CPI versus CER

Crop Productivity Index

Versus

Crop Equivalent Rating

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The NRCS Crop Productivity Index (CPI) ratings were developed for several reasons:

- Classification system to compare soils across Minnesota for:

- Farm Service Agency CRP Soil Rental Rate Groups
- Eliminate out of date corn and soybean yields in County soil databases & replace with CPI's
- Use CPI's to update corn and soybean yields in County soil databases
- Use CPI's to evaluate NRCS's land capability classes and assign yields to class IV or less
- BWSR funding to speed up this project and how about using CPI's to replace CER's!!!

Crop Productivity Index

The Minnesota Crop Productivity Index (CPI) ratings provide a relative ranking of soils based on their potential for intensive row crop production. An index can be used to rate the potential yield of one soil against that of another over a period of time. Ratings range from 0 to 100. The higher numbers indicate higher production potential.

Although CPI is primarily intended as a ranking potential for row crops, values were assigned to map units that are not ever considered cropland. Very low CPI values of less than 30 are rarely cropland and CPI values of less than 20 are never cropland, but the low CPI value still indicate a relative vegetative productivity. A CPI value of “0” was given to map units like: gravel pits, quarries, river wash, Urban land-complex, and water.

MuSym	Winona County Mapunit Name	CPI
477	Littleton silt loam	100
301A	Lindstrom silt loam, 1 to 3 percent slopes	99
285A	Port Byron silt loam, 1 to 3 percent slopes	99
455A	Festina silt loam, 0 to 2 percent slopes	98
285B	Port Byron silt loam, 3 to 6 percent slopes	98
194	Huntsville silt loam	95
24	Kasson silt loam	95
19	Chaseburg silt loam	92
301C	Lindstrom silt loam, 6 to 12 percent slopes	92
369B	Waubeek silt loam, 2 to 6 percent slopes	91
1830	Eitzen silt loam	91
285C	Port Byron silt loam, 6 to 12 percent slopes	91
99B	Racine silt loam, 2 to 6 percent slopes	91
455B	Festina silt loam, 2 to 6 percent slopes	90
401B	Mt. Carroll silt loam, 3 to 6 percent slopes	90
103A	Seaton silt loam, 1 to 3 percent slopes	90
215B	Southridge silt loams, 2 to 6 percent slopes	88
493B	Oronoco fine sandy loam, 3 to 8 percent slopes	88
331	Tripoli silty clay loam	87
580B	Blackhammer-Southridge silt loams, 2 to 6 percent slopes	87
262B	Medary silt loam, 1 to 6 percent slopes	87
176	Garwin silt loam	86
492B	Nasset silt loam, 3 to 6 percent slopes	86
1952B	Keltner silt loam, 3 to 6 percent slopes	85
587B	Palsgrove silt loam, 2 to 6 percent slopes	85
103B	Seaton silt loam, 3 to 6 percent slopes	85
369C	Waubeek silt loam, 6 to 12 percent slopes	80
401C	Mt. Carroll silt loam, 6 to 12 percent slopes	80
576	Newalbin silt loam	79
468	Otter silt loam	79
215C	Southridge silt loam, 6 to 12 percent slopes	78
322C2	Timula silt loam, 6 to 12 percent slopes, eroded	78
1937	Lawler loam, bedrock substratum	77
492C	Nasset silt loam, 6 to 12 percent slopes	77
99C	Racine silt loam, 6 to 12 percent slopes	76
301D	Lindstrom silt loam, 12 to 20 percent slopes	73
25	Becker fine sandy loam	71
587C	Palsgrove silt loam, 6 to 12 percent slopes	71
103C	Seaton silt loam, 6 to 12 percent slopes	71
388C	Seaton silt loam, valleys, 6 to 12 percent slopes	71
580C	Blackhammer-Southridge silt loams, 6 to 12 percent slopes	70
1952C	Keltner silt loam, 6 to 12 percent slopes	70

483	Waukee loam	69
1955A	Waukee loam, bedrock substratum, 0 to 2 percent slopes	69
1893B	Beavercreek variant loam, 1 to 6 percent slopes	68
826B	Gale-Blackhammer silt loams, 2 to 6 percent slopes	68
401D	Mt. Carroll silt loam, 12 to 20 percent slopes	67
586C	Nodine-Rollingstone silt loams, 4 to 12 percent slopes	67
198C	Rollingstone silt loam, 3 to 12 percent slopes	67
1955B	Waukee loam, bedrock substratum, 2 to 6 percent slopes	66
1951A	Flagler sandy loam, bedrock substratum, 0 to 2 percent slopes	65
829C	Seaton-Gale silt loams, 6 to 12 percent slopes	65
322D2	Timula silt loam, 12 to 20 percent slopes, eroded	64
1953	Marshan silt loam, loamy substratum	62
587D	Palsgrove silt loam, 12 to 20 percent slopes	62
103D	Seaton silt loam, 12 to 20 percent slopes	62
388D	Seaton silt loam, valleys, 12 to 20 percent slopes	62
501B	NewGlarus silt loam, 3 to 6 percent slopes	61
79B	Billett fine sandy loam, 1 to 6 percent slopes	60
484D	Eyota fine sandy loam, 12 to 20 percent slopes	59
215D	Southridge silt loam, 12 to 20 percent slopes	58
476B	Frankville silt loam, 2 to 6 percent slopes	58
826C	Gale-Blackhammer silt loams, 6 to 12 percent slopes	58
580D	Blackhammer-Southridge silt loams, 12 to 20 percent slopes	55
476C	Frankville silt loam, 6 to 12 percent slopes	55
501C	NewGlarus silt loam, 6 to 12 percent slopes	54
198D	Rollingstone silt loam, 12 to 20 percent slopes	54
1951B	Flagler sandy loam, bedrock substratum. 2 to 6 percent slopes	53
299B	Rockton silt loam, 1 to 6 percent slopes	53
1936	Hoopeston sandy loam, bedrock substratum	52
586D	Nodine-Rollingstone silt loams, 12 to 20 percent slopes	52
174D	Gale silt loam, 12 to 20 percent slopes	47
1954B	Spinks loamy fine sand, bedrock substratum, 1 to 6 percent slopes	45
501D	NewGlarus silt loam, 12 to 20 percent slopes	45
1822B	Abscota variant sand, 1 to 6 percent slopes	44
476D	Frankville silt loam, 12 to 18 percent slopes	43
1954C	Spinks loamy fine sand, bedrock substratum, 6 to 15 percent slopes	39
1960B	Haverhill variant, clay loam, 1 to 8 percent slopes	38
283B	Plainfield sand, 1 to 6 percent slopes	32
830D	Eleva-Seaton complex, 12 to 30 percent slopes	30
283C	Plainfield sand, 6 to 12 percent slopes	30
388E	Seaton silt loam, valleys, 20 to 30 percent slopes	30
283D	Plainfield sand, 12 to 25 percent slopes	27
95C	Dunbarton silt loam, rocky, 4 to 12 percent slopes	23
81B	Boone loamy fine sand, 2 to 6 percent slopes	22
81C	Boone loamy fine sand, 6 to 15 percent slopes	21

11B	Sogn silt loam, 1 to 6 percent slopes	21
598B	Beavercreek silt loam, 1 to 8 percent slopes, stony	20
1861	Chaseburg silt loam, channeled	20
1860	Comfrey silt loam, channeled	20
1857	Eitzen silt loam, channeled	20
604	Huntsville-Beavercreek complex, channeled	20
271	Minneiska fine sandy loam, channeled	20
577	Newalbin silt loam, channeled	20
522	Boots muck	15
322E2	Timula silt loam, 20 to 40 percent slopes, eroded	14
592E	Lamoille-Elbaville silt loams, 20 to 30 percent slopes	13
599E	Norden silt loam, 15 to 30 percent slopes	13
173F	Frontenac loam, 30 to 40 percent slopes	11
501E	NewGlarus silt loam, rocky, 12 to 30 percent slopes	6
11D	Sogn silt loam, rocky, 6 to 30 percent slopes	6
815F	Elbaville-Seaton silt loams, 30 to 45 percent slopes	5
1002	Fluvaquents, channeled	5
474B	Haverhill mucky silty clay loam, 1 to 8 percent slopes	5
578	Newalbin silt loam, very wet	5
1990	Otter mucky silt loam, very wet	5
606	Shiloh silt loam, ponded	5
322F	Timula silt loam, 40 to 60 percent slopes	5
584F	Lamoille-Dorerton silt loams, 30 to 45 percent slopes	4
599F	Norden silt loam, 30 to 45 percent slopes	4
457E	Lacrescent channery silt loam, 20 to 45 percent slopes	3
832F	Lacrescent-Rock outcrop complex, 30 to 45 percent slopes	3
898F	Bellechester-Brodale complex, rocky, 15 to 60 percent slopes	3
488G	Brodale cobbly loam, rocky, 45 to 70 percent slopes	2
283F	Plainfield sand, 25 to 50 percent slopes	2
457G	Lacrescent silt loam, rocky, 45 to 70 percent slopes	1
832G	Lacrescent-Rock outcrop complex, 45 to 70 percent slopes	1
831F	Spinks-Boone-Sogn complex, rocky, 15 to 60 percent slopes	1
1029	Pits, gravel	0
1013	Pits, quarries	0
1015	Psamments, fill	0
1010	Riverwash	0
1016	Udorthents, loamy	0
840	Urban land-Finchford complex	0
839	Urban land-Minneopa complex	0
W	Water	0
M-W	Water, miscellaneous	0

The CPI ratings do not take into account climatic factors, such as the differences in precipitation or growing degree days across Minnesota. The ratings are based on physical and chemical properties of the soils and on such hazards as flooding or ponding.

Available water capacity, reaction (pH), slope, soil moisture status, cation-exchange capacity (CEC), organic matter content, salinity, and surface fragments are the major properties evaluated when CPI ratings are generated. The soil properties selected are those that are important for the production of corn.

Yield versus Productivity

- Yield and soil productivity are related but are not equivalent terms
- Yield reflects genetics, soil properties, climate and management.
- Soil is the least likely to change
- Growing season temperature and precipitation can account for about 2/3 of the monthly yield variation of rain-fed corn

Climate Index Factor for Corn

215 BU/AC. X CIF = HIGH YIELD STARTING POINT FOR COUNTY
COUNTY HIGH YIELD X MAP UNIT CPI = MAP UNIT CORN YIELD
(215 BU/AC) X (.87) = 187 BU/AC

All soil component mapping phases in Minnesota were evaluated using the Cropland Productivity rule in the National Soil Information System (NASIS), and a CPI was generated for each phase. A statistical mean CPI value was created for each soil component mapping phase. All map units were populated with each component's mean CPI value, and a weighted average CPI was created for each soil map unit in the state. An individual map unit (for example, Canisteo clay loam, 0 to 2 percent slopes) will have the same CPI value wherever that map unit occurs throughout the state.

Map Unit = Component (A +B+C…)

When the soils are rated, the following assumptions are made: a) adequate management, b) no irrigation, c) artificial drainage where required, d) no land leveling or terracing, and e) no climatic factors considered.

The map unit CPI was used to update the map unit crop yields for corn and soybeans. Even though predicted average yields will change with time, the productivity indices are expected to remain relatively constant in relation to one another over time.

Differences between CER and CPI/FPI

For CER:

- Climate (growing degree days and precipitation) adjustments were made
- A moderate level of management was assumed
- Production cost of dominant crop/land use mix was considered
- CER reflect the net economic return per acre of whichever crop provides the highest net return
- Same soil may have a different number in another county
- Little emphasis given to forest and pasture land uses

For CPI/FPI:

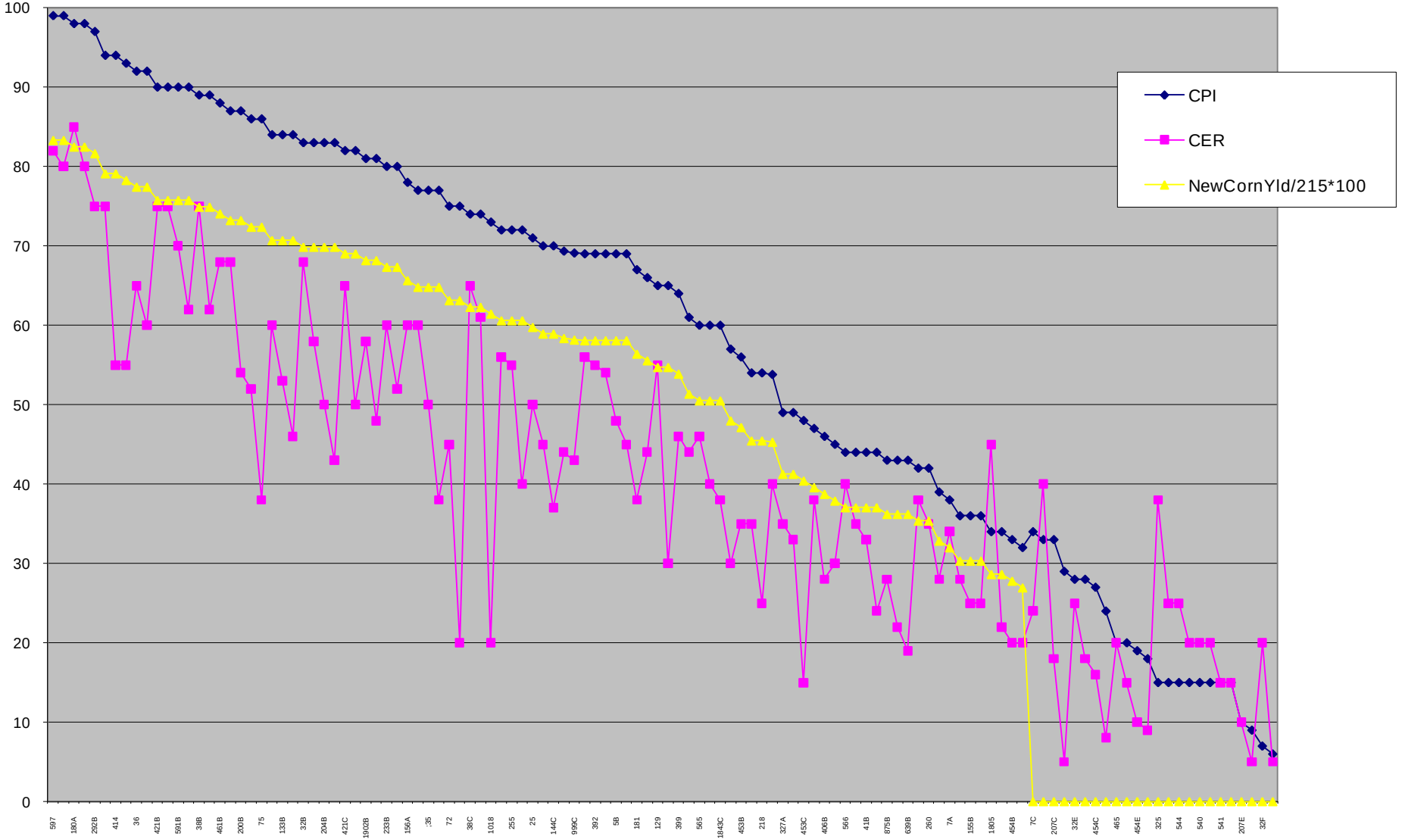
- Climate adjustments were not made
- Management practices were not specifically considered
- Production costs were not considered
- CPI/FPI rate a soil on the basis of physical/chemical properties in the rooting zone
- CPI uses corn as a reference species; FPI uses Aspen as a reference species
- Same soil will have the same number in any county
- Land use not a factor for CPI/FPI

Comparing Numbers

- As stated earlier, unlike CER which likely had a different number for the same soil in different counties depending on the crop mix and so forth, CPI will have the same number wherever it is located.
- That means--- as an example--- a soil that is mapped a hundred miles north to south will have the same CPI number. Will its yield of a given crop (and its relative “value”) be the same at its geographic extremes? Unlikely!!

Stearns County Crop Productivity Index

New Corn Yield / 215 bu * 100 versus CER



Comparing numbers

Keep comparisons local/regional and limited in geographic scope