Maryland Nutrient Management

Consultant's Resource Notebook

Maryland Department of Agriculture
Nutrient Management Program
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Introduction

This notebook contains a variety of resources that you will turn to over and over as you work with agricultural operators.

The design follows the outline of the "Fundamentals" course, allowing you to add notes and handouts. Space has been left intentionally for you to add materials in the future. The MDA Nutrient Management Program will help you keep your "Law, Regulations and Reference Manual" up to date. This notebook however, is yours. Use the internet references and continuing education courses to keep your notes up to date. Add materials that relate to the type of operations you work with.

Materials for "Fundamentals of Nutrient Management Course"

1) Textbook: "Chesapeake Bay Region Nutrient Management Training Manual"

   New version just released digitally:
   http://www.agnr.umd.edu/users/waterqual/themes/nutrient_management/manmh2006.htm

2) Notebook: "Maryland Nutrient Management: Law, Regulations and Manual"

3) Consultant's Resource Notebook

Course Description for "Fundamentals of Nutrient Management"

This two-day course provides instruction in the basic concepts of nutrient management required to pass the Nutrient Management Certification Exam. The exam consists of 100 multiple choice questions from nine knowledge areas. Eight of these knowledge areas are covered by the "Chesapeake Bay Region Nutrient Management Training Manual." Each of the Bay states uses this core question pool for its certification exam. The ninth knowledge area is specific to Maryland.

Knowledge Area	Percentage
1. General Nutrient Management	10
2. Basic Soil Science	12
3. Agricultural & Environmental Management	15
4. Sampling, Testing and Analysis	10
5. Basic Soil Fertility	15
6. Fertilizer Management	10
7. Manure Management	12
8. Biosolids (Sludge) Management	6
9. Technical Recommendations, Regulations & Incentives	10
Total	**100**

Reciprocity Agreements

Maryland, Pennsylvania, Virginia and Delaware have reciprocity agreements on training, exam standards, certification and continuing education credits. Persons seeking certification in Maryland who plan to work in PA, VA or DE need to consult their state nutrient management program for state-specific regulations and requirements.

Questions or comments should be directed to:

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MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND COLLEGE PARK•EASTERN SHORE

Information

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Nutrient Management

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PHOSPHORUS REMOVAL BY CROPS IN THE MID-ATLANTIC STATES

Reliable data about phosphorus (P) removal rates of crops are essential for nutrient management planners developing P-removal based recommendations. P-removal is available from many sources, although no source is comprehensive.

P-removal data from 7 regional or national published sources were used to compile the P-removal tables in this information sheet:

[1] *Chesapeake Bay Region Nutrient Management Manual*
[2] *Plant Food Uptake* booklet
[3] *Knott's Handbook for Vegetable Growers*
[4] *Nutrients Available from Livestock Manure Relative to Crop Growth Requirements*
[5] *The PLANTS Database*
[6] *The Fertilizer Handbook*
[7] *National Nutrient Database for Standard Reference*

P-removal was expressed as phosphate (P_2O_5) per unit yield.

- When P-removal information was available from more than one source, the source with the highest reported P-removal rate was used.
- When no data were available from regional or national published sources, data were obtained from an Extension Specialist with expertise on that particular crop. Typically, in these instances P-removal data were estimated from closely-related species with similar removal potential.
- Superscripts after each crop indicate the source of information.

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
GRAINS		
barley [4]	bushels	0.41
barley straw (per bushel grain) [5]	bushels	0.11
buckwheat [4]	bushels	0.37
corn [1]	bushels	0.40
corn stover (per bushel grain) [5]	bushels	0.14
oat [1]	bushels	0.30
oat straw (per bushel grain) [5]	bushels	0.09
proso millet [5]	bushels	0.39
rye [1]	bushels	0.50
rye straw (per bushel grain) [5]	bushels	0.17
sorghum [1]	bushels	0.42
triticale [4]	bushels	0.39
wheat [1]	bushels	0.56
wheat straw (per bushel grain) [5]	bushels	0.11

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
OILSEEDS		
canola [5]	cwt	1.3
soybean [1]	bushels	1.0
sunflower [5]	tons	27

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
SILAGE		
corn silage [2]	tons	3.6
grass silage [4]	tons	3.7
sorghum silage [4]	tons	5.6

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
FORAGES		
alfalfa hay [2]	tons	15
bermudagrass [2]	tons	12
birdsfoot trefoil [2]	tons	21
bluegrass [1]	tons	18
bluegrass/white clover [#]	tons	13
bluestem species [#]	tons	10
bromegrass [1]	tons	13
buffalograss [#]	tons	10

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
FORAGES (Continued)		
clover and grass [2]	tons	15
crown vetch [#]	tons	13
gamagrass [5]	tons	11
hairy vetch [5]	tons	14
indiangrass [#]	tons	10
lespedeza [5]	tons	10
millet [#]	tons	8.4
orchardgrass [1]	tons	17
red clover [1]	tons	10
reed canarygrass [5]	tons	12
ryegrass (annual [#] & perennial [2])	tons	17
small grain, hay or pasture [5]	tons	10
sorghum [2]	tons	8.4
sorghum x sudangrass [1]	tons	15
soybean and sorghum [1,2]	tons	9.2
soybean hay [1]	tons	10
soybean and millet [1,#]	tons	9.2
soybean and sudangrass [1,5]	tons	11
switchgrass [#]	tons	10
sudangrass [5]	tons	12
tall fescue [1]	tons	19
timothy [1]	tons	14
weeping lovegrass [#]	tons	10

No P-removal information was available in published sources for these forages. P-removal was estimated by Dr. Lester Vough, Extension Specialist, Forage Systems Management, from closely-related crops with similar uptake potential.

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
SEED CROPS		
crimson clover seed [4]	pounds	0.018
lespedeza seed [4]	pounds	0.016
red clover seed [4]	pounds	0.016
white clover [4]	pounds	0.030

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
VEGETABLES & HERBS		
artichoke (globe) [5]	cwt	0.20
artichoke (Jerusalem) [5]	cwt	0.14

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
VEGETABLES & HERBS (Continued)		
asparagus [5]	cwt	0.13
basil [7]	cwt	0.16
beans (dried, all types) [4]	cwt	1.1
beet (root) [5]	cwt	0.092
beet (top) [5]	cwt	0.12
broccoli [5]	cwt	0.18
brussels sprout [3]	cwt	0.29
cabbage [1]	tons	1.8
carrot [3]	cwt	0.092
cauliflower [5]	cwt	0.14
celery [5]	cwt	0.083
chervil ^	cwt	0.092
chickpeas ^	cwt	1.1
chive [5]	cwt	0.12
cilantro ^	cwt	0.092
collard ^	cwt	0.13
cucumber [5]	tons	1.1
dill ^	cwt	0.092
eggplant [5]	cwt	0.050
endive [5]	cwt	0.051
escarole [5]	cwt	0.032
fennel ^	cwt	0.092
garlic [5]	cwt	0.39
horseradish [7]	cwt	0.071
kale [5]	cwt	0.13
leafy greens (various) [5]	cwt	0.10
leek [5]	cwt	0.080
lettuce (head) [3]	cwt	0.079
lettuce (leaf) [5]	cwt	0.10
lima bean [5]	cwt	0.34
mint [7]	cwt	0.17
mustard green [5]	cwt	0.10
okra [5]	cwt	0.15
onion (dry) [5]	cwt	0.60
onion (green) [5]	cwt	0.084
oregano ^	cwt	0.17
parsley [5]	cwt	0.092
parsnip [5]	cwt	0.16

^ No P-removal data were available in published sources. P-removal was estimated by Extension Vegetable Specialists from closely-related crops with similar removal potential.

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
VEGETABLES & HERBS (Continued)		
pea [3]	cwt	0.57
pepper [5]	cwt	0.066
potato [4]	cwt	0.14
pumpkin [5]	tons	1.7
radish [5]	cwt	0.064
rutabaga [5]	cwt	0.092
snap bean [3]	cwt	0.23
soybeans (green, Edamame) [7]	cwt	0.44
spinach [6]	cwt	0.15
squash (summer) [5]	cwt	0.064
squash (winter) [5]	cwt	0.079
sweet corn [3]	cwt	0.14
sweet potato [3]	cwt	0.12
Swiss chard [5]	cwt	0.11
tomatillos ^	cwt	0.10
tomato [1]	tons	2.0
turnip (green) [5]	cwt	0.14
turnip (root) [5]	cwt	0.065

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
FRUITS		
apple [1]	bushels	0.020
grape [1]	tons	2.0
honeydew melon [3]	tons	1.3
muskmelon (cantaloupe) [3]	tons	3.5
peach [1]	bushels	0.033
Persian melon ^	tons	3.5
rhubarb (stalk) ^	cwt	0.046
watermelon [5]	tons	0.47
strawberry [5]	cwt	0.043

CROP	YIELD UNIT	LB P_2O_5 PER YIELD UNIT
MISCELLANEOUS		
cotton (seed & lint) [1]	tons	27
cotton (stalk, leaf & bur) [1]	tons	10
tobacco (leaf & stalk - based on harvest leaf weight) [1]	tons	30

Sources:

[1] Nagle, S., G. Evanylo, W.L. Daniels, D. Beegle, V. Groover, and F. Coale. 1997. Chesapeake Bay region nutrient management training manual. Misc. Publ.
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[5] USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA
[6] The Fertilizer Institute. 1982. The fertilizer handbook. The Fertilizer Institute, Washington, DC.
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