COST OF PRODUCTION FOR ORGANIC FIELD CROPS

ORGANIC COUNCIL OF ONTARIO
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About the Author

Tom Manley has 35 years of experience in business management, business operations, and planning. Tom grew up on a large dairy farm in Eastern Ontario, then pursued studies in Computer Science with a career in the military and civilian telecommunications management and design. Tom owned and operated the family business of Homestead Organics for 21 years where they supported and developed organic farms with seed, feed, farm supplies, and grain marketing.

Tom spent several years as a board member of Canadian Organic Growers, then continued as a board member and President of the Organic Council of Ontario. Tom is currently a freelance business consultant with a focus on organic farming and food processing.

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Introduction

Scope

This document is part of the 2020 series of organic cost of production (COP) models prepared by the Organic Council of Ontario. This particular model focuses on organic field crops and a three year crop rotation of corn, soybeans, and wheat. This document is accompanied by the Budget spreadsheet.

Who is this Resource for?

A crop budget or cost of production (COP) model is a management tool to estimate costs, understand profitability, and evaluate cropping alternatives. The primary objectives of this COP model are to assist:

- conventional farmers interested in adopting some organic production methods or potentially in transitioning to certified organic production in order to gain an understanding of the organic COP and profitability.
- organic farmers in order to:
    - understand where they are spending their money
    - determine what the profitability of their crops is and could be
    - benchmark their farm against the published COP model
    - strive to meet or exceed the published COP's yield and profit potential

A COP model is designed to analyze and optimize the cost of production and profitability per acre, not to manage the costs and profitability of a whole farm.

Reliability Disclaimer

Given the sample size of five participating farms, this COP model is not a statistically reliable representation of organic farming in Ontario. Instead of an average of the participating farms, the model represents a reasonable scenario with input from the participating farms and assumptions that are explained.

Every farm is different in terms of climate, region, soil conditions, farm size, crop rotations, infrastructure, resources, debt level, and management style. While the COP model is useful to all crop farms, any particular farm could see a considerable variance from the model.

The participating farms provided COP figures that are typical for their own farm without great consideration of yield peaks, crop failures, and exceptional situations over the years.

Environmental Scan: Other Available Resources

The following resources are available to assist farmers in estimating and managing their crop production costs:

- The OMAFRA field crop budgets including organic field crops.
- The OMAFRA crop budgeting spreadsheet.
- Organic crop production guideline from the government of Manitoba.
- Organic crop production budgets from the University of Iowa.
- Organic pricing and cost of production from ATTRA.

Methodology

This COP model for organic field crops is based on the OMAFRA (Ontario Ministry of Agriculture and Rural Affairs) crop production budgets. It incorporates data from five organic field crop farms and adopts various assumptions and cost factors for organic cropping.

Participant Overview

The author of this COP model reached out to many farms of various profiles, only five accepted to participate. Small farms and farms in transition to organic production were reluctant to participate because they do not track costs or produce yields that would be useful in building a COP model.

The five farms that contributed data to develop this COP have a wide range of scenarios. Two farms are in SW Ontario, two in eastern Ontario, and one in western Québec. Four farms have been fully certified organic for several years. The fifth farm is recently certified; its organic production is small compared to its large parallel conventional production and its organic yield has not yet reached the yields of the other organic farms.

One farm's organic crops feed its own organic hog production while the other four farms sell their crops in the organic markets. One farm is a small crop farm with 135 acres while the other four are large crop farms of more than 300 acres.

Differences Between OMAFRA Crop Budgets and the OCO COP Model

This organic COP model started with the OMAFRA organic field crop budgets, then made reasonable adjustments to it based on feedback from the participating farms.

	OMAFRA Crop Budgets	Differences in the OCO COP Model
Crop yields	The OMAFRA organic crop budgets rely on Ontario's 5-year weighted average of the organic yields of the reporting farms, as collected by AgriCorp in the crop insurance program. It is speculated that the AgriCorp crop yield average is diluted by: 1. farms that are new to organic production and therefore are still building their soil conditions and their yield; and 2. a large number of smaller farms that do not have the economies of scale and the yields of larger farms.	This organic COP model represents an achievable farm scenario with yield potentials that are slightly higher than the average crop yields as represented in the OMAFRA organic crop budget. These yields are higher than the OMAFRA averages since participating farmers in the COP model were applying manure, applying dry soil amendments, and obtaining significantly higher yields. The associated input costs have been included in the COP model.
Crop rotation	The OMAFRA crop budgets typically provide a COP model for one crop in one growing season assuming that all the inputs and field work in that year are wholly assigned to that crop and leave no residual value for the following crop.	This COP model for organic field crops presents a three year rotation of corn, soybeans, wheat (or it could be any cereal) and a legume cover crop in the wheat year. The soil development and cover crop costs are listed in the year of application but present a value for the three years. This COP model chose the example of a three year rotation as a fairly popular rotation. Farmers can insert additional columns or replace a crop in the model to represent their farm situation.
Seed costs	The OMAFRA crop budget specifies certified organic seed, as the organic standards require.	The organic standards also allow saved farm seed, common seed, and untreated conventional seed. Therefore, the model allows reduced seed costs based on input from the participating growers.
Input costs	Input prices for seed, fertilizer, fuel and pesticides in the OMAFRA	Input costs in the organic COP model are based on the feedback from the

	budgets were based on the survey results reported in the Ontario Farm Input Monitoring Project conducted by the University of Guelph, Ridgetown campus.	participating farms. They could be a range of manure, compost, allowed mineral amendments, and foliar feeds. They vary from farm to farm.
Machinery costs	The estimated costs for machinery in the OMAFRA budgets are derived from agricultural engineering formulas and Ontario average custom rates. The Ontario average custom rates are allocated across the six machinery-related expenses. It is recommended that you use your records to derive your costs.	The OCO organic COP model integrates the equipment amortization, interest or opportunity cost, fuel, lubricants, and labour to perform each field task, based on data from the participating farms.
Labour costs for hand weeding	The OMAFRA organic crop budget allows $46 (wheat), $61 (corn), and $92 (soybeans) in labour costs for hand weeding.	We have eliminated this input cost from our calculations as there is no evidence of consistent hand weeding in the organic crop sector, with only occasional exceptions for problems in certain fields or sections of fields.

Using the COP Model on Your Farm

Choosing Which Budget to Use

A farmer needs to make a first decision on which crop budget to choose, especially based on their ability to assign the cost of field operations to general enterprise expenses or to specific field tasks.

1. **OMAFRA Organic - Enterprise Method:** The published OMAFRA crop budget for organic crops takes an enterprise approach to track the cost of field operations and assigns field costs to expense categories such as fuel, labour, and amortization instead of assigning those costs to specific field tasks. This scenario uses the 5-year average crop yields reported to Agricorp.
2. **Organic Council of Ontario Organic - Task Method:** A task cost model for field operations was developed using data from organic farms. This scenario increases the 5-year average crop yields reported to Agricorp to account for reports from larger farmers with higher yields. And there are also some other changes to selected assumptions as explained previously.

Farmers can modify the COP model to represent their particular farm with the farm's expected yields and specific costs.

The COP spreadsheet has cell protection turned on and only the coloured cells may be used to enter farm data. But the protection is not password protected and can be turned off by the user.

Cost Accounting Methods

Like all other businesses, most farms report their operating costs in a tax return or income statement at the end of the year with all costs assigned to general operating accounts. To develop a COP model for their farm, the farmer must draw these figures from the tax return and make further calculations and assumptions.

Crop Costs: Some input costs clearly belong to a specific crop in a specific year such as seed, check-off fees, transportation, yields, crop prices, propane to dry the corn, an amendment that is unique to a crop type, etc. These costs directly impact the profitability of the specific crop.

System Costs: System inputs applied in one year benefit the whole rotation. These tend to be cyclical costs, such as manure applied before each corn year, or the legume cover crop in the wheat year. Therefore, this cost is assigned to the year that the input is applied and makes that crop look artificially less profitable; but the COP model of three years shows the positive impact on the profitability of the whole system.

Task Costs: These costs are more difficult to assign, such as fuel, equipment amortization, equipment maintenance, a grain handling system with a grain dryer, production labour, etc. Most farmers report general expense accounts in the income tax statement. They have not developed a method to distribute these costs to each task on the farm. But these costs are shared unevenly by all crops and acres. This COP model further manipulates these costs to assign them to specific tasks in each crop such as tillage, seeding, weed control, and combining.

Enterprise Costs: Many overhead costs such as organic certification, property taxes, buildings and infrastructure, and general farm insurance are whole farm costs. This COP model has assigned whole farm costs as an average cost per acre irrespective of the yield or the crop value on each acre.

Calculating Your Cost of Each Task

The Task Cost Method

Let's elaborate on the determination of task costs in field operations by including the cost of equipment, maintenance, labour, and fuel in each field activity.

The "Equipment Worksheet" tab in the spreadsheet is a tool to separate the cost of amortization, interest, maintenance, fuel and lubricants for each farm tractor, implement, and major assets. The tool then calculates a cost per hour for tractors and self propelled combines. You need the service time from the service clock of each machine in order to distribute the year's fuel cost per machine per hour of operation. Likewise, all other field equipment is assigned a cost per acre depending on how many acres the farm has in production in each crop type and how the equipment is being used.

There is an allowance for some non-productive or down time such as travelling to and from the field, calibration and repair time, secondary duties such as snow removal, etc. Down time can be estimated as a general percentage of operating time. Farmers have a pretty good idea of how many acres per hour they can cover for seeding, plowing, disking, finger weeding, combining, etc. Otherwise, refer to the Machine Operations tab in the spreadsheet for estimates data from OMAFRA.

The Custom Rate Method

Instead of doing the complicated task calculations, a farmer could use the custom rate method. The custom rate for each field task is published by OMAFRA from a survey of custom operators every three years, the latest one dating from 2018. The custom operations fees are included in the tab "Custom Operations" in the COP spreadsheet. A farmer can have a hybrid COP model using the enterprise method for in-house equipment and labour and the custom rate for certain tasks by custom operators like combining.

The custom rates include several inherent inaccuracies for the purposes of COP calculations. For one, they are based on large economies of scale, in-house maintenance activities, and the high depreciation and low maintenance costs of new machines which may all be unrealistically low for small organic farms. The custom rates include overhead, office and administration costs, management, risk, insurance, profit, labour, interest, and debt that may be unrealistically high and may duplicate costs that the farmer is already accounting for.

Reverting to enterprise costs

The COP spreadsheet prefers costs for each field task. If the farmer is not able to assess the cost of each task, then the COP spreadsheet still contains blank lines for the enterprise cost per acre of machine amortization, maintenance costs, fuel and lubricants, and paid labour. The farmer can zero each task cost and use the lines for enterprise costs.

The Cost of Labour on the Farm

A farm's typical income and expense statement or tax return includes hired labour but does not include the labour of the farm's owner and family. In reality, the farm's profit is the farmer's

taxable take-home pay and the farmer has not assigned family labour to the farm's COP. From farm to farm, there is more or less hired labour and the COP comparison is highly variable.

The COP model has assigned a value for farm labour in the COP calculations of approximately $25 per hour (including benefits), either family labour or hired labour, for several reasons:

- to make the cost of each task comparable from farm to farm in case some farms have to pay workers for farm tasks;
- to make the costs of each field task comparable to the custom operator rates;
- to highlight that a crop's profit must account for hired and family labour; and
- farm labour remains a cost of production and an opportunity cost since the farmer could work elsewhere.

The COP model only allows for production labour and not the farmer's time for general farm management or post production activities. When using the COP model for their own farm, a farmer is free to remove their unpaid labour from their calculations to understand their out-of-pocket production costs with the assumption that each crop's profit represents their take-home pay.

Multiple Enterprises

Although this COP is designed for field crops, many farms have multiple complementary enterprises (eg. dairy, livestock, mixed vegetables, custom farm services, etc.) Therefore, whole farm or equipment costs need to be proportioned to the various enterprises by a logical common denominator such as a proportion of revenues or acres. For example, if the field crop revenues represent 40% of the total revenues of a dairy farm, then the farmer's field crop COP model should be assigned 40% of the whole farm costs for organic certification, general farm insurance, field equipment, etc.

Financial Year Versus Crop Year

A farm reports income and expense over a fiscal year which is often the calendar year. But the COP model presents a crop year, which does not always relate to a fiscal or calendar year. When using the COP model, you may need to pull costs from two or more fiscal years and assign these costs to each crop year.

Farmers must choose a consistent method of assigning their input and activity costs to each crop year. Either method will work, as the model presents all the costs in the 3-year crop rotation.

- **The easiest method is by calendar year.** All input and activity costs are assigned to the crop grown in the calendar year that the input or activity occurred. For example,

manure and cover crop plowing are assigned to the wheat crop because they happened in the wheat year, even if they will be of particular benefit to the corn crop. The costs benefit the whole system as much as the corn.

- **The alternative method is the benefit method.** All input and activity costs are assigned to the crop to which they will deliver the most benefit. For example, the cost of manure and plowing in the wheat year are assigned to the corn crop. This requires consistent application. For example, the cost of plowing the corn stubble should then be assigned to the next crop.

Analysis, Observations, Business Decisions

To manage the cost of production, a farmer needs detailed expense records and a method to track each expense against each crop and each acre. If you do not have farm records, check with Agricorp, other organic farms in your region, or an organic farm advisor. They can help you develop plans and reasonable expectations for your crops.

Even though yield in organic production may be lower than conventional farming methods, experienced organic farmers confirm that crop rotations, cover cropping, and soil amendments bring benefits in terms of soil fertility, resiliency in the face of weather extremes, and improved yields over the long term. The organic premium and the reduced input costs make up for losses in yield so that farms are still profitable.

Like any farm or business operation, the economy of scale is an important factor that determines profitability. A large farm can distribute the cost of field equipment over more acres and thus afford large new equipment that covers more acres in an hour and incurs fewer maintenance costs.

Large successful field crop farms keep their crop rotation simple - 3 or 4 years with corn, soybeans, cereals, and cover crops. Despite the perceived agronomic benefits of niche crops such as buckwheat, oats, peas, hay, large farms go for simplicity in the rotation with high yielding high revenue crops, and short term cover crops. The niche crops simply do not have the yield and the revenue potential to justify their place in the rotation.

Glossary

Bin Run Seed - is another name for farm saved seed, or seed from the farm's own production. Bin run seed is grain drawn directly from the storage bin to plant in the field. The term assumes that the seed was not cleaned. The farmer should at least have the grain cleaned of trash and weed seeds and perform a germination and vigour test. High quality clean vigorous farm saved seed can be a great cost savings for the farmer. But it is not free seed and the cost must be

compared to the cost of purchased seed. It has an opportunity cost as the grain could have been sold to markets. There is the cleaning and testing cost, the cost of poor yield if the seed was of low quality, and there is an opportunity cost of not buying a better variety that could perform better on the farm.

Cover Crops - are crops intentionally grown for the purpose of soil development and not for harvest. Even a flush of weeds is a cover crop to develop organic matter. Most often, the farmer is spending money on seed and field work to plant a specific crop type to accomplish the desired outcome, such as a clover to fix nitrogen, fall rye to suppress weeds and hold nutrigen, oilseed radish to loosen the soil and hold nitrogen, buckwheat to suppress weeds, etc.

Crop Rotation - is a design of a succession of crops over a few years in the same field to develop a beneficial and sustainable crop system. Farmers choose a sequence of crops to cycle and fix nutrients, especially nitrogen among legumes and cereals, to alternate between row crops such as corn or soybeans and solid seeding such as cereals.

Foliar Feeds - represent a broad category of organic fertility inputs. They are liquid in nature and are sprayed on the growing crop for the foliage to absorb them. They include such things as: compost tea, soluble seaweed, hydrolyzed fish, molasses, and so on. Any crop input must be specifically listed as allowed in the permitted substances list of the Canada Organic Regulation and be approved by the organic certification body in the farm's production plan.

Organic Fertilizer - is a general term to represent soil amendments and fertility inputs that are allowed in organic production. Since the word fertilizer is usually associated with synthetic soluble fertilizers used in conventional agriculture, the organic sector tends to avoid the word fertilizer for the risk of confusion and prefers the word soil amendment. There are two general categories of organic fertility inputs, the inorganic soil amendments of rock origin (soft rock phosphate for example) and the products of organic origins such as manure or compost. Any crop input must be specifically listed as allowed in the permitted substances list of the Canada Organic Regulation and be approved by the organic certification body in the farm's production plan.

Organic Pesticides - are not to be confused with pesticides used in conventional agriculture which are generally prohibited in organic production. Organic farmers have access to a number of pest control tools that are not synthetic and naturally occurring. They include such things as: diatomaceous earth, insecticidal soap, and clay. Any crop input must be specifically listed as allowed in the permitted substances list of the Canada Organic Regulation and be approved by the organic certification body in the farm's production plan.

Parallel Production - is a production situation where a farm has both organic and non-organic or transitional crops in production, hence in parallel. The organic standards allow parallel production, but with certain conditions: there is a plan in place to progressively move all production to certified organic, crops are visually distinct to reduce the risk of accidental or intentional co-mingling of conventional crops into organic crops, and methods and records are

in place to avoid the contamination of organic crops with prohibited substances that are in use on the non-organic fields.

Seed Inoculant - is a microbial application to seed before planting. It is typically used to add beneficial nitrogen fixing bacteria to legume crops. The inoculant must be naturally occurring and not genetically engineered, and the carrier also respects organic regulations. There are other beneficial inoculants such as soil fungi that assist in the development of the root system. Seed and soil inoculants are allowed, even encouraged, in organic production to develop the soil microbiome and improve crop yields.

Seed Treatment - is the general term to represent antifungal and antimicrobial treatments to seed in conventional agriculture. The intention is to protect the seed from pests and moulds in the soil and will allow earlier planting in cold soil. These treatments are not allowed in organic production. To address the risk of seed damage, organic farmers usually wait for the soil to warm up, and often plant two weeks later than their conventional neighbours. The second strategy is to develop healthy soil with a diverse and active microbiome. Such diversity and microbial competition prevent pest or mould from taking control.