APPENDIX D
Blank Worksheets

The following blank worksheets can be used to calculate nutrient availability or to evaluate manure storage facilities.

WORKSHEET FOR CALCULATING NUTRIENT AVAILABILITY

Facility type (solid storage, manure tank, lagoon) _____

Selected nutrient accumulation period = _____ days

Nitrogen

Using data in Tables 21C-1 through 21C-9, calculate the nitrogen excreted.

lbN/d-1,000 # x no. animals x lbs/animal (avg. wt.) x period, d/1,000

_____ x _____ x _____ x _____ /1,000 = _____ lbN

Using data in Tables 21C-1 through 21C-9, calculate the nitrogen available.

LbN x availability factor

_____ x _____ = _____ lbN available

P_2O_5

Using data in Tables 21C-1 through 21C-9, calculate the P_2O_5 excreted.

lbP_2O_5/d-1,000 # x no. animals x lbs/animal (avg. wt.) x period, d/1,000

_____ x _____ x _____ x _____ /1,000 = _____ lbP_2O_5

lbP_2O_5 x availability factor

_____ x _____ = _____ lbP_2O_5 available

K_2O

Using data in Tables 21C-1 through 21C-9, calculate the K_2O excreted.

lbK_2O/d-1,000 # x no. animals x lbs/animal (avg. wt.) x period, d/1,000

_____ x _____ x _____ x _____ /1,000 = _____ lbK_2O

lbK_2O x availability factor

_____ x _____ = _____ lbK_2O available

WORKSHEET FOR SIZING MANURE STORAGE FACILITIES

Facility type (solid storage, manure tank, lagoon) _____

Selected manure storage period = _____ days

1. Volume of manure and bedding. Using data in Tables 21C-1 through 21C-9, Table 21-2, and Table 21-3, calculate the volume of manure and bedding for the selected storage period.

Manure:

ft^3 d/1,000 # x no. animals x lbs/animal (avg. wt.) x storage period, d/1,000

_____ x _____ x _____ x _____ /1,000 = _____ ft^3

Bedding:

lbBedding/Kwt-d x no. animals x lbs/animal (avg. wt.) x storage period, d/1,000

_____ x _____ x _____ x _____ /1,000 = _____ lbBedding

lbBedding x void factor (0.3-0.5)/bedding density, lb/ft^3

_____ x _____ / _____ = _____ ft^3 bedding

_____ ft^3 manure + _____ ft^3 bedding = _____ ft^3 manure/bedding

2. Volume of lot runoff. Using data in Figures 21B-1, -2, -3a, and -3b, calculate the volume of runoff from exposed dirt lots, concrete lots, and unguttered roofs.

dirt lot, ft^2 x rainfall, in x percent runoff /12

_____ x _____ x _____ /12 = _____ ft^3 runoff

concrete, unguttered roofs, ft^2 x rainfall, in x percent runoff /12

_____ x _____ x _____ /12 = _____ ft^3 runoff

ft^3 dirt lot runoff _____ + ft^3 concrete, roof runoff _____ = _____ ft^3 total runoff

3. Depth of rainfall-evaporation. Using data from Figures 21B-3a, -3b, and -4, calculate the depth of R-E on the exposed surface of the manure storage facility.

(rainfall, in – evaporation, in)/12

(_____ – _____) /12 = _____ ft R-E

4. Sludge accumulation. Using data in Tables 21C-1 through 21C-10, calculate the volume of sludge accumulation.

TS, lb/d/1,000 # x no. animals x lbs/animal (avg. wt.) x storage period, d/1,000

_____ x _____ x _____ x _____/1,000 = _____ lb TS

SAR, ft^3/lb TS x lb TS

_____ x _____ = _____ft^3

5. Treatment volume. Using data from Tables 21C-1 through 21C-9 and Figure 21B-5, calculate treatment volume (lagoons only).

VS, lb/d/1,000 # x no. animals x lbs/animal (avg. wt.)/1,000

_____ x _____ x _____ /1,000 = _____ lb VS/d

lb VS/d / lb VS/1,000 ft^3/d x 1,000

_____ / _____ x 1,000 = _____ ft^3

6. Volume/depth of 25-year, 24-hour storm. Using data in Figure 21B-6, calculate the depth of the 25-year, 24-hour storm on the manure storage facility surface and associated runoff from exposed lot and roof areas.

25-yr, 24-hr storm, in/12

Depth = _____ /12 = _____ ft

25-yr, 24-hr storm, ft x exposed lot/roof area, ft^2

_____ x _____ = _____ ft^3

7. Volume of washwater. Using water use data for the operation or estimating water use from similar operations, calculate the volume of washwater used during the selected storage period.

Washwater use, gal/day x storage period, days/7.48

_____ x _____ /7.48 = _____ft^3

8. Total volume of manure storage facility. Sum the applicable volumes from Steps 1 through 7 above to obtain total manure storage facility volume.

Manure/bedding + lot runoff + sludge + treatment + 25-yr, 24-hr storm + washwater

_____ + _____ + _____ + _____ + _____ + _____=

_____ ft^3 total volume

9. Determine dimensions of manure storage facility. Using the appropriate formula below, assume facility dimensions and calculate volume. Adjust dimensions by trial and error until the volume in Step 8 above is obtained.

Square or rectangular manure tank:

Volume = length, ft x width, ft x depth, ft

= _____ x _____ x _____ = _____ ft^3

Round manure tank:

Volume = diameter, ft x diameter, ft x depth, ft x 0.785

_____ x _____ x _____ x 0.785 = _____ ft^3

Square or rectangular earthen impoundments: (slope = inside or front slope of impoundment, i.e., for 3:1 slopes, slope = 3)

Volume = length, ft x width, ft x depth, ft

= _____ x _____ x _____ = _____ ft^3

- slope x depth, ft x depth, ft x (length, ft + width, ft)

- _____ x _____ x _____ x (_____ + _____)

+ 4 x slope x slope x depth, ft x depth, ft x depth, ft/3

+ 4 x _____ x _____ x _____ x _____ x _____ /3

= _____ ft^3

Depths of R-E; the 25-year, 24-hour storm; and freeboard, if applicable, must be added to the manure storage facility depth determined above.

Step 3 R-E, ft		Step 6 25-yr, 24-hr storm, ft		freeboard, ft		
_____	+	_____	+	_____	=	_____ ft added depth

According to the following formulas, this will increase the final length and width (at the top inside edge) of earthen impoundments.

New length = old length, ft + (added depth, ft x slope x 2)

= _____ + (_____ x _____ x 2) = _____ft

New width = old width, ft + (added depth, ft x slope x 2)

= _____ + (_____ x _____ x 2) = _____ft

Final depth = preliminary depth, ft + added depth, ft

= _____ + _____ x _____ = _____ft