

## AGRICULTURAL LAND CLASSIFICATION SYSTEM FOR NEW YORK

The purpose of the Agricultural Land Classification system is to evaluate and group the soils of New York on the basis of their productivity and capability. The primary use of the system is for taxation and assessments as provided by Senate Bill 8923-A and Assembly Bill 11551-A enacted by the New York State legislature in April 1980. Stipulation in this legislation was a land classification system to be developed and administered by the New York Department of Agriculture and Markets in consultation with New York State College of Agriculture and Life Sciences at Cornell University. The State Division of Equalization and Assessment was directed to calculate land values for each soil group within the system using the income capitalization approach based on economic profiles developed by the New York State College of Agriculture and Life Sciences at Cornell University.

The Agricultural Land Classification system is a production rating system utilizing total digestible nutrients (TDN) as a measure of production. TDN was selected as the production function to permit a direct comparison of the corn and hay crops commonly grown within a rotation in New York. The corn and hay rotation was selected to compare soils because they are grown in most, if not all, regions and most soils within the State. There was also a need to provide a means to consider erosion control on most of the soils of the State. Generally a rotation of corn and hay will reduce the soil loss to permissible levels provided the number of years of corn is restricted.

### Construction of the System

The system utilizes the soil map unit as the key to the data base. The yields for corn and hay were estimated for each map unit that occurs within the State. These yields were obtained from several sources: (1) research plots, (2) county soil surveys, (3) SCS Form 5 data and (4) soil test summaries. The yields from the various sources were compared and adjusted to obtain a prudent management yield<sup>1</sup> that would represent the soil over its range of occurrences within the State. Some soils or map units had little or no yield data available. For these soils, map unit yields were estimated by comparing the soil properties and landscapes to other better known soils with yield data.

The number of years corn can be grown in the rotation was determined by calculating the soil loss utilizing the "universal soil loss equation" and comparing this loss with the permissible loss (and "T Value") for that soil map unit. The years of corn were restricted to maintain the average soil loss for the 10 year rotation at or below the permissible soil loss.

The TDN was computed for the prudent management yields utilizing the equation:

$$\text{TDN} = (\text{Years Corn} * \text{Yield Corn} * 0.2) + \\ [ (10 - \text{years Corn}) * \text{Yield Hay} * 0.5 ]$$

The constants within the equation convert the corn silage yields or hay yields to dry matter and from dry matter to digestible nutrients.

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<sup>1</sup> See list of definitions for further information on this and other terms used within this test.

Using the TDN yield, an index Value was calculated to compare soil map units. The index value is computed as

$$\text{Index} = \frac{\text{TDN of soil map unit}}{\text{TDN for best soil}} \times 100$$

This index is the yield of TDN with respect to the yield on the "best" soil within the state.

The soils are placed into 10 groups based upon the index value (Table 1). Groups 1 through 6 are subdivided into a high and a low lime to account for the cost of lime in the budgets. The crop budgets for each group required that average yields be estimated. There is no data available for average yields by soil map unit for the State. The statistical data that does exist is the state average corn and hay yields from the NYS Crop Reporting Service.

Using the Conservation Needs Inventory data the acres of each soil in corn and hay were estimated. The prudent management yields were compared to state average yields and an equation was developed to convert prudent management yields to average management yields. This equation is as follows (see Table 1 for conversion factors):

$$\text{Ave Mgt Yields} = \text{Prudent Mgt Yield} \times \text{Conversion Factor}$$

The average management yields of corn are 75 percent (conversion factor = 0.75) of the prudent management yields for Groups 1 to 4. For groups 5 through 7 the conversion factor reduces by 0.01 per group. The average yields are 67 percent (conversion factor = 0.67) as much as the prudent management yields for Groups 1 to 4. For groups 5 through 7 the conversion factor is reduced by 0.01 per group.

The limitations for Group 8 soils are usually so large that the land should be limited to pasture; therefore, no corn yield is given for a Group 8 soil and the hay is limited to removal by pasture. Under pasture production there is a reduced yield because the animals are not as efficient in timing of harvest as machines; therefore, a lower conversion factor (0.48) was assigned.

These reductions per group are to account for increased waste land, more difficulty in managing the lower groups on time, etc.

Table 1. Values used to place soils into 10 soil groups and convert from prudent management to average management yields.

Soil Group Number	Index Number	Prudent Management TDN Range	Prudent to Average Conversion Factor	
			Corn	Hay
1	90.00-100.0	4.09-4.54	0.75	0.67
2	80.00-89.99	3.63-4.08	0.75	0.67
3	70.00-79.99	3.18-3.62	0.75	0.67
4	60.00-69.99	2.72-3.17	0.75	0.67
5	50.00-59.99	2.27-2.71	0.74	0.66
6	40.00-49.99	1.82-2.26	0.73	0.65
7	30.00-39.99	1.36-1.81	0.72	0.64
8	<30.00			0.48
9		soils unsuited for cultivation		
10		undrained organic soils or water areas		

The yields used for the construction of the budgets are means of the average management yields of all soil map units within that soil group. The years of corn within the rotation is the median number of years for the group.

### Evaluation of Flooding

Flooding for the purpose of the Land Classification System is defined as "the surface of the soil being covered with water as a result of a stream or river overflowing its banks or water level in the stream or river being high enough to prevent the water on the soil surface from draining away." Flooding, for the purpose of the system, is neither the result of the soil slope being insufficient to drain the water away (ponding) nor the result of excess water from a heavy rain that has insufficient time to runoff. The flood also must occur during one of the following periods: (1) period when the soil is normally tilled and/or planted, (2) the normal growing season, (3) prior or during normal harvest time, or (4) other periods that damages a perennial crop.

The evaluation of a flooding problem is given in the terms of crop loss. There are three categories of flooding:

- 1) None or rare (R) - does not, or<sup>2</sup> rarely floods during the growing season. Defined as no complete crop loss<sup>2</sup> in the last ten years or the sum of crop losses is less than one complete crop loss in the last ten years.
- 2) Sometimes (S) - sometimes floods during growing season. Defined as one complete crop loss within the last ten years or the sum of crop losses is equal to or greater than one, but less than two complete crop losses in the last ten years.
- 3) Usually (U) - usually floods during the growing season. Defined as two or more complete crop losses within the last ten years or the sum of crop losses is equal to or greater than two complete crop losses in the last ten years.

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<sup>2</sup>Crop loss is defined as that loss due to flooding which includes the yield harvest from decreased activity during the normal crop growing season or the yield loss due to planting or harvesting delays that exceed those normal for the soil on which the crop is grown.

DEFINITIONS OF TERMS USED WITHIN THE  
AGRICULTURAL LAND CLASSIFICATION SYSTEM<sup>3</sup>

MAP SYMBOL - The map symbol or map unit symbol is the abbreviation for the soil name and usually the soil slope used on the soil survey maps. The first letters or numbers identify the soil name. The last capital letter identifies the soil slope. A few of the soil surveys published prior to 1955 did not have the slope identified as part of the map symbol. For these, a capital letter identifying the slope has been added to the right of the map symbol. The map symbol remains the same for the soil surveys even though the soil name may have changed. The map symbol does not necessarily remain the same for a soil found in different counties.

SOIL CAPABILITY (CAP) - is the capability or limitations of the soil for various uses as defined by the Soil Conservation Service. The lower the capability number the fewer the limitations. There are also three letters that are usually combined with the numbers greater than one (1) which identify the most common limiting factor. An E is for eroded or erosion hazard; W is wet, and S is for droughty (which may be the result of excess sand, gravel stones, etc.).

SOIL TEMPERATURE REGIME (TP) - Soils are classified according to the mean annual soil temperature at 20 inches depth. The groups found within New York are as follows:

- M = Mesic - 59°C to 47°F mean annual temperature
- F = Frigid - Less than 47°F mean annual temperature
- C = Cool - A Mesic soil extending into Frigid region

Originally, the temperature separating the Mesic and Frigid soils were established to closely correlate with the soil minimum temperatures where winter wheat would prosper. Since these temperature ranges were established newer, more winterhardy wheat varieties have been released; therefore, the temperature ranges no longer have the same meaning. The Frigid soils are expected to have lower yields for crops that require a high number of growing degree days such as field corn.

SOIL MODIFIER - The soil modifier gives certain profile, topographical, erosion, or other characteristics that may cause the soil to vary from the defined concept for that particular soil, i.e., moderately shallow variant or severely eroded.

SOIL SLOPE - The soil slope is the slope within a map delineation. It is given in percent and as a range, i.e., 0-3 percent. Thus, a 0-3% slope would be from none to 3 feet change in elevation per 100 feet of length. The

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<sup>3</sup>These terms occur on the headings of the Agricultural Land Classification State Master Soil List. Not all terms are included in the county lists.

slope is also given as the last capital letter in the map symbol. The relationship between the capital letters and the slopes are generally as follows:

<u>Capital Letter</u>	<u>Slope(s)</u>	<u>Capital Letter</u>	<u>Slope(s)</u>
None	0-1, 0-2, 0-3, 0-5	U (Undulating)	3-8
A	0-1, 0-2, 0-3, 0-5	R (Rolling)	8-15
B	3-8	H (Hilly)	15-25
C	8-15, 6-12		
D	15-25, 10-20, 12-18		
E	25-35, 25-40, 20-40, 20-30		
F	35-45, 30-45		

This is by no means a complete list because the exact slope range is usually more closely defined within the descriptions for the soil unit within a soil survey.

**SOIL NAMES** - The most recently correlated soil name is used as the standard reference within the agricultural land classification system. When a name has been changed from that appearing in the modern soil survey, the older or published name is given listed with the new name in parenthesis. If the soil names on the farm plan or old soil surveys differ from this soil legend, the correlation of the soil names can be obtained from the local Soil Conservation Service or Cooperative Extension office.

**COUNTY (CNTY)** - is the county in which the soil is mapped. It is given as a unique 4-letter abbreviation. These are fairly obvious except for INDI which is the Seneca Indian Lands in Western New York.

**SOIL DRAINAGE** - is the natural drainage of the soil as identified by the range of characteristics for a given soil type -- either as specified by the Form 5 or within the County Soil Survey. The drainage is commonly given as a range. Abbreviations within the report are as follows:

<u>Symbol</u>	<u>Soil Drainage</u>
E	Excessively drained
W	Well-drained
M	Moderately well-drained
S	Somewhat poorly drained
P	Poorly drained
V	Very poorly drained

If more than one letter is given within the column, it is to be interpreted as the range by placing a "to" between the two drainage classes, i.e., WM for the Langford soil series is read as "Langford is well to moderately well-drained." For the soil associations composed of soils with different drainages, the drainage classes may need to be read with an "and" between the classes, i.e., Hunter-Onteora Association should be read as "the well and somewhat poorly drained Hunter-Onteora Association."

SOIL TEXTURE OR SOIL TEXTURAL CLASS - The soil texture is the class as defined by the percent sand, silt and clay in the soil. The soil texture given is the most common texture for the map unit. The abbreviations given are combinations of the soil texture and the textural modifier (if a modifier is given). Some of the more common textural abbreviations are:

<u>Symbol</u>	<u>Texture</u>	<u>Symbol</u>	<u>Texture</u>
S	Sand	SiL	Silt Loam
LS	Loamy Sandy	SiCL	Silty Clay Loam
LFS	Loamy Fine Sand	CL	Clay Loam
FSL	Fine Sandy Loam	C	Clay
VFSL	Very Fine Sandy Loam	MK	Muck
L	Loam	Pt	Peat

Some of the more common textural modifiers are as follows:

<u>Symbol</u>	<u>Modifier</u>
BY	Bouldry
CB	Cobbly
CN	Channery
CR	Cherty
FL	Flaggery
GR	Gravelly
MK	Mucky
R	Rocky
SH	Shaly
ST	Stony

These modifiers may also be followed by:

V = very  
X = extremely

STVSiL would be read as "very stony silt loam", while BYXL would be read as "extremely Bouldry loam." Yields are usually reduced when the soils are cobbly, flaggery, very or extremely cobbly, gravelly, or cherty. The soils are usually suitable only for pasture or non-agricultural use when they are very or extremely stony or bouldry.

LIME - Lime status is defined as the lime content within the rooting zone of the native soil profile and is not necessarily the surface soil pH in its' current state. The current pH could be reduced by various management factors such as nitrogen fertilizers and/or crop removal. There are two groups: High (Hi) - requires little lime in the crop rotation and Low (Lo) - requires limes additions within every rotation.

YEARS (YRS) - is the number of years of corn (or other row crops) that can be grown in a corn-hay rotation without exceeding the permissible soil loss by erosion without the use of additional practices such as cover crops, no-till practices, etc. Permissible soil loss is equivalent to the estimated rate of soil formation, thus it is the soil loss permitted without



loss in productivity. The soil loss is calculated using the length and steepness of slope, soil erodibility, soil cover and rainfall intensity factor within the Wischmeier or soil loss equation.

PRUDENT MANagements YIELDS - are the corn and hay yields (averaged over a period of about 10 years) that are expected when the best cultural practices are utilized. These yields approach those obtained from research plots and do not include certain harvesting losses, losses as a result of wet spots in the field, etc. The corn yields are rounded to the nearest 1 ton/acre and the hay yields are rounded to the nearest 0.5 tons/acre.

AVERAGE MANAGEMENT YIELDS - are the yields in tons/acre of corn and hay expected utilizing average management on that particular soil.

TOTAL DIGESTIBLE NUTRIENTS (TDN) - are the yields in tons/acre of total digestible nutrients computed from a 10 year rotation of corn and hay by the equation:  $TDN = (\text{Years of Corn} \times \text{Corn Yield} \times 0.2) + [(10 - \text{years corn}) \times \text{Yield Hay} \times 0.5]$ .

INDEX - is the TDN yield compared to the best soil within the State (expressed as a percent of the best yield).

$$\text{Index} = \frac{\text{TDN}}{\text{Best Yield}} \times 100$$

The index value used in placing the soils in the first 8 of the 10 soil groups is computed using the prudent management yields, yet little difference would be obtained if average management yields had been used.

SOIL GROUP - is the group from one to ten in which the soil has been placed based on its index value.

FLOODING (FD) - is the of flooding from overflow of a stream or river that results in crop loss. The flooding groups are:

- Blank = Soil not considered on a flood plain
- R = not flooded or rarely flooded
- S = sometimes flooded (1 year or less in 10 years)
- U = usually flooded (more frequent than 1 year in 10 years)

If there is a letter within this column, see the addendum list for the soil groups for this soil map unit.

CHANGE (CH) - means there was a change in the information for this soil map unit. These changes may or may not result in a change within the soil group. The letters that are found within this column are:

- N = new soil information - replacing information on previous list
- A = added soil - did not replace information on previous list
- O = old soil information - replaced by new information this year
- D = Soil deleted from the previous list

If a letter is found in the CH column, examine the addendum list to compare the changes between the last year's and this year's groups.