



USING COMPOST FOR GROWING VEGETABLES



BENEFICIAL MANAGEMENT PRACTICES (BMPs) FACTSHEET



Compost is a soil amendment and source of essential nutrients.

WHAT IS COMPOSTING?

Composting is the controlled management of a naturally occurring biological process called aerobic decomposition. When properly managed, composting microorganisms break down and stabilize organic materials over time to produce a uniform soil amendment and source of essential nutrients - compost.

Composting benefits include improved properties, reduced environmental risk and potential economic advantages. For growing vegetables, compost is an excellent source of numerous essential nutrients and improves soil growing conditions.



WHY COMPOST?

- Compost Benefits:
 - Reduces manure mass and volume over 1/2 (lower hauling costs), concentrates nutrients
 - Eliminates unpleasant odours
 - Destroys weed seeds, parasites and pathogens
 - Source of stabilized slow-release nutrients
 - Reduces risk of loss to ground or surface water because nutrients are in more stable forms
 - Improves soil properties such as porosity/ aeration, water infiltration and retention capacity, soil organic matter content
 - Compost has a uniform, soil-like quality



Composting destroys pests and eliminates unpleasant odours

WHAT IS REQUIRED TO COMPOST AT A SMALL TO MID-SCALE?

- Suitably sized composting site that adheres to regulatory setback distances from water sources and property lines; all-weather accessibility is ideal
- Composting starting materials such as manure, garden waste, leaves, etc.
- Depending on the amount of materials to be composted, composting equipment can range from a skid steer or front end loader to a dedicated compost turner
- Calculator tool or formulas for determining mixing ratios according to C:N ratio and moisture content; lab analyses or book values for C:N ratios
- Recording sheets for monitoring moisture and temperature and characterizing windrows
- Compost thermometer (20" or longer)
- Access to water

Table 1: Composting materials properties.

Starting Material	C:N ratio	Moisture
Agricultural Sources		
Cattle manure	16-20	Medium
Sheep manure	16	Medium
Straw	50-100	Low
Other Sources		
Wood chips	100	Low
Leaves	60	Medium
Grass clippings	20	High
Vegetable waste	13	Medium-high
Garden waste	40	Medium

COMPOSTING TIPS FOR SUCCESS

There are three critical factors to manage for successful composting, which equate to creating an ideal environment for composting microbes:

- **Starting Carbon : Nitrogen ratio:** Target **C:N ratio is 30:1**, although a range of 25-35 will still produce good quality compost if properly managed
- **Moisture Content (MC):** Maintain a **MC of 45-60%** (optimal 55%) throughout the active composting phase, avoiding letting the material either dry out or get too wet
- **Particle Size:** Windrows with a **mix of particle sizes** (6 to 75mm, 0.25 to 3") have good structure and airflow, but will not dry out too quickly. Smaller particles allow greater contact between microbes and materials.

Management:

- Use a mixing rate calculator tool to determine the proper mixing ratio for starting materials
- Thoroughly mix compost starting materials as recommended to achieve moisture and C:N targets
- Form uniform windrows of medium size to better manage moisture and aeration
- Regularly monitor and record temperature and moisture: Maintain an ideal environment for composting microbes by turning and/or adding water as needed
- The need for active windrow management is highest during the hot phase when decomposition is most rapid so that composting microbes are provided with adequate oxygen, moisture and "food" (digestible materials)
- Temperature profiles are the primary indicator of compost "doneness" - the active composting phase is complete when temperatures approach ambient and turning no longer generates a temperature increase
- Move finished windrows into piles for the curing phase (minimum 21 days)

Use a calculator
tool to
determine
mixing ratios

USING COMPOST FOR GROWING VEGETABLES

Compost is a soil amendment and a fertilizer...but not a soil substitute:

Mixing compost with soil improves both soil and compost properties

- Using compost as the sole growth medium may result in plant injury since manure-based compost may contain higher than desired salts/sodium levels
 - ⇒ Mix compost with soil rather than using compost as the sole growth medium to avoid potentially harmful effects to growing plants/seedlings
 - ⇒ If you are unsure of salt levels, conduct a seed germination test prior to using
- Repeated additions of compost to the same plot of land can lead to very high soil nutrient levels and therefore increased risk for loss to the environment
 - ⇒ Soil test to determine what if any nutrients are required for optimal plant growth
 - ⇒ Run nutrient analyses to determine nutrients, salts and other agronomic information
 - ⇒ Do not apply compost to soil if soil nutrient levels exceed recommended levels
- Often compost is not really compost ... but rather just aged manure
 - ⇒ Conduct a self-heating test or use a Solvita kit to determine if the material is stable (i.e. is compost)
 - ⇒ Send a sample to A&L labs for compost analyses for assurance that the material meets the CCME compost criteria standards for pathogen, trace element and foreign matter content

Table 2: Is it compost or manure/other composting material?

Measure	Compost	Manure and/or Other Composting Materials
Odour	earthy, mild	unpleasant, may smell like rotten eggs or ammonia
Particle size	uniform	mixed
Temperature	ambient	warmer in centre
Presence of pests (e.g. flies)	no	yes
Material composition	uniform/non-distinct	different materials visible (e.g. straw, wood chips)

COMPOST CRITERIA

As established by the Canadian Council of Ministers of the Environment (CCME), for organic materials to be considered fully composted, the following criteria are to be met:

- Composting material temperature is to exceed 55°C for at least 15 days with at least five turning events during this period
- The final Curing Phase is to be at least 21 days
- Compost is free of pathogens and meets trace element and foreign matter limits
- Meets stability (“doneness”) requirements

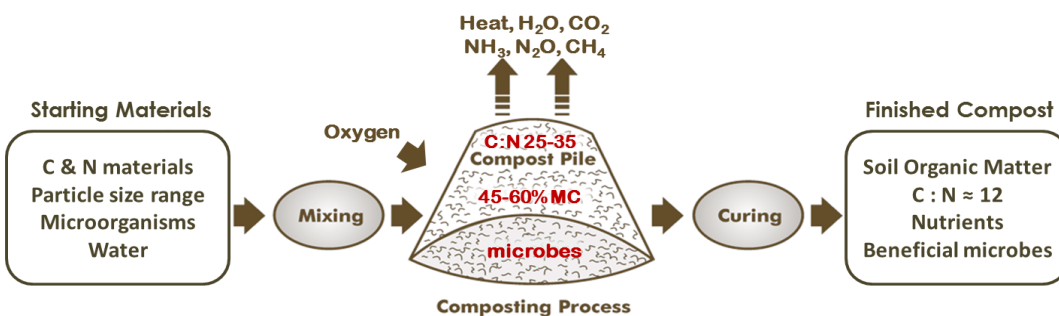


Figure 1. Simplified composting process (adapted: Alberta Agriculture, Food and Rural Development, 2005).

Mix compost
with soil -
mixing improves
both soil and
compost
properties

True compost
meets specific
criteria
established by
the CCME

TROUBLE SHOOTING

Problem	Possible Cause	Management
Unpleasant odour	Anaerobic conditions	If excessive moisture add dry material If poor structure, add “fluffy” or “airy” material or add material with larger particle size If windrow is large, reduce size to improve aeration
Ammonia odour	Too much nitrogen	Add C-rich material such as straw or wood chips
Windrow is too hot (>70C)	Windrow is too large	Increase monitoring for moisture and reduce windrow size if needed
	Not enough carbon	Add some C-rich material such as straw or wood chips
Windrow does not heat	Too dry	Add water and turn windrow
	Too small	Combine windrows to increase size
	Too wet	Turn windrow to improve aeration; add dry material
	Not enough nitrogen	Mix in N-rich material such as manure (low bedding)
Windrow does not re-heat	Too dry	Add water and turn windrow
	Too wet	Turn to aid drying
	Compost is near finished	Pile windrow for curing

Numerous
composting
resources and
tools are
available online

RESOURCES

NCLE website <http://umanitoba.ca/afs/ncle/programs/composting.html>

- Composting calculator tool for determining starting material mixing ratios
- Composting protocol (includes formulas for calculating moisture content, bulk density and the self-heating test to assess compost stability and sampling procedures)
- Windrow information and monitoring recording sheets (moisture and temperature)

Provincial regulations:

- Manitoba Livestock Manure and Mortalities Management Regulation, M.R. 42/98.
Available at: http://web2.gov.mb.ca/laws/regs/current/_pdf-regs.php?reg=42/98
(accessed Sept. 2016)

Additional composting guides/resources:

- Alberta Agriculture, Food and Rural Development. 2005. Manure Composting Manual. Available at: [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex8875#Introduction](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex8875#Introduction) (accessed Sept. 2016)
- NDSU Extension Service. 2010. Composting Animal Manures. Available at: <https://www.ag.ndsu.edu/manure/documents/nm1478.pdf> (accessed Sept. 2016)
- Nova Scotia Agricultural College, On-Farm Manure Management Through Composting. Available at: http://www.nsfa-fane.ca/efp/wp-content/uploads/2014/07/manure_management_through_composting.pdf (accessed Sept. 2016)

Select additional information:

- Canadian Council of Ministers of the Environment (CCME). 2005. Guidelines for Compost Quality. Available at: http://www.ccme.ca/files/Resources/waste/compost_quality/compostgdlns_1340_e.pdf (accessed Sept. 2016)
- Soil and manure analyses (Winnipeg): Central Testing Laboratory Ltd. and Farmers Edge
- Compost analyses (Ontario): A&L Canada Laboratories Inc. <http://www.alcanada.com/agricultural-compost.htm>
- Solvita compost maturity test kit (6 pk) <http://www.alcanada.com/About-Solvita.htm>



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