

SOLIDS WORKSHEET 2 - NUTRIENT BALANCE

Modified January 14, 2014

| | | | | | |
|---|---|--|---|-------------------------------|------------------|
| Tract | Field No. | Acres | | | |
| | | | Soil Test P Value (Mehlich 3) | | |
| Step 1 . Crop or Crop Sequence/Rotation | | | | | |
| See Table 2.1 Options | | | | | |
| Step 2 . Realistic Yield (Average from 5-10 Years on a per acre basis) | | | | | |
| | | | N | P ₂ O ₅ | K ₂ O |
| Step 3 . Plant Nutrients Needed or Allowed (lbs/ac) | | | | | |
| N | <u> </u> Table 2.1 Value for N | × <u> </u> Step 2 | = | <u> </u> | |
| P | <u> </u> Table 2.1 Value for P | × <u> </u> Step 2 | = | <u> </u> | |
| K | <u> </u> Table 2.1 Value for K | × <u> </u> Step 2 | = | <u> </u> | |
| | | | | P ₂ O ₅ | |
| Step 4 . Adjusted P₂O₅ Application Rate According to Threshold | | | | | |
| P | <u> </u> Step 3 P ₂ O ₅ | × <u> </u> Table 2.2 Value | = | <u> </u> | |
| | | | N | P ₂ O ₅ | K ₂ O |
| Step 5 . Fertilizer Credits (lbs/ac) | | | | | |
| | | | N | P ₂ O ₅ | K ₂ O |
| Step 6 . Plant Nutrients Needed Minus Credits (lbs/ac) | | | | | |
| N | <u> </u> Step 3 for N | - <u> </u> Step 5 for N | = | <u> </u> | |
| If Step 4 > 0: | | | | | |
| P | <u> </u> Step 4 for P | - <u> </u> Step 5 for P | = | <u> </u> | |
| If Step 4 = 0: | | | | | |
| | <u> </u> Step 3 for P | - <u> </u> Step 5 for P | = | <u> </u> | |
| K | <u> </u> Step 3 for K | - <u> </u> Step 5 for K | = | <u> </u> | |
| | | | N | P ₂ O ₅ | K ₂ O |
| Step 7 . Nutrients in Manure (lbs/ton) | | | | | |
| Step 4 Values from Solids Worksheet 1 or use Lab Results | | | | | |
| | | | N | P ₂ O ₅ | K ₂ O |
| Step 8 . Percent Nutrients Retained in System | | | | | |
| Enter Table 2.3 values or Enter zero if lab analysis is used | | | | | |
| | | | N | P ₂ O ₅ | K ₂ O |
| Step 9 . Net Retained Nutrients in Manure (lbs/ton) | | | | | |
| Enter zero if lab analysis is used | | | | | |
| N | <u> </u> Step 7 for N | × <u> </u> Step 8 for N | = | <u> </u> | |
| P | <u> </u> Step 7 for P | × <u> </u> Step 8 for P | = | <u> </u> | |
| K | <u> </u> Step 7 for K | × <u> </u> Step 8 for K | = | <u> </u> | |
| | | | N | P ₂ O ₅ | K ₂ O |
| Step 10 . Percent of Available Nutrients | | | | | |
| Enter Table 2.4 Value for N | | | | 80% | 100% |

| Step 11 . Net Available Nutrients (lbs/ton) | | | | N | P ₂ O ₅ | K ₂ O |
|--|---|---|------------------------------|--|-------------------------------|----------------------|
| If Lab Results are used in Step 7: | | | | | | |
| N | _____ | × | _____ | = | _____ | |
| | Step 7 for N | | Step 10 for N | | | |
| P | _____ | × | _____ | = | _____ | |
| | Step 7 for P | | Step 10 for P | | | |
| K | _____ | × | _____ | = | _____ | |
| | Step 7 for K | | Step 10 for K | | | |
| If Solid Worksheet 1 Values are used in Step 8: | | | | | | |
| N | _____ | × | _____ | = | _____ | |
| | Step 9 for N | | Step 10 for N | | | |
| P | _____ | × | _____ | = | _____ | |
| | Step 9 for P | | Step 10 for P | | | |
| K | _____ | × | _____ | = | _____ | |
| | Step 9 for K | | Step 10 for K | | | |
| | | | | N | P ₂ O ₅ | K ₂ O |
| Step 12 . Application Rate (tons/ac) | | | | N | P ₂ O ₅ | K ₂ O |
| N | _____ | ÷ | _____ | = | _____ | |
| | Step 6 for N | | Step 11 for N | | | |
| P | _____ | ÷ | _____ | = | _____ | |
| | Step 6 for P | | Step 11 for P | | | |
| K | _____ | ÷ | _____ | = | _____ | |
| | Step 6 for K | | Step 11 for K | | | |
| | | | | N | P ₂ O ₅ | K ₂ O |
| Step 13 . Net Application Amount for All Nutrients (lbs/ac) | | | | N | P ₂ O ₅ | K ₂ O |
| N | _____ | × | _____ | = | _____ | |
| | Step 11 for N | | Application Rate | | | |
| P | _____ | × | _____ | = | _____ | |
| | Step 11 for P | | Application Rate | | | |
| K | _____ | × | _____ | = | _____ | |
| | Step 11 for K | | Application Rate | | | |
| | | | | N | P ₂ O ₅ | K ₂ O |
| Step 14 . Nutrient Needs (negative) or Surpluses (positive) (lbs/ac) | | | | N | P ₂ O ₅ | K ₂ O |
| N | _____ | - | _____ | = | _____ | |
| | Step 13 for N | | Step 6 for N | | | |
| P | _____ | - | _____ | = | _____ | |
| | Step 13 for P | | Step 6 for P | | | |
| K | _____ | - | _____ | = | _____ | |
| | Step 13 for K | | Step 6 for K | | | |
| Step 15 . Balance | | | | | | |
| Tons Available | _____ | - | Tons Applied in Field | _____ | = | Balance _____ |
| | Step 3 from Solids Worksheet 1 or Balance from Previous Worksheet 2 | | | Application Rate x Field Acres or to deplete supply in one field: Tons Available ÷ Num. of Acres = Uniform App. Rate (Be sure not to exceed 10 tons/acre) | | |

Table 2.1 Crop Nutrient Removal Values in Pounds Per Unit Yield

| Crop | Total N | P₂O₅ | K₂O |
|---|----------------|-----------------------------------|-----------------------|
| Alfalfa Hay (Ton) | 51 | 14 | 55 |
| Barley Grain (Bushel) | 0.99 | 0.41 | 0.32 |
| Barley Straw (Ton)* | 13 | 5.1 | 39 |
| Bermudagrass - Hay (Ton) | 37.6 | 8.7 | 33.6 |
| Big Bluestem, Indiangrass, Little Bluestem, - Hay (Ton) | 22 | 12 | 58 |
| Bluegrass (Ton)* | 30 | 12 | 46 |
| Bromegrass (Ton)* | 32 | 10 | 46 |
| Corn Grain (Bushel) | 0.9 | 0.4 | 0.35 |
| Corn Silage (Ton) | 9.7 | 3.6 | 8 |
| Corn Stover (Ton)* | 16 | 5.8 | 40 |
| Eastern Gamagrass - Hay (Ton) | 35 | 16.1 | 31.2 |
| Fescue (Ton)* | 37 | 12 | 54 |
| Flax Grain (Bushel)* | 2.5 | 0.7 | 0.6 |
| Flax Straw (Bushel)* | 0.7 | 0.16 | 2.2 |
| Forage for Pastureland | 10.5 | 3.6 | 15.9 |
| Millet (Bushel)* | 1.4 | 0.4 | 0.4 |
| Oat Grain (Bushel)* | 0.77 | 0.28 | 0.19 |
| Oat Silage (Ton)* | 9 | 11 | 45 |
| Oat Straw (Ton)* | 12 | 6.3 | 37 |
| Orchardgrass (Ton)* | 36 | 13 | 54 |
| Other Cool Season Grass/Legume Hay (Ton) | 35 | 12 | 53 |
| Red Clover (Ton)* | 45 | 12 | 42 |
| Rye Grain (Bushel)* | 1.4 | 0.46 | 0.31 |
| Rye Straw (Ton)* | 12 | 3 | 22 |
| Ryegrass (Ton)* | 43 | 12 | 43 |
| Sorghum Grain (Bushel) | 0.95 | 0.41 | 0.3 |
| Sorghum Stover (Ton)* | 28 | 8.3 | 42 |
| Sorghum-Sudan (Ton)* | 30 | 9.5 | 34 |
| Soybean Grain (Bushel)* | 3.8 | 0.84 | 1.3 |
| Soybean Hay (Ton)* | 45 | 11 | 25 |
| Switchgrass (Ton)* | 22 | 12 | 58 |
| Timothy (Ton)* | 25 | 11 | 42 |
| Tobacco (Pound) | 0.07 | 0.01 | 0.08 |
| Vetch (Ton)* | 57 | 15 | 49 |
| Wheat Grain (Bushel)* | 1.5 | 0.6 | 0.34 |
| Wheat Silage (Ton) | 44 | 4 | 20 |
| Wheat Straw (Ton)* | 14 | 3.3 | 24 |

* Value from Murrell, 2008.

Table 2.2 Phosphorus Threshold

| STP | Application Rate Adjustment | Interpretation |
|------------|------------------------------------|--|
| < 400 | 0 | Manure applications can be made based on crop nitrogen requirements |
| 401-600 | 1 | Phosphorus applications at rates not to exceed the estimated removal of phosphorus in the harvested plant biomass |
| 601-800 | 0.5 | Phosphorus applications at rates not to exceed 1/2 of the estimated removal of phosphorus in the harvested plant biomass |
| >800 | - | Phosphorus applications are no longer allowed |

Table 2.3 Percent of Original Nutrient Content of Manure Retained By Various Management Systems*

| Management System | Beef | | | Dairy | | | Poultry | | | Swine | | |
|--|------|----|----|-------|----|----|---------|----|----|-------|----|----|
| | N | P | K | N | P | K | N | P | K | N | P | K |
| Open lot -cool humid region | 70 | 80 | 70 | 85 | 95 | 95 | - | - | - | 70 | 80 | 70 |
| Liquids & solids in a covered essentially watertight structure | 85 | 95 | 95 | 85 | 95 | 95 | - | - | - | 85 | 95 | 95 |
| Liquids & solids in a uncovered essentially watertight structure | 75 | 90 | 90 | 75 | 90 | 90 | - | - | - | 75 | 90 | 90 |
| Liquids & solids (diluted less than 50%) –waste storage pond | 80 | 95 | 95 | 80 | 95 | 95 | - | - | - | 80 | 95 | 95 |
| Manure with bedding in roofed storage | 80 | 95 | 95 | 80 | 95 | 95 | 70 | 95 | 95 | - | - | - |
| Manure with bedding in unroofed storage leachate lost | 75 | 85 | 85 | 75 | 85 | 85 | - | - | - | - | - | - |
| Manure stored in pits beneath slatted floor | 85 | 95 | 95 | 85 | 95 | 95 | 90 | 95 | 85 | 85 | 95 | 95 |
| Anaerobic lagoon or stored in waste storage pond diluted >50% | 35 | 50 | 65 | 35 | 50 | 65 | 30 | 50 | 60 | 30 | 50 | 60 |

* Adapted from 1992 NRCS Agricultural Waste Management Field Handbook

Table 2.4 Percent of Nutrients from Manure Available to a Crop During the Year of Application in Comparison with Fertilizer Nutrients*

| Nutrient and Application Type | | Availability Coefficient | |
|--|--------------------------------|--------------------------|---------------|
| | | Poultry or Liquid | Other Manures |
| Nitrogen (N) Corn, Tobacco, Annual Grasses or Sorghum | <i>Spring Applied</i> | | |
| | Incorporation: same day | 75 | 60 |
| | Incorporation: 2 days or less | 65 | 50 |
| | Incorporation: 3-4 days | 55 | 45 |
| | Incorporation: 5-6 days | 50 | 40 |
| | Incorporation: 7 days or more | 45 | 35 |
| | <i>Fall Applied</i> | | |
| | Without cover crop | 15 | 20 |
| | With cover crop | 50 | 40 |
| | Pasture (Fall or early Spring) | 80 | 60 |
| Phosphate (P₂O₅) | | 80 | 80 |
| Potash (K₂O) | | 100 | 100 |

*Note: Information from Table 2.3 or from a laboratory analysis will be used as a basis for Table 2.4. Table 2.4 Source: AGR-146 "Using Animal Manures as Nutrient Sources" 8/2000 University of Kentucky.