BASIC ISSUES OF MANURE MANAGEMENT:

ASSIGNING MANURE SPREADING PRIORITIES

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THE GOAL OF MANURE MANAGEMENT

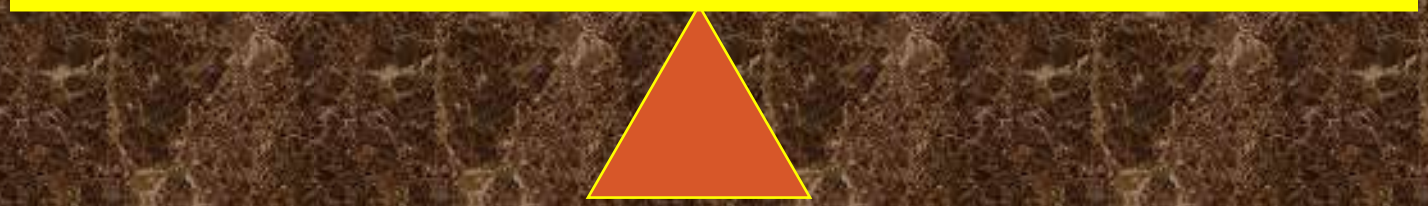
- UTILIZE PLANT NUTRIENTS FOR CROPS
  - *PROPER RATE*
  - *INCLUDE ALL NUTRIENT INPUTS*
- DISTRIBUTE MANURE EVENLY ON FARM
  - *AVOID HIGH SOIL TEST P*
- AVOID APPLICATION WHERE LOSSES OCCUR
  - *STEEPLY SLOPING GROUND*
  - *NEAR SURFACE WATER*
  - *SHALLOW OR SANDY SOILS*

PRACTICAL MANURE MANAGEMENT

BALANCE DISPOSAL NEED WITH NUTRIENT UTILIZATION AND ENVIRONMENTAL CONCERNS

NUTRIENT RECYCLING
CROP REQUIREMENT

DISPOSAL NEED
TIME/LABOR



COMPARING MANURE APPLICATION STRATEGIES

N BASED	P BASED
HIGHEST RATES	MAX. NUTRIENT EFFIC.
P & K BUILDUP	AVOIDS P & K BUILDUP
LABOR EFFICIENT	LABOR INEFFICIENT
LAND EFFICIENT	REQUIRES MORE LAND

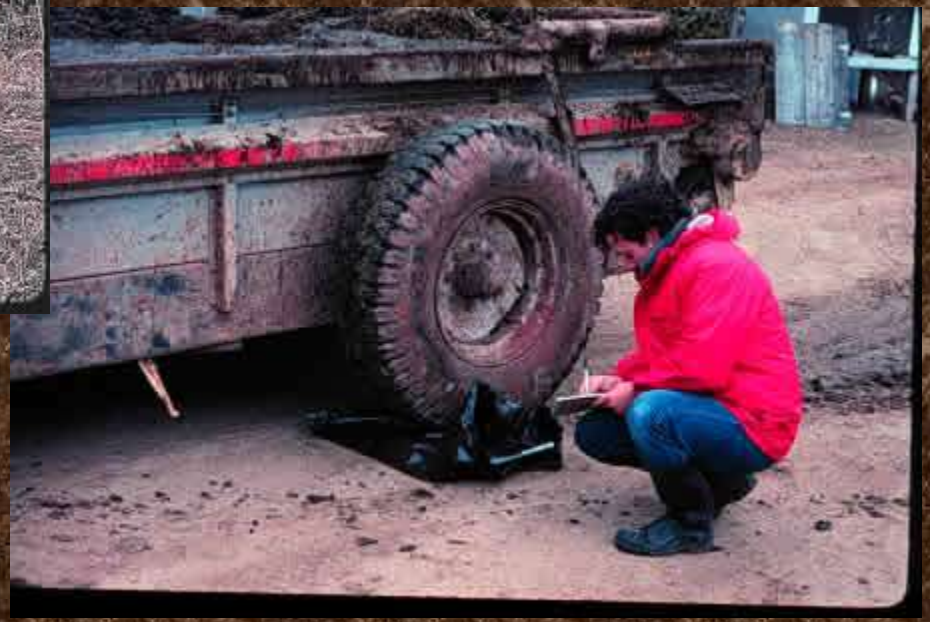
UNCERTAINTIES WITH MANURE USE

- APPLICATION RATE
- UNIFORMITY OF APPLICATION
- NUTRIENT CONTENT
- RESIDUAL AVAILABILITY
- WEATHER EFFECTS
- MINIMIZING LOSSES
- CROPPING SYSTEM COMPATIBILITY
- REGULATORY CONSTRAINTS

HELPING FARMERS OVERCOME OBSTACLES TO MANURE MANAGEMENT

EDUCATION

SPREADER CALIBRATION



MANURE IS A VALUABLE RESOURCE

FIRST YEAR AVAILABILITY - SOLID (lb/ton)

NUTRIENT	DAIRY	BEEF	POULTRY	SWINE
N	3 (4)	4 (4)	13 (15)	4 (5)
P_2O_5	3	5	14	3
K_2O	8	8	9	7

(N AVAILABILITY IF INCORPORATED)

MANURE IS A VALUABLE RESOURCE

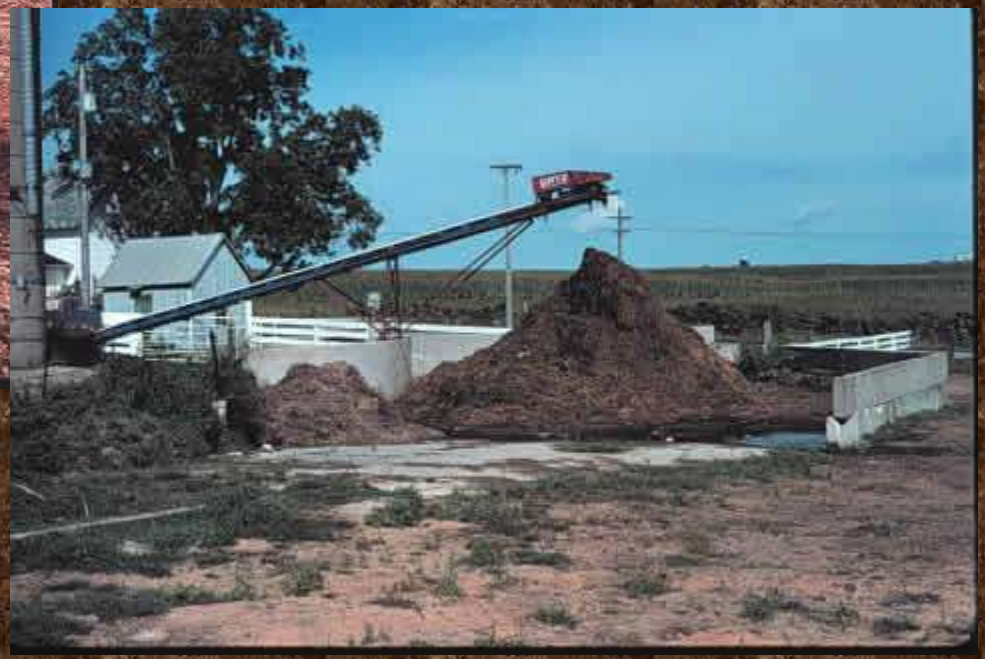
FIRST YEAR AVAILABILITY - SOLID ($/ton)

NUTRIENT	DAIRY	BEEF	POULTRY	SWINE
N	0.66	0.88	2.86	0.88
P_2O_5	0.75	1.25	3.50	0.75
K_2O	0.96	0.96	1.08	0.84
TOTAL	2.37	3.09	7.44	2.47

STORAGE MAKES MANURE MANAGEMENT EASIER

MESSY IN-FIELD STACKING

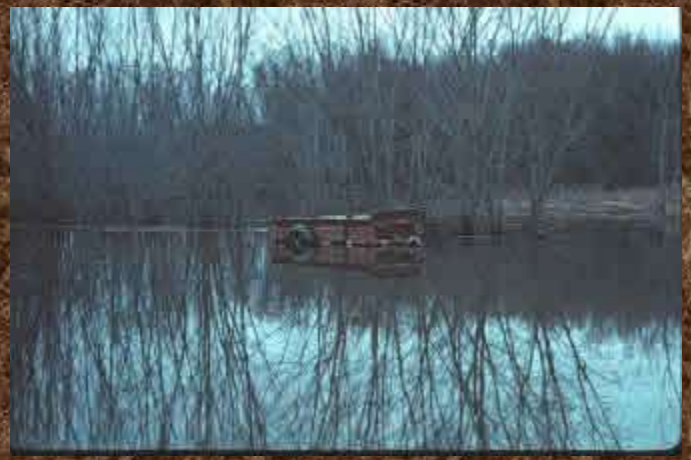
DESIGNED STORAGE



EFFECT OF HANDLING ON NUTRIENT AVAILABILITY

- PRESERVE LIQUID PORTION
  - *50 % N, 5 % P, 70 % K*
- INCORPORATE
  - *REDUCE N VOLATILIZATION*
  - *REDUCE RUNOFF LOSS*
- STACKING/COMPOSTING
  - *REDUCES NUTRIENT CONTENT*
  - *REDUCES AVAILABILITY*

MANURE SPREADING CONCERNS



IN FLOODPLAINS

THROUGH WATERWAYS

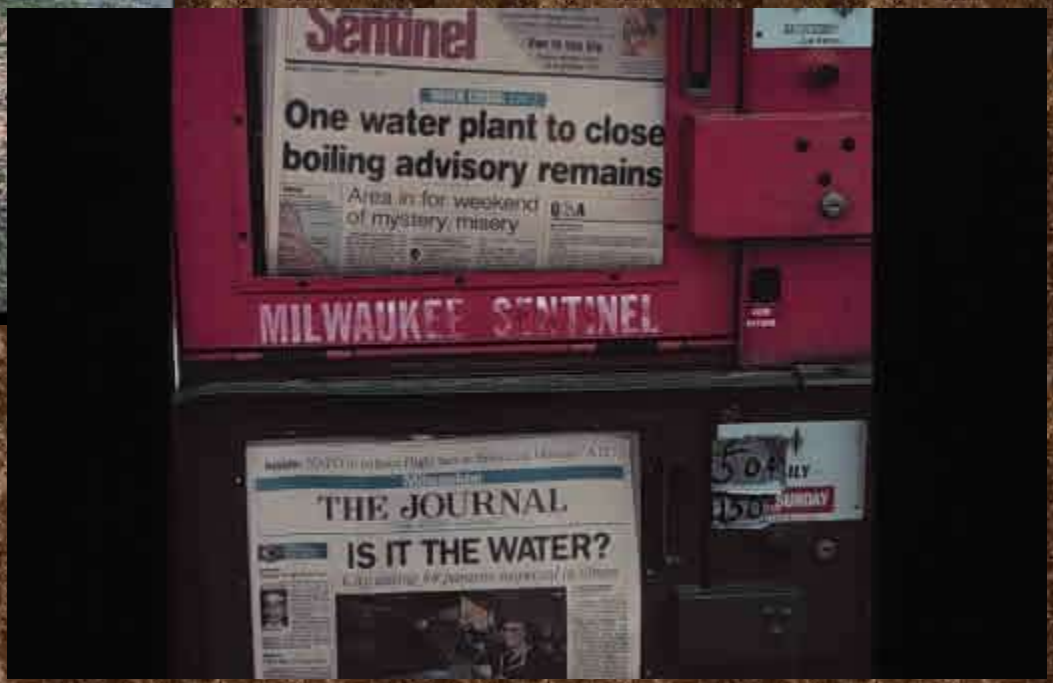
ON GROWING CROPS

ON PUBLIC ROADS

WATER QUALITY IS A POLITICAL ISSUE

RECREATION-
TROUT FISHING

PUBLIC HEALTH-
CRYTOSPORIDIUM



MANURE AND ENVIRONMENTAL RULES

- PROXIMITY TO WATER (SURFACE APPLICATION)
  - *> 200 ' FROM STREAMS AND LAKES*
  - *> 200 ' FROM WELLS, SINKHOLES, GRAVEL PITS, ETC.*
- NO SPREADING IN WATERWAYS, WETLANDS, TERRACES, ETC.
- SURFACE APPLICATION MAX = 75 lb/a P_2O_5

USDA-NRCS TECH. GUIDE 590

MANURE AND THE ENVIRONMENT

- SURFACE WATER
  - *PHOSPHORUS*
- GROUND WATER
  - *NITROGEN*
- WINTER SPREADING
  - *SLOPES >9 %*
  - *12 % WITH STRIPS AND CORN RESIDUE*

A SIMPLE SYSTEM TO HELP FARMERS MAKE SMART DECISIONS ABOUT MANURE APPLICATIONS

DIRECT MANURE

- NUTRIENT DEMANDING CROPS
- LOW TESTING SOILS
- UPLAND AREAS
- LEVEL LAND
- MEDIUM-FINE TEXTURE SOILS
- DEEP, WELL-DRAINED

AVOID MANURE

- LEGUME FORAGE PLOWDOWN
- HIGH TESTING SOILS
- FLOODPLAINS, WATERWAYS
- STEEP LAND
- SANDY SOILS
- SHALLOW SOILS

DEVELOPING A MANURE SPREADING PLAN

THREE STEPS:

1. *ESTIMATE MANURE AVAILABLE YEARLY*
   - *NUMBER, TYPE, SIZE, HANDLING*
2. *PRIORITIZE FIELDS BASED ON NUTRIENT NEED AND ENVIRONMENTAL CONSIDERATIONS*
   - *CROP N OR P NEED*
   - *SOIL TEST P AND K*
   - *WATER PROXIMITY*
   - *SLOPE*
   - *SOIL TYPE*
3. DISTRIBUTE MANURE BASED ON RANK
   - "CHECKBOOK SYSTEM" BASED ON LOADS
   - CONSIDER SEASONAL ACCESSIBILITY

WHAT'S NEEDED TO DEVELOP PLANS

- *MANURE AMOUNT*
  - TOTAL
  - COLLECTIBLE
- *NUTRIENT AVAILABILITY*
  - BOOK ESTIMATES
  - ANALYSIS
- *CROPPING PLAN*
  - PREVIOUS AND PLANNED CROPS
  - FIELD ID AND SIZE

WHAT'S NEEDED TO DEVELOP PLANS

- *FARM SOILS MAP*
  - TEXTURE, SLOPE, WATER, BEDROCK
  - CONSERVATION PRACTICES
  - RESTRICTED AREA/TIMES
- *INDIVIDUAL FIELD SOIL TEST*
  - NPK RECS. AND PK TEST RESULTS
  - LEGUME CREDITS
  - N AVAILABILITY TESTS
- *CALIBRATED SPREADER*
  - MULTIPLE RATES DESIRABLE

STEP ONE: ESTIMATE MANURE AVAILABLE YEARLY

EXAMPLE: 100 COW DAIRY W/REPLACEMENTS, SEMI-SOLID

100 cows	X 21 t/yr	=	2100 t
60 heifers	X 10 t/yr	=	600 t
40 calves	X 2 t/yr	=	80 t
			2780 t

x 0.85 = 2363 t

DO NOT RANK THE FOLLOWING FIELDS

- RECOMMENDED NUTRIENTS PREVIOUSLY APPLIED AS FERTILIZER
- APPLICATION IN 10 YR. FLOODPLAIN OR WITHIN 200 FT. OF SURFACE WATER OR OPEN ACCESS TO GROUNDWATER THAT WILL NOT BE INCORPORATED
- SLOPES >9% OR >12% WITH RUNOFF REDUCTION PRACTICES

INDIVIDUAL FIELD ASSESSMENT- CROP N NEED

PLANNED CROP	POINTS
CONTINUOUS CORN	10
SECOND YEAR CORN	8
CORN FOLLOWING LEGUME FORAGE	1
SMALL GRAIN	6
SMALL GRAIN (WITH SEEDING)	2-4
TOPDRESS FAIR LEGUME STAND	2
PRIOR TO DIRECT SEEDING ALFALFA	8

INDIVIDUAL FIELD ASSESSMENT- SOIL TEST P AND K

PHOSPHORUS	PTS.	POTASSIUM	PTS.
> 150 ppm	1	>200 ppm	6
75-150 ppm	3	100-200 ppm	8
30-75 ppm	5	<100 ppm	10
<30 ppm	10		

INDIVIDUAL FIELD ASSESSMENT- FIELD LIMITATIONS

PROXIMITY TO WATER	PTS.
INCORPORATED W/IN 10 YR. FLOODPLAIN OR WITHIN 200 FT. OF SURFACE WATER	1
OUTSIDE THESE RESTRICTIONS	5

SLOPE	
>9%	1
6-9% OR 9-12% w/RUNOFF REDUCTION PRACT.	3
2-6% OR 6-9% w/RUNOFF REDUCTION PRACT.	5
<2% OR 2-6% W/RUNOFF REDUCTION PRACT.	10

INDIVIDUAL FIELD ASSESSMENT- FIELD LIMITATIONS

SOIL TEXTURE	PTS.
SANDS, LOAMY SANDS	1
SANDY LOAMS, LOAMS OR SANDS, LOAMY SANDS SPRING APPLIED	3
OTHERS OR SANDY LOAMS, LOAMS SPRING APPLIED	5

DEPTH TO BEDROCK	
0 - 10 in.	0
10-20 in.	1
>20 in.	5

STEP TWO: RANK ALL FIELDS

FIELD	ROTATION	P	K	WATER	SLOPE	TEXT.	DEPTH	RANK
1	CCC	10	5	8	5	10	5	5	48
2	CCSb	2	5	8	5	5	5	5	35
3	ACC	8	3	8	5	5	5	5	39
4	AAC	1	1	6	1	10	5	5	29
5	CCO/A	2	5	8	5	5	5	5	35
6	CSbC	8	3	6	5	5	5	5	37
7	AAA	2	10	8	5	3	5	5	38
8	CSbW	6	1	6	5	5	5	5	33
9	CCA	8	3	6	5	5	5	5	37

STEP THREE: ALLOCATE BASED ON RANK

FIELD	RANK	ACRES	N RATE	MANURE	USED	LEFT	LOADS
			lb/a	ton/a	ton	ton	
1	48	15	160	40	600	1763	60
3	39	22	110	27	594	1169	59
7	38	7	75	25	175	994	18
6	37	12	120	30	360	634	36
9	37	2	75	25	300	334	30
2	35	13	75	25	325	9	33
5	35	5	20	7	--	--	--
8	33	10	20	7	--	--	--
4	29	20	0	0	--	--	--

ASSUME 10 TON/LOAD

CUSTOMIZE FOR LOCAL CONDITIONS

- *REGULATIONS*
  - MAX. 75 lb P_2O_5/A IF NOT INCORPORATED
  - TILLAGE SYSTEM/TIMING
  - RESTRICTED AREAS/TIMES
- *WINTER SPREADING*
  - SAVE CLOSE FIELDS
  - SELECT FLAT FIELDS
- *CROPPING SYSTEM*
  - POOR FORAGE STANDS FOR SUMMER SPREADING

SUMMARY

- GOAL IS TO APPLY WHERE NEEDED AND LOSSES ARE MINIMIZED
- NO SYSTEM IS PERFECT
- ACCOUNT FOR NUTRIENTS FROM ALL SOURCES
- KNOW HOW MUCH IS APPLIED
- CUSTOMIZE FOR LOCAL RECS. & REGS.
- STORAGE PROVIDES CONVENIENCE