AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

378.77427
D347
579

# Agricultural Economics Report

NUMBER 579 JUNE 1995

## CANOLA IN MICHIGAN: COMPARATIVE BREAK-EVEN ANALYSIS WITH MAJOR GRAINS

by

Samuel Asuming-Brempong,
James Hilker, Kandeh Yumkella,
Larry Copeland and Marcello Siles

WAITE LIBRARY
DEPT. OF APPLIED ECONOMICS
UNIVERSITY OF MINNESOTA
1994 BUFORD AVE. - 232 COB
ST. PAUL, MN 55108 U.S.A.

Department of
Agricultural Economics
MICHIGAN STATE
UNIVERSITY
East Lansing

378.77427
D347
579

# CANOLA IN MICHIGAN: COMPARATIVE BREAK-EVEN ANALYSIS WITH MAJOR GRAINS

Samuel Asuming-Brempong, James Hilker, Kandeh Yumkella,
Larry Copeland and Marcello Siles

## Introduction

The purpose of this study is to assess the potential of canola as an alternative crop in Michigan. In particular, we seek to estimate the relative profitability of canola to already established grains (wheat, corn grain, soybeans, navy beans, etc.); and to determine what prospects it holds over these grains to encourage farmers to adopt it.

Canola, an acronym for Canada Oil Low-Acid (and a registered trademark of the Canola Council of Canada) is an improved variety of rapeseed with a relatively short history. Canola is a distinct quality of rapeseed that produces high quality edible oil and animal feed. The erucic acid content in the oil is 2% or less; and the meal glucosinolate content is less than 30 micro moles per gram of defatted meal.[1]

## Background

Currently, canola vies with sunflower as the world's second largest source of edible oil. In the United States canola oil was granted Generally Regarded As Safe (GRAS) status in 1985. Canola oil has since been allowed in food products by the U.S. Food and Drug Administration. One major advantage of Canola over other edible oils is that it has a low saturated fat content (a major consumer concern about health), only 6% as compared to 11% and 15% content for sunflower and soybeans, respectively. This is an important reason why the demand for canola oil in the United States is rapidly expanding. For example, the U.S. imported an estimated 200,000 tons of canola oil in 1989 (mainly from Canada), and this figure doubled to 400,000 tons in 1992 (Copeland, et. al., 1993). If this trend continues, it will imply a significant market

[1]*These attributes contrast the high content of eicosenoic acid and erucic acids found in traditional rapeseed varieties, as well as high levels of glucosinolite which causes bitter taste and gives a pungent odor to the oil.*

potential for canola in the United States, making it potentially an important future crop for U.S. farmers.

Compared to wheat, corn grain, soybeans, and most other grains grown in Michigan, canola is a relatively new introduction. Considering the growing demand for canola in the U.S. food industry, there is need to assess whether canola has a potential as an alternative crop, providing diversification and flexibility to farmers without requiring substantial additional capital (eg., machinery) investment.

The addition of a new crop to the current cropping system may require changes in one or more of the following: (a) crop rotation, (b) machinery type and time of operation, (c) cultural practices, (d) management skills and procedures, (e) level and timing of labor, (f) chemical use and levels of residue, and (g) government program participation. Earlier studies have shown that canola fits well into the established production practices of major food grains cultivated in Michigan (Yumkella, et. al., 1993), and the tap root which canola develops makes it a useful crop in rotation with other grain crops (Copeland, et. al. 1991).

The pertinent issue, however, is whether canola can economically compete with the already established crops to induce farmers to grow it. If canola is included in a rotation, will it provide the farmer with a higher net return to fixed assets; or what is its risk-return trade-off relative to other crops?

## Objectives

This paper pursues a two-fold objective:

(a) given the yield per acre, we seek to determine what price of canola (break-even price) will enable it to generate the same net return to fixed costs as other grains; and

(b) given the prices and yields for other grains, we want to find out what the yield of canola (break-even yield) should be to enable it to generate the same net return to fixed costs as the other grains.

Based on the present status (eg., published data) of canola in Michigan, we hypothesize as follows: with a developed stable market, canola can compete with the established grains in Michigan.

The paper has seven sections. Following the introduction and background are the statement of the study objectives, an overview of break-even analysis, the data used, results of the analysis and subsequent discussion, and finally the conclusions.

## Overview of Break-Even Analysis

In agriculture, the short-run and long-run concepts tend to be relative. For example, a short-run in annual crops (wheat, corn, canola, etc.) differs from a short-run for perennial crops or tree crops (such as apples, citrus, etc.); and a short-run in crop production differs from that in animal production. The comparative break-even analysis is a short-run concept where returns to basic factors of production (land, machinery, family and/or hired labor, and management) from different crops are compared as a basis for their profitability.[2] In break-even analysis, only variable costs (ie., costs that are incurred only if production takes place) relative to gross revenue are compared rather than fixed costs (ie., costs that are incurred whether production takes place or not). The decision criterion is to cultivate the crop (or crop-mix) which provides the highest net return to fixed factors.

The principal issue in the comparative break-even analysis is the determination of a price/yield combination required by an alternative crop to be able to bid resources away from the original crop. Hilker, et. al. (1987) developed a method for comparative break-even analysis, and referred to the original and alternative crops as "defender" and "challenger", respectively.

---

[2]*In the short-run some factors of production are considered variable (seed, fertilizer, etc.) and others fixed (land, machinery, etc.). In the long-run, all factors are assumed to be variable.*

Schoney, et. al. (1992)[3] used a variant of this methodology to determine the relative profitability of canola and other crops in Canada and some parts of the U.S.A. The current study also adopts the Hilker et. al. (*ibid.*) approach, using corn grain, winter wheat, soybeans, and navy beans as the "defender crops", and canola as the "challenger crop".

The analysis was carried out in two stages. First, based on available data, estimates of expected yields and output prices are made for the current year in order to compute the expected gross revenue for each crop. Second, preharvest costs, harvest costs, as well as drying and marketing costs are computed. The break-even price and break-even yield of the challenger are then computed as follows:

$$BEP_c = (VC_c + RFF_d) / Y_c \quad .....(1)$$

$$BEY_c = (VC_c + RFF_d) / P_c \quad .....(2)$$

where:

$BEP_c$ and $BEY_c$ are the challenger's break-even price and break-even yield, respectively;

$VC_c$ is the challenger's variable cost/ac. (preharvest cost + harvest cost + drying and marketing cost);

$RFF_d$ is the defender's return to fixed factors/ac. (gross margin less variable cost, $P_dY_d$-$VC_d$);

$P_c$ and $Y_c$ are the challenger's price per unit of output and yield, respectively.

In order for the challenger crop to bid away resources from the defender crop, the Returns to Fixed Factors (RFF) for the challenger must exceed that for the defender. This is because the RFF is considered an "imputed" cost, and represents the gross revenue per acre that the challenger must generate to induce farmers to switch resources from competing crops. Alternatively, both the computed break-even price and yield for the challenger must be lower

---

[3]*Schoney et. al. (1992) used a linear programming model, based on the Top Management Farm Business Simulator, to generate gross operating margins and break-even yields for canola and various defending crops.*

than its current market price and actual yield, respectively; implying that at the current price and yield levels, the challenger generates more profit than the defender.

Sensitivity analysis is done on the break-even price and yield to ascertain how they are affected by changes in the assumptions (for example, stable yields and prices) underlying the analysis. This is important because of the uncertainty that surrounds the expected prices and yields estimated for the current year crops; and provides a means of assessing what deviations from the break-even values were reasonable to maintain profitability.

## The Data

In this study data obtained from "1992 Crops and Livestock Budget Estimates from Michigan" (Nott, et. al., 1992), and a comprehensive survey of canola producers in 1993 (Yumkella, et. al., 1993), are used to generate estimates of production costs and expected yields. The analysis is based on winter canola rather than spring canola because winter canola is the canola type commonly cultivated in Michigan, particularly central and southern Michigan. In both studies, long-term relative prices were used.

The study compares two scenarios. In one case the estimated budgets for all the crops for 1992 (corn grain, winter wheat, soybeans, navy beans, and canola) were used; while the other compares primary data for canola and the other crops from a survey on canola farms in Michigan for that year.

### Scenario One

Crop budget estimates and yields from Nott, et. al., 1992[4] were used for both canola (challenger) and the defender crops (corn grain, winter wheat, soybeans, navy beans). For each crop (except navy beans), estimates are made for high yield, medium yield, and low yield,

---

[4]*These crop budgets were assembled in February 1992 and represent one estimate of 1992 conditions. TELFARM yearly summaries reflecting 1992 price levels provide the basic cost data for all the crops. Seed, fertilizer, and chemical cost were based on ingredient costs from commercial sources; while MSU agricultural economists, with the assistance of county extension agents, compiled the price data.*

representing the profile of crop production in various parts of Michigan. The assumption here is that since the data for the various crops were compiled under similar conditions, they are fairly representative of the average performance of these crops under Michigan conditions.

Scenario Two

Primary data collected on canola for the 1990-1992 crop through a 1993 field survey of 237 farms were used. Data for the other crops were also collected from the farmers during the survey. The canola yield used for the analysis is the average of yields farmers reported for the three years between 1990 and 1992. The 1992 crop year was particularly bad for canola due very poor growing conditions, and therefore the average yield for canola in this scenario may be low.

## Results and Discussion

Scenario One

The first scenario represents expected normal yields and prices when growing and marketing conditions are normal; and the analyses proceeded under three categories for all the crops; namely: (a) high yield, (b) medium yield, and (c) low yield (except navy beans which has two categories) as shown in Table 1. In all three categories, canola is more profitable than all the traditional grains cultivated in Michigan except winter wheat at high yields (Tables 2a-2d). For this scenario, long-term average relative prices for the grains were estimated at $2.30/bu, $3.30/bu, $5.70/bu, $15.00/cwt, and $5.10/bu, for corn grain, winter wheat, soybeans, navy beans, and canola, respectively.

The analysis indicates that under this scenario, canola generated higher returns to fixed factors than any of the defender crops considered. The extra returns from canola as compared to the other crops is highest in the case of medium-yielding corn grain and medium-yielding navy beans. Farmers who change from growing medium-yielding corn grain to grow medium-yielding canola on their fields could make $50.43 more per acre (or 68.4% higher returns); and a

similar shift from navy beans could also generate $47.80 more on each acre of land (or 62.5% higher returns). The comparable figures for high and low-yielding corn grain and soybeans relative to canola show a similar trend.

In the case of winter wheat, a substitution of wheat with canola on an acre of land generates extra returns to fixed factors in the range of 62.0% more for low-yielding crops to 25.2% more for medium-yielding crops. On the other hand, canola is less profitable than high yielding winter wheat. The returns to fixed factors from high-yielding canola is $9.95 (or 6.7%) less per acre than that from high-yielding winter wheat.

The results suggest that in Michigan, canola has a substantial competitive edge over corn grain, soybeans, and navy beans particularly at medium to low yield levels. It is also more competitive than winter wheat at medium to low yield levels, but relatively less competitive when yields are high. The profitability of canola over the traditional grains in Michigan is further underscored by the canola break-even price (BEP) and break-even yield (BEY) analysis (Tables 2a-2d). For corn grain, canola BEP ranges from $3.95/bu (or 22.5% lower than the prevailing market price) to $4.27/bu (or 16.7% lower than the prevailing market price) for medium-yielding and low-yielding canola, respectively. The BEYs follow the same trend (see Tables 2a-2d). On the other hand, the canola BEP and BEY relative to high-yielding winter wheat is negative, estimated at $5.30/bu (or 3.9% higher than the prevailing market price) and 52.0 bu/ac. (or 4.0% higher than the current yield) for high-yielding canola, respectively.

Under Government Program[5] (Optional Flex) which covers corn grain and wheat mainly, government subsidy payments meant that corn price increased from $2.30/bu to $2.60/bu while the price of wheat moved from $3.30/bu to $3.55/bu in 1992. It should be noted

---

[5]*The Government Deficiency Program allows 15% of corn and wheat based acres to be planted to other crops (say, canola) without loss of government deficiency payment. But for the next 10% of the corn or wheat based acreage (optional flex), no deficiency payment is made once the land is planted to other crops.*

that the 1990 Farm Bill created the flexibility for the adoption of canola and other minor oil seeds since it allowed US farmers to grow alternative crops without losing program crop base. The impact of the "0-92" program (now changed to "0-85" program in 1994) will depend on factors such as a) projected crop deficiency payments, b) profitability of non-program alternative crops such as (FLEX acres alternative) and c) profitability of minor oilseeds. Schoney (1992) observed that in the Midwest the "0-92" option means that canola would have an effective subsidy of the projected deficiency payment. Moreover, farmers can receive 40% of the projected deficiency payment in the spring, and this cash advance may make the program even more attractive. For the US as a whole, if projected deficiency payments are large, then the "0-92" option could make canola an attractive crop, given good yields.

Using the government program prices for the break-even analysis, canola is slightly more profitable than corn (BEP is $4.93/bu and BEY is 48.4 bu/ac. or 3.3% less than the prevailing value in each case). On the other hand, canola shows worse performance relative to wheat. The BEP and BEY are $5.70/bu and 55.9 bu/ac., respectively, or 11.8% higher than the prevailing price or yield. This implies that under government program, canola may have a competitive edge over corn; but will need an increase of about 12% in either yield or price or both in order to replace wheat.

**Scenario Two**

The results for the second scenario where survey data are used present a different picture. In the analysis, both input and output prices for all the traditional grains are assumed to be the same as those under scenario one which depicts normal production and marketing conditions. Yields are three-year averages as reported by farmers during the survey. Under this scenario, canola is less profitable than all the other grains cultivated in Michigan.

The competitiveness of canola is least relative to soybeans in which case its BEP and BEY are $7.14/bu (or 40% higher) and 44.6 bu/ac. (or 39.8% higher) than prevailing market

price and yield, respectively (Table 3). Similarly, canola requires a BEP and a BEY of $5.90/bu, or 15.7% higher) and 36.9 bu/ac. (or 15.8% higher), respectively, to be able to compete with both corn grain and navy beans. This implies that there must be an increase of $2.04/bu or 12.7 bu/ac. (ie., 40.0% in each case) in canola price and quantity, respectively, for canola to be competitive relative to soybeans. In the case of corn grain and navy beans, an increase of $0.80/bu or 5.0 bu/ac. (ie., 15.8% in each case) for BEP and BEY, respectively, are required to make canola competitive.

However, with winter wheat, canola requires a BEP of only about $5.31/bu (or 4.1% more than the current market price) to be more competitive. Similarly, the BEY required for canola to be competitive over winter wheat is 33.2 bu/ac. (or 4.1% more than the present average yield level). The implication here is that under unfavorable growing conditions, the profitability of canola could be greatly impaired; reducing its ability to compete with the traditional grains in Michigan.

## Sensitivity Analysis

A sensitivity analysis was done to verify the robustness of the computed canola BEP and BEY to alternate assumptions. The variable costs were held constant (at the levels used for the analysis) while allowing the BEP and BEY to vary.

The yield ratios (under the optimistic conditions) are in the range of 1.1 - 1.3, 1.5 - 1.7, 2.3 - 2.5, and 3.0 - 3.1 for soybeans, winter wheat, corn grain, and navy beans, respectively. It could be inferred from the low variability in the yield ratios that canola could show consistency in profitability over a reasonable range of scenarios. These relative relationships are also an important consideration in the crop mix decisions by farmers.

We should note here that this analysis does not incorporate the effects of canola in rotation with other crops, an issue which is well covered by Schoney (*ibid.*); and our results are

consistent with his findings (variations in figures may be due to the effects of these programs but our conclusions are similar).

## Conclusion

The break-even analysis suggests that winter canola has potential as an alternative crop in Michigan, and it is relatively more profitable than most of the traditional grains (corn grain, winter wheat, soybeans, and navy beans) under normal growing conditions (scenario one). For example, current data from experimental plots indicate that the higher relative yields used in the scenario one analysis are achievable. However, the survey data (scenario two) shows that under current farm practices in Michigan, the performance of canola makes it a less desirable crop. Canola seems to suffer more damage from unfavorable weather conditions and therefore generates relatively less profit than the other grains, particularly at high yield levels.

It is important to put these seemingly contrasting results (ie. scenario one and scenario two) into perspective. Scenario one was based on published data and demonstrates what is achievable with canola in Michigan. Scenario two used survey results to show what the current performance (ie., 1992) of canola is in Michigan. The most important issue here seems to be improved management practices by farmers who are still on a learning curve. For example, failure to seed canola in the ten-day "window" between August 8th and 10th for Michigan could result in total winter kill since the crop would not be established enough before snow cover. Farmers therefore need more education to improve current management practices. Also, a better marketing system for canola which could perhaps give better relative price than that used for the analysis; as well as developing local canola processing could create the needed incentives for farmers to devote more time and crop land to canola.

In general, with more improved management practices as farmers become familiar with canola, losses could be substantially reduced and the competitive edge of canola over other grains will become more apparent.

## References

Copeland, L.O., S.G. Elias, R.H. Leep, and D.A. Landis. "Canola Production in Michigan." *Department of Crop and Soil Sciences Newsletter*, Michigan State University. June 1993.

_____, R.H. Leep, and D.A. Landis. "Canola Production in Michigan." *Department of Crop and Soil Sciences Newsletter*, Michigan State University. June 1991.

Downey R.K. *From Rapeseed to Canola and Beyond.* Canada Agriculture Research Station, Saskatoon, Saskatchewan, Canada. 1990.

Hilker, J.H., J.R. Black, and O.B. Hesterman. *Break-Even Analysis for Comparing Alternative Crops.* Cooperative Extension Service, Michigan State University, Extension Bulletin E-2021. July 1987.

Nott S.B., G.D. Schwab, A.E. Shapley, M.P Kelsey, J.M. Hilker, and L.O. Copeland. *1992 Crops and Livestock Budget Estimates for Michigan.* Department of Agricultural Economics, Michigan State University, Agricultural Economics Report No.556. January 1992.

Putnam D.H., L.L. Hardman, E.A. Oelke, M.O. Johnson, E.I. Fuller, D.M. Noetzel, R.A. Meronuck, M.E. Morris, and K.N. Sannes. *Prospects for Canola In Minnesota.* Center For Alternative Plant and Animal Products, University of Minnesota, Agricultural Utilization Research Institute. April 1991.

Schoney, R.A. "Canola Production Potential in the High Prairies and Midwest United States." *Canadian Journal of Agricultural Economics*, 40 (pp. 663-676). 1992.

Thompson S., R.J. Hauser, H.D. Guither, and E. D. Nafziger. *Evaluating Alternative Crops From A Marketing Perspective: The Case of Canola.* Illinois Agriculture Experiment Station. January 1992.

Yumkella, K.K., M. Siles, L.O. Copeland, and J.H. Hilker. "An Analysis of Canola Adoption and Production in Michigan." Department of Agricultural Economics, Michigan State University, Staff Paper No. 93-54. December 1993.

**Table 1. Crop Yields[a] and Prices[b] for Scenario 1 and from Survey**

| CROP | YIELD - PUBLISHED DATA HIGH | MEDIUM | LOW | YIELD - SURVEY | PRICE |
|---|---|---|---|---|---|
| Corn (bu/ac.) | 120 | 100 | 80 | 112.1 | $2.30/bu |
| Winter Wheat (bu/ac.) | 80 | 60 | 40 | 54.1 | $3.30/bu |
| Soybeans (bu/ac.) | 40 | 30 | 25 | 38.3 | $5.70/bu |
| Navy Beans (cwt/ac.) | 17 | 13 | - | 13.7 | $15/cwt |
| Canola (bu/ac.) | 50.0 | 44.0 | 30.0 | 31.9 | $5.10/bu |

**Source:** [a]Average yield estimates for the 1991-1992 crop year obtained from Nott, et. al.; and yields from the survey representing averages of about three years.
[b]Prices are five-year averages.

**Table 2a. Break-even Analysis: Corn Grain vs. Winter Canola**

| | HIGH | MEDIUM | LOW |
|---|---|---|---|
| **DEFENDER --- CORN GRAIN** | | | |
| Yield bu/ac. | 120.0 | 100.0 | 80.0 |
| Price $/bu | 2.30 | 2.30 | 2.30 |
| **Gross Revenue $/ac.** | 276.00 | 230.00 | 184.00 |
| **Variable Costs** | | | |
| Preharvest Cost $/ac. | 120.45 | 105.23 | 97.95 |
| Harvest+Drying+Mktg. $/ac. | 61.20 | 51.00 | 40.80 |
| **Total Variable Cost $/ac.** | 181.65 | 156.23 | 138.75 |
| **Returns to Fixed Factors (RFF) $/ac.** | 94.35 | 73.77 | 45.25 |
| **CHALLENGER --- WINTER CANOLA** | | | |
| Yield bu/ac. | 50.0 | 44.0 | 30.0 |
| Price $/bu | 5.10 | 5.10 | 5.10 |
| **Gross Revenue $/ac.** | 255.00 | 224.40 | 153.00 |
| **Variable Costs** | | | |
| Preharvest Cost $/ac. | 96.55 | 84.60 | 72.50 |
| Harvest+Drying+Mktg. $/ac. | 19.80 | 15.60 | 10.40 |
| **Total Variable Cost $/ac.** | 116.35 | 100.20 | 82.90 |
| **Returns to Fixed Factors (RFF) $/ac.** | 138.65 | 124.20 | 71.00 |
| **Excess of Returns ($/ac.):** | 44.30 | 50.43 | 25.75 |
| **Challenger - Defender** | (47.0%) | (68.4%) | (56.9%) |
| **BREAK-EVEN CANOLA PRICE** | **4.21** | **3.95** | **4.27** |
| **BREAK-EVEN CANOLA YIELD** | **41.3** | **44.00** | **25.1** |

Note: Results refer to Scenario One.

**Table 2b. Break-even Analysis: Winter Wheat vs. Winter Canola**

| | HIGH | MEDIUM | LOW |
|---|---|---|---|
| **DEFENDER --- WINTER WHEAT** | | | |
| Yield bu/ac. | 80.0 | 60.0 | 40.0 |
| Price $/bu | 3.30 | 3.30 | 3.30 |
| **Gross Revenue $/ac.** | 264.00 | 198.00 | 132.00 |
| **Variable Costs** | | | |
| Preharvest Cost $/ac. | 98.60 | 86.15 | 70.65 |
| Harvest+Drying+Mktg. $/ac. | 16.80 | 12.60 | 8.40 |
| **Total Variable Cost $/ac.** | 115.40 | 98.75 | 79.05 |
| **Returns to Fixed Factors (RFF) $/ac.** | 148.60 | 99.25 | 52.95 |
| **CHALLENGER --- WINTER CANOLA** | | | |
| Yield bu/ac. | 50.0 | 44. | 30.0 |
| Price $/bu | 5.10 | 5.10 | 5.10 |
| **Gross Revenue $/ac.** | 255.00 | 224.50 | 153.00 |
| **Variable Costs** | | | |
| Preharvest Cost $/ac. | 96.55 | 84.60 | 72.50 |
| Harvest+Drying+Mktg. $/ac. | 19.80 | 15.60 | 10.40 |
| **Total Variable Cost $/ac.** | 116.35 | 100.20 | 82.90 |
| **Returns to Fixed Factors (RFF) $/ac.** | 138.65 | 124.30 | 85.82 |
| **Excess of Returns ($/ac.): Challenger - Defender** | -9.95 (-6.7%) | 25.50 (25.2%) | 32.87 (62.0%) |
| **BREAK-EVEN CANOLA PRICE** | **5.30** | **4.53** | **4.53** |
| **BREAK-EVEN CANOLA YIELD** | **52.0** | **39.1** | **26.6** |

Note: Results refer to Scenario One.

**Table 2c. Break-even Analysis: Soybeans vs. Winter Canola.**

| | HIGH | MEDIUM | LOW |
|---|---|---|---|
| DEFENDER --- SOYBEANS | | | |
| Yield bu/ac. | 40.0 | 30.0 | 25.0 |
| Price $/bu | 5.70 | 5.70 | 5.70 |
| **Gross Revenue $/ac.** | 228.00 | 171.00 | 142.50 |
| **Variable Costs** | | | |
| Preharvest Cost $/ac. | 85.40 | 81.20 | 81.10 |
| Harvest+Drying+Mktg. $/ac. | 8.60 | 6.30 | 5.25 |
| **Total Variable Cost $/ac.** | 94.00 | 87.50 | 86.35 |
| **Returns to Fixed Factors (RFF) $/ac.** | 134.00 | 83.50 | 56.15 |
| CHALLENGER --- WINTER CANOLA | | | |
| Yield bu/ac. | 50.0 | 44.0 | 30.0 |
| Price $/bu | 5.10 | 5.10 | 5.10 |
| **Gross Revenue $/ac.** | 255.00 | 224.50 | 153.00 |
| **Variable Costs** | | | |
| Preharvest Cost $/ac. | 96.55 | 84.60 | 72.50 |
| Harvest+Drying+Mktg. $/ac. | 19.80 | 15.60 | 10.40 |
| **Total Variable Cost $/ac.** | 116.35 | 100.20 | 82.90 |
| **Returns to Fixed Factors (RFF) $/ac.** | 138.65 | 124.30 | 70.10 |
| **Excess of Returns ($/ac.): Challenger - Defender** | 4.65 (3.5%) | 40.80 (48.9%) | 13.95 (24.8%) |
| **BREAK-EVEN CANOLA PRICE** | **5.01** | **4.17** | **4.63** |
| **BREAK-EVEN CANOLA YIELD** | **49.1** | **36.0** | **27.3** |

Note: Results refer to Scenario One.

**Table 2d. Break-even Analysis: Navy Beans vs. Winter Canola**

| | HIGH | MEDIUM |
|---|---|---|
| **DEFENDER --- NAVY BEANS** | | |
| Yield cwt/ac. | 14.5 | 10.5 |
| Price $/cwt | 15.00 | 15.00 |
| **Gross Revenue $/ac.** | 217.50 | 157.50 |
| **Variable Costs** | | |
| Preharvest Cost $/ac. | 79.10 | 76.00 |
| Harvest + Drying + Mktg. $/ac. | 6.55 | 5.00 |
| **Total Variable Cost $/ac.** | 85.65 | 81.00 |
| **Returns to Fixed Factors (RFF) $/ac.** | 131.85 | 76.50 |
| **CHALLENGER --- WINTER CANOLA** | | |
| Yield bu/ac. | 50.0 | 44.0 |
| Price $/bu | 5.10 | 5.10 |
| **Gross Revenue $/ac.** | 255.00 | 224.50 |
| **Variable Costs** | | |
| Preharvest Cost $/ac. | 96.55 | 84.60 |
| Harvest + Drying + Mktg. $/ac. | 19.80 | 15.60 |
| **Total Variable Cost $/ac.** | 116.35 | 100.20 |
| **Returns to Fixed Factors (RFF) $/ac.** | 138.65 | 124.30 |
| **Excess of Returns ($/ac.):** | 6.80 | 47.80 |
| **Challenger - Defender** | (5.2%) | (62.5%) |
| **BREAK-EVEN CANOLA PRICE** | **4.96** | **4.02** |
| **BREAK-EVEN CANOLA YIELD** | **48.7** | **34.6** |

Note: Results refer to Scenario One.

**Table 3. Break-even Analysis: Winter Canola vs. Corn Grain, Winter Wheat, Soybeans, and Navy Beans (SURVEY DATA).**

| | CORN GRAIN | WINTER WHEAT | SOYBEANS | NAVY BEANS |
|---|---|---|---|---|
| **DEFENDER - CROPS** | | | | |
| Yield bu/ac. | 112.1 | 54.1 | 38.3 | - |
| cwt/ac. | | | | 13.7 |
| Price $/bu | 2.30 | 3.30 | 5.70 | - |
| $/cwt | | | | 15.00 |
| **Gross Revenue $/ac.** | 257.83 | 178.53 | 218.31 | 205.50 |
| **Variable Costs** | | | | |
| Preharvest Cost $/ac. | 112.42 | 93.00 | 81.98 | 74.75 |
| Harvest+Drying+Mktg. $/ac. | 56.92 | 15.80 | 8.26 | 6.20 |
| **Total Variable Cost $/ac.** | 169.34 | 108.80 | 90.24 | 80.95 |
| **Returns to Fixed Factors (RFF) $/ac.** | 88.49 | 69.73 | 128.07 | 124.55 |
| **CHALLENGER - WINTER CANOLA** | | | | |
| Yield bu/ac. | 31.9 | 31.9 | 31.9 | 31.9 |
| Price $/bu | 5.10 | 5.10 | 5.10 | 5.10 |
| **Gross Revenue $/ac.** | 162.69 | 162.69 | 162.69 | 162.69 |
| **Variable Costs** | | | | |
| Preharvest Cost $/ac. | 91.09 | 91.09 | 91.09 | 91.09 |
| Harvest+Drying+Mktg. $/ac. | 8.50 | 8.50 | 8.50 | 8.50 |
| **Total Variable Cost $/ac.** | 99.59 | 99.59 | 99.59 | 99.59 |
| **Returns to Fixed Factors (RFF) $/ac.** | 63.10 | 63.10 | 63.10 | 63.10 |
| **Excess of Returns ($/ac,; $/cwt)** | -25.39 | -6.63 | -64.97 | -61.45 |
| **Challenger - Defender** | (-28.7%) | (-9.5%) | (-50.7%) | (-49.3%) |
| **BREAK-EVEN CANOLA PRICE** | **5.90** | **5.31** | **7.14** | **5.90** |
| **BREAK-EVEN CANOLA YIELD** | **36.9** | **33.2** | **44.6** | **36.9** |

Note: Results refer to Scenario Two.

WAITE LIBRARY
DEPT. OF APPLIED ECONOMICS
UNIVERSITY OF MINNESOTA
1994 BUFORD AVE. - 232 COB
ST. PAUL, MN 55108 U.S.A.