# *AgTools*™: An Evaluation Tool for Agricultural Producers Facing Climate Change

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## Introduction

**I. Case Study Farm**

Windy Canyon Farm LLC is a 3,800 acre dry land wheat farm located in a 12" to 18" precipitation zone in the mid-Columbia Region of Oregon, currently practicing a winter wheat and summer fallow rotation on owned and leased land.

**II. Background**

A previous *AgTools*™ study showed Windy Canyon Farm LLC would be more profitable (over ten year period), by switching from a wheat-fallow rotation to an annual cropping of wheat with camelina, canola, and dry peas.

**III. Motivation**

With the possibility of climate change resulting in increased winter precipitation, a winter wheat and summer fallow rotation is compared against annual cropping winter wheat with camelina, canola, and dry peas with and without climate change to determine which cropping system is more profitable after projected increased winter wheat yields and increased input costs such as fertility, insecticides and fungicides, as a result of climate change.

## Methods

**I. *AgTools*™ (available on line at http://www.agtools.org/)**

*A* suite of software programs used to evaluate the profitability and feasibility of changes in crop rotations and management decisions, at the farm level .

**II. *AgTools*™ Software used in this Study**

***AgProfit***™ - assesses profitability using existing Oregon State University budget cost and return information for winter wheat, summer fallow, winter camelina, winter canola, and spring dry peas.
***AgFinance***™ - evaluates additional equipment purchases and employee withdrawals required to support additional crops.

**III. Modifications to *AgProfit*™ Budget Files**

WITHOUT CLIMATE CHANGE

- Winter wheat yields are adjusted to represents actual wheat yields from Umatilla County for 2003 to 2012, then randomized by year to estimate future production for years 2014-2023, assuming past yields will occur in the future without climate change.
- Camelina, canola, and peas have varying yields and net returns. Yields vary by +/- 20 percent. The price for camelina varies by 40%, 20% for canola, and approximately 10% for peas.

WITH CLIMATE CHANGE

- Projected wheat yields for 2014-2023 in Umatilla County from the RCP 4.5 Global Climate Change Models (GCM), Regional Concentration Pathways 4.5 and 8.5 GFDL-ESM2M (GCM 7), are used in the winter wheat budgets.
- Fertilizer costs were increased by 20 percent, costs for insecticides ($30/acre) and fungicides ($25/acre) were added, and the number of sprayer applications increased from one to five in the winter wheat budgets.
- Camelina, canola, and pea yields and fertilizer costs were increased 20 percent.

## Rotations by Field

**Table 1. Crop Rotations by Year and by Field for Wheat Fallow System**

| Year | Northside | Eastside | Westside | Southside |
|---|---|---|---|---|
| | Owned Land | | Leased Land | |
| 1 | Wheat | Wheat | Wheat | Wheat |
| 2 | Fallow | Fallow | Fallow | Fallow |
| 3 | Wheat | Wheat | Wheat | Wheat |
| 4 | Fallow | Fallow | Fallow | Fallow |
| 5 | Wheat | Wheat | Wheat | Wheat |
| 6 | Fallow | Fallow | Fallow | Fallow |
| 7 | Wheat | Wheat | Wheat | Wheat |
| 8 | Fallow | Fallow | Fallow | Fallow |
| 9 | Wheat | Wheat | Wheat | Wheat |
| 10 | Fallow | Fallow | Fallow | Fallow |

**Table 2. Crop Rotations by Year and by Field for Annual Cropping System[1]**

| Year | Northside | Eastside | Westside | Southside |
|---|---|---|---|---|
| | Owned Land | | Leased Land | |
| 1 | Dry Peas | Wheat | Wheat | Camelina |
| 2 | Wheat | Camelina | Canola | Wheat |
| 3 | Canola | Wheat | Wheat | Dry Peas |
| 4 | Wheat | Dry Peas | Camelina | Wheat |
| 5 | Camelina | Wheat | Wheat | Canola |
| 6 | Wheat | Canola | Dry Peas | Wheat |
| 7 | Dry Peas | Wheat | Wheat | Camelina |
| 8 | Wheat | Camelina | Canola | Wheat |
| 9 | Canola | Wheat | Wheat | Dry Peas |
| 10 | Wheat | Dry Peas | Camelina | Wheat |

[1]In any given year at least 1,800 acres of winter wheat must be planted along with alternative crops.

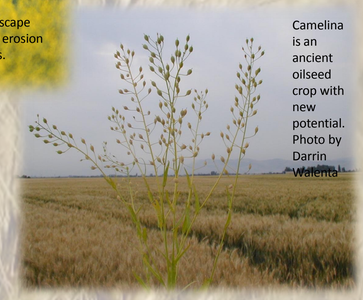
## Results

**Table 3. Cash Flow[2] and Accumulative Net Farm Incomes[3] by Crop Alternative, With and Without Climate Change**

| Year | Base Operation | | Annual Cropping | | Base Operation | | Annual Cropping | |
|---|---|---|---|---|---|---|---|---|
| | Cash Flow | Accumulative Net Income | Cash Flow | Accumulative Net Income | Cash Flow | Accumulative Net Income | Cash Flow | Accumulative Net Income |
| | Without Climate Change | | | | With Climate Change | | | |
| 1 | $747,138 | $637,596 | $1,275,889 | $345,303 | $454,845 | $1,132,003 | $1,070,799 | $926,912 |
| 2 | $693,901 | $1,223,228 | $802,341 | $757,265 | $520,231 | $1,769,221 | $828,056 | $1,589,845 |
| 3 | $252,501 | $1,369,008 | $716,784 | $1,064,897 | $414,353 | $2,318,826 | $1,200,864 | $2,623,531 |
| 4 | $356,193 | $1,617,041 | $425,079 | $1,559,722 | $602,986 | $2,579,045 | $785,631 | $3,244,301 |
| 5 | $448,142 | $1,958,106 | $694,176 | $1,805,944 | $353,298 | $3,117,153 | $872,313 | $3,960,545 |
| 6 | $518,966 | $2,369,082 | $632,043 | $2,197,921 | $499,968 | $3,588,771 | $837,239 | $4,637,359 |
| 7 | $407,105 | $2,661,540 | $848,317 | $2,408,959 | $325,685 | $4,274,336 | $1,036,785 | $5,511,392 |
| 8 | $613,867 | $3,161,348 | $570,204 | $2,784,440 | $489,540 | $4,686,576 | $654,034 | $6,007,462 |
| 9 | $70,092 | $3,118,194 | $517,482 | $2,999,211 | $328,016 | $5,038,352 | $1,101,045 | $6,942,800 |
| 10 | $26,905 | $3,032,582 | $141,477 | $3,331,412 | $444,718 | $5,014,827 | $603,551 | $7,381,349 |

[2]Cash flow includes gross incomes minus cash costs plus operating interest.
[3]Accumulative Net Farm Incomes includes annual cash flows, +/- inventory changes in current assets and liabilities from the balance sheet, + interest from annual operating, intermediate and long-term loans, + capital lease payments and any down payments associated with acquiring a lease, + depreciation.

Yellow fields of canola create a patchwork landscape where growers rotate crops to help reduce soil erosion and increase net returns. Photo by Brad Stokes.



Camelina is an ancient oilseed crop with new potential. Photo by Darrin Walenta

## Citations/References:


- www.agtools/org
- Julian, James W. and Clark F. Seavert. 2011. "AgProfit™: a net present value and cash flow based decision aid for agriculture producers", Agricultural Finance Review, Vol. 71 Issue: 3, pp.366 – 378.
- Farm Financial Standards Council. Financial Guidelines For Agricultural Producers: Recommendations of the Farm Financial Standards Council (Revised) January 2008. www.ffsc.org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