



Canadian Organic Growers

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Canadian Organic Growers Inc is Canada's national membership-based education and networking organization representing farmers, gardeners and consumers in all provinces.

COG Reference Series

#6, From Conventional to Ecological Agriculture A Guide to Crop Transition

Introduction

To make the change from conventional to organic or ecological agriculture requires a fundamental change in the way of looking at your farming operation. A preferred approach for making the change is the conviction that sustainability in agriculture is important. In the organic movement, it is generally held that to be sustainable, an agricultural system should be ecologically sound, economically viable, socially just and humane.

Varied definitions of "organic" farming include ecological agriculture, agroecology, biodynamic farming, low-input farming, permaculture, restorative, regenerative, sustainable and, in some cases, "traditional" agriculture, all of which are based on similar concepts. These various concepts all include substituting diversity (through rotational cropping) for monoculture, recycling wastes and creating a fertile productive soil by natural means. As well, they aim at operating without the use of pesticides or synthetic chemical fertilizers.

Allied with appropriate modern technology, sound conservation practices and the establishment of an ecological balance with minimum damage to the environment and wildlife, these aims will ultimately seem appropriate whatever your motivation for making the change.

The task is not an easy one and not necessarily very profitable to begin with, but persistence improves you farm's capability as time goes on. It has been shown over the long term that organic farms compare very favorably with conventional ones both in productivity and profitability, especially under adverse conditions>(*7)

For that matter, as bankruptcies and abandonments are frequent, despite subsidies, can conventional farming really be considered profitable? (This is without taking into account environmental damage, long-term topsoil and fertility loss, human health deficits and social degradation, none of which appear on the financial balance sheets.)

As an obvious first step, it is necessary to prepare yourself thoroughly. Advantages and constraints must be carefully studied (Table 1). It is advisable to visit other farmers who have made the change, especially those in your neighborhood or with similar conditions. Read as much as you can of other people's experiences and traditional organic authors. (*3) Federal and provincial Agriculture Departments may not have advice and are lacking in information and trained personnel to help you. As yet, there is little or no financial assistance to see you through the lower-profit transition period. This is not a unique situation. A US report, Alternative Agriculture by the National Research Council (*7) shows unequivocally that there has been a "bias against alternative farming systems" and an "inability of publicly supported research institutions to provide information...".

In the UK, Barry Wookey in his book Rushall: The Story of an Organic Farm states: "This

(experimental) work should have been undertaken by the Ministry of Agriculture by devoting one of its farms to research on organic methods or by conducting the same research on parts of all its farms. Despite my efforts and those of the organic movement, the Ministry has never faced up to the challenge. One day it will regret this.”(13*) So, your decision will be largely a personal one, probably lacking official support, although the situation is changing.

Table 1: Pros and Cons of Changing from Conventional to Organic Agriculture

Pros

- Improved natural fertility and efficient nutrient cycling.
- Sustainable system withstands stress and reduces topsoil loss.
- Less soil and water contamination
- Farm family and laborers are not exposed to poisons.
- Crop rotation and diversity can lessen pests, weeds, diseases, risks and harvest time pressure.
- Forage legumes fix nitrogen, bring up trace minerals, improve tilth and reduce soil compaction.
- Lower inputs reduce costs and lessen vulnerability to market fluctuations.
- Conservation of non-renewable resources and energy. On-farm resources are used more.
- More nutritious, better tasting food for increased consumer health and satisfaction.
- Farmer satisfaction is greater.

Cons

- Demands more time and management skills.
- May be more labor intensive.
- Initial income drop during transition period.
- Not a remedy for farms already financially troubled.
- Better prices for organic foods decrease as more producers jump on the bandwagon.
- Different machinery and new buildings may be necessary.
- Credit is difficult to obtain for “transition” farmers.
- Agriculture industry and international trade will not change with you.
- Increased stress to farmer, land and animals associated with the changes. Expect dislocation.
- Insect cycles need study. Crop monitoring and timing necessary for control.

Preliminary Decisions

If, after weighing the pros and cons, you decide to go ahead, there are some preliminary decision to be made:

1. Will you be farming with or without livestock?

This will directly affect your management plans. If you already have livestock, this is a plus in your favor. Straw from grain can be used as bedding and in compost. Forage legumes, the best soil conditioners, are fully utilized by ruminants and, of course, animals can stabilize income. Farming without livestock is more complex as outside sources of manure/fertilizer have to be found. Composting is possible but is easier with manure. Organic authorities recommend inclusion of livestock in your system.

2. Are you aiming at certification either right away or in the future?

Certification standards are rigorous. If you convert all at once, it will take three years and with consumer pressure for certified organic food now this may seem a long wait. However, going “cold turkey” is a difficult process. Farmers need time to learn new management skills and the soil needs time to rebuild itself. It is better to go slowly and convert part of your farm at a time - even a few fields, what you can afford to risk while experimenting. Done gradually, the full transition can take many years. However, this enables you to absorb mistakes and learn as you go. Organic authorities recommend becoming certified but converting slowly - over a period of five to ten years.

3. Are you able to withstand a lower income during the transition period?

It takes time to establish a good nutrient cycle and to regenerate soil. There may be initial expense with livestock buildings and machinery depending on how you farmed before. Virtue being its own reward is all you can rely on at the moment unless you can find a financial backer. Many farmers experience a drop in crop yield during transition. This drop in yield is greater with crops like corn and vegetables than with forages or small grains.

4. Have you an assured market for organic produce which is easily accessible on a good transportation route for pick up or delivery?

The demand for organic produce is strong now and prices are good, but look before you leap. Be sure that what you want to grow is in demand, or change to what is needed. Check out payment procedures as buyers can be slow in settling up. Aggressive marketing is of vital importance.

5. Have you a specialty that will sell as an attraction?

If you don't have a regular organic market, try to develop one. A pick-your-own operation with vegetables, berries and apples, a community supported agriculture (CSA) program or a nursery business will bring customers to you, which saves money but not necessarily time (people love to come to the country and chat). Other products such as cider, maple syrup, freezer meats, organic ice cream or stone ground flour from your own wheat are also drawing cards as you develop your own clientele. Look for an on-farm specialty or “niche” - innovative ideas can become good business.

Assessment of Resources

With preliminaries out of the way, it is time to assess your own resources before making your final plan.

Human

The organic farmer needs an adaptive, patient, and innovative temperament, eager to meet the challenge of new ideas (actually they are the old traditional ones!) and the more difficult skills of a rotational system that is the heart and soul of ecological agriculture. Plans rarely work out exactly and you must be prepared for setbacks and able to accept them. The first step is the worst; after that things tend to fall into place, although some farmers notice a doubting period about half way through the transition, when full regeneration has not yet taken place and you begin to wonder if it ever will. This is where the patience comes in.

As in conventional farming, a supportive spouse, family or associate is a blessing. It is helpful for a member of your unit to have skills in plumbing, electrical work, carpentry, bookkeeping and mechanics. The cost of such work is high. Many farmers have an innate knowledge of

mechanics and such a skill saves time and money by:

- spot repairs and maintenance of machinery;
- becoming familiar with older and preferably less heavy machinery, which can be “babied” into useful service;
- adapting existing machinery to new purposes.

At least one person should work full-time on the farm, because daily observation and care are an essential part of organic farming. Assess possibilities of off-farm help for peak periods, when time is at a premium, and be sure to plan ahead.

Organic farmers are usually willing to help each other and share information. Before making the transition join an organic farming organization, take part in farm tours, courses and conferences and read up on the issue.

Climate

Climate is beyond your control but you can keep temperature and rainfall records, which may be of help in times of climatic change. Techniques to mitigate drought and heat should be studied, such as mulching, and timing planting to maximize use of moisture and prevent soil erosion.

Land

Land is the farm’s backbone; study every inch of it! Make maps. To develop your land’s potentials you must be aware of its ranges of soil types, water availability, slope, temperature and fertility. You will need to tailor your crops and rotations to your land and match field size to its contours. For instance, strip cropping helps to control erosion on slopes by combining contour planting with rotations in alternate strips across the slopes. Windbreaks reduce soil erosion, protect crops and conserve moisture (2*).

Water

Conservation of water should be a priority. A pond is a valuable adjunct, especially in times of drought. It attracts wildlife, birds and frogs, the two latter being inveterate insect eaters.

Birds

Make a list of those you have and plant to attract more. Wrens, for instance, demolish Colorado Potato Beetles. Farm hedges are habitat for wildlife and birds. Traditional farmers often left a strip in their fields to grow wild. They even seeded them with “herbs” to attract wildlife and insects.

Weeds

Though certainly not our best friend, weeds are a resource none the less as indicators of and contributors to soil fertility (4*) (8*). Make a list of the weeds and determine where they are located and whether they are annuals or perennials. Keep track of them - you can learn much from their study. Weeds bring up micro nutrients from the soil and deep-rooted ones keep the soil open. Some weeds are beneficial and quite acceptable in pasture and forage crops.

Dandelions and lamb’s quarters are nutritious for livestock (human too for that matter). Usually a well-balanced soil does not have a preponderance of weeds. The allopathic capacity of weeds can work for you and is worth serious study. Some plants are inimical to others and can inhibit their growth; other plants grow well together and benefit each other. There are good weed/crop combinations (1*) (11*).

Planning the System

Soil becomes degraded with chemical additives and continuous mono culture. It takes time to

restore a system of nutrient cycling. Soil tests should be taken and should be as detailed as possible. Analysis should include Cation Exchange Capacity as well as levels of available nutrients to help you identify problems. Aim to restore the natural tilth and fertility of the soil without chemicals.

Crop Rotations

Rotations diversify crops in time and have been credited with controlling populations of weeds, diseases and insects. Nutrients can also be replenished in the topsoil by rotating to a deep-rooted crop after growth of a heavy-feeding crop. In addition, legumes are well known for fixing atmospheric nitrogen and then contributing this available nitrogen to plants. The nitrogen can be held in decomposing plant biomass in the soil or in cover crops for subsequent nitrogen users in the rotation. Apart from the nitrogen benefit of some rotations, there is also a “rotation effect”. For example, soybean yields are often higher after small grains or corn than after soybean.

The ideal rotation is subject to specific soil and climatic conditions and natural vegetation. Haying often must be done when it is time to rotary hoe or cultivate row crops. The most effective rotation may be different on each farm and on parts of the same farm according to local conditions and requirements.

It is useful to plan for heavy-feeding crops to follow soil builders. In Ontario, corn or winter wheat can suitably follow a legume sod plowdown. On a livestock operation, heavy applications of compost or manure are useful before planting corn (Table 2). If compost is applied in the fall, oil radish can be planted to hold nutrients over winter. Oil radish can also be sown after winter wheat to release phosphorous and provide a winter cover crop. The next year would then include a spring cereal such as oats and/or barley, possibly mixed with peas and underseeded with a legume-grass forage crop. Barley is a flexible crop for livestock, as it can be fed as silage if it has to be cut early to control weeds or because it has lodged. Imperfectly drained land might best be seeded to red clover or trefoil rather than alfalfa. The hay crop may maintain an adequate proportion of legumes for four years, but usually a shorter period for hay is better, so that perennial weeds are controlled.

The rotation in Table 3 features a heavy reliance on legumes, both pulses and forage legumes. The lentils and flax are grown when nitrogen levels are low to reduce weed pressure. Weed problems can develop in these crops when nitrogen levels are high, for example, after a green manure ploughdown. Highly competitive crops, like cereals are alternated with the less competitive peas, lentils or flax. The clover can be used for hay or as a green manure.

Table 2: Potential Rotation for a Livestock Operation

<u>Year</u>	<u>Crop</u>
1	Corn planted on soil previously treated with manure or compost and overwintered under oil radish
2	Barley (possibly for silage) underseeded by alfalfa
3	Alfalfa hay
4	Alfalfa hay and pasture, sod broken and planted to winter cereal in the fall
5	Winter wheat, winter rye or winter triticale followed by oil radish in the fall

Table 3: Potential Rotation for a Prairie Farm (15)

<u>Year</u>	<u>Crop</u>
1	Red clover or yellow sweet clover for green manure or hay
2	Cereal crop

- 3 Peas or lentils or flax
- 4 Cereal planted and overseeded with red clover

Tillage

The best tillage implement is probably a field of red clover. The soil is penetrated and held in place by fine roots, microbial activity is enhanced for the build-up of solid organic matter, annual weeds are checked, rain drop impact is reduced and water movement is facilitated through numerous small root channels. There is also the nitrogen benefit from legume N₂-fixation. However, farmers choose to grow other crops which require appropriate seed beds, reduced competition from weeds and soil with adequate organic matter and moisture availability, both in the short and long terms. As a general rule, excessive tillage should be avoided because soil can be compacted and losses of organic matter accelerated. On the other hand, a timely tillage operation can prevent herbicide use.

The use of moldboard plows should be restricted, if possible, to turning under sod. Other primary tillage can be done with chisel plows or offset disks to prevent the formation of a plow-layer. It is advisable for bare ground to be arranged in strips between strips of vegetative cover or to maintain a ground cover over winter, to prevent erosion.

Secondary tillage may be important for seed bed preparation for some crops, and if well-timed can destroy emerging weeds, but it should be done sparingly. Minimum-tillage or no-tillage proponents argue that secondary tillage is unnecessary. Frequently, the only option for weed control in a strict no-till program is the spraying herbicides. However, a no-till planter can be used as part of a ridge-tillage operation to avoid primary tillage in the fall so that the crop residues protect fields over winter. Be aware that pest and disease problems will develop if a given crop is planted into residue of the same crop. Ridge-tillage facilitates early soil warming and drying in the spring and is well-adapted to inter row cultivation (Nature's Ag School). In Eastern Ontario, Ron and Jack McCoy have developed a minimum-tillage system and demonstrated that the use of herbicides can still be reduced to the point where none are used on most fields (*REAP Newsletter*, 2 (*4): p.4 1989).

After crops are planted, secondary tillage operations include inter row cultivation, harrowing, rotary hoeing and the use of finger weeders or spring weeders (*New Farm*, March/April 1989). It is important to take advantage of the principle that emerging broadleaf weeds have shallow root systems and can be easily removed without damage to a deeper rooted crop. Light tillage operations to control weeds in standing crops have a minimal negative impact on the soil. Sometimes effective weed control can be achieved by planting a crop into a winter cover crop which is then mowed, or by chopping a spring cereal crop for silage before weeds go to seed. Quackgrass may be set back by tillage, but it may be more effectively controlled by inter planting ryegrass into corn, and some argue that there is nothing better than a good stand of buckwheat to gain the upper hand with quackgrass.

Manure Management

It is recommended that organic farmers keep livestock, among other reasons, for easy access to manure, a source of fertilizer. It is preferable not to spread manure directly onto the fields. Avoid application in the fall unless there is a cover crop to hold the nutrients. Do not spread manure on frozen ground or snow. After spreading, incorporate as soon as possible. Manure is a good source of nitrogen.

Organic authorities recommend composting manure rather than applying it directly. Composting is a biological process that encourages microorganisms to decompose organic matter by aeration, moisture and heating factors. Requirements are:

- 50 - 60% moisture which can be adjusted by adding dry matter or moisture;
- 5 - 15% air, introduced by turning the pile or by the use of aerated pipes and blowers;
- a carbon/nitrogen (C/N) ratio from 10/1 to 30/1;
- a normal temperature range (mesophyllic) between 5-41 deg. C for optimum microbial activity;
- a higher temperature range (thermophyllic) between 41-54 deg. C to kill pathogens and weed seeds;
- a pH6-pH8 range for best results.

There are many different composting methods. The windrow, static pile and in-vessel methods are most common (*10). Composting is possible without the use of manure by using other sources of nitrogen but keeping the C/N ration the same. Some farmers prefer to incorporate organic amendments into the compost pile.

Be sure that any organic fertilizers you use conform to those allowed by the certifying body. Kelp is a good soil amendment because as well as Pand K, it contains a wide spectrum of trace minerals. Dolomitic limestone is the form of lime to use, and colloidal rock phosphate, organic bonemeal and greensand are some of the sources of phosphorus. Granite dust, greensand and hardwood ashes can supply potash. Certification standards are quite explicit about what may or may not be used and what practices are to be followed, both for field work and animal care. They should be studied well before you decide on making the change.

Green Manures

Legumes are an excellent source of nitrogen when incorporated into the field. In addition, they produce organic matter, protect the soil against excessive solar radiation, wind, water and temperature and suppress weeds. Green manures also extract minerals from the soil and make them available to subsequent crops.

Control of Pests and Diseases

The deleterious effects of pesticides have been well documented. Selective crop combinations and tillage systems are the first line of defence against pests. Intercropping, double cropping and polyculture reinforce pest control and beneficial organisms are natural helpers.

Weed Control

Weeds are not necessarily damaging to crops and are usually most detrimental to yield during the first third of crop growth (*1). Tillage practices can reduce weed ascendancy as well as such strategies as:

- (a) correcting soil imbalances where weeds thrive;
- (b) mowing annual weeds before they go to seed;
- (c) increasing plant densities;
- (d) timing and staggering crops;
- (e) cover crops and mulches.

Due to the allelopathic effect, it is advisable to plant crops that are toxic to weeds or tolerant of them (*11). There are ongoing research experiments with Flamers, Weeder Geese and other

tactics.

Disease Control

The best control for pathogens is to use disease resistant seed. Sanitation, disposal of diseased plants and crop rotation are good practices. Soil pH can be manipulated to eliminate some problems. For example, scab in potatoes is controlled by planting in more acidic soil

Insect Control

Insect control requires an intimate knowledge of insect life cycles and habitats and vigilant monitoring in the field. Insect resistant varieties of some crops are obtainable. Natural insect controls are predators, parasites and pathogens which are free. They have adapted to your field conditions and microclimate. Pesticides decimate beneficial as well as harmful insects which are shown to be slower to regenerate than pests. Beneficial insects may be purchased. They require careful handling; their release has to be timed accurately to match the target pest and the correct coverage must be estimated. Once established, however, they are expensive and maintenance free.

Integrated Pest Management (IPM)

is a system that integrates several strategies to control pests and by careful, continuous monitoring determines when a pest approaches a level requiring intervention. Row covers, pheromones and vacuum suction are strategies under experimentation.

Action Plan

A. Designate and draw up a map of the acreage to be converted to organic production. Consider the most likely portion to be successful, possibly land where alfalfa has been grown previously. Alternatively, consider poor land for restoration purposes. If not successful, you have less to lose. Determine what to plant on the land you chose. Find a source of certified organic seed and consider open-pollinated varieties if you can.

B. As crop diversity and rotation are the most important part of your procedures, consider putting some of them in place before gradually eliminating fertilizers and pesticides. Try to reduce pre-emergent herbicides first. Keep records.

C. To assess your progress use side-by-side fields or strips for comparison. Dick Thompson of Practical Farmers of Iowa has developed a system of randomized/replicated side-by-side comparisons for such on-farm research which is considered a model of its kind (*12).

The transition to ecological agriculture is for the well-being and health of the land, the environment and the people at a reasonable profit.

Sources Cited in Document

*1. *Altieri, Miguel A.* 1987. **Agroecology: the Scientific Basis of Alternative Agriculture.** Boulder: Westview Press. 227 pp. (Theory with practical examples. Part 4 covers insect, pathogen and weed control).

*2. *Brandie, J.R./Hintz/Sturrock* (eds.) 1988. **Windbreak Technology.** Proceedings of 1st International Symposium. Lincoln, Nebraska, 1986. New York: Elsevier. 598 pp. (Wind erosion, control, soil and crop protection, snowfall management.)

*3. *Canadian Organic Growers.* **Ecological Agriculture Early Writings.** COG Reference Series #1 Part I/1991.

4 pp. (Bibliographical essay on the founders of the organic movement.)

- *4. *Cocannouer, J.A.* 1950. **Weed Guardians of the Soil.** New York: Devin Adair. 179 pp.
- *5. *Debach, Paul.* 1974. **Biological Control of Natural Enemies.** Cambridge: University Press. 323 pp.
- *6. *ECO-FARM Supplement.* 1989. **Making the Transition - Three Views.** Organic Food Matters, Vol. II, nos 3,4 Fall/Winter 1989.
- *7. *National Research Council (US).* 1989. **Alternative Agriculture.** Washington D. C.: National Academy Press. 448 pp. (Part 2 consists of 11 case studies of 14 organic farms, well documented. pp. 247-417).
- *8. **Pfeiffer, Erhenfried. Weeds and What They Tell.** Reprint of an early bio-dynamic work. Toronto: Tri-fold Book Service.
- *9. *Power, J.F.* ed. 1987. **The Role of Legumes in Conservation Tillage Systems.** Ankeny, Iowa: Soil Conservation Society of America. 153 pp.
- *10. *Rynk, Robert,* ed. 1988. **Proceedings of the On-Farm Composting Conference, Jan. 1987.** Amherst, MA: U of Massachusetts. 94 pp.
- *11. *Thompson, Alonzo C.,* ed. 1985. **The Chemistry of Alleopathy: biochemical interactions among plants.** Washington, D.C.: American Chemical Society. 470 pp.
- *12. *Thompson's On-Farm Research. Summary. A Farmer's Approach to On-Farm Design. Paper.* 20 pp.
- *13. *Wookey, Barry.* 1987. **Rushall: The Story of an Organic Farm.** New York: Basil Blackwell. 209 pp.
- *14. *Reganold, J.P./Eliot/Unger.* 1987. **Long-term Effects of Organic and Conventional Farming in Soil Erosion.** Nature 330: 370-372.
- *15. *Wallace, Janet.* ed. **Organic Field Crop Manual.** Second edition. Canadian Organic Growers, Ottawa. 2001. 292 pp.

Other Resources

Appropriate Technology Transfer for Rural Areas (ATTRA), Fayetteville, Ar. <http://www.attra.org>

Brusko, Mike. ed. **Profitable Farming Now!** Regenerative Agriculture Association. Emmanus, PA. 1985.

Canadian Organic Growers. Organic Agriculture Selected Books and Sites, COG Reference Series #1 Part II, 2001.

Canadian Organic Growers Website, Ottawa. <http://www.cog.ca>

Dougherty, M. **Field Guide to On-Farm Composting.** Northeast Regional Agriculture Engineering Service. NRAES-114. Ithaca, N.Y. 1999. 128 pp.

Environment Canada and Manitoba Agriculture. Getting Started in Organic Farming. Winnipeg, Manitoba. 1992. 46 pp.

Kirschenmann, Frederick. **Switching to Sustainable Agriculture: Strategies for Converting from Conventional/Chemical to Sustainable/Organic Farming.** North Plains Sustainable Agriculture Society. Windsor, North Dakota. 1988. 18 pp.

Macey, Anne. ed. **Organic Livestock Manual.** Canadian Organic Growers. Mothersill Printing Inc. 2000. Canadian Organic Growers, Ottawa.

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