

Mass Balance Instruction for Crop and Livestock: USDA National Organic Program

The purpose of the mass balance procedure is to verify that the quantity of organic product produced and sold aligns with the quantity of organic production, inputs purchased, used, and stored. A Mass Balance may be a yield audit, a sales-compared-to-yield audit, a production audit, or an inventory-compared-to-purchase or production audit. The goal is to validate that non-organic materials have not been substituted for or mixed with organic materials, or to indicate whether conventional production practices have been employed to increase yield. A mass balance can also be utilized for prohibited or allowed inputs.

I. General Requirements for All Operations

1. **Scope:** The mass balance shall cover all certified organic products and operations (crops, livestock, and/or handling). Each scope must have its own Mass Balance audit.
2. **Frequency:** The mass balance should be conducted a minimum of **annually**, or more frequently based on risk or other factors (e.g., after each harvest, processing batch, or at the end of a production cycle).
3. **Documentation:** Maintain records for a minimum of **five years** (or as required by the certifying agent/NOP rule) including:
 - Inventory records (beginning and ending).
 - Purchase invoices for all inputs (seeds, feed, amendments, etc.).
 - Sales/shipping records for all outputs.
 - Production records (yields, feed consumption, batch records).
 - Mass Balance Worksheet/Summary (as detailed below).
4. **Reconciliation:** Any significant discrepancies (typically $\geq 5\%$) between the calculated organic output and the actual organic output must be investigated and explained. This does not automatically indicate a compliance issue. In the case that a discrepancy indicates fraud or violation of requirements, compliance action should be taken.

II. Mass Balance for Organic Crop Operations

The mass balance for crop yield focuses on starting inventory, harvest, sale, and comparison to expected yield. You can also perform a mass-balance on **organic seed/plant material** and **certified organic harvested product**, accounting for **expected yield** and **on-farm use**. Considerations for crop mass balance take into account production type (irrigation, dryland, etc.), regional yield norms, and input activity.



A. Records to Track (Per Crop/Field)

*not all records will be necessary for every Mass Balance

Input/Output Type	Required Data	Source of Data
Beginning Inventory (A)	Quantity of prior year's harvested product on hand or purchased product still in inventory, if applicable.	Storage/Purchase/ Inventory Records
Harvest or Use Records (B)	Quantity of harvest or use or inputs being audited.	Harvest records/ weigh sheets/ application records
Purchased or Brought-in Product (C)	Quantity of purchased or brought-in product.	Purchase Records/ Delivery Records Organic Certificates
Sales/Transfers Out (D)	Quantity/Weight of all certified organic product sold or harvested	Sales/Shipping Records
Loss/Shrinkage (E)	Documented and justifiable losses (spoilage, shrinkage, cleaning, etc.)	Production/Grading Records/ Established Norms for product shrinkage
On-Farm Use (F)	Quantity used for organic feed, seed, or planting	Production/Use Records
Ending Inventory or Expected Yield (G)	Quantity of certified organic product on hand Expected Yield	Storage/Inventory Records Regional acreage yield expectation Previous year's yield
Organic Inputs Purchased (H)	Quantity/Weight of Organic Seed or Transplants Quantity/ Weight/ Volume of purchased or applied inputs.	Purchase Invoices/Seed Tags Application Records for organic and nonorganic production.
Organic Inputs Produced (I)	Seed/Transplants from on-farm Organic Stock Used	Production/Inventory Records



B. Mass Balance Formula for Crops

The total quantity *accounted for* must approximately equal the total quantity *produced/ used*.

Yield Mass Balance:

[A(Beginning Inventory)+B (Harvest Records)+C(Bought or Mingled Product)]-[D(Sales/Transfers)+E(Loss/Shrinkage)+F(On-Farm Use)]

≈G (Ending Inventory/ Expected Inventory)

Compare to Ending Inventory, Real or Expected Yield based on region/ production type/ or noted use record.

- **If $(A+B+C)-(D+E+F)>G$:** A surplus is expected (e.g., unexpected yield).
- **If $G>(A+B+C)-(D+E+F)$:** A deficit occurs, indicating potential issues (e.g., commingling, unaccounted loss, non-organic input use) that require investigation.
 - Note that buffer harvest may need to be accounted for, as well as cleanout.

III. Mass Balance for Organic Livestock Operations

The mass balance for livestock focuses on the flow of **organic feed** and **organic animals/animal products**, ensuring that all animals designated as organic meet the feed and living requirements. You can also perform a mass balance on medication, treatments, feed or remedy inputs, or any area of risk where records have been maintained for purchase.

A. Records to Track (Per Organic Herd/Flock/Product)

Input/Output Type	Required Data	Source of Data
Organic Feed Purchased (H)	Quantity/Weight of certified organic feed bought	Purchase Invoices
Organic Feed Produced/Used (I)	Quantity/Weight of on-farm organic feed used	Production/Use Records/ Feed Inventory
Beginning Livestock Inventory (J)	Number of organic animals by class/age	Inventory/Herd Records/ Birth Records/ Receiving Records



Sales/Slaughter (K)	Number of organic animals sold/treated/slaughtered (including culls)	Sales/Treatment/ Euthanasia/ Slaughter Records
Births/Acquisitions (L)	Number of organic animals born/brought onto the farm	Birth/Acquisition Records Organic Certificates
Mortality/Loss (M)	Number of animal losses (must be documented)	Mortality/Vet Records
Ending Livestock/ Poultry Inventory (N)	Number of organic animals by class/age	Inventory/Herd/ Flock Records
Organic Product Output (O)	Quantity of organic milk/eggs/fiber/ animals/ meat sold/used	Sales/Production/ Harvest Records
Estimated Feed Consumption (P)	Estimate based on species, production stage, and feed type	Standard Rations/Feed Plan
Pasture Records (Q) (Ruminant only)	Dates on pasture/ Animal numbers/ Feed Records	Pasture Records/ Feed Records

B. Mass Balance Formulas for Livestock

The livestock operation requires two key balances:

1. Animal Count Balance: Verifies the number of organic animals.

$$(J+L)-(K+M)=N$$

2. Feed Balance (Verification of Organic Status): Ensures sufficient certified organic feed was available for the entire organic animal population.

$$(H+I) \approx P$$

- **Verification:** The *total actual organic feed consumed* (P) must be justified by the *total available organic feed* (H+I) and should align with the established **Organic System Plan (OSP)** feeding program. A significant shortage in organic feed indicates a compliance issue.
- **For Product Output:** For products like milk or eggs, the **Organic Product Output (O)** must be reasonably correlated with the number of producing animals in inventory (N) and their typical production rates (as specified in the OSP).



C. Which Audit To Perform:

Options for Crop Mass Balance:

- 1) Seed mass balance: purchased/ saved and planted seems appropriate for documented seeding rate and remaining inventory.
- 2) Yield Mass Balance: Acreage yield appropriate for crop/ regional production/ production type. Accounts for buffer area harvest as conventional, if applicable.
- 3) Sale Mass Balance: Amount of product sold is appropriate for yield production.
- 4) Input Mass Balance: Amount of expected use of inputs, treatments based on operation OSP/ Use records versus used material.

Options for Livestock Mass Balance:

- 1) DMI from Pasture: Audit 30% Dry Matter Intake from pasture- use the entire pasture grazing season by class of animal(s).
- 2) Feed Audit: amount of feed purchased, fed, and remaining inventory balances
- 3) Purchase and Livestock inventory mass balance: Evaluate if purchase records support livestock numbers.
- 4) sale/ product mass balance: Amount of milk, eggs, meat sold or shipped are supported by the number of animals and production age.
- 5) Medication/ Input Mass Balance: Audit of medication based on medication administration records, etc.
- 6) Land Audit/ Mass Balance- Is there enough pasture or outdoor access space for the number of animals?

Livestock DMD Tables for Reference:

Review resources 5017: <https://www.ams.usda.gov/rules-regulations/organic/handbook/5017>

Dairy Cattle: <https://www.ams.usda.gov/sites/default/files/media/NOP-5017-2-DryMatterDemandTablesforClassesofDairyCattle.pdf>

Beef Cattle: <https://www.ams.usda.gov/sites/default/files/media/NOP-5017-3-DryMatterDemandTablesforClassesofBeefCattle.pdf>

Goats: <https://www.ams.usda.gov/sites/default/files/media/NOP-5017-7-DryMatterDemandTablesforClassesofDairyGoats.pdf>

USDA Guidance on DMI Audits: <https://www.ams.usda.gov/rules-regulations/organic/handbook/5017-1>

