

Tab 1a. Pigs
Data Entry and Assumptions

Farm Specific Data Entry:

- Number of pigs for each pig category
- Type of manure storage

Fixed Variables

- Feed consumed per pig
 - Gestating sow, 2.3 kg/pig/day
 - Nursing sow, 6.3 kg/pig/day
 - Gilts, 2.7 kg/pig/day
 - Boars, 2.5 kg/pig/day
 - Weanling, 33 kg/pig/cycle
 - Grower-finisher (g-f), 262 kg/pig/cycle
- Number of cycles
 - 6.4 cycles/year for weanlings
 - 2.3 cycles/year for g-f
- Protein content of feed
 - 14% for gestating sows, gilts, boars
 - 15% for g-f
 - 16% for nursing sows
 - 18% for weanlings
- % N excretion calculated from ASAE 2005 pg. 16
 - 77% for gestating sows
 - 66% for gilts, boars, g-f
 - 55% for nursing sows
 - 52% for weanlings
- N Volatilization based on the Farm Practices Guidelines for Pig Producers in Manitoba, 1998
- P content of feed based on CFIA Table 4 and 2013 Manitoba Feed Survey
 - 0.59% for gestating sows
 - 0.65 for nursing sows and weanlings
 - 0.5 for g-f (limited by CFIA Table 4)
- P retention
 - 5.34 g/kg, Manitoba Feed Model
- % P excretion (calculated for Manitoba)
 - 92% for gestating sows
 - 95 % for nursing sows
 - 66% for gilts
 - 100% for boars
 - 45% for weanlings
 - 61% for g-f
- Pig numbers for Sows – Farrow to Nursery (28 kg) and Farrow to Finish:
 - Weanlings: 13.2 piglets per litter x 0.89 survival to wean x 2.375 litters per year /52 weeks per year x 6 weeks in room
 - Grower Finisher: 13.2 piglets per litter x 0.89 survival to wean x 2.375 litters per year x 0.972 survival to g-f / 52 weeks per year x 17 weeks in room

Tab 1b. Beef
Data Entry and Assumptions

Farm Specific Data Entry:

- Number of cattle for each category
- Weight in and weight out for each category (optional defaults provided)
- Days on feed (optional defaults provided)
- Number of cycles (optional defaults provided)
- Type of manure storage

Fixed Variables

- Feed consumed per animal based on 2.5% of weight per day as dry matter
- Protein in feed
 - 9% for pasture cattle
 - 10% for cows and bulls
 - 11% for bred heifers, calves and backgrounders
 - 12% for feedlot cattle
- % N excretion calculated from ASAE, 2005 pgs. 3-4
 - 85% for a finished animal applied to all categories
- N Volatilization based on the Farm Practices Guidelines for Pig Producers in Manitoba, 1998
- P content of feed
 - 0.17% for bulls
 - 0.19% for cows and pasture cattle
 - 0.21 for backgrounders
 - 0.22 for calves
 - 0.23 for bred heifers
 - 0.31 for feedlot cattle
- % P excretion based on ASAE, 2005 but adjusted for animals that are not gaining weight (cows and bulls)
 - 77% for all categories except cows and bulls
 - 96% for cows and bulls
- P retention in weight gain
 - 7-8 g/kg (Flaten 2003; Lynch and Caffrey, 1997)
- Animal numbers for Cows, plus associated livestock
 - 100 cows, 15 bred heifers, 90 calves, 3 bulls

**Tab 1c. Dairy
Data Entry and Assumptions**

Farm Specific Data Entry:

- Number of cattle for each category
- Weight in and weight out for each category (optional defaults provided)
- Type of manure storage

Fixed Variables

- Feed consumed per animal per day
 - 22.1 kg/day for a lactating cow
 - 13.1 kg/day for a dry cow
 - 0.7 kg/day for a calf (0-3 months)
 - 5.1 kg/day for a calf (3-13 months)
 - 10.6 kg/day for a replacement heifer
- Protein in feed
 - 16.5% for lactating cows
 - 11.5% for dry cows
 - 17% for calves (0-3 months)
 - 12.6% for calves (3-13 months)
 - 10.7% for replacement heifers
- % N excretion calculated from ASAE, 2005 pg 7
 - 75% for lactating cows
 - 95% for dry cows
 - 36% for calves (0-3 months)
 - 71% for calves (3-13 months)
 - 81% for replacement heifers
- N Volatilization based on the Farm Practices Guidelines for Pig Producers in Manitoba, 1998
- P content in feed
 - 0.44% for lactating cows
 - 0.22% for dry cows
 - 0.65% for calves (0-3 months)
 - 0.33% for calves (3-13 months)
 - 0.24% for replacement heifers
- P retained in milk
 - 0.9 g/kg milk (Flaten 2003; Lynch and Caffrey, 1997)
- P retained in weight gain
 - 8 g/kg (Flaten 2003; Lynch and Caffrey, 1997)
- % P Excreted
 - 78% for all categories based on average of MB excretion calculations
 - **to be reviewed**
- 32 kg milk/day
- Number of Animals for Cows, plus associated livestock
 - 100 mature cows (80 lactating, 20 dry), 8 calves (0-3 months), 20 (4-13 months), 35 (>13 months)

Tab 1d. Sheep
Data Entry and Assumptions

Farm Specific Data Entry:

- Sheep places
- Weight in and weight out for each category (optional defaults provided)
- Days on feed (except ewes plus associated livestock; optional defaults provided)
- Number of cycles (except ewes plus associated livestock; optional defaults provided)
- Type of manure storage

Fixed Variables

- N Volatilization based on the Farm Practices Guidelines for Pig Producers in Manitoba, 1998
- N excretion (ASAE 2005; AWMFH 2008)
 - 0.45 kg N per 1000 kg live weight
- P excretion (ASAE 2005; AWMFH 2008)
 - 0.07 kg P per 1000 kg live weight
- P retained in weight gain
 - **Unavailable**
- Number of Animals for Sheep, plus associated livestock
 - 100 ewes, 3 rams, 15 replacements, 294 lambs

**Tab 1e. Poultry
Layer, Broiler Chicken and Turkey Data Entry and Assumptions**

Farm Specific Data Entry:

- Bird places
- Weight in and weight out for each turkey category (optional defaults provided)
- Days on feed (optional defaults provided)
- Number of cycles (optional defaults provided)
- Type of manure storage

Fixed Variables

Broilers

- Weight in
 - 0.05 for 0 weeks
 - 2 kg broiler breeder hens
- Weight out
 - 1.98 kg for broilers
 - 2 kg for broiler pullets
 - 3.94 kg for broiler breeder hens
- Number of eggs
 - 170 eggs for broiler breeder hens
- Egg weight
 - 65 g for broiler breeder hens
- Days on feed
 - 33 for broilers
 - 140 for broiler pullets
 - 273 for broiler breeder hens
- Cycles per year
 - 7.4 for broilers
 - 2 for broiler pullets
 - 1 for broiler breeder hens
- N Volatilization based on the Farm Practices Guidelines for Pig Producers in Manitoba, 1998
- N excretion (ASAE 2005; AWMFH 2008)
 - 0.96 kg N per 1000 kg live weight
- P excretion (ASAE 2005; AWMFH 2008)
 - 0.28 kg P per 1000 kg live weight – **to be reviewed based on retention**
- Feeding rates per cycle
 - 1.65 kg feed/kg weight gain for broilers
 - 6.3 kg per broiler breeder pullet
 - 39.6 kg per broiler breeder hen
- P retained in weight gain
 - 5 g/kg meat (Flaten 2003; Lynch and Caffrey, 1997)
- P retained in eggs
 - 2 g/kg eggs (Flaten 2003; Lynch and Caffrey, 1997)
- % P in Feed
 - 0.65%
- % P Excretion

- Same range as ASAE (51%) for broilers

Layers

- Weight in
 - 0.05 for 0 weeks
 - 1.375 for layer hens and layer breeder hens
- Weight out
 - 1.38 kg for layer pullets and layer breeder pullets
 - 1.7 kg for layer hens and layer breeder hens
- Number of eggs
 - 306 eggs per year for layers
 - 294 eggs per year for layer breeders
- Egg weight
 - 60 g for layers
- Days on feed
 - 133 for layer pullets and layer breeder pullets
 - 355 for layer hens
 - 329 for layer breeders
- Cycles per year
 - 2 for layer pullets and layer breeder pullets
 - 1 for layer hens and layer breeders
- N Volatilization based on the Farm Practices Guidelines for Pig Producers in Manitoba, 1998
- N excretion (ASAE 2005; AWMFH 2008)
 - 1.1 kg N per 1000 kg live weight
- P excretion (ASAE 2005; AWMFH 2008)
 - 0.33 kg P per 1000 kg live weight
- Feeding rates per cycle
 - 36 kg per layer hen per year
 - 34.5 kg per breeder hen per year
- P retained in weight gain
 - 5 g/kg meat (Flaten 2003; Lynch and Caffrey, 1997)
- P retained in eggs
 - 2 g/kg eggs (Flaten 2003; Lynch and Caffrey, 1997)
- % P Excretion
 - Same range as ASAE (81%) for hens

Turkeys

- Weight in
 - User input
- Weight out
 - User input
- Days on feed
 - User input
- Cycles per year
 - User input
- N Volatilization based on the Farm Practices Guidelines for Pig Producers in Manitoba, 1998
- N excretion (ASAE 2005; AWMFH 2008)

- 0.72 per 1000 kg live weight for all hens except breeding hens
 - 0.53 kg per 1000 kg live weight for breeding hens and all toms
- P excretion (ASAE 2005; AWMFH 2008)
 - 0.20 per 1000 kg live weight for all hens except breeding hens
 - 0.16 kg per 1000 kg live weight for breeding hens and all toms
- Feed Conversion
 - 1.975 kg feed per kg weight gain for broiler hens
 - 2.075 kg feed per kg weight gain for hens
 - 2.325 kg feed per kg weight gain for heavy hens
 - 2.15 kg feed per kg weight gain for toms
- P retained in weight gain
 - **Unavailable**
- % P in Feed
 - 0.62%

Tab 2. Crop Rotation

Farm Specific Data Entry:

- Historical crop yields
- Crop acreage over the course of a rotation

Fixed Variables

- N uptake for each crop (MAFRD, 2009)
- P_2O_5 removal for each crop (MAFRD, 2009)

Tab 3. Farm Excretion

Output:

- Summary of N and P₂O₅ excretion for all livestock associated with the operation

Tab 4. Land Summary

Output:

- Nitrogen (N) – the number of acres required to balance N excretion for the operation with N uptake by the crop
- $2XP_2O_5$ – the number of acres required to balance P_2O_5 excretion with twice what the crop can remove over the course of the rotation; generally only used in areas of low livestock intensity where additional land is available and can be accessed over time
- $1XP_2O_5$ – the number of acres required to balance P_2O_5 excretion with crop P_2O_5 removal over the course of a rotation; recommended in areas of high livestock intensity where land available for manure application is limited