is 20 yrs
- Ownership documentation and legal land location
- Lands in Dry Prairie region (Brown/Dk Brown) – Parkland coefficient not well documented in science
- Proof land in project was annually cropped (date-stamped farm records and attestation)
- Mechanism to address permanency of sequestered carbon
- Mandatory Reporting/Verification every 5 years

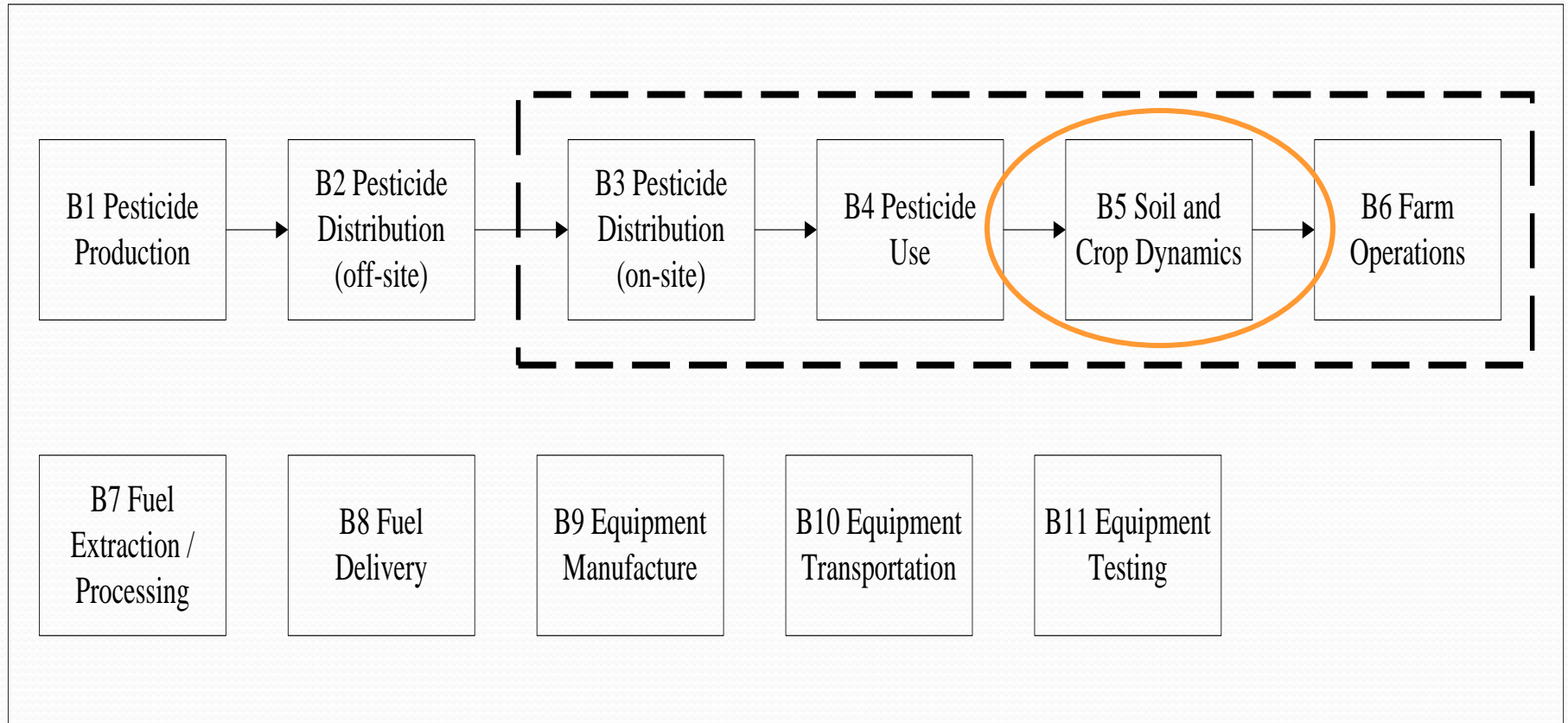
Process Flow Diagram - Project



Basis for Reductions

- Functional Equivalence
 - Based on the area (hectares) of land; the area of land farmed and the area of land in fallow in the project condition is compared to the average area of land farmed and in fallow of the 3 historical years that make up the baseline.
- Emission Reduction Mechanisms
 - Increased Carbon sequestration in the project (more area cropped)

Process Flow Diagram - Baseline



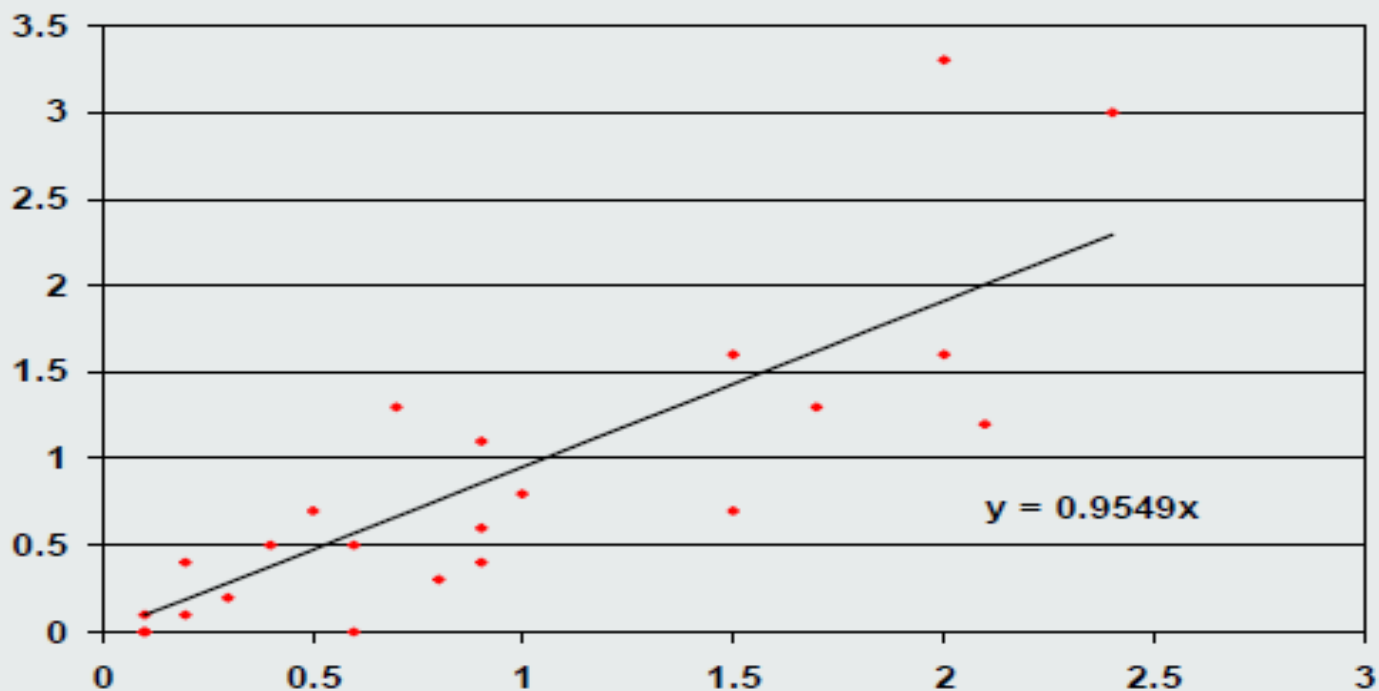
Baseline Condition

- Continued use of summerfallow or chemfallow as a land management technique. The baseline GHG emissions are quantified based on the business as usual use of summerfallow determined on a project by project basis.
- Defined as average percentage of fields in fallow of the total land included in the project. The average is based on 3 years of data prior to the project implementation.

Project Condition

- Carbon sequestration (removals) from reduced fallow on Brn and Dk Brn soils - *Campbell et al. 2005*
- Incremental fossil fuel emissions from increased on-site fuel usage from seeding, fertilizing and herbicide applications - *Little et al. 2008*
- Incremental fossil fuel emissions from increased upstream fertilizer production. 20 to 40% increase in fertilizer use if crop all summerfallow acres in Brn and Dk Brn soils - *Little et al. 2008*
- Rates of soil N₂O emissions from fallow land (baseline) are similar to rates from cropped land (project), therefore exclude - *Dr. R. Lemke, AAFC*

Annual N₂O loss from fertilized continuous wheat versus fallow at five sites in Alberta and Saskatchewan (n = 24; 12 site years x 2 tillage)



Lemke, published and unpublished data

Emission Reduction Calculation

$$\text{Emission Reduction} = \text{Emissions}_{\text{Baseline}} - \text{Emissions}_{\text{Project}}$$

$$\text{Emissions}_{\text{Baseline}} = \text{Emissions}_{\text{Summerfallow}}$$

$$\text{Emissions}_{\text{Project}} = \text{Emissions}_{\text{Soil Organic Carbon Sequestration}} + \text{Emissions}_{\text{Energy}} + \text{Emissions}_{\text{Upstream Fertilizer Production}}$$

Example Calculation of Total Coefficients

	Soil Carbon Sequestration	Energy for Fuel and Herbicide Use	N Fertilizer Production	P ₂ O ₅ Fertilizer Production	Total
	----- Mg CO ₂ e ha ⁻¹ y ⁻¹ -----				
Dry Prairie	-1.95	0.08	0.15	0.02	- 1.71

Addressing Permanency

- Fallowing is an easily reversible activity
- Minimal capital investment; risk management tool for growers
- Used to mitigate drought risk
- Depends also on market factors
- Decisions to use can be made in spring of planting year
- Co-implementation with Reduced Tillage Protocol reduces likelihood of reversal since moisture conservation is increased

Adapting Voluntary Carbon Standard (VCS) Sliding Buffer Approach

- Combines risks of reversals in real time, while ensuring future reversals are covered by using a sliding buffer pool that sets mandatory reporting/verification intervals
- As the project risk goes down over time, the size of the reserve can be minimized. The project developer is motivated to not reverse, and the incentive for sustaining the activity as well as verifying every 5 years is there.

VCS Forestry Example

- 30% of deductions from every project are set aside in the buffer reserve.
- At verification (mandated every five years) if no reversals were found, then 15% of the total buffer reserve is released back and the overall percentage deduction goes down for the next 5 year period.
- If reversals occurred the risk rating of the project remains the same and the total buffer reserve will not be reduced.

VCS Forestry Example

Years Since 1st VCS Verification	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Total buffer (% withheld of total carbon credits generated by project)	30	25.5	21.68	18.42	15.66	13.31	11.31	9.62	8.17	6.95	5.91	5.02	4.27	3.63	3.08

Adaptation of Approach

- Mandatory minimum reporting/verification period of 5 yrs
- Total credit duration period of 20 yrs
- Agreed upon variability of fallow incidence of 20% - initial buffer reserve amount
- If no reversals (increased acreage converted back to SF) then 20% returned

Verification Intervals (y)	0	5	10	15	20
Total buffer (% offsets withheld)	20	16	12.8	10.2	8.16

Implementation of Permanency Approach

- Project Developer calculates total tonnes reduced
- Verifier weighs in – Verification report
- Tonnes are serialized by the Registry
- Registry sets aside the required set of verified tonnes and in a special account for that project developer
- Upon verification intervals, the Registry could release the amount, put them back into circulation in the Project Developer's account, and then let the Project Developer know what the next buffer requirement would be.



Questions?