FILLING IN MISSING VALUES IN THE NORTH DAKOTA LAND VALUATION MODEL

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ABSTRACT

The North Dakota Land Valuation Model relies on a crop yield data set published by the USDA's National Agricultural Statistics Service. Over the years this data set, due to the way in which the data is collected, has developed a growing problem with missing values. This research utilizes a secondary data set and the spatial nature of the crop yield data to develop a new methodology for interpolating the missing values in the NASS data set.

This methodology uses the secondary data set to establish the spatial nature of the yield data and to build spatial weights matrices. These spatial weights matrices are used in conjunction with the secondary data set and weather data to develop various methods of estimating the missing values. Once this is done the results of the methodologies are analyzed for both individual and global convergence.

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INTRODUCTION

This paper will use spatial data models in an application to agricultural yield data. The principle purpose of this paper is to fill in missing data values in the National Agricultural Statistics Service data set for use in the North Dakota Land Valuation Model (NDLVM). The NASS data set is used in many US states besides North Dakota and in scholarly studies so while this study focuses on the missing values problem in the context of the NDLVM, the results will be useful for any project that relies on the NASS data set.

The NDLVM is a model maintained by North Dakota State University's department of Agribusiness and Applied Economics. The model is used to calculate county level agricultural land values for taxation purposes, with land value calculated as landowner share of gross returns divided by capitalization rate (Aakre, Saxowsky and Vreugdenhil 2003). Landowner share of gross returns is calculated using revenue generated from agricultural land, which is calculated as income from crops, livestock, government payments, etc.

Crop income is calculated using information from the US Department of Agriculture's NASS. The NASS data used in the NDLVM calculation of crop revenue (per acre) include Acres Harvested, Yield/Acre Harvested, and Price. Data on crop acreages and yields is obtained from surveys sent out each December from NASS to a random sample of producers (USDA NASS 2009). The missing data problem arises when there are too few respondents from a given county for a given crop, which legally requires that the data be omitted to maintain confidentiality. When this happens, NASS does not report the information that might reveal information about a given operation, but instead combines it with reports from other counties for a combined total (USDA NASS 2008). This is the source of the missing values problem.

Currently, missing values in the NASS data set are filled into the NDLVM using simple averaging techniques. A missing crop yield for a county is calculated using an ad hoc method that averages the yields of the counties surrounding it (Haugen 2012). This method is described as an ad hoc because there is no set methodology or procedure for selecting which surrounding counties' yields will be included in the average for a missing value.

There are multiple problems with this technique. First, it is often the case that Using only the yields for counties that actually share a border with the county of interest ignores the influence of counties that may be near the county in question but do not actually border it. Also, this technique assumes that each county that has some border with the county of interest exerts equal influence over its crop yields as any other bordering county. These assumptions are very likely wrong, so a more accurate technique for estimating yield data is necessary because these values are used to calculate farmer's tax rates. The more accurate our estimates, the more fairly the state of North Dakota can assess taxes.

The estimation technique explored in this paper will use spatial matrices and an alternative data set obtained from the USDA's Risk Management Agency (RMA) to fill in the missing values in the NASS data set. The RMA data set is much richer than the NASS data set because the data collected comes from farmers reporting information about their operation for crop insurance through the Federal Crop Insurance Corporation (FCIC). The USDA estimates that as of 1998 over two-thirds of the field crops in the United States were insured under—and thus reported to—the RMA (USDA RMA 2011). Because the majority of farming operations participate in crop insurance programs and thus must report to the RMA, the RMA data set does not have any missing or estimated values.

The benefit of using this richer data set is that a spatial regression model can be used to estimate values for counties where the value is already known. This allows the model to describe exactly the relationship between a given county and its neighbors, rather than just estimating what the relationship might be, which would be the case if we were restricted to using only the NASS data.

The reason that a spatial model is used rather than just a simple panel regression model is that any model that ignores the spatial relationship between counties where one exists will result in biased regression coefficients. The spatial model is preferable to a fixed effects approach because, while the fixed effects model allows for some omitted variables that vary across entities (counties in our case) but not over time (Stock and Watson 2011). This method is not ideal since we know that the variation across entities is caused by spatial correlation and the fixed effects regression is useful when the cross-entity variation is unknown. We want to use the model that utilizes all of the available information to obtain the most accurate estimates possible.

The missing values in the NASS data set that we propose to fill in are an issue for not just North Dakota, but all states that rely on yield data to calculate tax rates. As farms continue to consolidate, resulting in fewer operations per county, there are more and more missing values reported by NASS each year. There are many available papers that discuss interpolation of missing values in a data set. This is a problem of interest in many academic fields because there are many issues that arise when attempting to analyze a data set with missing values. One of the biggest problems that researchers working with a data set with missing values face is that many software packages will not run with an incomplete data set.

LITERATURE REVIEW

Brubacher and Wilson (1976) use the case of electricity demand in Canada to illustrate methods for interpolating missing values in a data set. The case studied in this paper uses a time-series data set with missing values in random years that have blocks of known values before and after the missing values. The authors describe the modifications to the OLS process that must be performed before estimating the least squares equation for the missing values. These mathematical modifications are necessary to ensure that the model will fit the form of the existing data in the set (that form being, in this case, uncorrelated time series). Once this has been, all that is left is to estimate the model for the missing values. The authors also provide a description of the procedure for interpolating a missing value in a data set with only one missing entry. [1]

A paper by Jinn and Sedranski (1989) provides a discussion of common methods of estimating missing values followed by an analysis of their flaws. This paper points out the bias issues that can arise from basic imputation methods when the data set is subjected to secondary analysis. The authors then discuss regression methods of estimating missing values, with the conclusion that regression methods result in the best estimated values.

Skinner and Coker (1996) published another paper that discusses various methods of estimating missing values in a data set. This paper lists the common imputation methods before turning to a discussion of the use of maximum likelihood estimation. This paper's biggest limitation is that it limits any analysis to data sets that are only missing values in one covariate.

Papers more closely related to the subject of this paper are those that discuss the interpolation of missing values in panel data sets though there are not many papers focusing

[1] Brubacher and Wilson's paper is just one example of the available literature on dealing with missing observations in time series data. Other papers on this subject have been published by Damsleth (1980), and Harvey and Pierce (1984).

specifically on panel data interpolation. One paper particularly concerned with dealing with missing values in panel data in the context of political science research has been published by Honaker and King (2010). The paper begins with a discussion of the common technique of using multiple imputations to estimate missing values in several different ways and then combing the results. The authors discuss the problems with this method, which arise due to the fact that this method is best suited to problems with 30–40 variables from sample surveys and other data with similar rectangular, nonhierarchical properties. The new method of dealing with missing values in panel data simplifies the complex matrix process by replacing it with a bootstrapping algorithm and relaxes restrictions on data formats.

While all of the above papers address the issue of estimating missing values in a data set, none of them discuss how to proceed with a data set that exhibits spatial as well as temporal autocorrelation. Honaker and King's paper above is one of the few papers that discuss missing value estimation for a panel data set, but that study implicitly assumes cross-sectional units are independent across space.

There are many papers and textbooks that discuss what spatial data is, and how it can be modeled in the regression framework. LeSage (1998) provides a general text on modeling with spatial data. LeSage's book provides explanations of spatial models and provides MATLAB functions that can be used to run these models, along with detailed information on several specifications of the spatial model, including spatial error modeling. Ward and Skrede-Gleditsch (2008) cover mapping and interpreting spatial data, working with spatially lagged dependent variables, and working with spatially correlated errors. Their book explains the problems that can arise when working with spatial data, such as biased estimates and underestimated data variance. A paper from Cliff and Ord (1975) is one of the most cited works on spatial data

analysis. This paper lists the properties of spatial data and the difficulties that arise when working with this type of data set, which can include assumptions of stationarity, spatial dependence, problems with aggregation, and issues with data availability. It also lays out the various ways spatial relationships can be described. Unwin and Hepple (1974) discuss approaches to modeling with spatially correlated data. The authors open with a discussion of what spatial data is, and then move on to a discussion of the approaches for dealing with spatial data. Trend surface models decompose the data into two components: a systemic, spatial component, and non-systemic effects. The authors then move on to discuss the problems with this approach, which are found in specification, computation, and result inference. Because of these issues, spatial models are preferable because they avoid making assumptions about the model specification and instead look at the covariances between observations. Finally, we have a paper on modeling Approaches to the statistical analysis of geographical data from Bennett and Haining (1985). This paper is of special interest to this study because of its emphasis on the analysis of geographical data. Like the papers mentioned above, it begins with definitions. The authors then provide a list of three criteria that a problem must meet to be modeled spatially: the models must derive from either joint or conditional specification, the models must involve spatial dependence, and the models will involve either unidirectional or bidirectional spatial dependence. Applications of spatial models are presented to illustrate the use of spatial nearest neighbor models and hierarchical models. The authors conclude with a discussion of what they see as the most important problems in modeling with spatial data: the specification of spatial linkages, modeling non-stationarity, and model validation.

Cliff and Ord's paper contains a discussion of an application of the spatial analysis techniques discussed in their paper. The authors use as an example studies on both the spacing

and the size of settlements in various states, which, through the use of spatial models, are shown to be random, not hexagonal as economists had previously thought.

Cressie and Chan's 1989 paper Spatial Modeling of Regional Variables is a study of SIDS (sudden infant death syndrome) rates in North Carolina. This paper is particularly useful for its illustration of modeling with spatial data on a county level.

Nistor et al provide a thorough list of recent spatial data applications in economics. The subjects of these studies are diverse. However, none of these studies involve crop yield analysis or farm land valuation.

Crop yield models appear in a variety of papers. Yu (Yu 2010) presents a model for yield as a function of weather factors. The factors in the model include yield, time, temperature, and rain. The research demonstrates the bias that can be introduced into a model during periods of particularly good/bad weather. The final component introduced into the model is a step recently introduced by the RMA which corrects for heteroskedasticity by regressing log of the estimated yield variation on the log of trend yield.

There are many other studies on the distribution of yield data. A paper on policy implications of crop yield and revenue variability from Coble, Dismukes, and Thomas (2007) estimates crop yields using national, state and county level data from USDA NASS and RMA with a simple linear regression in their study of policy implications on revenue variability (which is heavily dependent on yield). A paper from Kapiamba (2005) that model heteroskedasticity of crop yield distributions studies the extent to which heteroskedasticity effects crop yield estimates.

One recent paper by Huang and Khanna (2010) uses analysis of crop yields and crop acreages to gain insight on the possible impacts of climate change on yields. The data used in

this paper is county level panel data from USDA NASS. This study uses regression analysis to show that crop yields can be described as a function of climate variables, crop prices, land quality, and input prices. The impacts of other county characteristics are controlled with county fixed effects. The functional form used for the yield model is linear, which the authors establish as commonly used in the literature. The methodology used to establish the acreage model is similar to that used for the yield model. The result is that acreage is a function of lagged acreage, climate variables, economic variables, risk variables, and county population density. The functional form used for this model is log linear, as per the existing literature.

There are many papers that value agricultural land with relation to crop yield data. A report from the University of Missouri's Food and Agricultural Policy Research Institute (2011) illustrates how the production value of an acre of agricultural land can be calculated. This report was drafted with the intention of quantifying the agricultural cost of flooding. In order to accomplish this, the authors used data from previous years to calculate the acreages and yields of the crops that would have been planted in the flooded area. Multiplying acreage by yield per acre by average current price for each commodity and then adding these values together results in a value for lost crop production from the flooding. This paper also factors in things like government payments and costs of production. The data used in this paper are estimates based on the USDA-NASS GIS CropScape tool rather than official values based on survey information, but it the paper is still useful because it reinforces the methodology for calculating the value of agricultural production in a single year.

Gloy, et al (2011) discuss land valuation for the purposes of calculating appropriate land sales prices. This analysis does not just consider the value of production for a single year, as in the previous paper; it bases the land's value on the expected returns for all future years,

discounted back to the present. To do this, it is necessary to estimate the factors driving returns to farmland (crop prices, costs, and yields), and capitalization rates (interest rates, risk premiums, and income growth). This paper clearly has an objective that requires the use of discounted expected future values to determine fair purchase price, rather than the use of a single year's known values to value one year's worth of farmland production for taxation purposes. The common element to this paper's approach and the one that will be used below is the use of crop acreages, yields, and prices to obtain a value for farmland.

Gloy et al.'s paper discussed above is just one of many papers that use the present value approach to value agricultural land based on expected future returns calculated from expected crop acreages, yields, and prices. Other papers that use this approach in some way have been published by Lloyd (1994) and Goodwin, Mishra, and Ortalo-Magne (2003), which are both critiques of the present value approach of valuing agricultural land (neither of these papers disputes the value of using crop yield and acreage estimates in valuation; the critiques focus on discounting approaches).

There are several recent papers that use spatial panel data along with crop yields to explain variations in crop yields across both time and space. Nistor, et al. (2008) use spatial panel data to estimate a yield response model for a farm practicing precision agriculture, specifically the impact of controlled drainage technology. The authors give a thorough breakdown of their data sources and composition, including how crop yield data is obtained and how precipitation data is collected. This section also includes a discussion of their choice of model specification, which is a model with a spatially dependent error and controls for topography, weather, and drainage treatment. This is followed by a discussion of the spatial panel model types and the authors' choice to place the spatial component for their model in the

error term. This paper does not specifically estimate land values, but it does use spatial panel data on crop yields to estimate yields.

Lippert, Chatzopoulos, and Aurbacher (2011) provide an applied example of the use of spatial data to estimate crop yields in the Baden-Württemberg region of Germany. The authors seek to understand the relationship between environmental variables and crop yields, which can only be accurately estimated if some spatial component is added to their analysis. The authors describe the model that will be used—a model that includes a spatial component plus independent variables for environmental factors. All of the possible forms of the spatial component are described and tested in STATA, with the spatial error model ultimately being chosen as the best fit.

Ozaki, et al. (2005) present a case study on the pricing of crop insurance in Brazil. The authors discuss their modeling framework, explaining that to derive individual premium rates, county level data must be used. Alternative modeling methods—parametric, semi parametric, nonparametric, Bayesian—and alternative crop yield distributions—normal, Beat, inverse hyperbolic, gamma—are discussed before it is settled that agricultural yields follow a spatio-temporal distribution. Further model specification is then discussed, first from the temporal aspect and then the spatial and finally spatio-temporal.

The estimation of crop yields for application to crop insurance schemes is discussed in other papers, but the above paper is unique in its use of spatial modeling techniques in its analysis. Papers using crop yields in crop insurance pricing studies that lack spatial consideration include those published by Turvey and Zhao (1999), Zhu (2011), and Skees, Hazell, and Miranda (1999). Crop insurance studies are useful because they, like the NDLVM, focus on valuing crop production for a single year.

The above literature review reveals a hole in the literature that we will attempt to fill with this study. There are many papers on the interpolation of missing values in a data set (Abraham 1981), (Brubacher and Wilson 1976), (Honaker and King 2010), and several that discuss interpolation in a panel data set specifically (Skinner and Coker 1996), but none of them discuss methods for estimating missing values for a data set that exhibits spatial dependence.

There are many papers that model with spatially correlated data (Cliff and Ord 1975), (Cressie and Chan 1989), (Ward and Skrede Gleditsch 2008). The limitation of the current literature is that it all seems to focus on models that explain relationships between variables where there is spatial correlation present. There are no papers that discuss the use of spatial data for forecasting or missing value estimation.

There are papers already in the literature that discuss agricultural land valuation based on yield data, (Food and Agricultural Policy Research Institute-University of Missouri 2011), (Gloy, et al. 2011), (Kendall 1938) , and even a few that factor in the spatial correlation present in yield data (Nistor, et al. 2008), (Lippert, Chatzopoulos and Aurbacher 2011). The missing component is, again, the use of this spacial analysis for missing value interpolation.

The current literature contains many studies that estimate missing data values, including some that specifically estimate missing values in panel data sets. There are also many studies that use spatial techniques to build models and even some that use spatial techniques to value land based on crop yield data. This paper is where all of these branches will meet—we will use a crop yield panel data set with spatial dependence to estimate missing values in a data set, which will allow those running the NDLVM to calculate land values using the data set that has been completed with the estimation techniques.

DATA

The two sources of crop yield data used in this problem both come from the USDA. The first, the data set used in the NDLVM and the source of the missing values problem, is from the National Agricultural Statistics Service (NASS). NASS data is available to the public online through the USDA. The other data set was obtained for this project from the Risk Management Agency (RMA).

NASS obtains their data from surveys sent to North Dakota farmers each year (USDA NASS 2009). The results from these surveys are publicly available on the USDA's website through their quick stats program (USDA NASS 2012), which is how the data used in this study was retrieved.

For the state of North Dakota, NASS provides yield data for fourteen different crops, with some crops being broken down into irrigated and non-irrigated, or into subcategories based on their specific uses. The crops for which information is available through NASS are Beans, Dry Edible, Barley, Canola, Corn, Flaxseed, Hay, Lentils, Oats, Potatoes, Peas, Dry Edible, Sugarbeets, Sunflowers, Soybeans, and Whet. The following table, Table 1, lists all of the crops reported, all subcategories (type or practice), and their four-digit abbreviations used in statistical analysis.

The NASS data used in this study encompasses all of the above crops for each of the 53 counties of North Dakota for the years 2008 through 2010. While there is NASS data available through quick stats for the last ten plus years, only three years of data were retrieved for this study because the second data source from the RMA, which will be discussed next, only provides data for the years 2008-2010.

Table 1: NASS Variables

Crop	Type	Practice	Code
Beans Dry Edible	All	All	NBDE
Barley	All	All	NBRA
Canola	All	All	NCAN
Corn	for Grain	All	NCGT
Corn	for Grain	Irrigated	NCGI
Corn	for Grain	Non-Irrigated	NCGN
Corn	for Silage	All	NCST
Flaxseed	All	All	NFXS
Hay	All	All	NHYA
Hay	Alfalfa	All	NHYF
Hay	Other	All	NHYO
Lentils	All	All	NLNT
Oats	All	All	NOAT
Potatoes	All	Irrigated	NPAI
Potatoes	All	All	NPAT
Peas Dry Edible	All	All	NPDE
Sugarbeets	All	All	NSGB
Sunflowers	All	All	NSFA
Sunflowers	Oil	All	NSSO
Sunflowers	Non-Oil	All	NSSN
Soybeans	All	All	NSYB
Wheat	All	All	NWHA
Wheat	Durum	All	NWHD
Wheat	Other Spring	All	NWOS
Wheat	Winter All	All	NWWA

As mentioned above, the second crop yield data set used in our analysis comes from the USDA's RMA. The RMA data set is much richer than the NASS data set because the data collected comes from farmers reporting information about their operation for crop insurance through the Federal Crop Insurance Corporation (FCIC). The USDA estimates that as of 1998 over two-thirds of the field crops in the United States were insured under—and thus reported to—the RMA (USDA RMA 2011). The data in this set is very similar to the NASS data set—it provides crop yield data for all 53 North Dakota counties for the years 2008-2010 for fourteen

crops. As in the NASS set, some crops are broken up into subcategories by type or practice. The crops and their codes are listed in Table 2 below.

Table 2: RMA Variables

Crop	Type	Practice	Code
Beans Dry Edible	All	All	RBDE
Barley	All	All	RBRA
Canola	All	All	RCAN
Corn	for Grain	Irrigated	RCGI
Corn	for Grain	Non-Irrigated	RCGN
Corn	for Silage	Irrigated	RCSI
Corn	for Silage	Non-Irrigated	RCSN
Flaxseed	All	All	RFXS
Hay	Alfalfa	All	RHYF
Hay	Mixed	All	RHYM
Lentils	All	All	RLNT
Oats	All	All	ROAT
Potatoes	All	Irrigated	RPAI
Potatoes	All	Non-Irrigated	RPAN
Peas Dry Edible	All	All	RPDE
Sugarbeets	All	Irrigated	RSGI
Sugarbeets	All	Non-Irrigated	RSGN
Sunflowers	Oil	All	RSSO
Sunflowers	Non-Oil	All	RSSN
Soybeans	All	All	RSYB
Wheat	Durum	Irrigated	RWDI
Wheat	Durum	Non-Irrigated	RWDN
Wheat	Spring	Irrigated	RWSI
Wheat	Spring	Non-Irrigated	RWSN

The weather data used in this study comes from the North Dakota Agricultural Weather Network (NDAWN) and was obtained from their website. All of the data used in this study is available to the public through their website (NDAWN 2012). NDAWN has 72 stations scattered throughout North Dakota and in several border towns in Minnesota, Montana, and South Dakota. The weather variables that NDAWN records and that were downloaded for this study are listed in Table 3 below.

Table 3: Weather Variables

Variable	Units	Code
Latitude	Degrees	LAT
Longitude	Degrees	LNG
Elevation	Feet	ELV
Maximum Temperature	Degrees Fahrenheit	MXT
Minimum Temperature	Degrees Fahrenheit	MNT
Average Temperature	Degrees Fahrenheit	AVT
Bare Soil Temperature	Degrees Fahrenheit	BST
Turf Soil Temperature	Degrees Fahrenheit	TST
Average Wind Speed	MPH	AVW
Maximum Wind Speed	MPH	MXW
Solar Radiation[2]	Ly(Langleys)/Day	SRD
Average PET[3]	Inches	AVP
Total PET	Inches	TLP
Rainfall	Inches	RNF
Dew Point Temperature	Degrees Fahrenheit	DPT
Wind Chill Temperature	Degrees Fahrenheit	WCH

These variables are available for download in hourly, daily, weekly, monthly, and yearly increments. For this study, only yearly data was downloaded since the data from the RMA and NASS are reported on yearly basis.

The NDAWN data set required some modification to be made compatible with the rest of the data used in this study. This is due to the fact that NDAWN does not have one station in each county so there is not one measurement for each county. There are thirteen counties that have more than one station, fourteen counties that do not have any station, leaving only twenty-six counties that have one observation per year. For counties that have only one station, the measurements from that one station are used as is for that county's measurements. For counties in the other two categories, some modifications were required.

[2] Solar radiation is measured as the total incident solar radiation energy received in a day. The yearly figures used for this study are calculated by finding the average of all daily measurements.

[3] PET stands for potential evapotranspiration, an estimate of the maximum water loss from crops and is measured daily. NDAWN provides data for total PET in a year and for average PET in a year.

For counties with two or more observations, the data from each of the county's stations were averaged. The county averages are used for each of these thirteen counties. The process for estimating values of the weather variables in counties that have no stations is a bit more complicated. The method used to obtain values for these counties is one of simple averaging of the weather variables for all counties contiguous to the one missing values.

METHODS

All regression and estimation models used for this project were run using STATA. This section will discuss the methods used in this study. This section will also discuss the complications that arise during the implementation of these methods and the methods used to deal with these complications.

The data used in this study is county-level crop yield data, which is suspected of exhibiting spatial autocorrelation. To test the hypothesis that crop yield data exhibits spatial autocorrelation, we will calculate Moran's I for each crop/year[4]. Moran's I is a measure of spatial autocorrelation that can be calculated for any set of data provided that it is complete and that there exists a matrix *W* of spatial weights for the data set. This means that we must use the RMA data to calculate the Moran's I.

Using the RMA data we can calculate the Moran's I for both the contiguity and inverse-distance matrices for each crop/year. The value of Moran's I can range from -1 to +1, where a Moran's I value of -1 indicates perfect dispersion, or no spatial autocorrelation at all, and a value of +1 indicates perfect spatial autocorrelation. The Moran's I can be transformed into a corresponding Z-value, which can then be used for conducting statistical tests, such as determining whether or not the North Dakota yield data exhibits statistically significant spatial autocorrelation.

The Moran's I and corresponding Z-values are listed in Chart 1 (contiguity) and Chart 2 (inverse-distance) in the appendix. These charts each list the Moran's I, its expected value, its standard deviation, and the corresponding z and p values for each crop for each of the three years for which data is available. Crop/years that have statistically significant Moran I's (as determined

[4] Crop/year is a generic term meaning each cop in each year. For example, barley/2008 is a crop year. So are barley/2010 and canola/2008.

by the crop/year's Moran's I z value) are indicated with an asterisk in the corresponding z column.

Now that we have established that the crop data is spatially dependent, we discuss the construction of the spatial weights matrices. A spatial weights matrix is a matrix that contains data about the intensity of the spatial relationship between data points in a region. This intensity can be quantified in many different ways—by distances, by length of shared border, by 'region', etc. The data set used in this study contains information on contiguity and the geographical coordinates of county centers, so two spatial weights matrices can be built: one based on contiguity (row normalized) and one based on inverse distances from county center to county center.

Once it has been verified that the crop yield data exhibited spatial dependence, the next step is to begin constructing the regression equations that would be used to actually estimate the missing values in the data. We know that the general form of the initial regression will look like

$$NASS = \beta 1 \times RMA + \beta 2 \times X + \epsilon \quad (1)$$

where NASS represents the NASS variable, RMA is the RMA variable, X represents the additional variables that could be added to the equation to improve the estimation, and ϵ is the error term.

The first element of Equation 1 to be determined is which RMA variable best explains each NASS variable. In some cases this is a straightforward determination, such as when both NASS and RMA both report the exact same variable. This is the case with the crops barley, canola, flaxseed, hay—alfalfa, lentils, oats, peas dry edible, sunflower seed—oil, and soybeans. For these crops, no further analysis is needed to match up the NASS and RMA data sets.

For the rest of the crops, we must calculate several possible regression equations to determine which RMA variables best explain the NASS data. In these cases, the adjusted R-squared is used to determine the best regression equation for each crop. We use adjusted R-squared because it is a statistic that tells us how well the model fits the observed dependent (NASS) variables while adjusting for the influence of adding additional explanatory variables, which the R-squared does not do. If we base our determination on R-squared, the regression model with the most variables will always be determined as the best, while the adjusted R-squared penalizes the addition of more explanatory variables. Since our possible models listed in the following paragraph could include one or two explanatory variables, we must make our determination of which is best based on the adjusted R-squared.

The NASS variables that do not have an exact match in the RMA data set are corn for grain—total, hay—other, sugarbeets, wheat—durum, and wheat—other spring. In many of these cases, such as with sugarbeets, the NASS data set provides data for total sugarbeet yield while the RMA data set provides a more detailed breakdown of irrigated and non-irrigated sugarbeet yields. This is also the situation for corn for grain—total, wheat—durum, and wheat—other spring. For each these crops a series of three regressions were estimated with the RMA variable or combination of RMA variables with the highest adjusted R-squared being chosen for inclusion in the crop's regression equation. Below are the three regressions estimated for sugarbeets.

$$NSGB = \beta 1 \times RSGI + \beta 2 \times RSGN + \epsilon \quad (2)$$

$$NSGB = \beta 1 \times RSGI + \epsilon \quad (3)$$

$$NSGB = \beta 1 \times RSGN + \epsilon \quad (4)$$

Finally, corresponding RMA variables were determined for the NASS variables that have no exact crop name match. These NASS variables are hay—other and wheat—all. For wheat—

all, more regressions were necessary since any of the four reported RMA wheat variables could explain the variable. The best of these estimations, as determined from R-squared, is chosen as the equation with which we will proceed. Once this final determination is made, we have the first component, RMA, of Equation 1 set and can proceed to determining the exact configuration of the second component, X.

The results of all of the regressions used to determine which RMA variables best explain which NASS variables are listed in tables 8-17. There is one chart for each crop, with each of the possible regressions listed, along with their corresponding F, R-squared, and adjusted R-squared statistics.

A 2010 paper from Yu (Yu 2010) determines that weather variables might be added to a crop yield model to increase its explanatory power. Based on this and other papers[5], it was determined that weather and geographical variables might be added to X to increase the accuracy of the model. Once this data was obtained and formatted for compatibility with the NASS and RMA data sets, a series of regressions containing the weather variables could be estimated. The generic regression forms are listed on pages 135 through 137 in the appendix.

Each of these generic regressions is run for each crop for each of the three years of available data. The adjusted R-squared is then stored for each regression. With a goal of keeping the estimation methods used later in the analysis simple (so that the usefulness of the results of this study to other applications could be maximized), it was decided to choose one of the generic regression equations listed above for all of the crop estimations.

To choose the one generic form that would be used for all of the crops and years, each generic format is given a score, with the generic format that receives the highest score being the

[5] Geigel and Sundquist provide a detailed review of the literature establishing the strong connection between climate and crop yield. (Geigel and Sundquist 1984)

one that is used in all further estimations. To score the generics, the adjusted R-squares for the generic regression formats for each crop/year are ranked from most explanatory to worst based on adjusted R-square values. Then the top three generic formats from each crop/year are then weighted, with the best form receiving a weight of three, the second best a two, and the third best a one. Once this is done, each generic's score can be calculated by adding together any points it received from the ranking of the crop/years.

For example, if generic 2 received two best scores, one second best, and six third bests, its score would be $(3 * 2) + (2 * 1) + (1 * 6) = 14$. The result of these scores is that equation 23 is the equation that best explains the majority of crop/years. Once this final determination has been made, Equation 1 is complete and ready to be estimated.

Equation 1 is just the first step in the imputation cycle that will be used to estimate the missing NASS values. Equation 1 is used to fill in the missing values in the first step of the imputation cycle so that in the next step we can run spatial regressions using the contiguity and inverse distance spatial weights matrices discussed above—we must initially fill in the missing values with the regression estimates because the spatial regressions cannot be estimated on a data set with missing values. Once the missing values have been filled in with regression estimates, we can begin imputing, with the general imputation equation

$$NASS = \rho \times W \times NASS + \beta 1 \times RMA + \beta 2 \times AVP + \beta 3 \times TLP + \beta 4 \times DPT + \epsilon \quad (5)$$

This procedure is called R1 from here on out.

This equation is imputed a total of ten times for each crop/year for each of the spatial weights matrices. This imputation process is done by taking the initial estimates generated above, then using the spatial matrix to run a spatial regression on the completed data set. Using this regression, we generate new estimates for the missing values. We then fill these new

estimates into our original data set and run the spatial regression again, which we can then use to generate a second set of estimates. This process is repeated a total of ten times to find a point of convergence for each crop/year.

Once this first set of estimates has been obtained, we can modify our general estimation equation, run it again, and compare it to the results obtained using the above methods. The first modification made is to exclude the weather variables from the imputed equation. The resulting new equation is shown below.

$$NASS = \rho \times W \times NASS + \beta 1^{x} RMA + \epsilon \quad (6)$$

This equation is imputed nine more times and run for each of the spatial weights matrices for every crop/year, just as the previous one was. This procedure is called R2.

The above equation is then modified even further, with the weather variables dropped from the initial equation, with new equation being

$$NASS = \beta 1^{x} RMA + \epsilon \quad (7)$$

This procedure is called R3.

Once this initial regression has generated initial estimates for the missing values, Equation 6 is then imputed for both spatial weights matrices and each crop/year just as in the first two versions above.

In the interest of increasing the general usefulness of the methods developed in this project, some additional estimates were estimated that did not rely on a second overlapping, complete dataset (the RMA data). This means that the initial values generated thus far with Equations 1 and 7, which are dependent on the RMA data, cannot be used for this last series of regressions. With no secondary dataset to use as a basis for obtaining the initial values, initial

values must be filled using only the information that we do have in the incomplete (NASS) dataset.

Four potential methods of filling in the missing values initially will be used: with each crop/year's mean, minimum, and maximum, and with values generated using STATA's random number generator with the random numbers distributed uniformly between each crop/years minimum and maximum reported values for the given crop/year. These procedures are called MEAN, MIN, MAX, and R4. These starting values are all generated using STATA commands. These four methods of estimating initial values for the initial values are then imputed using Equation 6, which is imputed ten times, as in the above estimations.

One final procedure is developed that uses the initial regression equation but modifies the imputation equation. This equation, called R5 (Equation 8 below), is unique because it does not rely on any information outside of the NASS data set and the spatial weights matrix.

$$NASS = \rho \times W \times NASS + \epsilon \quad (8)$$

This concludes the regression and estimation portion of this project. Once all of these estimations have been run and their results stored, the results from the various estimation methods can be compared. The results and comparisons will be covered in the Results section below.

RESULTS

In this section the results from the models discussed in the methods section will be presented and discussed. Many of these results will be presented in the form of charts and graphs, which will be attached in the appendix and explained here. For the purpose of illustration, we will present and explain in-depth the results for just one crop/year, barley/2008, in this section. Any discussion for this crop/year can then be generalized to the results that are presented graphically for all others in the appendix.

The first step in this project that generated statistical results is the calculation of Moran's I for each crop/year and for both the inverse distance and contiguity matrices. Table 1 in the appendix tells us that Moran's I for barley/2008 for the contiguity and inverse-distance matrices are .687 and .262, respectively. The corresponding Z-values are 8.219 for the contiguity matrix and 15.174 for the inverse-distance matrix, both of which are higher than 1.96. This means that the data for barley/2008 exhibits spatial autocorrelation that is significant at the 1% level. Moran's I and the corresponding Z-values for all other crop years are included in charts 1 and 2 on page__.

Once the Moran's I tests have proven that the crop yield data does in fact exhibit spatial autocorrelation, we move on to the next step in the project, in which we determine which variables to include in our regression equations. First, we determine which RMA variables match up with which NASS variables when there are differences in their definitions. The NASS variables that do not have an exact match in the RMA data set are corn for grain—total, corn for silage—total, hay—all, hay—other, potatoes—total, sunflowers—all, sugarbeets, wheat—all, wheat—durum, and wheat—other spring. There was a series of regressions run for each of these

crops, with their results presented in tables A3 through A12. We will discuss in depth the results presented in one of these charts, the chart for wheat—other spring.

There are three possible regression forms that would relate RMA data to the NASS data for wheat—other spring. The RMA data for spring wheat is divided into irrigated and non-irrigated, so the basic regression could include only irrigated acres, only non-irrigated acres, or both. As shown in Chart A12, the respective Adjusted R-squared variables for these three regressions are 0.1614, .9713, and .9709. The higher the adjusted R-squared value, the more variation in the data is explained by the model, so we will choose the regression form that yields the highest adjusted R-square value, in this case the model that includes only non-irrigated spring wheat acres.

The process used to determine RMA regressor(s) on wheat—other spring is used for all other crops mentioned above as well. The results are summarized (adjusted R-squares) in Table 4 below.

Table 4: NASS to RMA Variables

NASS	RMA	Adj R-Squared
Corn for Grain--Total	Corn for Grain--Non-Irrigated; Corn for Grain--Irrigated	0.72
Corn for Silage--Total	Corn for Silage--Non-Irrigated; Corn for Silage--Irrigated	0.68
Hay--All	Hay--Alfalfa	0.50
Hay--Other	Hay--Alfalfa	0.43
Potatoes--Total	Potatoes--Non-Irrigated	0.62
Sunflowers--All	Sunflower seed--Oil	0.45
Sugarbeets	Sugarbeets--Non-Irrigated	0.38
Wheat--All	Wheat--Durum, Non-Irrigated; Wheat--Spring, Non-Irrigated	0.97
Wheat--Durum	Wheat--Durum, Non-Irrigated	0.89
Wheat--Other Spring	Wheat--Spring, Non-Irrigated	0.97

Now that we have matched up the NASS and RMA variables, we can determine what other variables should be included in the final regression equations. The possible regressors that could be added to the basic regression equations are listed on page 15 in the data section. Each of these possible variables were added to each crop/year equation, and some combinations of multiple repressors were also added. These results are shown in the appendix in tables A13 through A63.

As above, we will only discuss one of these tables in depth, returning to barley/2008. This table, and all the others, contains the results from twenty-four regressions. Since we are concerned only with determining which of these regressions does the best job of explaining the variation in the barley/2008 data, the most important regression statistic is the adjusted R-squared. Looking at the table, we can see that regression 21 is the best, regression 17 second best, and regression 7 third best. The regressions for all other crop/years are ranked similarly. Once this ranking is finished, each regression form is scored as described on pages 20 and 21 in the Methods section.

The result of this scoring gives us the additional variables that will be added to the regression equation for each crop/year. These variables are average PET, Total PET, and dew point temperature. We have now determined that the form of the barley equation is

$$\text{NASS barley} =$$

$$\beta_0 + \beta_1 \text{RMA barley} + \beta_2 \text{average PET} + \beta_3 \text{Total PET} + \beta_4 \text{dew point temperature} + \epsilon. \quad (9)$$

The rest of our results are from regressions that estimate the missing values in the NASS data set. The values are all estimated by first filling in the missing values with a base number and then running iterations from there.

We will discuss all regression results for the crop/year barley/2008. The regression summaries for barley/2008 are shown in Chart A64. The summary charts contain summary statistics such as R^2s and F-statistics.

Each of the ten iterations for all eight regression forms are summarized in a graph (figure) for regressions using the contiguity matrix and a graph for those using the inverse-distance matrix (for a total of sixteen regressions) for each crop year. Figure B1 shows all regressions using the contiguity matrix for barley/2008 in Sargent County and Figure B2 shows all regressions using the inverse-distance matrix for barley 2008 for that county. The important information we can get from the visual representation of the results in graphical form is the convergence. We want to see two different levels of convergence in each graph—convergence to a single value for each regression, and, ideally, convergence of all eight regression lines to a single value. If convergence is demonstrated, we know that the individual regression is stable and has reached a conclusive value. If global convergence is evident, then we can be confident that the value of convergence is a good estimate for the missing value since it was reached through several variations on the estimation equation.

In both Figure B1 and Figure B2, we see the estimation lines converging in two groups. In both figures, the lines representing mean, maximum, minimum, R4, and R5 converge to an area above the area where the lines representing R1, R2, and R3 converge. In both graphs, the two areas of convergence differ by about forty bushels/acre. This is not surprising considering the different approaches used in the two groups. The first group consists of estimations that use the RMA data sparingly, if at all. The regressions mean, maximum, minimum, and R4 do not use the RMA data at all in their estimation and regression R5 uses it only in the initial linear

regression to generate starting values. This indicates that including the RMA data in our estimation process results in a bias in our estimation results for this crop.

The two distinct clusters of estimation results are found in over half of the county graphs for barley for both the contiguity and inverse-distance matrices. The majority of the remainder of graphs had all regressions converging to a single point or all but one converging.

The rest of the crops' graphs can be analyzed accordingly. For the canola graphs we see a pattern emerging that is very similar to what we see for Barley—many of the graphs have two points of convergence. The difference is that for canola the regression groupings are R1, R4, mean, minimum, and maximum in the first and R2, R3, and R5 in the second. These groupings are present in approximately thirty percent of graphs. The rest have one area of convergence (approximately twenty percent), or have all lines but R5 converging (thirty-five percent of graphs), which happens only in 2009 graphs. There are also some graphs where no clear convergence is observed, but this is seen only in approximately ten percent of graphs.

The graphs for corn for grain—total exhibit several patterns. Approximately forty percent of the graphs indicate convergence to a range of twenty or smaller, while sixteen percent of graphs exhibit convergence of all lines but R5, and as above this is only present in the 2009 graphs. Fifteen percent of graphs have R1, R4, mean, minimum, and maximum all converging to the same point.

The figures for Flaxseed fall into the same general categories as those for corn for grain—total, with ten percent showing all lines converging to one small area, over thirty percent showing the lines for R1, R4, mean, minimum, and maximum converging to the same point, and twenty-seven percent of the graphs show all lines but the line for R5 converging.

After analyzing the graphs for the above crops, we see a pattern emerging. The graphs that show the regression results for the crops that are not discussed above and are available upon request. From all of these graphs it is clear that the regressions R1, R4, minimum, maximum, and mean generally give the same result across all crops, years, and counties, while regressions R2, R3, and R5 generally reach their own point of convergence. This result is not unexpected because, as mentioned above, the two sets of regressions vary in their use of the RMA data. The first set uses the secondary yield data from the RMA very little, if at all, while the second group is dependent on the RMA data set.

CONCLUSIONS

This study's purpose is to develop and test a methodology for filling in missing values in a spatial data set, specifically the NASS data set used in the North Dakota Land Valuation Model. To do this, first an alternate data source was identified. Then, the spatial nature of the data was demonstrated. Once this was done, the spatial regressions were put together and run to initially fill in the missing values and then impute them each ten times. Once this was achieved, the results were put into graphs for ease of interpretation.

In interpreting these graphs, we see that our method is successful because each of the regression types used in the analysis reach a point of convergence, and in most cases reach the same convergence point in each crop/year. This demonstrates the consistency of the methodology.

It would be ideal if the estimated values generated using the methodology developed in this study could be compared to the values estimated using the current ad hoc methods for the North Dakota Land Valuation Model, but due to the ad hoc nature of the current method, the results cannot be duplicated for comparison. We cannot say for sure how different our results are from the results generated using the existing method but this methodology is still useful because the NASS data set is used in many applications besides the NDLVM where an ad hoc methodology would not be sufficient for filling in holes.

This study was possible because there was a second, overlapping crop data source available from the RMA. In many cases where data may be missing it may not be possible to find an alternative source of data, so a possible area of further study is to develop methodologies for filling in missing spatial values when no alternative data sources are available.

Other extensions to this research topic are being considered. The first is to develop confidence intervals for the missing values generated using the methodology developed above. The other is to develop a stopping criterion in the STATA code for the iterative process so that the process will automatically terminate once the estimated values have ceased to change from one iteration to the next.

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APPENDIX A. TABLES

Table A1: Moran's I Contiguity

Moran's I (Contiguity Matrix)						
Year	Crop	Moran's I	E(I)	sd(I)	z	p-value
2008	BDE	0.683	-0.019	0.087	*8.096	0
2008	BRA	0.687	-0.019	0.086	*8.219	0
2008	CAN	0.57	-0.019	0.086	*6.835	0
2008	CGI	0.437	-0.019	0.086	*5.291	0
2008	CGN	0.817	-0.019	0.086	*9.702	0
2008	CSI	-0.053	-0.019	0.084	-0.405	0.343
2008	CSN	0.4	-0.019	0.086	*4.865	0
2008	FXS	0.271	-0.019	0.086	*3.38	0
2008	HYF	0.746	-0.019	0.086	*8.87	0
2008	HYM	0.598	-0.019	0.085	*7.282	0
2008	LNT	0.242	-0.019	0.083	*3.161	0.001
2008	OAT	0.731	-0.019	0.085	*8.77	0
2008	PAI	.	-0.019	0.087	.	.
2008	PAN	0.326	-0.019	0.081	*4.246	0
2008	PDE	0.367	-0.019	0.085	*4.524	0
2008	SGI	0.196	-0.019	0.081	*2.664	0.004
2008	SGN	0.644	-0.019	0.083	*7.956	0
2008	SSO	0.581	-0.019	0.086	*6.996	0
2008	SSN	0.613	-0.019	0.085	*7.407	0
2008	SYB	0.695	-0.019	0.086	*8.263	0
2008	WDI	0.206	-0.019	0.081	*2.774	0.003
2008	WDN	0.556	-0.019	0.086	*6.724	0
2008	WSI	0.199	-0.019	0.087	*2.522	0.006
2008	WSN	0.882	-0.019	0.086	*10.448	0
2009	BDE	0.396	-0.019	0.086	*4.828	0
2009	BRA	0.312	-0.019	0.081	*4.105	0
2009	CAN	0.5	-0.019	0.085	*6.104	0
2009	CGI	0.217	-0.019	0.086	*2.73	0.003
2009	CGN	0.654	-0.019	0.085	*7.892	0
2009	CSI	-0.043	-0.019	0.084	-0.285	0.388
2009	CSN	-0.055	-0.019	0.083	-0.439	0.33
2009	FXS	0.394	-0.019	0.084	*4.894	0
2009	HYF	0.509	-0.019	0.085	*6.206	0
2009	HYM	0.409	-0.019	0.085	*5.02	0
2009	LNT	0.12	-0.019	0.085	1.645	0.05
2009	OAT	0.189	-0.019	0.084	*2.465	0.007
2009	PAI	0.145	-0.019	0.086	1.911	0.028

Table A1: Moran's I Contiguity (continued)

Moran's I (Contiguity Matrix)						
Year	Crop	Moran's I	E(I)	sd(I)	z	p-value
2009	PAN	0.486	-0.019	0.081	*6.275	0
2009	PDE	0.216	-0.019	0.085	*2.758	0.003
2009	SGI	0.12	-0.019	0.081	1.71	0.044
2009	SGN	0.647	-0.019	0.083	*8.011	0
2009	SSO	0.288	-0.019	0.085	*3.621	0
2009	SSN	0.373	-0.019	0.087	*4.529	0
2009	SYB	0.578	-0.019	0.086	*6.931	0
2009	WDI	0.026	-0.019	0.083	0.549	0.292
2009	WDN	0.274	-0.019	0.082	*3.561	0
2009	WSI	0.009	-0.019	0.087	0.322	0.374
2009	WSN	0.54	-0.019	0.086	*6.52	0
2010	BDE	0.151	-0.019	0.019	*9.189	0
2010	BRA	0.055	-0.019	0.017	*4.24	0
2010	CAN	0.124	-0.019	0.018	*7.777	0
2010	CGI	0.081	-0.019	0.019	*5.368	0
2010	CGN	0.183	-0.019	0.018	*11.012	0
2010	CSI	-0.017	-0.019	0.018	0.141	0.444
2010	CSN	-0.037	-0.019	0.018	-1.003	0.158
2010	FXS	0.106	-0.019	0.018	*6.856	0
2010	HYF	0.147	-0.019	0.018	*9.027	0
2010	HYM	0.081	-0.019	0.018	*5.466	0
2010	LNT	0.064	-0.019	0.018	*4.564	0
2010	OAT	0.027	-0.019	0.018	*2.565	0.005
2010	PAI	0.05	-0.019	0.019	*3.733	0
2010	PAN	0.103	-0.019	0.017	*7.013	0
2010	PDE	0.048	-0.019	0.018	*3.644	0
2010	SGI	0.014	-0.019	0.018	1.883	0.03
2010	SGN	0.141	-0.019	0.018	*8.895	0
2010	SSO	0.023	-0.019	0.018	*2.326	0.01
2010	SSN	0.063	-0.019	0.019	*4.422	0
2010	SYB	0.215	-0.019	0.019	*12.633	0
2010	WDI	0	-0.019	0.018	1.068	0.143
2010	WDN	0.042	-0.019	0.018	*3.461	0
2010	WSI	0.004	-0.019	0.019	1.24	0.107
2010	WSN	0.164	-0.019	0.018	*9.913	0

Table A2: Moran's I Inverse-Distance

Moran's I (Inverse-Distance Matrix)						
Year	Crop	Moran's I	E(I)	sd(I)	z	p-value
2008	BDE	0.273	-0.019	0.019	*15.651	0
2008	BRA	0.262	-0.019	0.019	*15.174	0
2008	CAN	0.155	-0.019	0.019	*9.346	0
2008	CGI	0.147	-0.019	0.019	*8.971	0
2008	CGN	0.284	-0.019	0.019	*16.323	0
2008	CSI	-0.025	-0.019	0.018	-0.343	0.366
2008	CSN	0.138	-0.019	0.019	*8.45	0
2008	FXS	0.066	-0.019	0.019	*4.598	0
2008	HYF	0.293	-0.019	0.019	*16.808	0
2008	HYM	0.202	-0.019	0.018	*12.092	0
2008	LNT	0.02	-0.019	0.018	*2.221	0.013
2008	OAT	0.266	-0.019	0.018	*15.472	0
2008	PAI	.	-0.019	0.019	.	.
2008	PAN	0.089	-0.019	0.018	*6.129	0
2008	PDE	0.094	-0.019	0.018	*6.128	0
2008	SGI	0.03	-0.019	0.018	*2.793	0.003
2008	SGN	0.137	-0.019	0.018	*8.653	0
2008	SSO	0.172	-0.019	0.018	*10.352	0
2008	SSN	0.174	-0.019	0.018	*10.512	0
2008	SYB	0.264	-0.019	0.019	*15.212	0
2008	WDI	0.023	-0.019	0.018	*2.411	0.008
2008	WDN	0.198	-0.019	0.018	*11.788	0
2008	WSI	0.067	-0.019	0.019	*4.622	0
2008	WSN	0.34	-0.019	0.019	*19.332	0
2009	BDE	0.505	-0.019	0.087	*6.046	0
2009	BRA	0.252	-0.019	0.082	*3.306	0
2009	CAN	0.642	-0.019	0.084	*7.878	0
2009	CGI	0.221	-0.019	0.086	*2.786	0.003
2009	CGN	0.729	-0.019	0.085	*8.818	0
2009	CSI	0.04	-0.019	0.085	0.703	0.241
2009	CSN	0.028	-0.019	0.081	0.585	0.279
2009	FXS	0.543	-0.019	0.086	*6.568	0
2009	HYF	0.148	-0.019	0.085	*1.965	0.025
2009	HYM	0.19	-0.019	0.085	*2.473	0.007
2009	LNT	0.315	-0.019	0.086	*3.868	0
2009	OAT	0.127	-0.019	0.084	1.736	0.041
2009	PAI	0.287	-0.019	0.087	*3.536	0
2009	PAN	0.266	-0.019	0.077	*3.689	0
2009	PDE	0.272	-0.019	0.085	*3.429	0

Table A2: Moran's I Inverse-Distance (continued)

Moran's I (Inverse-Distance Matrix)						
Year	Crop	Moran's I	E(I)	sd(I)	z	p-value
2009	SGI	0.011	-0.019	0.077	0.396	0.346
2009	SGN	0.624	-0.019	0.084	*7.644	0
2009	SSO	0.202	-0.019	0.08	*2.752	0.003
2009	SSN	0.284	-0.019	0.086	*3.535	0
2009	SYB	0.646	-0.019	0.086	*7.724	0
2009	WDI	0.307	-0.019	0.081	*4.042	0
2009	WDN	0.212	-0.019	0.084	*2.754	0.003
2009	WSI	0.104	-0.019	0.086	1.423	0.077
2009	WSN	0.798	-0.019	0.086	*9.471	0
2010	BDE	0.19	-0.019	0.019	*11.191	0
2010	BRA	0.092	-0.019	0.018	*6.232	0
2010	CAN	0.153	-0.019	0.018	*9.495	0
2010	CGI	0.082	-0.019	0.019	*5.415	0
2010	CGN	0.233	-0.019	0.018	*13.779	0
2010	CSI	0.004	-0.019	0.018	1.25	0.106
2010	CSN	-0.02	-0.019	0.018	-0.031	0.488
2010	FXS	0.176	-0.019	0.018	*10.585	0
2010	HYF	0.041	-0.019	0.018	*3.252	0.001
2010	HYM	0.044	-0.019	0.018	*3.44	0
2010	LNT	0.134	-0.019	0.019	*8.204	0
2010	OAT	0.027	-0.019	0.018	*2.524	0.006
2010	PAI	0.096	-0.019	0.019	*6.175	0
2010	PAN	0.069	-0.019	0.017	*5.239	0
2010	PDE	0.049	-0.019	0.018	*3.738	0
2010	SGI	-0.013	-0.019	0.017	0.363	0.358
2010	SGN	0.142	-0.019	0.018	*8.885	0
2010	SSO	0.041	-0.019	0.017	*3.446	0
2010	SSN	0.037	-0.019	0.019	*3.016	0.001
2010	SYB	0.219	-0.019	0.019	*12.843	0
2010	WDI	0.035	-0.019	0.018	*3.072	0.001
2010	WDN	0.051	-0.019	0.018	*3.881	0
2010	WSI	0.045	-0.019	0.019	*3.47	0
2010	WSN	0.303	-0.019	0.019	*17.331	0

Table A3: CGT Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
CGI, CGN	40	50.43	0	0.7316	0.7171	*
CGI	40	32.89	0	0.464	0.4498	
CGN	40	99.63	0	0.7239	0.7166	

Table A4: CST Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
CSI, CSN	21	22.63	0	0.7154	0.6838	*
CSI	21	2.23	0.1521	0.1049	0.0578	
CSN	21	33.52	0	0.6382	0.6192	

Table A5: HYA Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
HYF, HYM	29	14.9	0	0.5341	0.4983	
HYF	29	28.99	0	0.5178	0.4999	*
HYM	29	22.81	0.0001	0.458	0.4379	

Table A6: HYO Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
HYF, HYM	32	12.27	0.0001	0.4584	0.4211	
HYF	32	24.68	0	0.4513	0.433	*
HYM	32	17.58	0.0002	0.3695	0.3485	

Table A7: PAT Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
PAI, PAN	9	7.42	0.0239	0.7121	0.6162	*
PAN	9	13.8	0.0075	0.6635	0.6155	
PAI	9	1.44	0.2694	0.1704	0.0519	

Table A8: SFA Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
SSO, SSN	16	7.38	0.0072	0.5317	0.4596	*
SSO	16	13.08	0.0028	0.4831	0.4462	
SSN	16	7.21	0.0178	0.3399	0.2928	

Table A9: SGB Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
SGI, SGN	9	3.19	0.1138	0.5154	0.3539	
SGI	9	0.95	0.3623	0.1195	-0.0063	
SGN	9	5.96	0.0447	0.4599	0.3828	*

Table A10: WHA Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
WDI, WDN, WSI, WSN	19	150.39	0	0.9773	0.9708	
WDI, WDN, WSI	19	78.24	0	0.9399	0.9279	
WDI, WDN, WSN	19	214.73	0	0.9772	0.9727	
WDI, WSI, WSN	19	172.42	0	0.9718	0.9662	
WDI, WSN	19	275.69	0	0.9718	0.9683	
WDI, WSI	19	2.19	0.1441	0.2151	0.1169	
WDI, WDN	19	124.93	0	0.9398	0.9323	
WDI	19	3.72	0.0706	0.1795	0.1313	
WDN, WSN, WSI	19	214.19	0	0.9772	0.9726	
WDN, WSN	19	342.35	0	0.9772	0.9743	*
WDN, WSI	19	121.31	0	0.9381	0.9304	
WDN	19	256.31	0	0.9378	0.9341	
WSI, WSN	19	275.6	0	0.9718	0.9683	
WSI	19	0.4	0.5348	0.0231	-0.0344	
WSN	19	585.39	0	0.9718	0.9701	

Table A11: WHD Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
WDI, WDN	23	83.1	0	0.8926	0.8818	
WDI	23	2.35	0.1406	0.1005	0.0576	
WDN	23	173.71	0	0.8921	0.887	*

Table A12: WOS Regression Summaries

Regressor(s)	Observations	F	Prob > F	R-squared	Adj R-Squared	Best Fit (*)
WSI, WSN	53	867.31	0	0.972	0.9709	
WSI	53	11.01	0.0017	0.1775	0.1614	
WSN	53	1760.35	0	0.9718	0.9713	*

Table A13: Barley 2008 Weather Regressions

2008	2008	2008 Reg 2	2008	2008	2008	2008	3 2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2 2008	2008	2008	2008	1 2008	2008	2008	2008
Variable	Reg1	2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8
	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1
LAT		1.8	0.9															2.1						
																		1.0						
LNG			-0.2															0.6						
			0.7															0.8						
ELV				0.0																				
				0.0																				
PMXT					-1.2														-1337.0					
					0.4														-1480.9					
PMNT						-1.1													-1336.7					
						0.5													-1481.2					
PAVT							-1.4												-2672.2					
							0.5												-2962.1					
PBST								-1.6												-0.5				
								0.7												1.0				
PTST									-1.7											-1.3				
									0.6											0.9				
PAVW										1.1											6.0			
										1.0											1.3			
PMXW											-1.1										-4.4			
											0.7										1.0			
PSRD												-0.1												
												0.1												
PAVP													-167.6									-395.4	406.4	
													84.2									3824.0	3904.2	
PTLP														-0.5								0.6	-1.5	
														0.2								10.4	10.6	
PRNF															-0.2									0.0
															0.4									0.4
PDPT																-1.1							-0.8	-1.1
																0.7								0.8
PWCH																	-1.4							
																	0.4							
CONS		-72.7	-5.6	7.9	79.8	42.1	71.4	82.3	88.1	-0.6	40.1	47.7	41.7	41.6	12.4	42.6	60.6	-29.2	75.6		66.8	41.7	58.5	42.9
	2.3	43.2	76.8	8.7	24.5	14.0	21.2	30.3	27.6	10.9	19.5	31.9	15.5	15.5	4.1	20.5	15.7	74.6	25.0	31.1	17.0	15.7	22.9	21.0
R2	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
ADJ R2	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

Table A14: Barley 2009 Weather Regressions

2009	1 2009	2009 Reg	2009	2009	2009	2009	2009	2009	2 2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	3 2009	2009	2009	2009	2009
Variable	Reg1	2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.6	0.6	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.7	0.7	0.6
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-0.4	1.0															-0.5						
																		1.0						
LNG			-0.4															-0.5						
			0.6															0.6						
ELV				0.0																				
				0.0																				
PMXT					0.4														1471.3					
					0.5														1564.5					
PMNT						0.2													1470.8					
						0.6													1564.6					
PAVT							0.4												- 2941.5					
							0.6												3129.0					
PBST								0.9												0.0				
								0.7												1.1				
PTST									1.1											1.1				
									0.6											1.0				
PAVW										0.0											-0.5			
										1.1											1.8			
PMXW											0.2										0.5			
											0.8										1.3			
PSRD												0.0												
												0.1												
PAVP													55.9									2632.9	3002.3	
													87.0									3626.3	3747.6	
PTLP														0.1								-7.0	-8.0	
														0.2								9.8	10.1	
PRNF															0.0									-0.1
															0.4									0.5
PDPT																0.2							0.3	0.3
																0.7								0.8
PWCH																	0.4							
																	0.5							
CONS		41.9	-23.0	23.7	0.4	18.9	6.5	-17.4	-23.5	23.9	18.7	37.8	13.9	14.3	24.5	18.3	10.8	-4.7	-2.5		15.8	8.4	-1.7	16.8
	5.8	48.3	66.3	12.9	28.8	18.0	26.8	29.7	27.1	12.8	23.2	28.9	17.3	17.1	6.7	19.7	19.0	78.8	29.5	30.2	25.9	19.0	28.6	20.9
R2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
ADJ R2	0.9	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.9	0.6	0.6	0.6	0.6	0.6	0.6

Table A15: Barley 2010 Weather Regressions

2010	1 2010	2010 Reg	2010	2010	2010	3 2010	2 2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010
Variable	Reg1	2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-0.6	1.1															-0.6						
																		1.1						
LNG			0.0															-0.1						
			0.7															0.7						
ELV				0.0																				
				0.0																				
PMXT					0.6														-371.4					
					0.7														1612.8					
PMNT						0.7													-371.1					
						0.8													1612.5					
PAVT							0.8												743.3					
							0.8												3225.2					
PBST								0.1												-0.2				
								0.8												1.2				
PTST									0.2											0.5				
									0.8											1.3				
PAVW										-0.1											0.8			
										1.2											2.6			
PMXW											-0.2										-0.7			
											0.9										1.9			
PSRD												0.0												
												0.1												
PAVP													50.1									- 1783.0	- 1588.3	
													128.3									3693.9	3791.5	
PTLP														0.1								5.0	4.5	
														0.4								10.2	10.5	
PRNF															0.1									0.0
															0.4									0.4
PDPT																0.5							0.4	0.5
																1.0								1.1
PWCH																	0.5							
																	0.7							
CONS		50.4	19.3	17.5	-8.8	2.4	-11.8	18.7	11.5	23.2	27.4	32.2	14.8	14.4	21.8	6.8	4.1	43.6	-8.3		32.5	13.6	5.6	6.9
	5.5	49.8	74.4	12.7	38.9	22.4	34.9	34.3	36.3	12.8	21.9	31.7	20.5	20.5	7.5	30.8	24.8	86.5	40.3	38.0	27.3	20.8	33.1	31.3
R2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
ADJ R2	0.9	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.9	0.6	0.6	0.6	0.6	0.6	0.6

Table A16: Canola 2008 Weather Regressions

2008 Var	2008 Reg 1	2008 Reg 2	2008 Reg3	2008 Reg 4	2008 Reg5	2008 Reg 6	2008 Reg7	2008 Reg8	2008 Reg9	2008 Reg1 0	2008 Reg1 1	2008 Reg1 2	2008 Reg13	2008 Reg14	2008 Reg1 5	2008 Reg1 6	2008 Reg1 7	2008 Reg1 8	2008 Reg19	2008 Reg2 0	2008 Reg2 1	2008 Reg22	2008 Reg23	2008 Reg2 4
RMA	0.7	0.8	0.7	0.7	0.6	0.7	0.6	0.8	0.8	0.7	0.7	0.8	0.5	0.5	0.6	0.8	0.7	0.7	0.6	0.8	0.7	0.5	0.6	0.7
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-64.0	45.7															-35.4						
																		58.0						
LNG			31.7															21.7						
			21.1															26.9						
ELV				0.0																				
				0.1																				
PMXT					-24.7														87959.5					
					22.9														55342.1					
PMNT						-11.6													87987.4					
						21.5													55349.5					
PAVT							-29.0												-175959.5					
							28.3												110680.7					
PBST								41.9												38.4				
								26.0												28.9				
PTST									26.1											9.4				
									29.2											31.4				
PAVW										5.1											47.3			
										35.8											81.4			
PMXW											-3.6										-35.3			
											26.9										61.1			
PSRD												1.6												
												3.1												
PAVP													-5923.1									-6177.1	-26920.7	
													3249.5									119086.6	123489.2	
PTLP														-16.2								0.7	59.1	
														8.9								326.4	339.0	
PRNF															19.6									17.8
															10.4									10.9
PDPT																34.6							24.8	21.4
																32.6								32.7
PWCH																	-16.8							
																	23.3							
CONS	72.9	3278.2 2129.1	3604.7 2195.8	384.2 300.2	1709.2 1308.7	636.8 634.4	1550.3 1221.8	-1650.0 1212.9	-913.2 1360.4	247.5 360.3	392.3 715.1	-280.8 1093.2	1413.7 616.1	1417.5 618.4	137.9 110.3	-689.6 933.7	940.1 891.5	4210.9 2433.9	1298.5 1377.1	1542.3	767.4 970.4	1413.5 634.9	584.5 1304.3	-458.2 917.1
R2	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
ADJ R2	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

Table A17: Canola 2009 Weather Regressions

Var	2009 Reg1	2009 Reg 2	2009 Reg3	2009 Reg4	2009 Reg5	2009 Reg6	2009 Reg7	2009 Reg8	2009 Reg9	2009 Reg10	2009 Reg11	2009 Reg12	2009 Reg13	2009 Reg14	2009 Reg15	2009 Reg16	2009 Reg17	2009 Reg18	2009 Reg19	2009 Reg20	2009 Reg21	2009 Reg22	2009 Reg23	2009 Reg24
RMA	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-70.8	25.6															-69.9						
																		27.3						
LNG			-9.4															-1.3						
			11.7															11.0						
ELV				0.1																				
				0.0																				
PMXT					30.4														4289.5					
					9.8														35466.6					
PMNT						27.4													4272.9					
						15.6													35467.5					
PAVT							41.6												-8524.6					
							13.6												70932.8					
PBST								33.6												14.2				
								18.4												24.3				
PTST									36.3											27.5				
									16.9											22.8				
PAVW										-29.0											-101.9			
										29.9											36.9			
PMXW											18.8										59.7			
											17.1										21.2			
PSRD												2.4												
												1.6												
PAVP													2037.4									-75154.6	-2564.2	
													1633.9									83469.1	87983.3	
PTLP														5.6								209.7	14.4	
														4.4								226.7	238.5	
PRNF															8.2									-1.4
															11.2									12.5
PDPT																34.9							41.4	36.1
																19.7								23.0
PWCH																	35.9							
																	10.8							
CONS	162.9	4018.5 1210.4	-274.5 1215.3	538.6 195.7	-894.0 532.9	-147.8 504.7	-1036.0 581.2	-913.5 896.5	-946.8 777.7	985.1 341.3	213.6 465.4	-119.7 573.4	372.4 304.3	370.4 302.3	620.9 193.1	-341.8 605.3	-560.4 402.5	3840.8 1945.1	-1047.8 600.2	925.5	189.1 412.0	468.9 322.6	-959.2 815.1	-365.9 656.0
R2	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.7
ADJ R2	0.9	0.7	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.9	0.7	0.7	0.7	0.6	0.7	0.6

Table A18: Canola 2010 Weather Regressions

2010	2 2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	3 2010	2010	1 2010	2010	2010	2010	2010	2010	2010
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.8	0.7	0.8	0.8	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.8	0.8	0.8
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		32.4	24.1															37.5						
																		24.6						
LNG			-8.0															-11.4						
			11.0															11.0						
ELV				0.0																				
				0.0																				
PMXT					-21.1														-24714.7					
					15.5														30323.4					
PMNT						-13.8													-24701.1					
						17.5													30322.4					
PAVT							-26.5												49389.0					
							19.8												60644.3					
PBST								-21.9												-40.6				
								15.8												23.4				
PTST									-5.3											27.3				
									17.6											25.5				
PAVW										17.3											45.8			
										26.2											54.5			
PMXW											4.8										-21.2			
											17.1										35.4			
PSRD												-1.3												
												1.5												
PAVP													-674.5									40176.2	31719.7	
													2522.3									72243.8	71157.1	
PTLP														-2.0								-111.8	-89.1	
														6.9								197.6	194.6	
PRNF															-2.9									-0.3
															8.4									8.4
PDPT																-33.5							-33.0	-33.4
																21.8								22.6
PWCH																	-22.7							
																	15.0							
CONS		-1115.8	-493.5	329.4	1504.1	783.8	1474.7	1366.8	609.8	205.5	254.7	832.5	481.0	488.5	400.0	1406.6	1188.1	-2584.3	1636.0		450.5	455.4	1503.0	1404.4
	157.3	1120.0	1201.0	217.0	841.7	543.2	838.7	730.8	796.1	299.8	450.7	560.0	432.8	431.1	177.8	688.2	562.6	1806.8	893.1	804.7	509.2	439.8	832.8	702.2
R2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
ADJ R2	0.9	0.7	0.6	0.6	0.7	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.9	0.6	0.7	0.6	0.6	0.6	0.7

Table A19: Corn for Grain 2008 Weather Regressions

2008 Var	2008 Reg 1	2008 Reg 2	2008 Reg3	2008 Reg4	2008 Reg5	2008 Reg 6	2008 Reg7	2008 Reg 8	2008 Reg9	2008 Reg1 0	2008 Reg1 1	2008 Reg1 2	2008 Reg1 3	2008 Reg1 4	2008 Reg1 5	2008 Reg1 6	2008 Reg1 7	2008 Reg1 8	2008 Reg19	2008 Reg2 0	2008 Reg2 1	2008 Reg22	2008 Reg23	2008 Reg2 4
RMA	0.5	0.5	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.5	0.3	0.4	0.5	0.5	0.4	0.1	0.3
	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
LAT		2.8	3.2															1.9						
																		3.3						
LNG			5.1															4.7						
			3.5															3.6						
ELV				0.0																				
				0.0																				
PMXT					-1.6														-7071.7					
					1.3														4424.3					
PMNT						0.3													-7063.9					
						2.2													4425.0					
PAVT							-1.4												14137.2					
							1.8												8849.5					
PBST								-0.7												-2.0				
								2.1												3.1				
PTST									0.4											1.9				
									2.3											3.4				
PAVW										0.4											2.0			
										3.2											4.8			
PMXW											-0.5										-1.7			
											2.4										3.7			
PSRD												-0.3												
												0.2												
PAVP													-470.7									-8907.4	-17940.4	
													226.6									13031.6	11814.9	
PTLP														-1.3								22.9	46.6	
														0.6								35.4	32.1	
PRNF															1.9									1.6
															1.1									1.1
PDPT																4.8							10.1	4.1
																3.1								3.1
PWCH																	-1.2							
																	1.3							
CONS	4.9	-74.0 152.4	585.8 359.9	109.0 22.5	144.0 68.9	47.1 62.1	112.6 71.4	89.2 96.2	40.1 104.5	52.6 31.8	69.8 62.1	169.4 85.2	136.1 38.5	135.4 38.4	37.4 12.0	-77.0 85.3	98.0 45.8	452.0 429.6	91.1 70.0	109.8	79.1 66.5	141.5 39.7	-79.0 74.6	-73.1 83.8
R2	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8
ADJ R2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7

Table A20: Corn for Grain 2009 Weather Regressions

2009 Var	2009 Reg1	2009 Reg2	2009 Reg3	2009 Reg4	2009 Reg5	2009 Reg6	2009 Reg7	2009 Reg8	2009 Reg9	2009 Reg10	2009 Reg11	2009 Reg12	2009 Reg13	2009 Reg14	2009 Reg15	2009 Reg16	2009 Reg17	2009 Reg18	2009 Reg19	2009 Reg20	2009 Reg21	2009 Reg22	2009 Reg23	2009 Reg24
RMA	0.8	0.9	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.7	0.7	0.8
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		3.0	2.0															2.5						
																		2.1						
LNG			1.6															1.3						
			1.1															1.2						
ELV				0.0																				
				0.0																				
PMXT					0.2														-4152.7					
					1.1														3348.6					
PMNT						0.2													-4153.1					
						1.6													3349.0					
PAVT							0.3												8305.4					
							1.6												6697.1					
PBST								1.4												-1.8				
								1.5												2.8				
PTST									1.8											3.2				
									1.2											2.4				
PAVW										-2.3											-3.2			
										1.6											2.6			
PMXW											-0.9										0.9			
											1.2										1.9			
PSRD												-0.3												
												0.1												
PAVP													-189.6									-16208.0	-17057.2	
													152.2									5313.9	5991.7	
PTLP														-0.5								43.9	46.2	
														0.4								14.6	16.4	
PRNF															0.0									-0.4
															0.5									0.7
PDPT																1.2							-0.6	1.9
																1.7								2.2
PWCH																	1.1							
																	1.1							
CONS		-132.0	184.8	48.5	8.1	11.0	6.4	-44.6	-60.0	41.3	38.7	111.6	41.7	40.2	16.6	-14.7	-14.3	29.1	23.0		30.1	53.8	68.3	-30.9
	7.5	99.6	118.2	12.7	50.6	41.6	55.7	64.5	50.8	19.4	30.1	37.3	21.6	21.6	8.5	46.4	32.6	175.7	57.9	64.0	30.6	19.1	47.7	55.4
R2	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
ADJ R2	0.7	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.9	0.9	0.8	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.8	0.9	0.8	0.9	0.9	0.8

Table A21: Corn for Grain 2010 Weather Regressions

Var	2010 Reg1	2010 Reg2	2010 Reg3	2010 Reg4	2010 Reg5	2010 Reg6	2010 Reg7	2010 Reg8	2010 Reg9	2010 Reg10	2010 Reg11	2010 Reg12	2010 Reg13	2010 Reg14	2010 Reg15	2010 Reg16	2010 Reg17	2010 Reg18	2010 Reg19	2010 Reg20	2010 Reg21	2010 Reg22	2010 Reg23	2010 Reg24
RMA	0.4	0.4	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.2	0.4	0.4	0.4	0.4	0.2	0.3
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-1.8	2.8															-2.4						
																		2.5						
LNG			6.8															7.0						
			1.8															1.8						
ELV				0.0																				
				0.0																				
PMXT					1.4														-3775.4					
					1.9														4601.8					
PMNT						3.8													-3768.6					
						2.1													4601.6					
PAVT							3.0												7547.3					
							2.2												9203.3					
PBST								0.2												0.3				
								2.8												4.8				
PTST									0.1											-0.1				
									2.5											4.3				
PAVW										1.2											16.9			
										3.3											7.0			
PMXW											-1.9										-13.4			
											2.5										5.4			
PSRD												-0.5												
												0.2												
PAVP													-298.8									3633.8	10016.1	
													354.7									10428.0	9376.8	
PTLP														-0.8								-10.8	-29.5	
														1.0								28.6	25.8	
PRNF															2.3									1.9
															1.1									1.1
PDPT																6.7							9.3	5.9
																2.5								2.5
PWCH																	2.0							
																	1.8							
CONS	6.9	147.9 134.5	775.8 192.1	120.3 18.7	-7.9 100.8	-47.0 60.9	-56.6 89.0	53.9 131.0	58.8 113.9	52.6 32.3	108.7 60.5	228.6 74.3	106.0 50.7	106.7 50.7	27.8 18.1	-145.8 77.7	-4.5 64.1	904.9 232.7	5.8 98.9	133.3	222.4 74.3	106.7 51.2	-118.1 77.7	-148.6 75.8
R2	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.7	0.7
ADJ R2	0.7	0.5	0.7	0.6	0.5	0.6	0.6	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.6	0.7	0.6	0.5	0.6	0.5	0.6	0.6

Table A22: Flaxseed 2008 Weather Regressions

2008 Var	2008 Reg1	2008 Reg 2	2008 Reg3	2008 Reg4	2008 Reg5	2008 Reg6	2008 Reg7	2008 Reg8	2008 Reg9	2008 Reg10	2008 Reg11	2008 Reg12	2008 Reg13	2008 Reg14	2008 Reg15	2008 Reg16	2008 Reg17	2008 Reg18	2008 Reg19	2008 Reg20	2008 Reg21	2008 Reg22	2008 Reg23	2008 Reg24
RMA	0.8	0.6	0.7	0.5	0.4	0.6	0.4	0.7	0.6	0.8	0.7	0.6	0.5	0.5	0.7	0.8	0.5	0.2	0.4	0.6	0.6	0.5	0.4	0.6
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		2.0	0.8															3.3						
																		0.8						
LNG			0.7															1.4						
			0.4															0.3						
ELV				0.0																				
				0.0																				
PMXT					-1.0														-1430.2					
					0.3														1074.9					
PMNT						-1.1													-1430.2					
						0.4													1075.0					
PAVT							-1.5												2858.8					
							0.4												2149.8					
PBST								-0.6												0.1				
								0.5												0.6				
PTST									-1.3											-1.3				
									0.5											0.5				
PAVW										-0.4											1.0			
										0.8											1.4			
PMXW											-0.6										-1.2			
											0.5										0.9			
PSRD												-0.1												
												0.1												
PAVP													-144.0									262.4	718.9	
													45.2									2109.3	2050.0	
PTLP														-0.4								-1.1	-2.4	
														0.1								5.8	5.6	
PRNF															0.3									0.4
															0.2									0.2
PDPT																-1.0							-1.0	-1.2
																0.7								0.6
PWCH																	-1.1							
																	0.3							
CONS	3.1	-91.7	74.8	17.6	58.9	34.7	65.5	30.3	63.2	7.1	18.9	45.1	29.5	29.6	-0.2	31.2	43.9	-11.3	69.1	60.9	24.1	29.8	59.2	32.7
	1.6	39.4	42.1	5.3	16.9	11.0	15.6	25.0	21.8	7.8	13.9	20.9	8.4	8.5	2.7	19.2	12.2	38.1	16.6	26.2	15.7	8.8	19.0	18.4
R2	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0.9	0.8	0.8	0.7	0.8	0.8	0.8
ADJ R2	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.7

Table A23: Flaxseed 2009 Weather Regressions

2009 Var	2009 Reg1	2009 Reg 2	2009 Reg3	2009 Reg4	2009 Reg5	2009 Reg6	2009 Reg7	3 2009 Reg8	2009 Reg9	2009 Reg10	2009 Reg11	2009 Reg12	2009 Reg13	2009 Reg14	2009 Reg15	2009 Reg16	2009 Reg17	1 2009 Reg18	2009 Reg19	2 2009 Reg20	2009 Reg21	2009 Reg22	2009 Reg23	2009 Reg24
RMA	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	0.9	0.8	0.8
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2
LAT		-0.2	0.8															-0.1						
																		0.8						
LNG			-0.6															-0.6						
			0.4															0.4						
ELV				0.0																				
				0.0																				
PMXT					0.3														-143.7					
					0.4														1504.1					
PMNT						0.0													-144.2					
						0.5													1504.1					
PAVT							0.3												288.1					
							0.6												3008.6					
PBST								-1.0												-1.7				
								0.4												0.5				
PTST									-0.1											1.2				
									0.6											0.6				
PAVW										1.2											1.9			
										0.7											1.3			
PMXW											0.5										-0.5			
											0.5										0.9			
PSRD												0.1												
												0.1												
PAVP													102.3									- 1186.1	- 1968.5	
													50.4									2788.7	3159.2	
PTLP														0.3								3.5	5.6	
														0.1								7.5	8.5	
PRNF															0.0									0.2
															0.4									0.4
PDPT																-0.3							-0.4	-0.5
																0.6								0.7
PWCH																	0.0							
																	0.5							
CONS	1.8	11.3	-61.7	-1.6	-11.8	1.8	-8.4	48.2	5.8	-10.5	-10.5	-21.3	-11.4	-11.2	1.6	11.6	3.2	-57.1	-11.3	60.9	-5.5	-8.3	4.8	14.4
	3.4	39.7	40.9	4.5	19.8	15.2	21.9	19.0	24.6	7.7	11.3	16.7	7.2	7.1	5.1	17.6	14.4	59.9	28.4	19.5	11.5	10.1	24.6	19.3
R2	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.7	0.8	0.8	0.8	0.7	0.7	0.7	0.8	0.7	0.9	0.8	0.8	0.8	0.7
ADJ R2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.8	0.6	0.8	0.7	0.7	0.7	0.7

Table A24: Flaxseed 2010 Weather Regressions

2010	2 2010	2010 Reg	2010	2010	3 2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	1 2010	2010	2010	2010	2010	2010	2010
Var	Reg1	2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.7	0.8	0.7	0.7	0.8	0.7	0.8	0.7	0.7	0.6	0.7	0.7	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.8
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
LAT		-0.8	0.5															-0.8						
																		0.5						
LNG			-0.2															-0.2						
			0.3															0.3						
ELV				0.0																				
				0.0																				
PMXT					0.8														787.9					
					0.3														650.4					
PMNT						0.1													786.7					
						0.4													650.3					
PAVT							0.8												- 1574.0					
							0.4												1300.6					
PBST								0.1												-0.1				
								0.3												0.5				
PTST									0.3											0.3				
									0.4											0.6				
PAVW										-0.8											-2.4			
										0.7											1.1			
PMXW											0.0										1.3			
											0.5										0.8			
PSRD												0.0												
												0.0												
PAVP													86.3									-715.2	-529.1	
													60.5									1832.8	1985.2	
PTLP														0.2								2.2	1.7	
														0.2								5.1	5.5	
PRNF															-0.1									-0.1
															0.2									0.2
PDPT																0.2							0.1	0.3
																0.5								0.6
PWCH																	0.6							
																	0.3							
CONS	6.2	44.9	-12.3	2.8	-38.0	2.6	-26.3	-1.0	-6.0	15.7	7.1	-4.7	-7.4	-7.6	6.9	-1.0	-15.2	27.1	-37.1	60.9	-2.0	-7.9	-12.7	-3.4
	2.9	24.0	26.8	3.8	17.7	13.5	19.3	17.0	18.1	8.0	12.9	13.1	10.0	10.0	4.0	17.4	12.8	36.0	19.0	19.0	12.9	10.2	20.6	18.4
R2	0.5	0.6	0.5	0.5	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.5	0.6	0.5	0.5	0.5
ADJ R2	0.7	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8	0.6	0.5	0.5	0.5	0.5	0.5

Table A25: Hay-Alfalfa 2008 Weather Regressions

2008 Var	2008 Reg1	2008 Reg 2	2008 Reg3	2008 Reg4	2008 Reg5	2008 Reg6	2008 Reg7	2008 Reg8	2008 Reg9	2008 Reg10	2008 Reg11	2008 Reg12	2008 Reg13	2008 Reg14	2 2008 Reg15	2008 Reg16	2008 Reg17	2008 Reg18	2008 Reg19	2008 Reg20	2008 Reg21	2008 Reg22	3 2008 Reg23	1 2008 Reg24
RMA	0.6	0.6	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.5	0.6	0.4	0.5	0.6	0.5	0.5	0.4	0.3
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		0.0	0.1															0.0						
																		0.1						
LNG			0.1															0.1						
			0.1															0.1						
ELV				0.0																				
				0.0																				
PMXT					0.0														-37.0					
					0.0														117.5					
PMNT						0.0													-36.8					
						0.0													117.5					
PAVT							0.0												73.9					
							0.0												235.0					
PBST								0.0												-0.1				
								0.1												0.1				
PTST									0.0											0.0				
									0.0											0.1				
PAVW										0.0											0.1			
										0.1											0.1			
PMXW											0.0										-0.1			
											0.1										0.1			
PSRD												0.0												
												0.0												
PAVP													-4.5									-155.8	-236.2	
													5.6									293.0	280.1	
PTLP														0.0								0.4	0.6	
														0.0								0.8	0.8	
PRNF															0.1									0.1
															0.0									0.0
PDPT																0.1							0.2	0.1
																0.1								0.1
PWCH																	0.0							
																	0.0							
CONS		1.7	13.4	1.4	1.2	-0.7	0.1	2.8	1.2	0.2	1.0	3.5	1.4	1.3	-0.3	-2.1	0.5	14.9	2.0		1.5	1.3	-2.2	-2.4
	0.1	3.4	6.3	0.4	1.7	1.1	1.5	2.5	2.1	0.8	1.3	2.4	1.0	1.0	0.3	1.8	1.1	7.3	1.7	2.5	1.4	1.0	1.8	1.6
R2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8
ADJ R2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8

Table A26: Hay-Alfalfa 2009 Weather Regressions

2009	2 2009	2009 Reg	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	1 2009	2009	2009	2009	2009	3 2009	2009
Var	Reg1	2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.2	0.3	0.4	0.4	0.4	0.2	0.3
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		0.0	0.0															-0.1						
																		0.0						
LNG			0.1															0.1						
			0.0															0.0						
ELV				0.0																				
				0.0																				
PMXT					0.0														35.9					
					0.0														74.7					
PMNT						0.0													36.0					
						0.0													74.7					
PAVT							0.0												-71.8					
							0.0												149.3					
PBST								0.0												0.0				
								0.0												0.1				
PTST									0.1											0.1				
									0.0											0.1				
PAVW										0.0											0.0			
										0.1											0.1			
PMXW											0.0										0.0			
											0.0										0.0			
PSRD												0.0												
												0.0												
PAVP													-3.9									-9.8	120.7	
													4.2									179.6	163.6	
PTLP														0.0								0.0	-0.3	
														0.0								0.5	0.4	
PRNF															0.0									0.0
															0.0									0.0
PDPT																0.1							0.1	0.1
																0.0								0.0
PWCH																	0.0							
																	0.0							
CONS		3.2	7.8	1.4	1.1	-0.1	0.4	-1.0	-2.0	0.8	1.2	1.3	1.6	1.6	0.7	-2.0	0.6	14.6	0.8		1.3	1.6	-1.9	-1.8
	0.1	2.3	3.0	0.3	1.1	0.8	1.1	1.5	1.4	0.5	0.9	1.3	0.6	0.6	0.2	1.1	0.7	4.4	1.1	1.6	0.9	0.7	1.2	1.1
R2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.7	0.6
ADJ R2	0.7	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.5	0.7	0.6	0.6	0.5	0.5	0.6	0.6

Table A27: Hay-Alfalfa 2010 Weather Regressions

2010	2 2010	2010 Reg	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	1 2010	2010	2010	2010	2010	3 2010	2010
Var	Reg1	2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.4	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.4	0.2	0.2
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-0.2	0.1															-0.2						
																		0.1						
LNG			0.1															0.1						
			0.0															0.0						
ELV				0.0																				
				0.0																				
PMXT					0.1														-8.8					
					0.0														118.5					
PMNT						0.2													-8.7					
						0.0													118.5					
PAVT							0.2												17.7					
							0.1												237.0					
PBST								0.2												0.1				
								0.0												0.1				
PTST									0.2											0.0				
									0.1											0.1				
PAVW										0.0											0.2			
										0.1											0.2			
PMXW											-0.1										-0.2			
											0.1										0.1			
PSRD												0.0												
												0.0												
PAVP													0.0									422.5	499.3	
													8.4									289.9	244.8	
PTLP														0.0								-1.2	-1.4	
														0.0								0.8	0.7	
PRNF															0.1									0.0
															0.0									0.0
PDPT																0.2							0.3	0.2
																0.1								0.1
PWCH																	0.1							
																	0.0							
CONS		8.9	14.4	2.5	-4.0	-3.8	-5.9	-6.2	-5.8	1.8	3.0	2.8	1.4	1.5	0.3	-6.2	-3.6	23.8	-4.7		3.9	1.4	-6.4	-5.6
	0.3	3.5	3.2	0.4	2.5	1.5	2.2	2.3	2.6	0.8	1.4	1.9	1.2	1.2	0.4	1.8	1.5	4.5	2.4	2.6	1.7	1.2	2.0	1.8
R2	0.2	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.3	0.2	0.3	0.3	0.2	0.2	0.4	0.5	0.4	0.5	0.4	0.4	0.3	0.3	0.5	0.5
ADJ R2	0.7	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.7	0.4	0.3	0.2	0.2	0.5	0.4

Table A28: Hay-Other 2008 Weather Regressions

2008 Var	2008 Reg1	2008 Reg2	2008 Reg3	2008 Reg4	2008 Reg5	2008 Reg6	2008 Reg7	2008 Reg8	2008 Reg9	2008 Reg10	2008 Reg11	2008 Reg12	2008 Reg13	2008 Reg14	2008 Reg15	2008 Reg16	2008 Reg17	2008 Reg18	2008 Reg19	2008 Reg20	2008 Reg21	2008 Reg22	2008 Reg23	2008 Reg24
RMA	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1
LAT		0.1	0.1															0.1						
																		0.1						
LNG			0.1															0.1						
			0.0															0.0						
ELV				0.0																				
				0.0																				
PMXT					-0.1														103.5					
					0.0														100.9					
PMNT						0.0													103.6					
						0.0													101.0					
PAVT							0.0												-207.1					
							0.0												201.9					
PBST								-0.1												0.0				
								0.0												0.1				
PTST									-0.1											0.0				
									0.0											0.1				
PAVW										0.1											0.3			
										0.1											0.1			
PMXW											0.0										-0.2			
											0.0										0.1			
PSRD												0.0												
												0.0												
PAVP													-8.4									133.3	54.5	
													4.1									240.0	247.2	
PTLP														0.0								-0.4	-0.2	
														0.0								0.7	0.7	
PRNF															0.0									0.0
															0.0									0.0
PDPT																0.0							0.1	0.0
																0.1								0.0
PWCH																	-0.1							
																	0.0							
CONS		-2.2	6.4	1.3	3.6	1.6	2.8	3.5	3.6	0.0	1.1	3.8	2.2	2.2	0.3	0.3	2.6	3.3	4.3		2.6	2.2	0.8	0.4
	0.1	2.6	4.8	0.3	1.2	0.8	1.1	1.9	2.0	0.6	1.0	1.9	0.7	0.7	0.2	1.4	0.8	5.4	1.3	2.1	1.0	0.7	1.3	1.3
R2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.6	0.5	0.6	0.5	0.6	0.6
ADJ R2	0.4	0.4	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.4	0.5	0.4	0.5	0.4	0.6	0.5	0.5	0.5

Table A29: Hay-Other 2009 Weather Regressions

2009 Var	2009 Reg1	2009 Reg2	2009 Reg3	2009 Reg4	2009 Reg5	2009 Reg6	2009 Reg7	2009 Reg8	2009 Reg9	2009 Reg10	2009 Reg11	2009 Reg12	2009 Reg13	2009 Reg14	2009 Reg15	2009 Reg16	2009 Reg17	2009 Reg18	2009 Reg19	2009 Reg20	2009 Reg21	2009 Reg22	2009 Reg23	2009 Reg24
RMA	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.2	0.1	0.0
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-0.2	0.1															-0.1						
																		0.1						
LNG			-0.1															-0.1						
			0.0															0.0						
ELV				0.0																				
				0.0																				
PMXT					0.1														-99.3					
					0.0														91.6					
PMNT						0.1													-99.3					
						0.0													91.6					
PAVT							0.1												198.6					
							0.0												183.1					
PBST								0.0												0.0				
								0.0												0.1				
PTST									0.1											0.1				
									0.0											0.1				
PAVW										0.1											-0.1			
										0.1											0.1			
PMXW											0.1										0.1			
											0.0										0.1			
PSRD												0.0												
												0.0												
PAVP													14.9									325.9	430.1	
													4.3									170.8	178.6	
PTLP														0.0								-0.8	-1.1	
														0.0								0.5	0.5	
PRNF															0.0									0.0
															0.0									0.0
PDPT																0.1							0.1	0.0
																0.0								0.1
PWCH																	0.1							
																	0.0							
CONS		8.9	-8.9	0.5	-1.9	-0.5	-1.7	0.0	-0.9	0.7	-1.1	-3.9	-0.8	-0.7	1.3	0.0	-0.1	-1.1	-1.4		-1.3	-1.2	-3.0	0.3
	0.1	2.5	3.3	0.3	1.3	0.9	1.2	1.8	1.6	0.5	0.8	1.3	0.7	0.6	0.2	1.2	0.8	4.7	1.3	1.8	0.9	0.7	1.3	1.3
R2	0.0	0.2	0.2	0.2	0.2	0.1	0.2	0.0	0.1	0.1	0.2	0.3	0.2	0.2	0.0	0.0	0.1	0.3	0.2	0.1	0.2	0.3	0.3	0.0
ADJ R2	0.4	0.1	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.0	0.0	0.1	0.4	0.1	0.0	0.2	0.2	0.3	0.0

Table A30: Hay-Other 2010 Weather Regressions

2010	2 2010	2010 Reg	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	1 2010	2010	2010	2010	3 2010	2010	2010
Var	Reg1	2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1
	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
LAT		-0.1	0.0															-0.1						
																		0.0						
LNG			0.0															0.0						
			0.0															0.0						
ELV				0.0																				
				0.0																				
PMXT					0.1														21.9					
					0.0														70.7					
PMNT						0.0													21.8					
						0.0													70.7					
PAVT							0.1												-43.7					
							0.0												141.3					
PBST								0.0												0.0				
								0.0												0.1				
PTST									0.0											0.1				
									0.0											0.1				
PAVW										0.0											-0.1			
										0.1											0.1			
PMXW											0.1										0.1			
											0.0										0.1			
PSRD												0.0												
												0.0												
PAVP													18.2									402.3	405.5	
													4.1									134.2	136.9	
PTLP														0.0								-1.1	-1.1	
														0.0								0.4	0.4	
PRNF															0.0									0.0
															0.0									0.0
PDPT																0.0							0.0	0.0
																0.0								0.0
PWCH																	0.0							
																	0.0							
CONS		6.2	-2.3	1.3	-1.7	0.7	-1.0	0.9	-0.2	1.2	0.3	-1.0	-0.8	-0.8	2.0	1.7	0.4	2.3	-1.7		-0.2	-0.9	-1.1	1.0
	0.1	2.0	2.0	0.2	1.4	0.9	1.3	1.4	1.5	0.5	0.8	1.0	0.6	0.6	0.3	1.2	0.9	2.8	1.4	1.6	1.0	0.5	1.1	1.2
R2	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.1	0.0	0.0	0.2	0.1	0.1	0.1	0.4	0.4	0.1
ADJ R2	0.4	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.4	0.0

Table A31: Oats 2008 Weather Regressions

2008 Var	2008 Reg1	2008 Reg2	2008 Reg3	2008 Reg4	2008 Reg5	2008 Reg6	2008 Reg7	2008 Reg8	2008 Reg9	2008 Reg10	2008 Reg11	2008 Reg12	2008 Reg13	2008 Reg14	2008 Reg15	2008 Reg16	2008 Reg17	2008 Reg18	2008 Reg19	2008 Reg20	2008 Reg21	2008 Reg22	2008 Reg23	2008 Reg24
RMA	0.7	0.7	0.6	0.7	0.6	0.7	0.6	0.7	0.7	0.7	0.7	0.6	0.5	0.5	0.4	0.7	0.6	0.6	0.5	0.6	0.6	0.5	0.4	0.4
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-1.6	2.7															-1.2						
																		2.7						
LNG			2.0															1.9						
			1.7															1.7						
ELV				0.0																				
				0.0																				
PMXT					-1.5														1750.3					
					1.0														3819.8					
PMNT						-0.7													1754.7					
						1.5													3820.1					
PAVT							-1.5												- 3505.5					
							1.3												7639.7					
PBST								0.6												2.5				
								1.8												2.7				
PTST									-0.6											-2.4				
									1.7											2.7				
PAVW										1.3											5.2			
										2.6											4.5			
PMXW											-0.4										-3.2			
											1.7										3.0			
PSRD												-0.3												
												0.3												
PAVP													-313.2									-8689.9	- 15500.5	
													168.2									10668.4	10630.8	
PTLP														-0.8								22.8	41.1	
														0.5								29.1	28.9	
PRNF															2.2									2.1
															1.0									1.0
PDPT																1.9							4.8	1.1
																2.4								2.3
PWCH																	-1.5							
																	1.1							
CONS		91.2	225.2	10.6	97.1	35.5	75.9	-12.3	41.5	3.5	25.6	105.0	69.7	69.2	-4.3	-36.4	71.0	270.5	96.4		47.0	71.7	-41.4	-33.7
	4.2	128.3	175.8	18.0	56.4	42.8	54.7	80.2	78.1	26.0	44.9	93.1	28.9	28.9	9.8	68.0	38.7	207.2	57.8	84.7	48.2	29.2	63.6	63.3
R2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
ADJ R2	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.8

Table A32: Oats 2009 Weather Regressions

2009 Var	1 2009 Reg1	2009 Reg 2	2009 Reg3	2009 Reg4	2009 Reg5	2009 Reg6	2009 Reg7	2009 Reg8	2009 Reg9	2009 Reg10	2009 Reg11	2009 Reg12	2009 Reg13	2009 Reg14	2009 Reg15	2009 Reg16	2009 Reg17	2 2009 Reg18	2009 Reg19	2009 Reg20	2009 Reg21	2009 Reg22	2009 Reg23	3 2009 Reg24
RMA	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		0.5	2.0															0.7						
																		2.1						
LNG			-0.3															-0.4						
			0.9															0.9						
ELV				0.0																				
				0.0																				
PMXT					0.1														1464.2					
					0.7														2699.7					
PMNT						-0.7													1461.4					
						1.3													2699.5					
PAVT							-0.1												-2926.5					
							1.0												5399.1					
PBST								0.0												-0.3				
								1.4												1.8				
PTST									0.4											0.7				
									1.8											2.4				
PAVW										-2.5											-2.0			
										1.9											2.5			
PMXW											-1.3										-0.6			
											1.2										1.6			
PSRD												0.0												
												0.1												
PAVP													-56.3									3323.5	3294.1	
													115.8									6267.7	6471.5	
PTLP														-0.2								-9.1	-9.0	
														0.3								16.9	17.5	
PRNF															1.1									1.7
															0.6									0.7
PDPT																-0.2							-0.3	-2.9
																2.0								2.1
PWCH																	0.3							
																	0.8							
CONS		4.8	-1.3	27.4	23.7	47.2	32.3	28.3	10.5	51.7	58.8	41.7	35.3	35.4	14.2	34.4	17.1	-45.7	36.0		60.0	28.9	38.0	88.8
	8.6	94.2	88.4	12.3	36.8	38.2	39.6	62.4	76.2	20.3	30.3	46.5	18.2	18.0	11.1	56.4	27.1	157.0	41.6	80.7	30.7	22.1	64.8	55.8
R2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.6
ADJ R2	0.7	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.4	0.4	0.7	0.4	0.4	0.5	0.4	0.4	0.6

Table A33: Oats 2010 Weather Regressions

2010	1 2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2 2010	2010	2010	3 2010	2010	2010	2010
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		0.4	1.6															0.5						
																		1.6						
LNG			1.2															1.2						
			0.8															0.8						
ELV				0.0																				
				0.0																				
PMXT					-1.4														934.8					
					1.1														2452.4					
PMNT						0.7													938.7					
						1.2													2452.1					
PAVT							-0.6												- 1873.8					
							1.4												4904.2					
PBST								0.0												0.2				
								1.1												1.8				
PTST									-0.1											-0.3				
									1.2											2.1				
PAVW										3.9											9.5			
										1.9											3.2			
PMXW											0.8										-5.4			
											1.6										2.5			
PSRD												-0.2												
												0.1												
PAVP													-218.8									- 2316.4	- 1904.8	
													184.6									5855.8	5821.9	
PTLP														-0.6								5.8	4.6	
														0.5								16.1	16.0	
PRNF															0.9									0.8
															0.6									0.7
PDPT																1.7							1.9	1.0
																1.5								1.6
PWCH																	-1.3							
																	1.1							
CONS		14.6	159.2	45.3	104.7	10.7	57.3	33.2	37.2	-4.7	14.4	88.9	63.2	63.0	19.2	-22.7	78.8	137.1	85.4		69.8	62.1	5.4	-10.3
	6.1	76.3	79.4	10.9	56.7	37.1	56.0	50.6	57.4	19.0	38.0	42.6	26.8	26.9	10.4	48.1	38.9	107.1	58.9	58.6	39.2	27.3	53.0	49.1
R2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4
ADJ R2	0.7	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.7	0.4	0.3	0.5	0.4	0.4	0.4

Table A34: Peas 2008 Weather Regressions

2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.6	0.6	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.6	0.5	0.6	0.4	0.4	0.5	0.6	0.5	0.4	0.5	0.6	0.5	0.4	0.4	0.5
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		45.2	62.0															53.9						
																		53.6						
LNG			93.9															95.3						
			29.0															29.0						
ELV				-0.3																				
				0.1																				
PMXT					-46.5														93682.7					
					25.3														89528.9					
PMNT						-50.5													93719.5					
						30.9													89556.9					
PAVT							-60.4												-187453.3					
							30.6												179077.7					
PBST								2.4												44.0				
								41.7												52.2				
PTST									-41.3											-68.7				
									41.5											52.9				
PAVW										-172.7											-54.7			
										50.8											103.3			
PMXW											-115.0										-84.9			
											31.2										65.0			
PSRD												-4.6												
												4.2												
PAVP													-10141.1									-8905.6	-18546.1	
													3389.3									177607.3	181594.3	
PTLP														-27.8								-3.4	22.0	
														9.3								486.7	497.4	
PRNF															48.9									49.4
															16.5									16.7
PDPT																-14.7							23.2	-25.1
																56.8								50.5
PWCH																	-29.0							
																	27.5							
CONS		-1456.0	10397.0	1491.6	3260.8	2118.4	3218.3	546.5	2565.4	2329.7	3672.2	2280.1	2497.7	2503.9	192.4	1071.1	1737.8	8027.3	3353.4		3413.1	2498.5	1908.9	895.6
	122.5	2900.1	3007.4	303.2	1419.1	901.9	1303.8	1944.4	1923.3	502.9	823.3	1476.5	625.0	627.1	190.5	1605.8	1031.6	3822.2	1432.3	2144.7	966.5	647.1	1506.4	1427.8
R2	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.7	0.8	0.8	0.8	0.8
ADJ R2	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.8

Table A35: Peas 2009 Weather Regressions

2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.4	0.5	0.5
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		18.9	85.3															5.9						
																		87.8						
LNG			31.9															31.3						
			40.6															42.2						
ELV				-0.1																				
				0.2																				
PMXT					-0.7														193418.6					
					35.9														136753.3					
PMNT						-8.1													193386.3					
						48.7													136740.5					
PAVT							-4.4												-386786.0					
							47.0												273475.4					
PBST								59.9												59.8				
								55.0												75.7				
PTST									39.4											0.1				
									54.5											74.0				
PAVW										-77.8											-142.6			
										87.2											127.3			
PMXW											-7.8										53.0			
											52.2										75.1			
PSRD												-1.7												
												6.1												
PAVP													-2926.5									-16984.3	6484.5	
													5385.9									295139.7	304244.1	
PTLP														-7.9								38.1	-24.8	
														14.6								799.0	823.4	
PRNF															27.9									29.1
															29.9									38.4
PDPT																32.6							29.9	-4.1
																62.7								79.6
PWCH																	6.5							
																	38.7							
CONS		452.0	4650.1	1658.4	1362.0	1566.9	1506.7	-1441.0	-411.0	2085.7	1519.1	1907.9	1773.7	1767.9	992.6	348.6	1096.4	4319.4	251.8		1409.4	1797.4	823.9	1101.0
	316.3	3954.3	4245.6	580.1	1918.8	1476.5	1961.9	2562.0	2424.4	908.8	1330.0	2155.4	884.5	876.0	477.6	1910.5	1402.7	6564.8	2159.8	2767.7	1327.4	1028.9	2397.1	2166.2
R2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.4
ADJ R2	0.7	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.8	0.3	0.3	0.3	0.3	0.2	0.3

Table A36: Peas 2010 Weather Regressions

2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		63.2	54.8															46.0						
																		55.1						
LNG			47.9															42.3						
			29.1															30.0						
ELV				-0.2																				
				0.1																				
PMXT					-50.0														84383.9					
					35.8														71442.2					
PMNT						-14.6													84440.9					
						46.2													71423.1					
PAVT							-48.6												-168859.7					
							46.6												142863.4					
PBST								19.8												30.0				
								38.8												61.0				
PTST									9.4											-13.4				
									39.1											61.1				
PAVW										-24.7											38.8			
										73.5											145.2			
PMXW											-23.9										-43.3			
											42.8										84.9			
PSRD												1.1												
												4.1												
PAVP													-7432.4									56888.4	107532.5	
													5500.4									194765.1	207233.1	
PTLP														-20.6								-176.9	-320.2	
														15.1								535.3	571.3	
PRNF															49.4									50.0
															20.3									21.0
PDPT																11.6							53.5	-9.5
																62.8								58.0
PWCH																	-29.1							
																	41.5							
CONS		-1685.5	6323.8	1785.9	3905.9	1773.5	3325.3	395.2	899.2	1558.5	1877.9	973.1	2387.7	2394.6	592.5	963.6	2359.1	3551.0	3420.7		1964.8	2388.9	922.7	884.5
	200.2	2621.1	3040.0	318.0	1857.3	1423.7	1923.5	1843.0	1799.7	713.3	1005.7	1382.1	808.3	807.6	352.7	1985.9	1484.2	4516.6	1958.4	1978.9	1077.0	824.4	2073.4	1810.8
R2	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.5	0.5

Table A37: Sunflower Seeds 2008 Weather Regressions

2008 Var	2008 Reg1	2008 Reg 2	2008 Reg3	2008 Reg4	2008 Reg5	2008 Reg6	2008 Reg7	2008 Reg8	2008 Reg9	2008 Reg10	2008 Reg11	2008 Reg12	2008 Reg13	2008 Reg14	2008 Reg15	2008 Reg16	2008 Reg17	2008 Reg18	2008 Reg19	2008 Reg20	2008 Reg21	2008 Reg22	2008 Reg23	2008 Reg24
RMA	0.7	0.7	0.6	0.6	0.6	0.7	0.6	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.6
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		24.0	31.2															16.3						
																		29.2						
LNG			40.1															39.3						
			14.8															15.0						
ELV				-0.1																				
				0.1																				
PMXT					-25.9														-34006.3					
					10.9														59250.5					
PMNT						-9.2													-33958.7					
						17.7													59259.0					
PAVT							-27.4												67950.1					
							15.2												118507.6					
PBST								-19.5												-32.0				
								24.7												33.2				
PTST									-2.0											16.1				
									21.2											28.3				
PAVW										-18.1											46.3			
										31.1											65.8			
PMXW											-20.7										-47.0			
											19.8										42.3			
PSRD												-5.2												
												2.1												
PAVP													-4522.3									83357.9	67268.9	
													1589.6									104504.1	110207.6	
PTLP														-12.4								-239.7	-196.1	
														4.3								285.0	300.4	
PRNF															24.1									24.6
															9.4									9.8
PDPT																8.9							13.2	-6.0
																26.7								25.7
PWCH																	-22.9							
																	13.0							
CONS		-632.1	4626.7	838.1	1895.9	748.3	1618.2	1380.0	578.5	663.3	1014.1	2296.5	1264.8	1267.1	256.2	243.1	1306.6	3776.2	1722.3		1234.8	1245.0	902.8	417.3
	96.7	1462.0	1526.7	182.8	599.1	505.7	632.5	1131.7	954.3	313.7	510.8	725.5	286.6	286.0	128.5	745.9	473.5	2163.8	626.9	1171.4	602.3	288.7	733.6	702.1
R2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7
ADJ R2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7

Table A38: Sunflower Seeds 2009 Weather Regressions

2009	2 2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	1 2009	2009	3 2009	2009	2009	2009	2009
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.8	0.7	0.7	0.8	0.7	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8
	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
LAT		-55.0	44.9															-48.1						
																		45.3						
LNG			-25.4															-22.0						
			21.4															21.5						
ELV				0.1																				
				0.1																				
PMXT					37.2														-25720.7					
					22.8														59082.4					
PMNT						21.5													-25753.4					
						26.3													59083.3					
PAVT							41.6												51510.4					
							28.4												118158.8					
PBST								-11.9												-91.1				
								32.1												46.3				
PTST									30.8											93.4				
									28.3											41.7				
PAVW										30.5											-13.0			
										39.9											75.5			
PMXW											30.2										38.4			
											29.5										56.3			
PSRD												2.6												
												2.7												
PAVP													6282.6									-40490.4	-36724.4	
													3419.1									163973.7	167713.1	
PTLP														17.0								126.6	116.6	
														9.2								443.6	453.7	
PRNF															-20.2									-25.1
															18.9									20.8
PDPT																4.0							7.6	20.2
																31.5								34.0
PWCH																	27.0							
																	23.4							
CONS		2947.2	-2230.6	142.6	-1406.5	-311.8	-1224.3	781.2	-1006.4	1.2	-346.5	-516.5	-354.2	-344.2	500.8	139.3	-525.6	455.9	-1331.0		-401.6	-266.4	-501.9	-26.1
	243.3	2208.2	2103.7	264.0	1047.1	736.9	1039.3	1438.2	1185.7	413.6	637.2	858.6	406.2	400.7	333.2	946.0	718.6	3286.6	1136.5	1349.5	723.5	515.3	1088.8	948.1
R2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5
ADJ R2	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.7	0.5	0.5	0.4	0.5	0.5	0.5

Table A39: Sunflower Seeds 2010 Weather Regressions

2010	2 2010	2010	3 2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	1 2010	2010	2010	2010	2010	2010	2010
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.8
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		11.9	34.1															11.1						
																		33.9						
LNG			-15.5															-15.5						
			12.9															13.1						
ELV				0.0																				
				0.1																				
PMXT					9.9														15216.5					
					22.1														46546.1					
PMNT						2.9													15196.7					
						21.6													46535.2					
PAVT							8.0												-30404.1					
							24.6												93078.7					
PBST								-24.3												-52.3				
								25.4												37.0				
PTST									0.5											39.5				
									26.4											37.9				
PAVW										-37.3											-71.0			
										32.0											70.5			
PMXW											-18.6										28.1			
											23.9										52.2			
PSRD												2.5												
												2.6												
PAVP													2394.0									-74459.3	-69839.6	
													3783.4									115601.2	116495.5	
PTLP														6.8								212.1	199.2	
														10.4								318.8	321.3	
PRNF															0.1									4.4
															10.0									11.1
PDPT																-20.3							-19.3	-25.0
																24.5								27.5
PWCH																	7.6							
																	19.3							
CONS		-270.3	1226.5	260.6	-174.6	223.7	-4.9	1461.3	287.6	575.3	661.5	-440.5	58.0	47.4	307.2	956.8	45.4	1758.9	-228.6		284.2	-9.4	615.1	1018.2
	169.6	1669.8	1286.7	185.7	1090.2	660.9	978.9	1217.5	1207.9	284.2	484.4	807.4	431.0	433.7	263.3	801.6	688.3	2084.8	1136.5	1292.9	612.3	446.4	926.3	826.8
R2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
ADJ R2	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.5	0.5	0.5	0.5	0.5	0.5

Table A40: Soybeans 2008 Weather Regressions

2008 Var	2008 Reg1	2008 Reg 2	2008 Reg3	2008 Reg4	2008 Reg5	2008 Reg6	2008 Reg7	2008 Reg8	2008 Reg9	2008 Reg10	2008 Reg11	2008 Reg12	2008 Reg13	2008 Reg14	2008 Reg15	2008 Reg16	2008 Reg17	2008 Reg18	2008 Reg19	2008 Reg20	2008 Reg21	2008 Reg22	2008 Reg23	2008 Reg24
RMA	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.7
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		0.0	0.3															0.0						
																		0.3						
LNG			0.1															0.1						
			0.2															0.2						
ELV				0.0																				
				0.0																				
PMXT					-0.1														673.2					
					0.1														477.7					
PMNT						0.1													674.0					
						0.1													477.8					
PAVT							0.0												-1347.2					
							0.2												955.4					
PBST								0.1												0.2				
								0.2												0.3				
PTST									0.0											-0.2				
									0.2											0.3				
PAVW										-0.1											-0.4			
										0.3											0.5			
PMXW											0.0										0.3			
											0.2										0.4			
PSRD												0.0												
												0.0												
PAVP													-30.7									-957.0	-1331.0	
													21.1									953.3	970.5	
PTLP														-0.1								2.5	3.5	
														0.1								2.6	2.6	
PRNF															0.2									0.2
															0.1									0.1
PDPT																0.1							0.3	-0.1
																0.2								0.2
PWCH																	0.0							
																	0.1							
CONS		5.3	17.0	5.6	10.8	3.6	6.5	3.2	7.5	6.6	5.1	14.4	9.9	9.8	4.0	3.0	6.7	15.9	15.0		4.0	10.1	5.3	5.2
	1.5	13.1	22.6	2.7	6.2	3.6	5.4	7.8	7.3	3.5	4.7	7.6	3.3	3.3	1.6	4.5	4.1	24.5	6.2	8.2	4.9	3.3	4.7	4.4
R2	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
ADJ R2	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

Table A41: Soybeans 2009 Weather Regressions

2009	1 2009	2009 Reg	2009	2009	2009	3 2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2 2009	2009	2009	2009	2009	2009	2009
Var	Reg1	2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.9	0.7	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.8	0.8	0.8	0.9	0.7	0.8
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-1.0	0.4															-0.9						
																		0.4						
LNG			0.4															0.2						
			0.3															0.3						
ELV				0.0																				
				0.0																				
PMXT					0.4														54.6					
					0.3														488.1					
PMNT						0.6													55.5					
						0.2													488.1					
PAVT							0.6												-109.6					
							0.2												976.2					
PBST								0.4												0.0				
								0.3												0.4				
PTST									0.4											0.4				
									0.2											0.4				
PAVW										0.1											-0.7			
										0.3											0.7			
PMXW											0.3										0.7			
											0.3										0.6			
PSRD												0.0												
												0.0												
PAVP													-6.3									-504.4	1793.4	
													47.4									1138.1	1250.7	
PTLP														0.0								1.4	-4.9	
														0.1								3.1	3.4	
PRNF															0.2									0.0
															0.1									0.1
PDPT																0.6							0.8	0.6
																0.2								0.3
PWCH																	0.4							
																	0.2							
CONS		53.6	37.2	1.0	-13.5	-12.0	-18.2	-14.7	-14.4	-0.1	-4.2	0.7	2.2	2.1	0.7	-11.8	-7.1	67.7	-6.1		-6.8	2.7	-19.5	-11.8
	3.1	20.0	28.2	3.6	11.2	4.9	8.0	11.0	8.8	4.9	6.5	10.3	6.1	6.0	3.1	5.7	5.4	29.3	10.6	10.9	7.1	6.3	9.2	6.7
R2	0.7	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8
ADJ R2	0.9	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.9	0.8	0.8	0.7	0.7	0.8	0.8

Table A42: Soybeans 2010 Weather Regressions

2010	1 2010	2010	2010	3 2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2 2010	2010	2010	2010	2010	2010	2010
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.2	0.2	0.2	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
LAT		-0.5	0.4															-0.1						
																		0.4						
LNG			0.8															0.8						
			0.3															0.3						
ELV				0.0																				
				0.0																				
PMXT					0.8														-221.8					
					0.3														676.2					
PMNT						0.4													-223.1					
						0.3													676.3					
PAVT							0.7												445.6					
							0.3												1352.5					
PBST								0.9												1.4				
								0.3												0.6				
PTST									0.6											-0.5				
									0.3											0.6				
PAVW										-1.2											-1.3			
										0.4											1.4			
PMXW											-0.8										0.0			
											0.3										1.0			
PSRD												0.0												
												0.0												
PAVP													-40.1									233.3	554.6	
													61.4									1611.1	1473.7	
PTLP														-0.1								-0.8	-1.8	
														0.2								4.4	4.1	
PRNF															0.4									0.3
															0.2									0.2
PDPT																0.8							0.9	0.5
																0.3								0.3
PWCH																	0.7							
																	0.2							
CONS		46.9	105.6	34.0	-15.3	11.0	-3.1	-20.0	-2.4	36.0	44.1	36.6	30.2	30.2	18.4	0.5	-0.7	107.6	-18.9		35.7	30.3	7.8	2.3
	2.0	20.9	29.4	3.3	15.1	8.9	12.6	16.6	16.1	4.5	7.8	13.4	8.7	8.7	3.1	10.5	8.6	31.3	16.5	16.8	11.8	8.9	11.6	10.2
R2	0.3	0.4	0.5	0.5	0.5	0.4	0.4	0.5	0.4	0.5	0.5	0.4	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.3	0.5	0.5
ADJ R2	0.9	0.3	0.4	0.5	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.5	0.9	0.4	0.4	0.4	0.3	0.4	0.4

Table A43: Wheat-Spring 2008 Weather Regressions

2008	2008	2008	2008	2008	2008	2008	2008	2 2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	3 2008	1 2008	2008	2008	2008
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.9	0.9	0.9	0.9	1.0	0.9	1.0	0.9	0.9	0.9	0.9	0.9	1.0	1.0	0.9	0.9	1.0	0.9	1.0	0.9	1.0	1.0	0.9	0.9
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0
LAT		-1.2	0.4															-1.2						
																		0.5						
LNG			0.4															0.0						
			0.4															0.4						
ELV				0.0																				
				0.0																				
PMXT					0.6														209.2					
					0.2														777.7					
PMNT						0.5													208.7					
						0.3													777.9					
PAVT							0.7												-417.2					
							0.3												1555.6					
PBST								1.0												0.9				
								0.3												0.4				
PTST									0.8											0.2				
									0.3											0.4				
PAVW										-0.4											-2.6			
										0.5											0.7			
PMXW											0.6										2.0			
											0.4										0.5			
PSRD												0.1												
												0.0												
PAVP													56.4									1748.1	1398.0	
													48.0									1894.2	1770.3	
PTLP														0.2								-4.6	-3.8	
														0.1								5.2	4.9	
PRNF															0.2									-0.1
															0.2									0.2
PDPT																1.1							1.1	1.2
																0.3								0.4
PWCH																	0.6							
																	0.2							
CONS		57.9	44.6	3.1	-31.7	-12.2	-25.6	-44.9	-35.0	6.3	-13.0	-15.6	-7.8	-7.6	0.7	-27.8	-19.1	58.3	-30.5		-24.3	-6.5	-26.6	-29.4
	0.9	21.1	44.8	4.2	12.5	7.4	10.9	13.7	13.9	5.3	9.5	15.9	8.6	8.7	2.0	9.3	7.7	43.1	13.4	14.6	9.2	8.8	10.7	9.8
R2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
ADJ R2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table A44: Wheat-Spring 2009 Weather Regressions

2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.7
	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0
LAT		-0.9	0.5															-0.9						
																		0.5						
LNG			0.0															-0.1						
			0.3															0.3						
ELV				0.0																				
				0.0																				
PMXT					0.7														-60.7					
					0.2														771.6					
PMNT						0.5													-61.3					
						0.3													771.7					
PAVT							0.8												122.7					
							0.3												1543.3					
PBST								0.6												0.0				
								0.3												0.5				
PTST									0.6											0.6				
									0.3											0.5				
PAVW										-0.7											-1.9			
										0.5											0.8			
PMXW											0.1										1.3			
											0.4										0.6			
PSRD												0.0												
												0.0												
PAVP													45.5									-21.7	1963.7	
													49.6									1765.4	1794.5	
PTLP														0.1								0.2	-5.2	
														0.1								4.8	4.9	
PRNF															0.3									0.1
															0.2									0.2
PDPT																0.7							0.9	0.5
																0.3								0.4
PWCH																	0.7							
																	0.2							
CONS		47.3	7.8	9.1	-30.2	-7.5	-24.8	-17.8	-20.7	14.9	4.1	-2.2	-1.0	-0.9	4.1	-12.4	-15.6	39.9	-30.2		-5.9	-0.9	-32.0	-8.7
	2.5	21.5	31.8	4.9	12.6	8.2	11.7	15.2	13.6	6.1	11.4	14.7	8.9	8.8	2.7	8.3	7.5	35.3	12.9	15.5	11.4	9.6	14.3	10.1
R2	0.8	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9
ADJ R2	1.0	0.9	0.8	0.8	0.9	0.9	0.9	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.8	0.9	0.9

Table A45: Wheat-Spring 2010 Weather Regressions

2010	2 2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	3 2010	1 2010	2010	2010	2010	2010	2010	2010
Var	Reg1	Reg 2	Reg3	Reg4	Reg5	Reg6	Reg7	Reg8	Reg9	Reg10	Reg11	Reg12	Reg13	Reg14	Reg15	Reg16	Reg17	Reg18	Reg19	Reg20	Reg21	Reg22	Reg23	Reg24
RMA	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.7
	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
LAT		-0.7	0.3															-0.6						
																		0.3						
LNG			0.3															0.2						
			0.3															0.3						
ELV				0.0																				
				0.0																				
PMXT					0.7														64.0					
					0.2														485.8					
PMNT						0.4													63.2					
						0.2													485.7					
PAVT							0.7												-126.6					
							0.2												971.5					
PBST								0.6												0.4				
								0.2												0.4				
PTST									0.6											0.2				
									0.2											0.4				
PAVW										-0.8											-2.4			
										0.4											0.8			
PMXW											-0.3										1.5			
											0.3										0.7			
PSRD												0.1												
												0.0												
PAVP													81.0									-97.1	364.0	
													46.2									1187.1	1187.5	
PTLP														0.2								0.5	-0.9	
														0.1								3.3	3.3	
PRNF															0.0									-0.1
															0.1									0.1
PDPT																0.7							0.6	0.7
																0.3								0.3
PWCH																	0.7							
																	0.2							
CONS		38.3	39.6	11.3	-27.2	-4.2	-19.4	-19.7	-19.2	14.6	14.0	-15.6	-5.1	-5.2	7.0	-13.1	-15.4	53.6	-27.6		-5.7	-5.2	-16.4	-13.5
	1.3	15.0	28.4	3.9	10.6	6.8	9.6	10.5	11.2	3.9	7.8	10.6	7.2	7.2	2.0	8.6	6.4	28.8	10.9	11.5	10.0	7.3	9.5	8.7
R2	0.9	0.9	0.9	0.9	1.0	0.9	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	0.9	1.0	1.0	1.0	0.9	1.0	0.9
ADJ R2	1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9

APPENDIX B. FIGURES

Figure B1: Barley, Sargent County 2008, Contiguity[6]

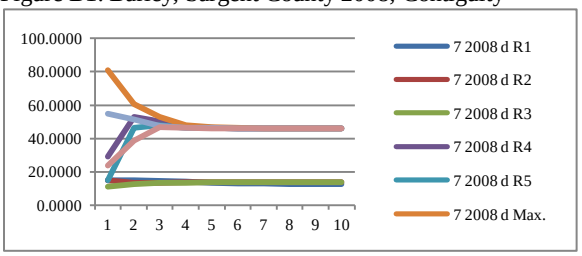


Figure B2: Barley, Sargent County 2008, Distance

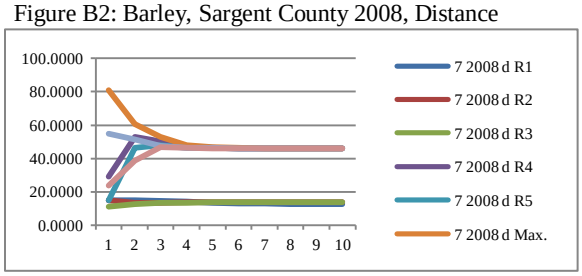


Figure B3: Barley, Richland County 2008, Contiguity

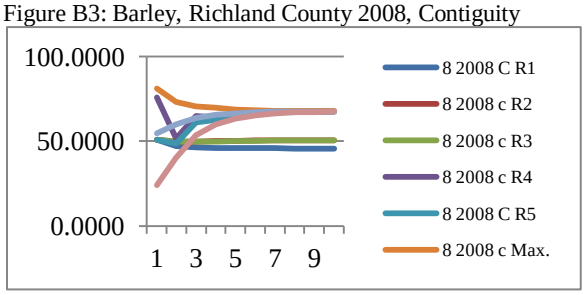


Figure B4: Barley, Richland County 2008, Distance

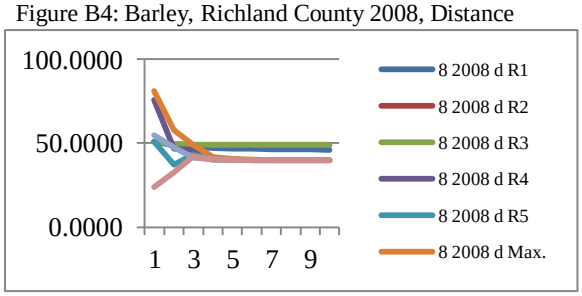


Figure B5: Barley, Golden Valley County 2008, Contiguity

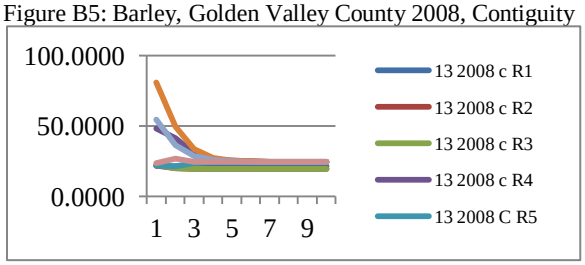


Figure B6: Barley, Golden Valley County 2008, Distance

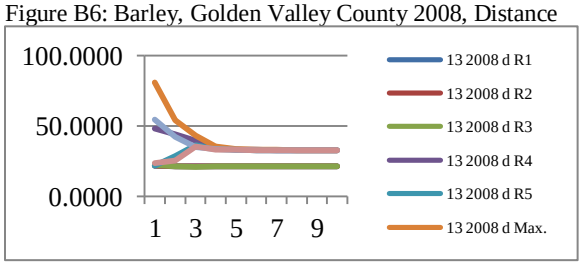


Figure B7: Barley, Kidder County 2008, Contiguity

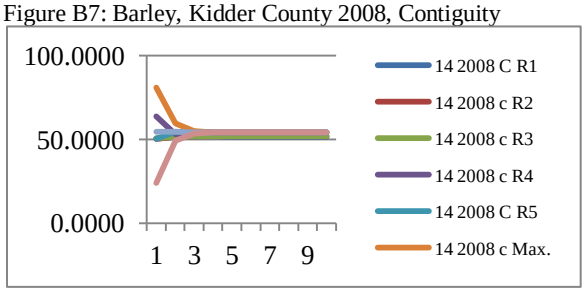


Figure B8: Barley, Kidder County 2008, Distance

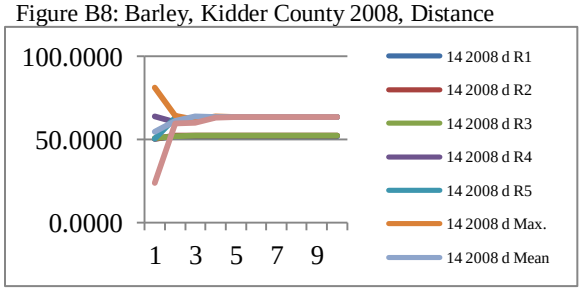


Figure B9: Barley, Sheridan County 2008, Contiguity

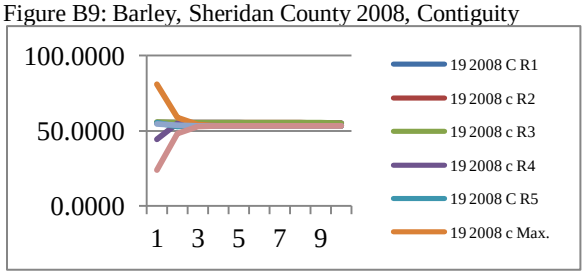
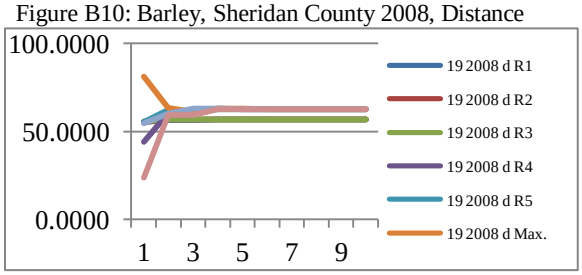


Figure B10: Barley, Sheridan County 2008, Distance



[6] Due to space limitations, axis labels are omitted from the graphs. For each figure the vertical axis units are bushels per acre and the horizontal axis represents imputations 1 through 10.

Figure B11: Barley, Grant County 2008, Contiguity

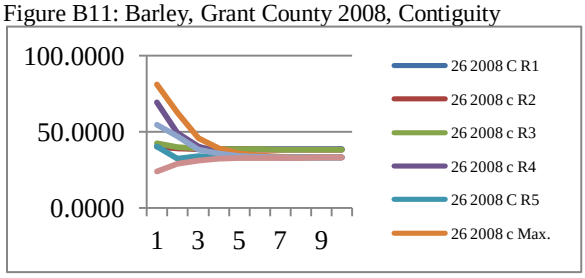


Figure B12: Barley, Grant County 2008, Distance

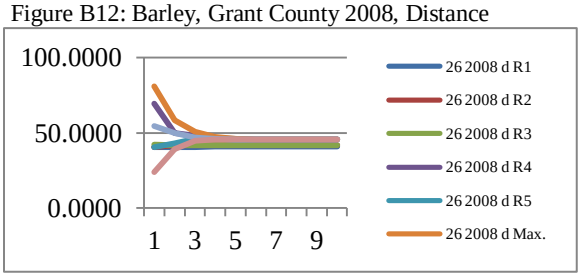


Figure B13: Barley, Pembina County 2008, Contiguity

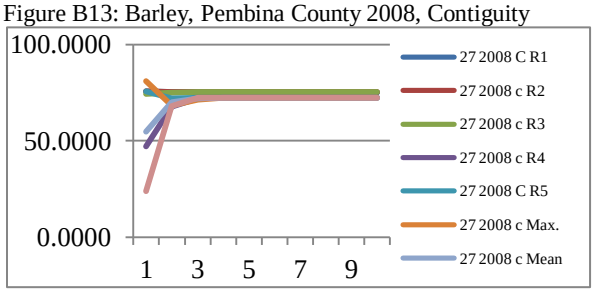


Figure B14: Barley, Pembina County 2008, Distance

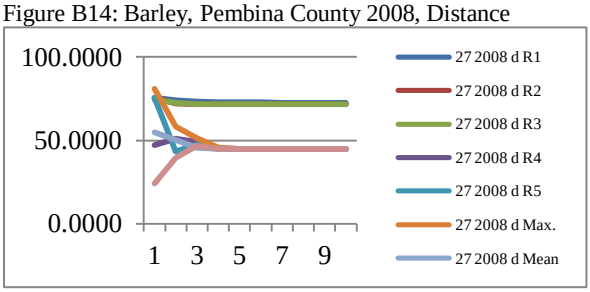


Figure B15: Barley, Sioux County 2008, Contiguity

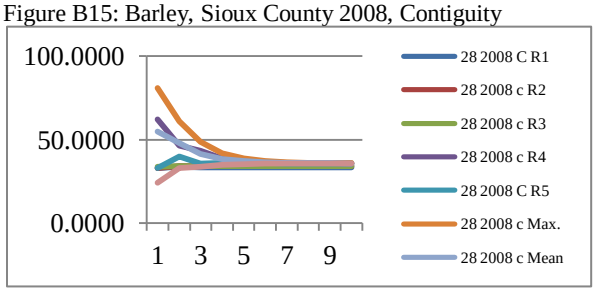


Figure B16: Barley, Sioux County 2008, Distance

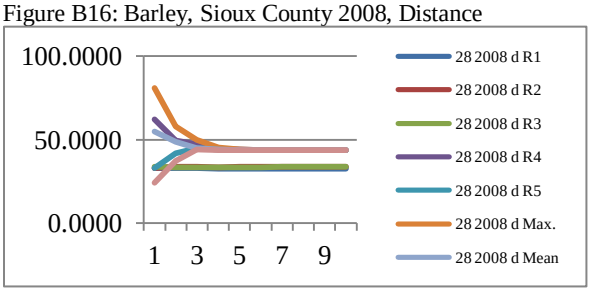


Figure B17: Barley, Adams County 2008, Contiguity

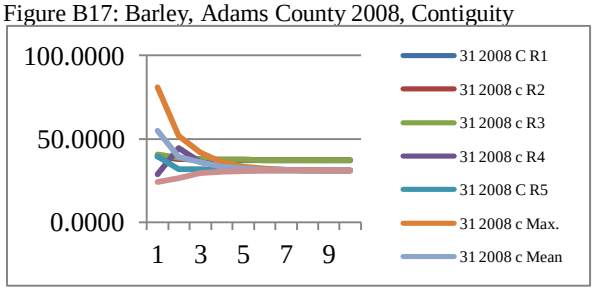


Figure B18: Barley, Adams County 2008, Distance

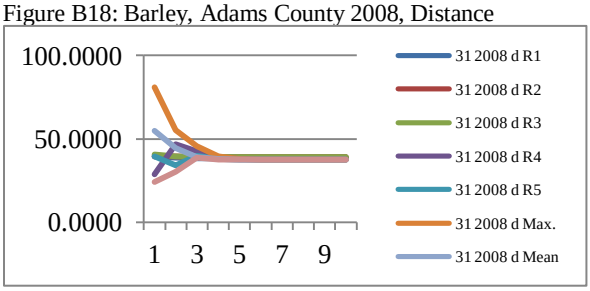


Figure B19: Barley, Billings County 2008, Contiguity

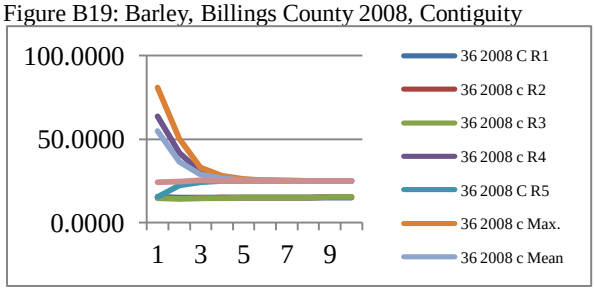


Figure B20: Barley, Billings County 2008, Distance

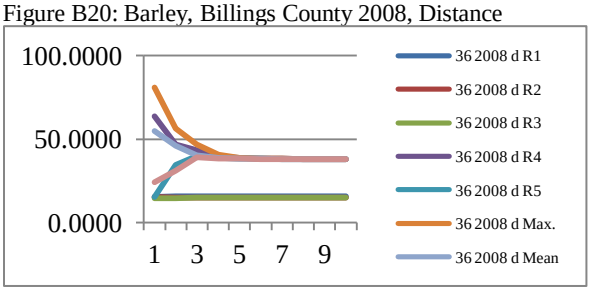


Figure B21: Barley, Grand Forks County 2008, Contiguity

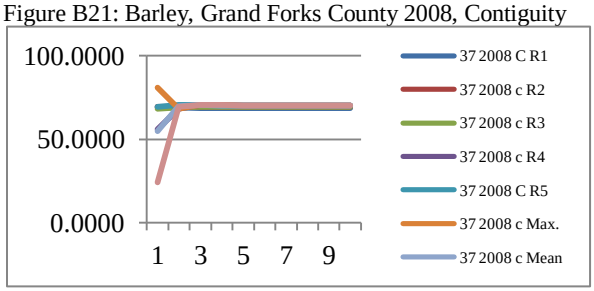


Figure B22: Barley, Grand Forks County 2008, Distance

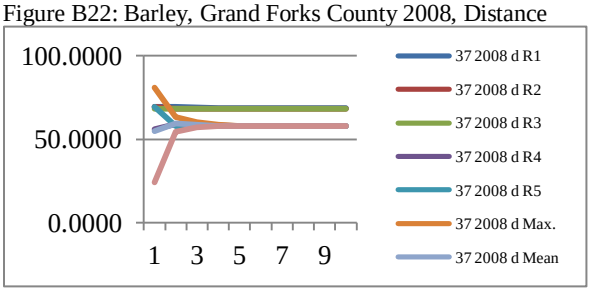


Figure B23: Barley, Ransom County 2008, Contiguity

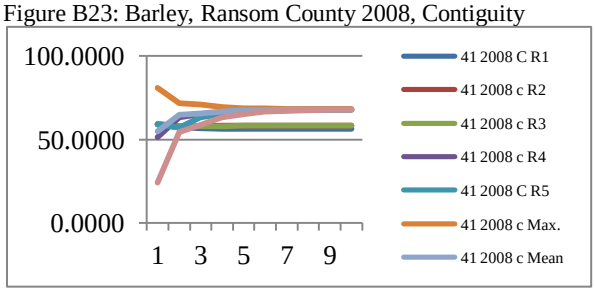


Figure B24: Barley, Ransom County 2008, Distance

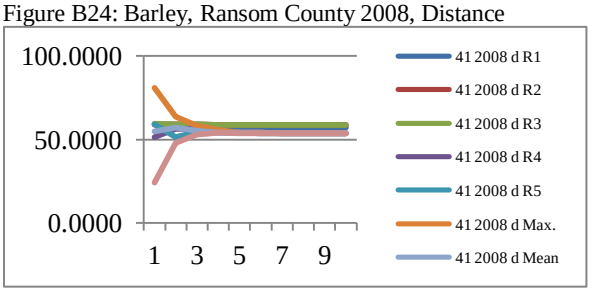


Figure B25: Barley, Stark County 2008, Contiguity

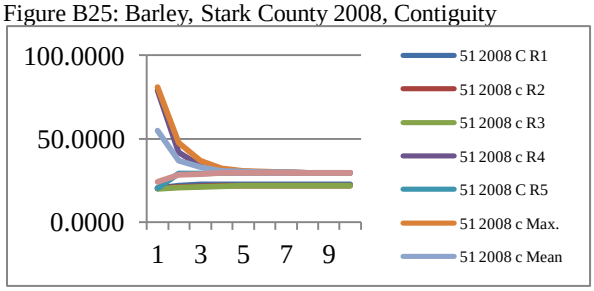


Figure B26: Barley, Stark County 2008, Distance

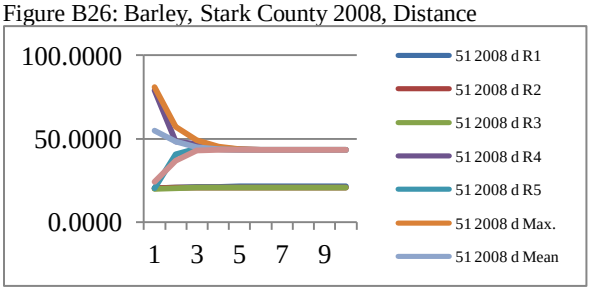


Figure B27: Barley, Sargent County 2009, Contiguity

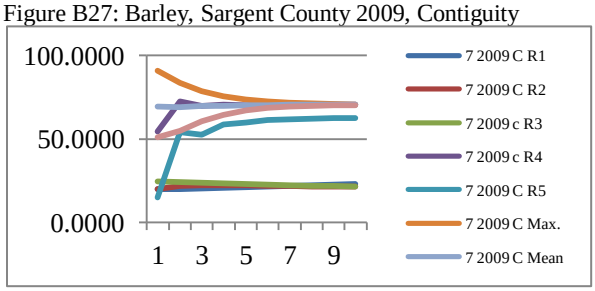


Figure B28: Barley, Sargent County 2009, Distance

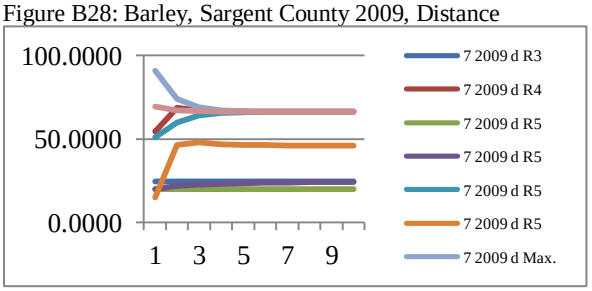


Figure B29: Barley, Richland County 2009, Contiguity

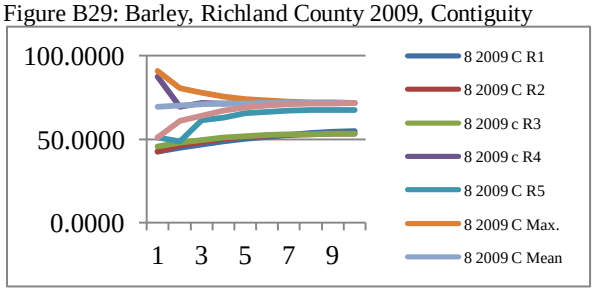


Figure B30: Barley, Richland County 2009, Distance

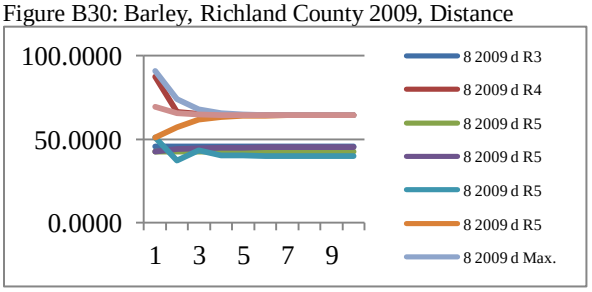


Figure B31: Barley, Grant County 2009, Contiguity

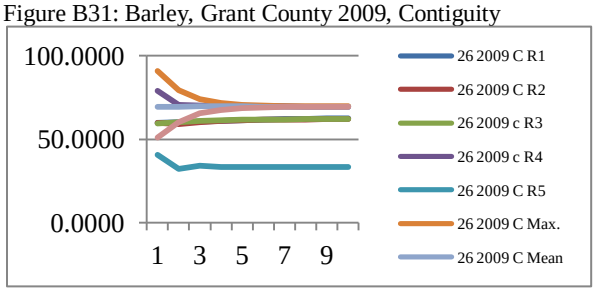


Figure B32: Barley, Grant County 2009, Distance

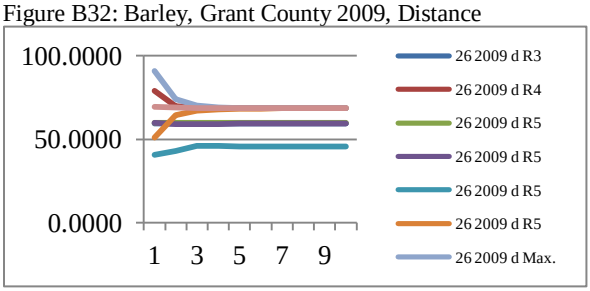


Figure B33: Barley, Pembina County 2009, Contiguity

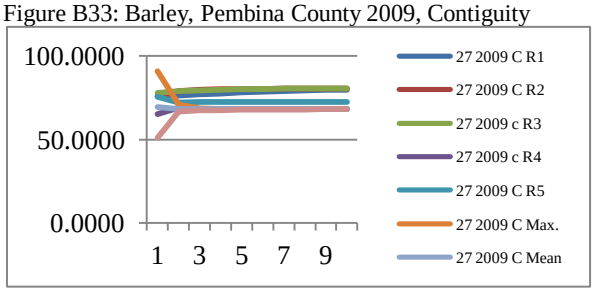


Figure B34: Barley, Pembina County 2009, Distance

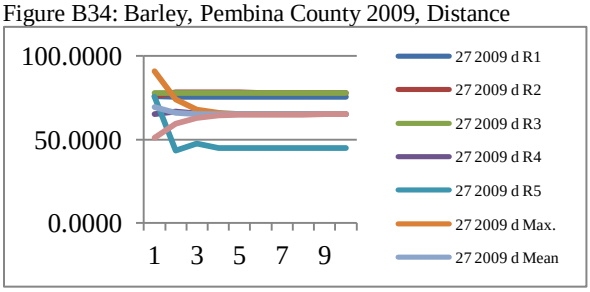


Figure B35: Barley, Sioux County 2009, Contiguity

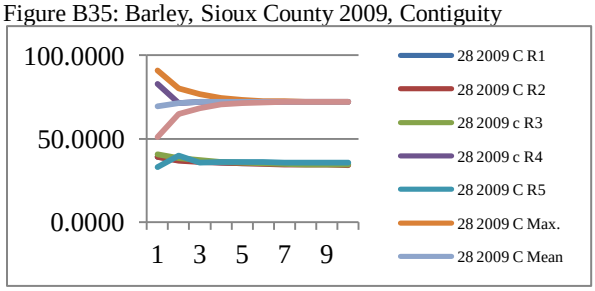


Figure B36: Barley, Sioux County 2009, Distance

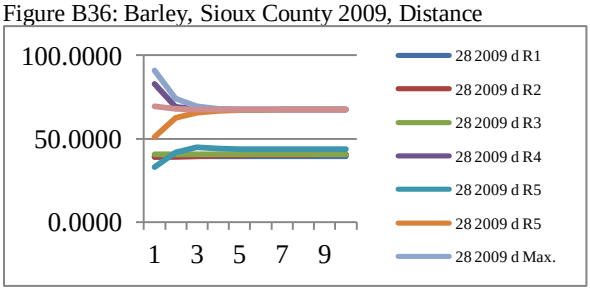


Figure B37: Barley, Adams County 2009, Contiguity

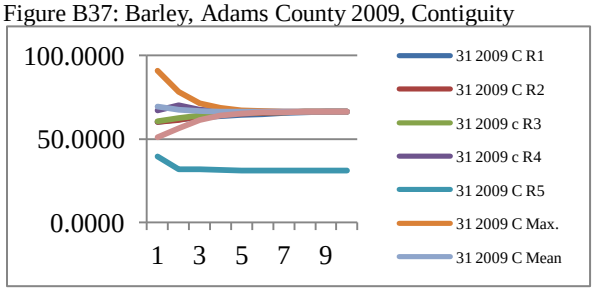


Figure B38: Barley, Adams County 2009, Distance

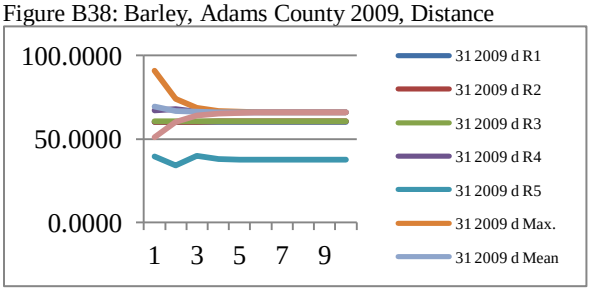


Figure B39: Barley, Dickey County 2009, Contiguity

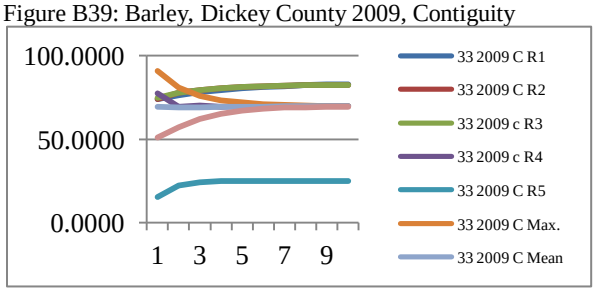


Figure B40: Barley, Dickey County 2009, Distance

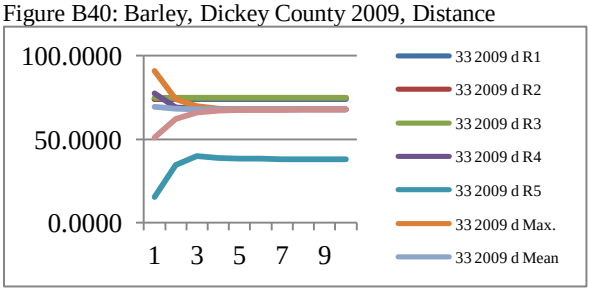


Figure B41: Barley, Grand Forks County 2009, Contiguity

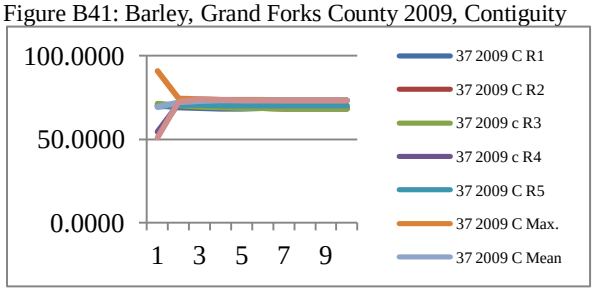


Figure B42: Barley, Grand Forks County 2009, Distance

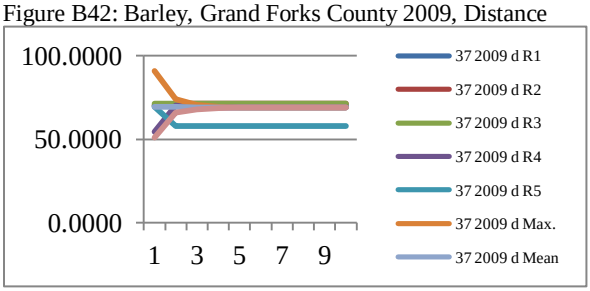


Figure B43: Barley, Ransom County 2009, Contiguity

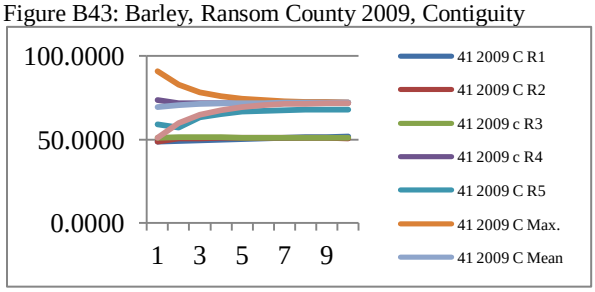


Figure B44: Barley, Ransom County 2009, Distance

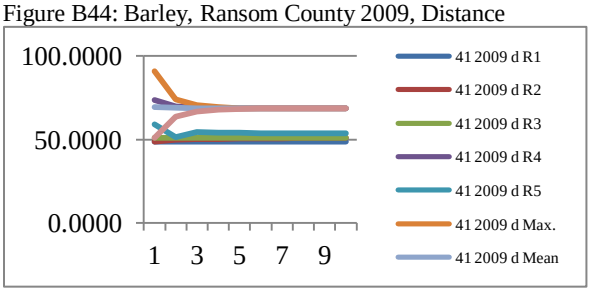


Figure B45: Barley, Stark County 2009, Contiguity

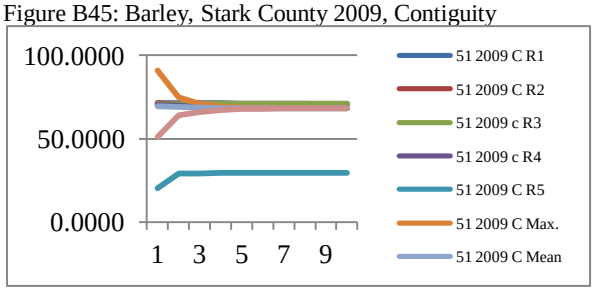


Figure B46: Barley, Stark County 2009, Distance

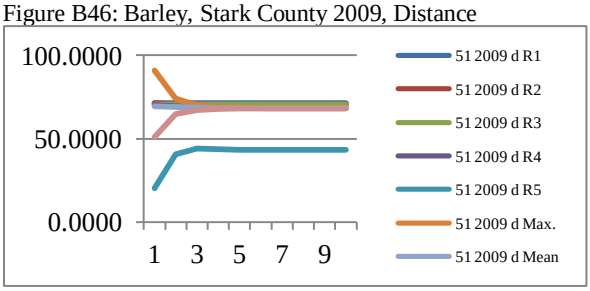


Figure B47: Barley, Sargent County 2010, Contiguity

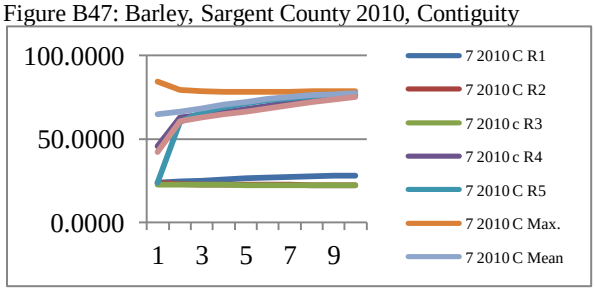


Figure B48: Barley, Sargent County 2010, Distance

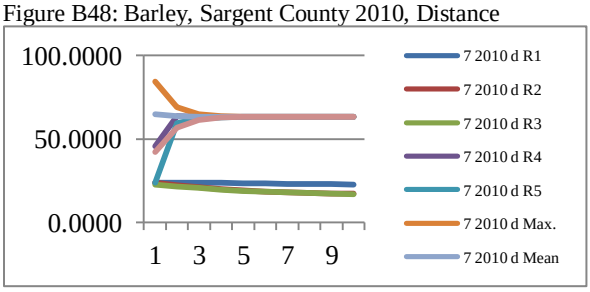


Figure B49: Barley, Richland County 2010, Contiguity

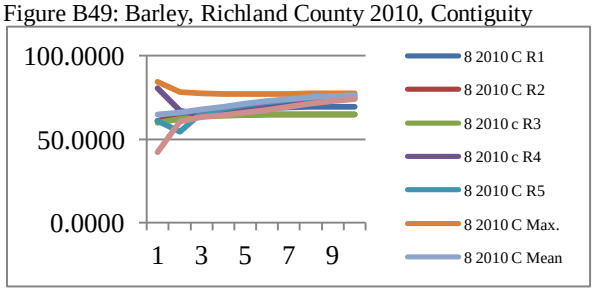


Figure B50: Barley, Richland County 2010, Distance

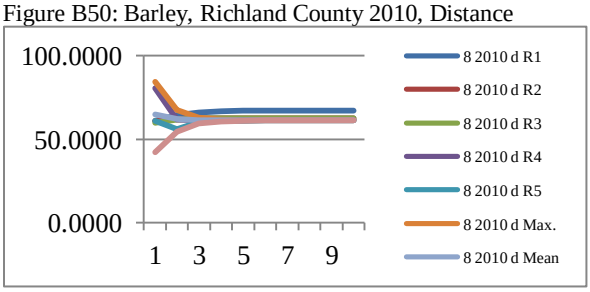


Figure B51: Barley, Grant County 2010, Contiguity

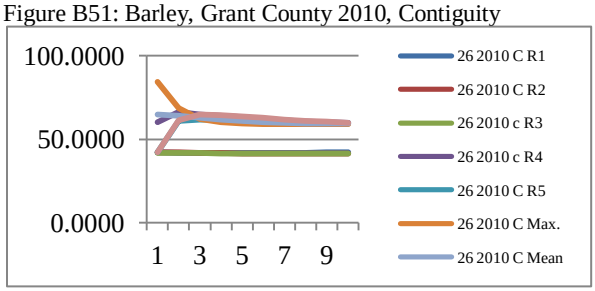


Figure B52: Barley, Grant County 2010, Distance

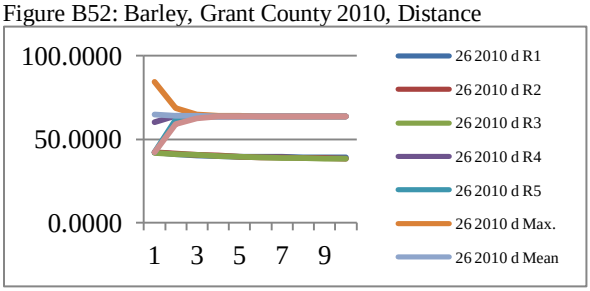


Figure B53: Barley, Pembina County 2010, Contiguity

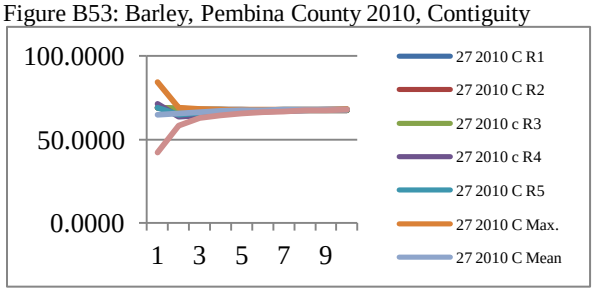


Figure B54: Barley, Pembina County 2010, Distance

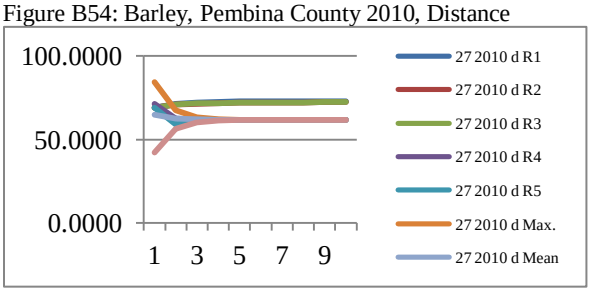


Figure B55: Barley, Sioux County 2010, Contiguity

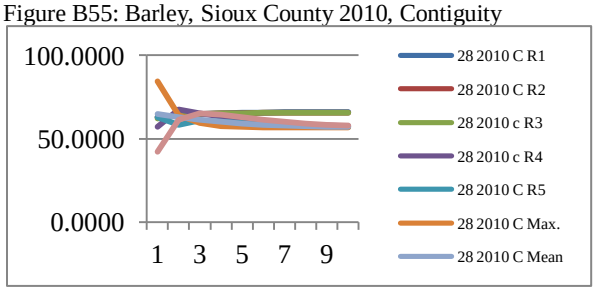


Figure B56: Barley, Sioux County 2010, Distance

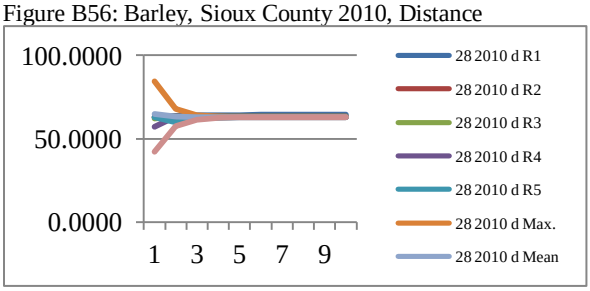


Figure B57: Barley, Billings County 2010, Contiguity

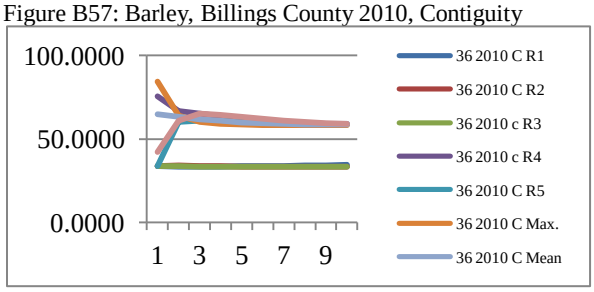


Figure B58: Barley, Billings County 2010, Distance

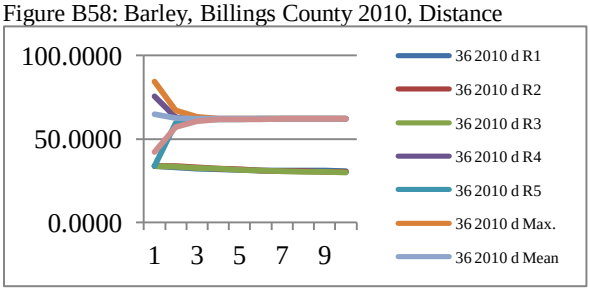


Figure B59: Barley, Steele County 2010, Contiguity

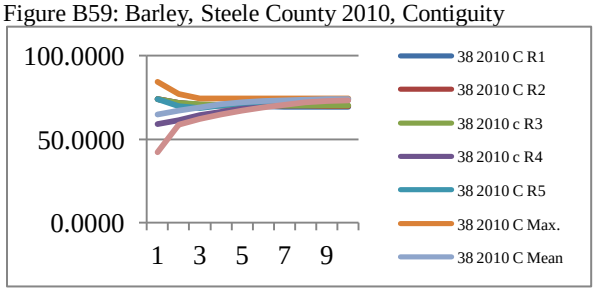


Figure B60: Barley, Steele County 2010, Distance

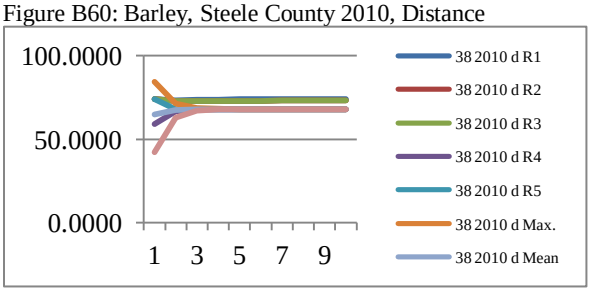


Figure B61: Barley, LaMoure County 2010, Contiguity

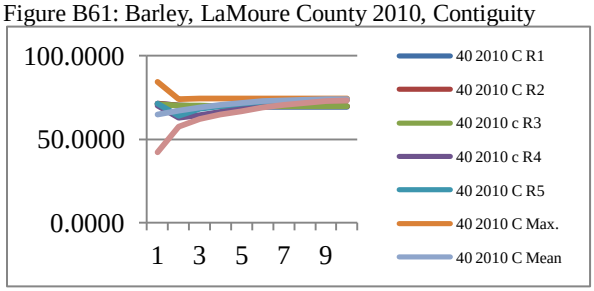


Figure B62: Barley, LaMoure County 2010, Distance

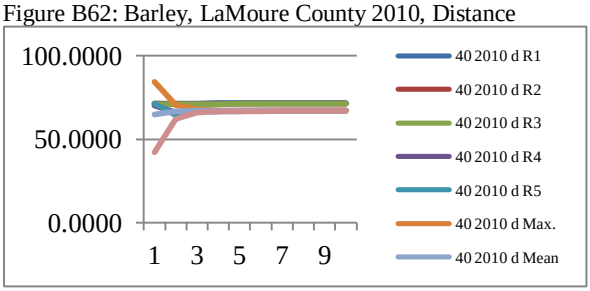


Figure B63: Barley, Ransom County 2010, Contiguity

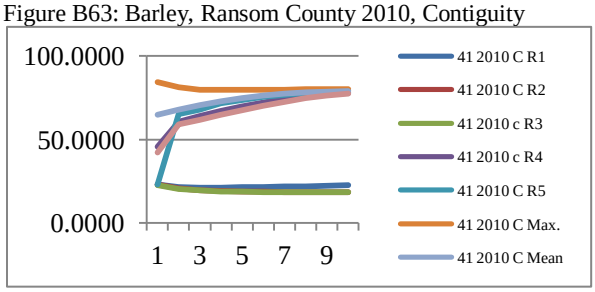


Figure B64: Barley, Ransom County 2010, Distance

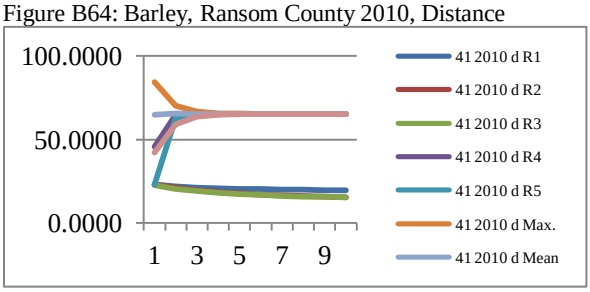


Figure B65: Barley, Nelson County 2010, Contiguity

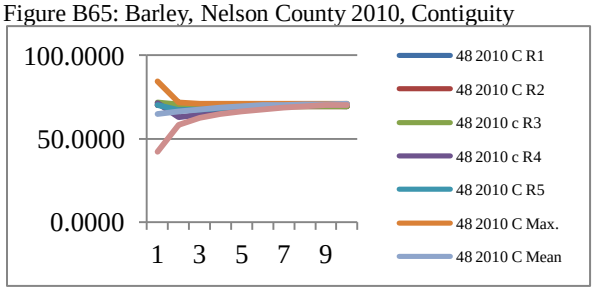


Figure B66: Barley, Nelson County 2010, Distance

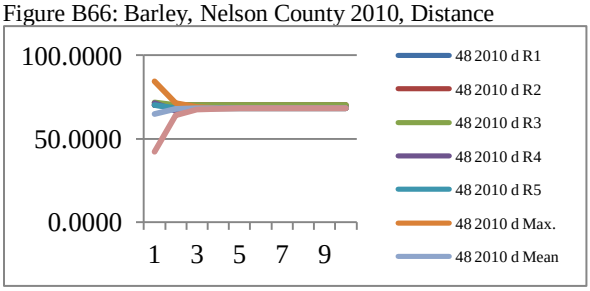


Figure B67: Barley, Stark County 2010, Contiguity

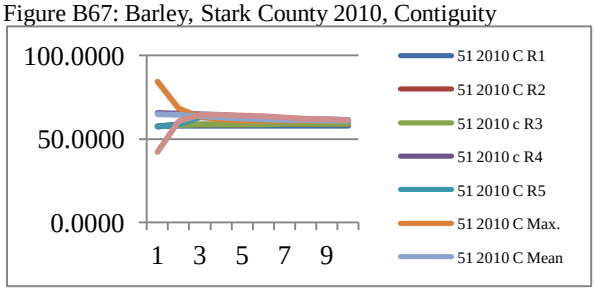


Figure B68: Barley, Stark County 2010, Distance

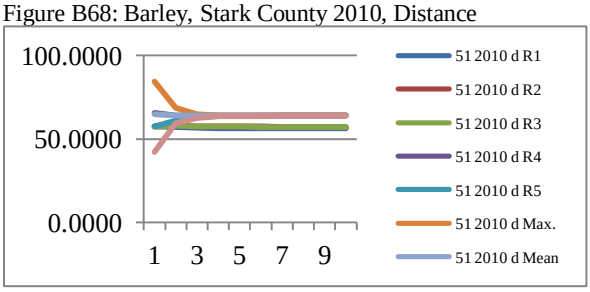


Figure B69: Barley, Traill County 2010, Contiguity

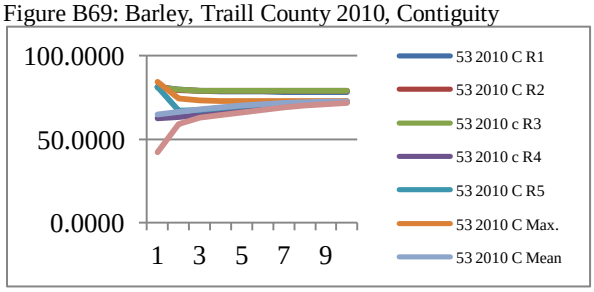


Figure B70: Barley, Traill County 2010, Distance

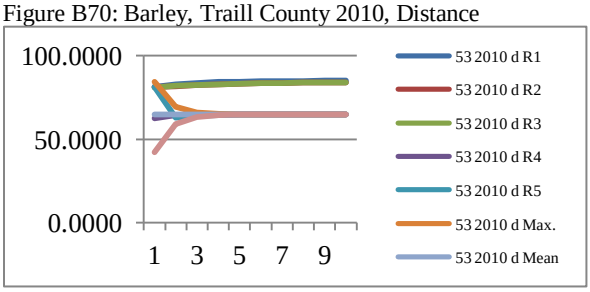


Figure B71: Canola, Bowman County 2008, Contiguity

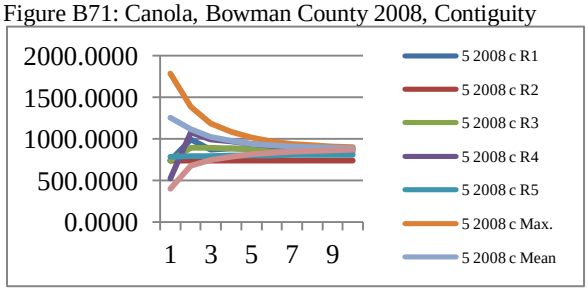


Figure B72: Canola, Bowman County 2008, Distance

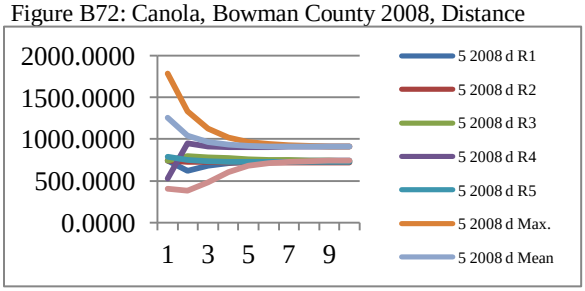


Figure B73: Canola, Emmons County 2008, Contiguity

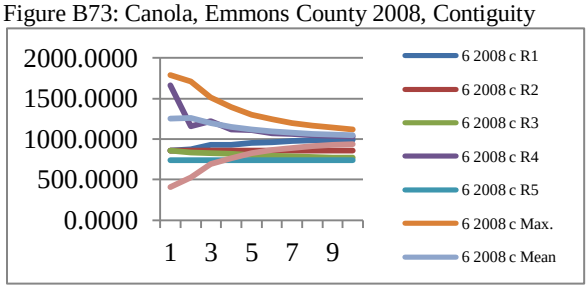


Figure B74: Canola, Emmons County 2008, Distance

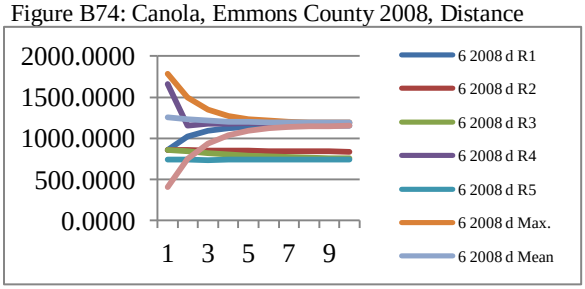


Figure B75: Canola, Sargent County 2008, Contiguity

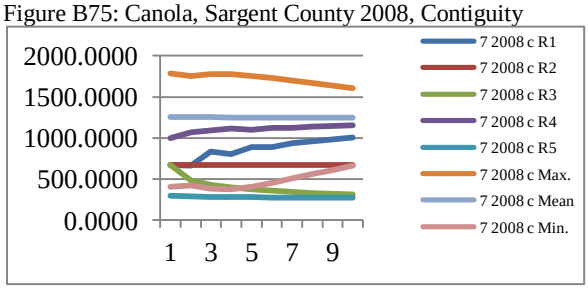


Figure B76: Canola, Sargent County 2008, Distance

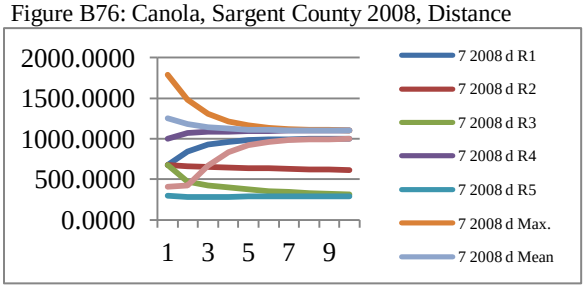


Figure B77: Canola, Richland County 2008, Contiguity

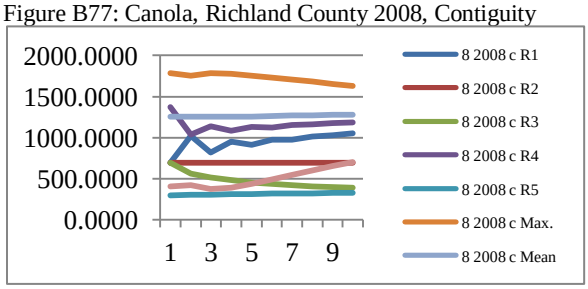


Figure B78: Canola, Richland County 2008, Distance

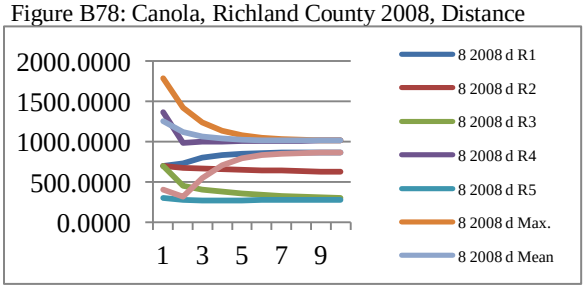


Figure B79: Canola, Golden Valley County 2008, Contiguity

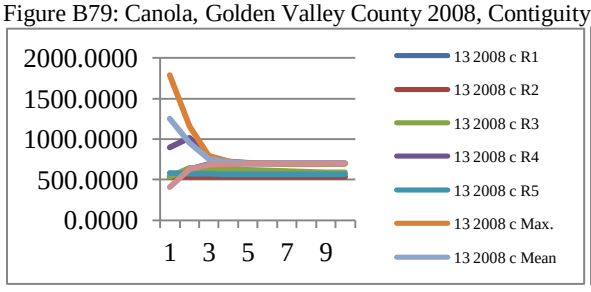


Figure B80: Canola, Golden Valley County 2008, Dist

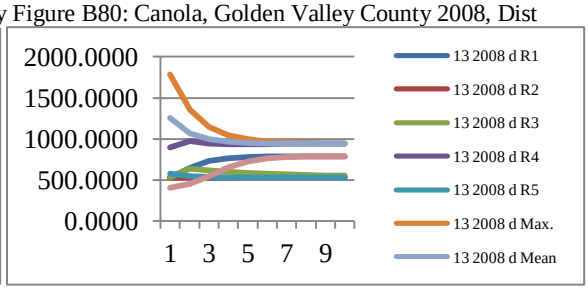


Figure B81: Canola, Logan County 2008, Contiguity

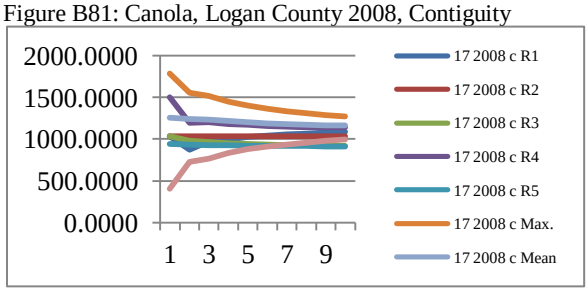


Figure B82: Canola, Logan County 2008, Distance

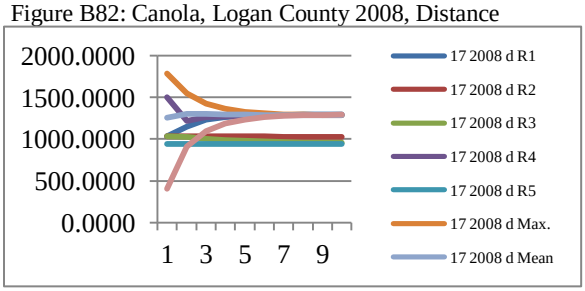


Figure B83: Canola, Morton County 2008, Contiguity

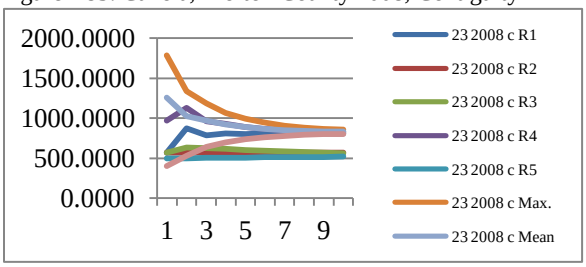


Figure B84: Canola, Morton County 2008, Distance

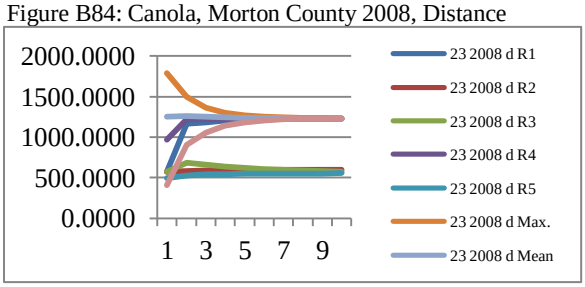


Figure B85: Canola, Grant County 2008, Contiguity

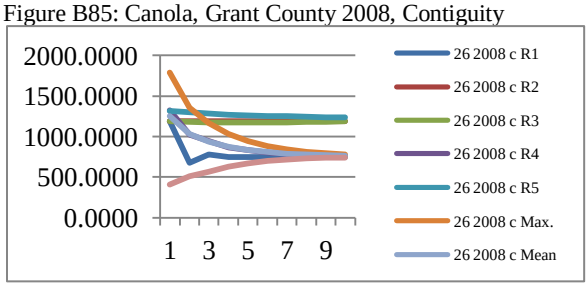


Figure B86: Canola, Grant County 2008, Distance

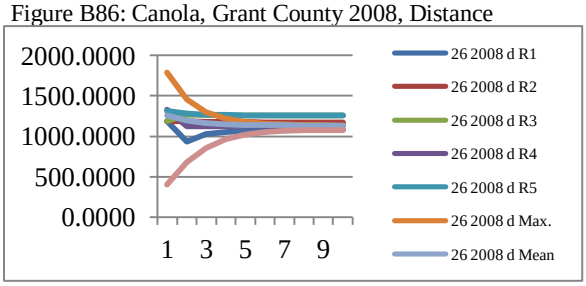


Figure B87: Canola, Pembina County 2008, Contiguity

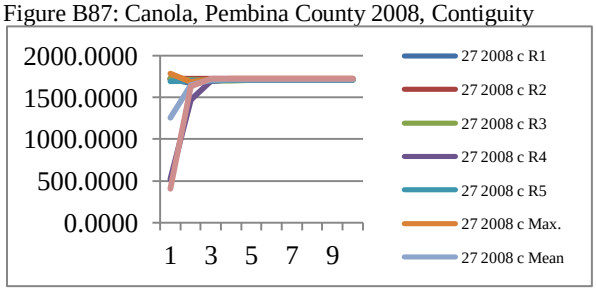


Figure B88: Canola, Pembina County 2008, Distance

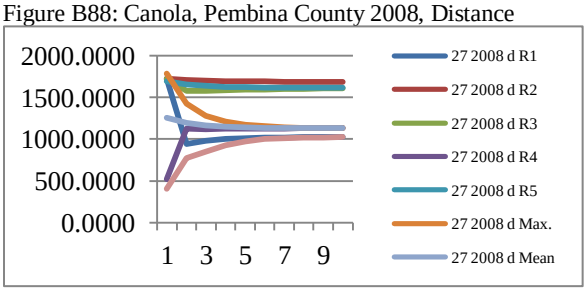


Figure B89: Canola, Sioux County 2008, Contiguity

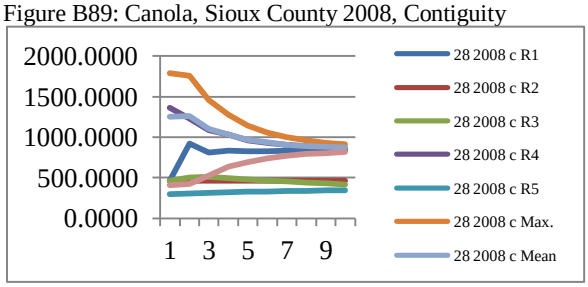


Figure B90: Canola, Sioux County 2008, Distance

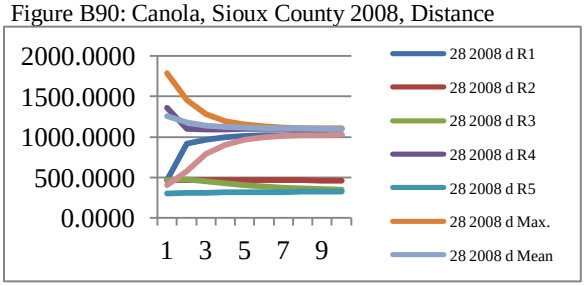


Figure B91: Canola, Cass County 2008, Contiguity

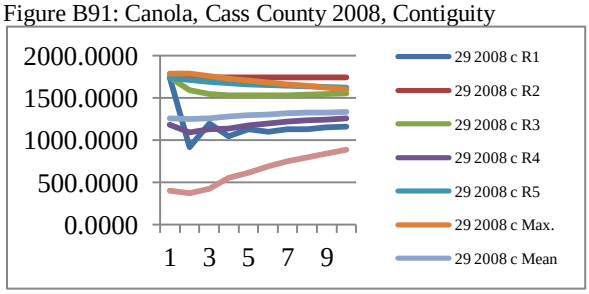


Figure B92: Canola, Cass County 2008, Distance

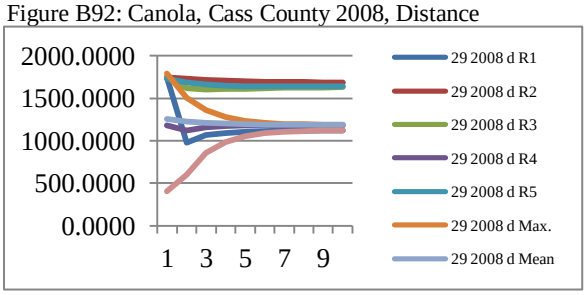


Figure B93: Canola, Adams County 2008, Contiguity

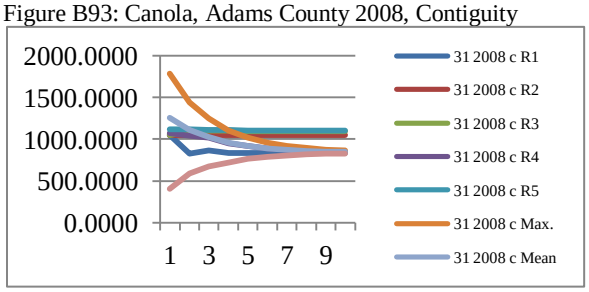


Figure B94: Canola, Adams County 2008, Distance

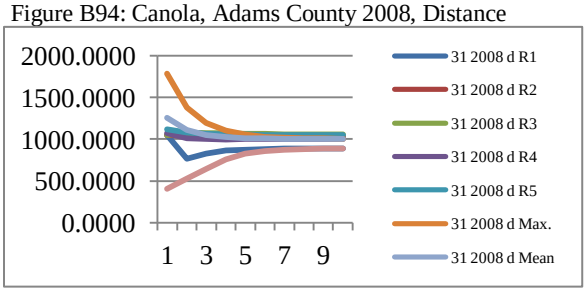


Figure B95: Canola, Barnes County 2008, Contiguity

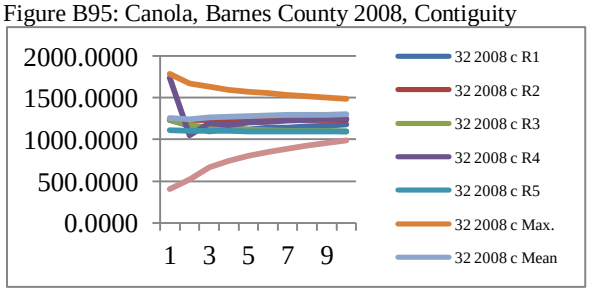


Figure B96: Canola, Barnes County 2008, Distance

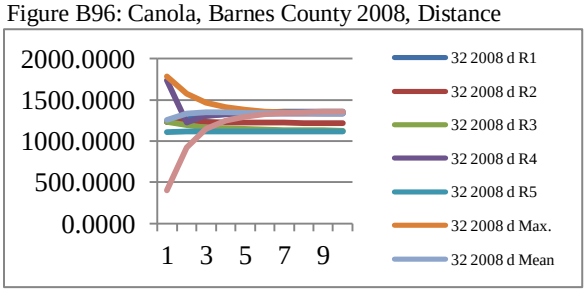


Figure B97: Canola, Dickey County 2008, Contiguity

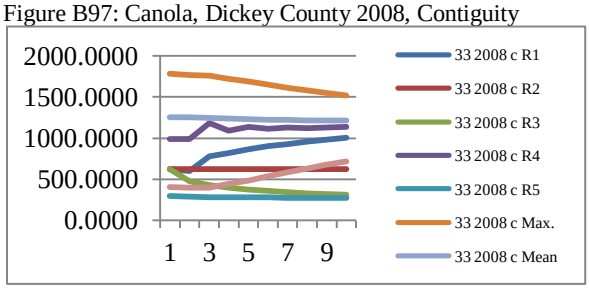


Figure B98: Canola, Dickey County 2008, Distance

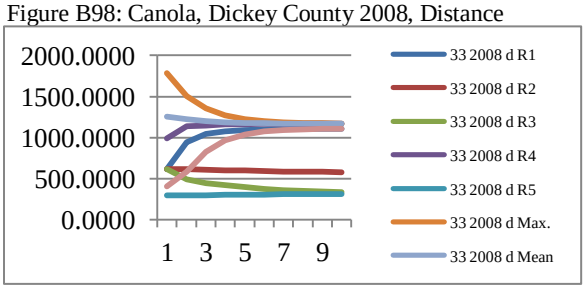


Figure B99: Canola, Griggs County 2008, Contiguity

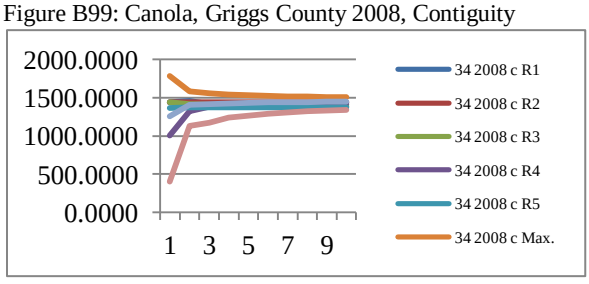


Figure B100: Canola, Griggs County 2008, Distance

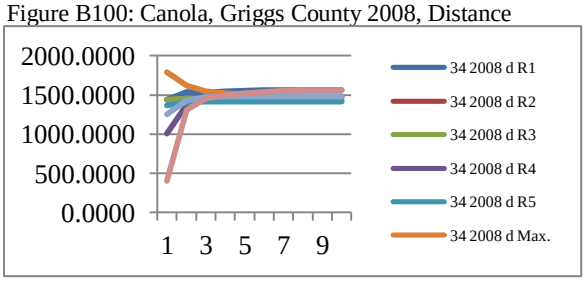


Figure B101: Canola, Billings County 2008, Contiguity

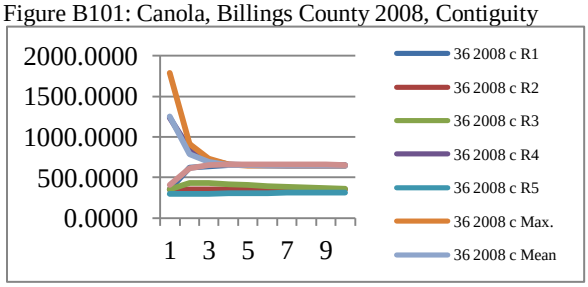


Figure B102: Canola, Billings County 2008, Distance

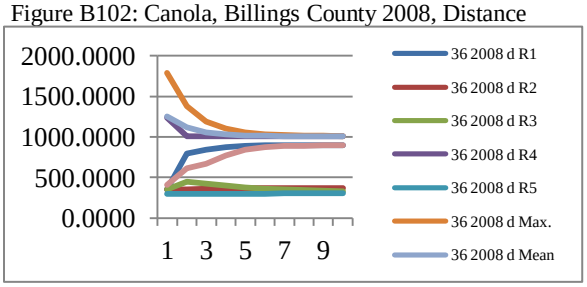


Figure B103: Canola, Grand Forks County 2008, Contiguity

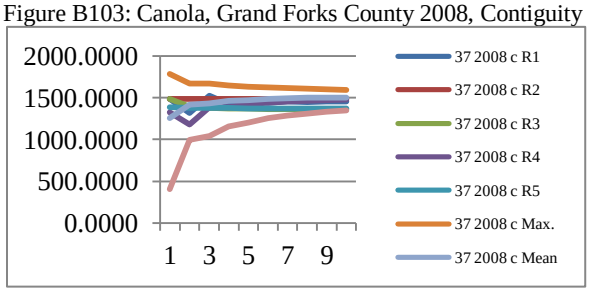


Figure B104: Canola, Grand Forks County 2008, Distance

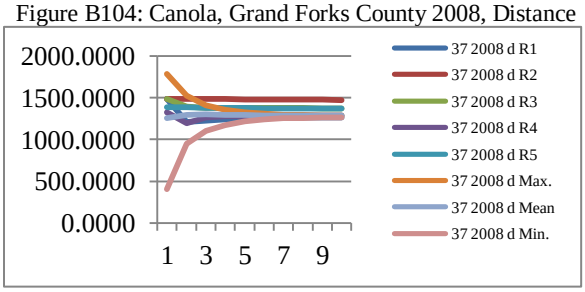


Figure B105: Canola, Steele County 2008, Contiguity

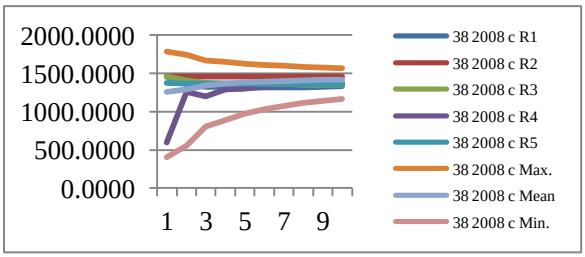


Figure B106: Canola, Steele County 2008, Distance

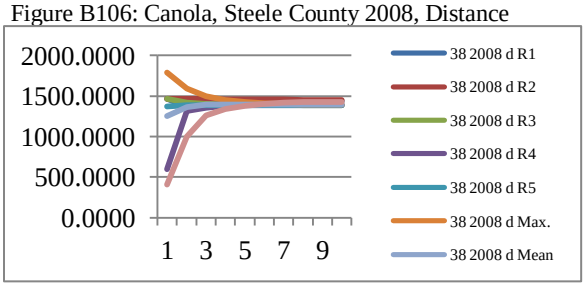


Figure B107: Canola, La Moure County 2008, Contiguity

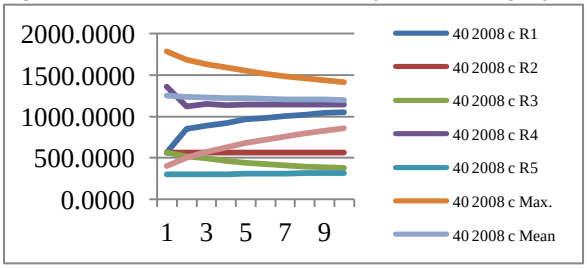


Figure B108: Canola, La Moure County 2008, Distance

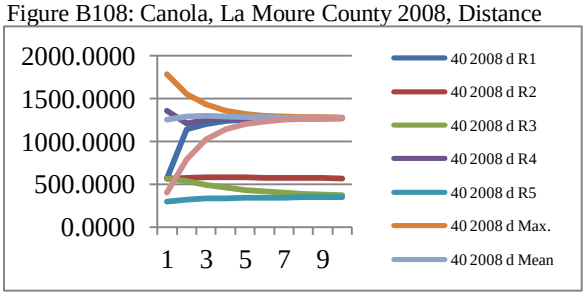


Figure B109: Canola, Ransom County 2008, Contiguity

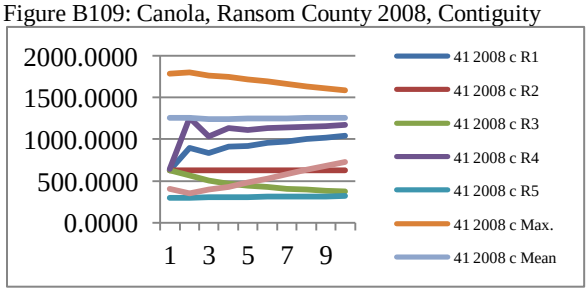


Figure B110: Canola, Ransom County 2008, Distance

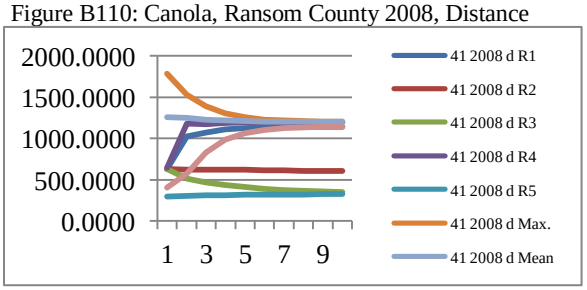


Figure B111: Canola, Burleigh County 2008, Contiguity

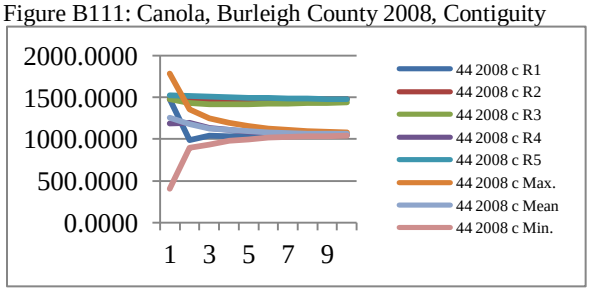


Figure B112: Canola, Burleigh County 2008, Distance

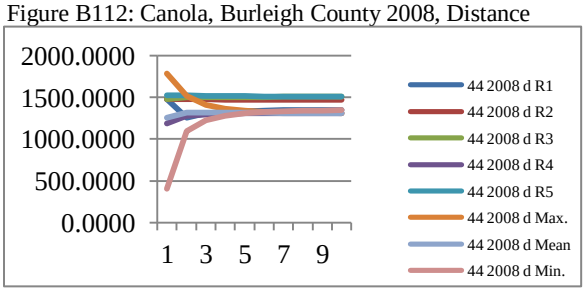


Figure B113: Canola, McIntosh County 2008, Contiguity

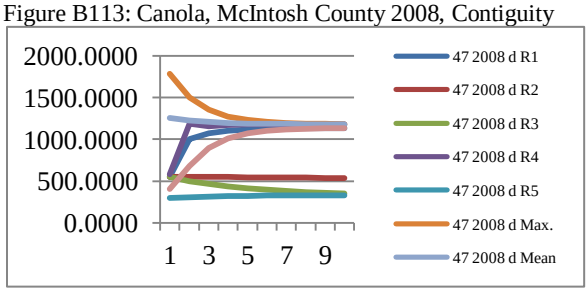


Figure B114: Canola, McIntosh County 2008, Distance

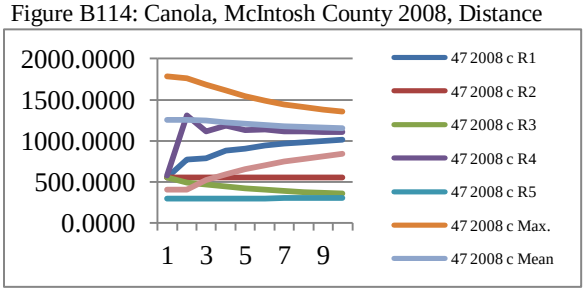


Figure B115: Canola, Traill County 2008, Contiguity

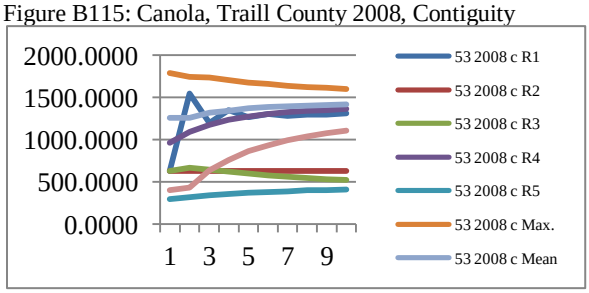


Figure B116: Canola, Traill County 2008, Distance

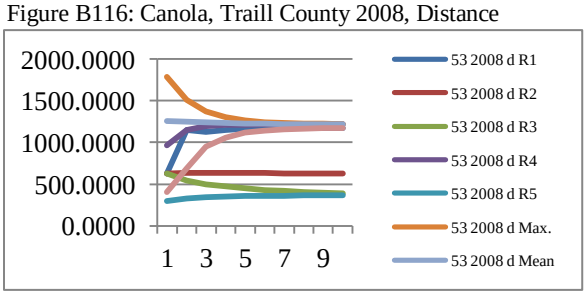


Figure B117: Canola, McHenry County 2009, Contiguity

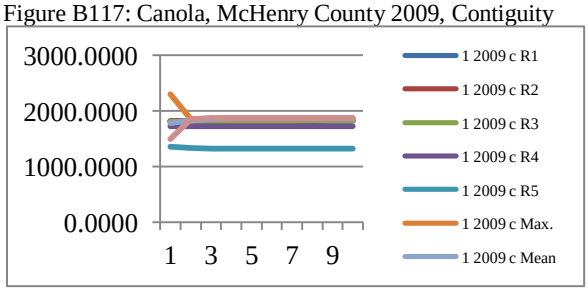


Figure B118: Canola, McHenry County 2009, Distance

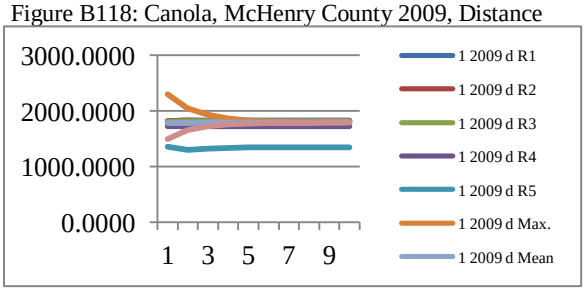


Figure B119: Canola, Walsh County 2009, Contiguity

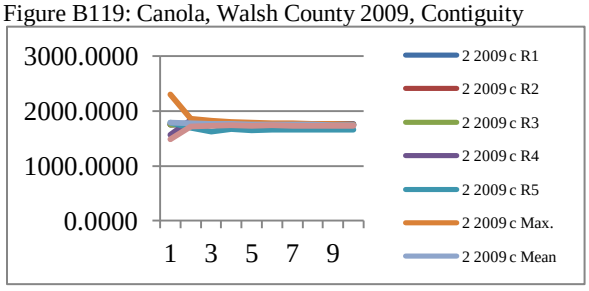


Figure B120: Canola, Walsh County 2009, Distance

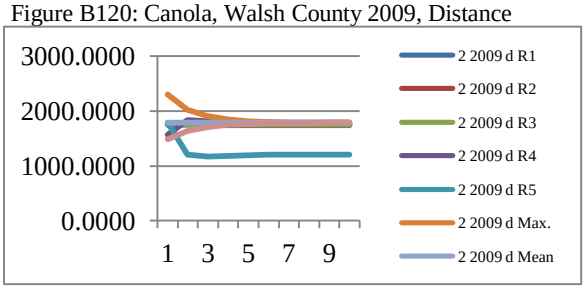


Figure B121: Canola, Renville County 2009, Contiguity

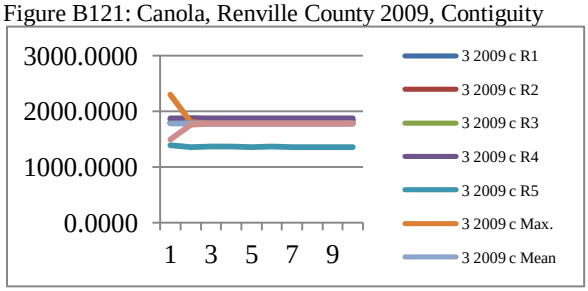


Figure B122: Canola, Renville County 2009, Distance

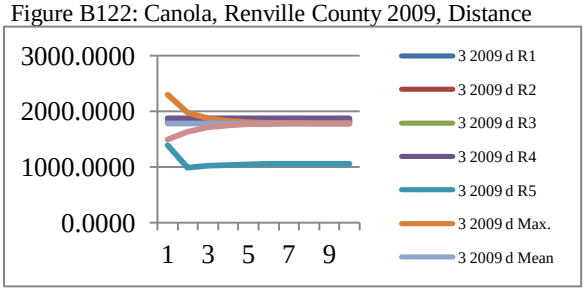


Figure B123: Canola, Wells County 2009, Contiguity

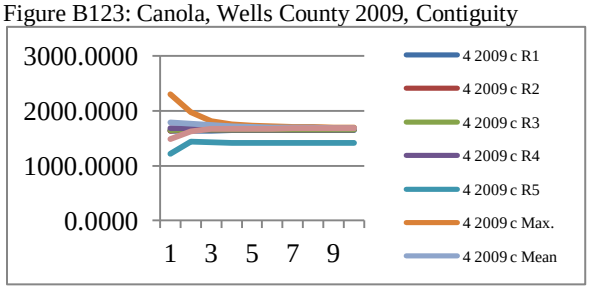


Figure B124: Canola, Wells County 2009, Distance

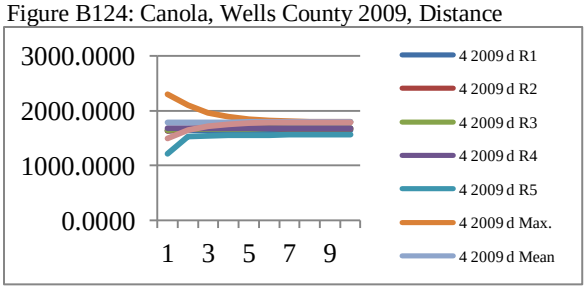


Figure B125: Canola, Bowman County 2009, Contiguity

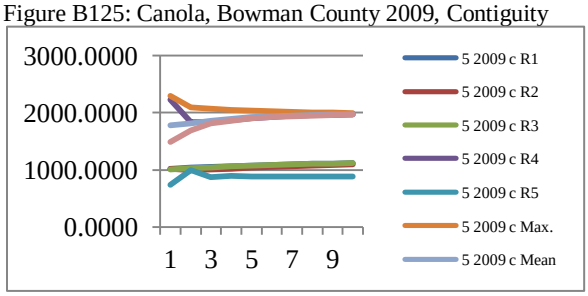


Figure B126: Canola, Bowman County 2009, Distance

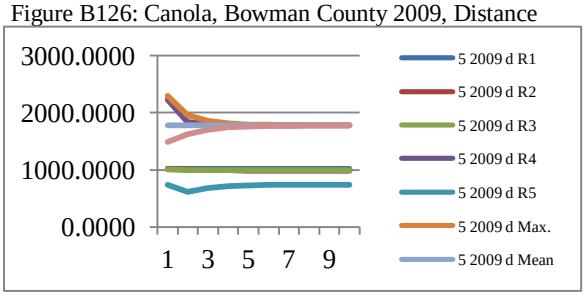


Figure B127: Canola, Emmons County 2009, Contiguity

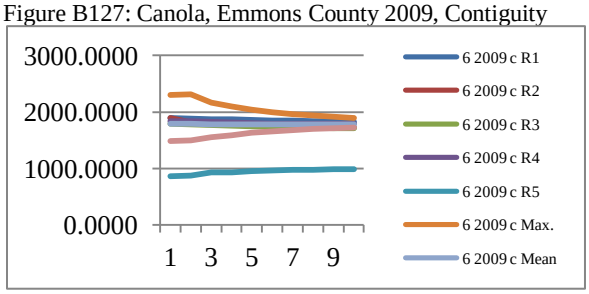


Figure B128: Canola, Emmons County 2009, Distance

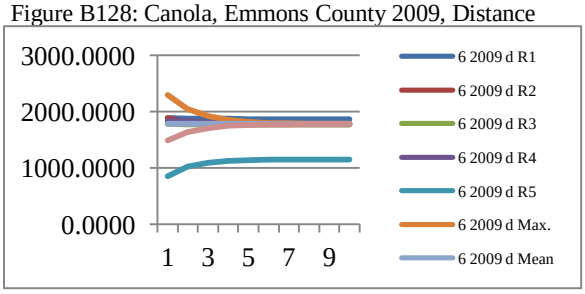


Figure B129: Canola, Sargent County 2009, Contiguity

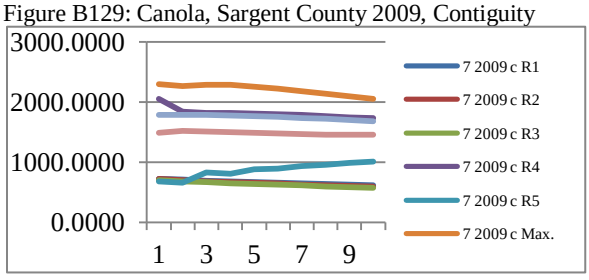


Figure B130: Canola, Sargent County 2009, Distance

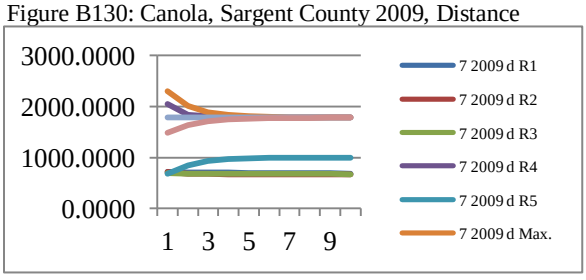


Figure B131: Canola, Richland County 2009, Contiguity

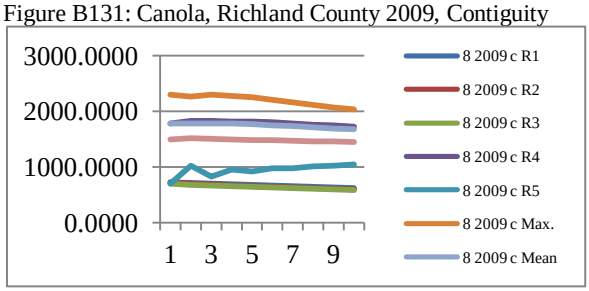


Figure B132: Canola, Richland County 2009, Distance

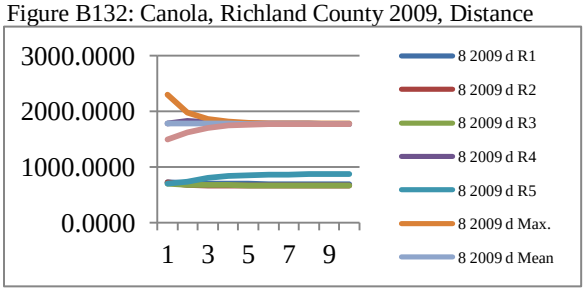


Figure B133: Canola, McKenzie County 2009, Contiguity

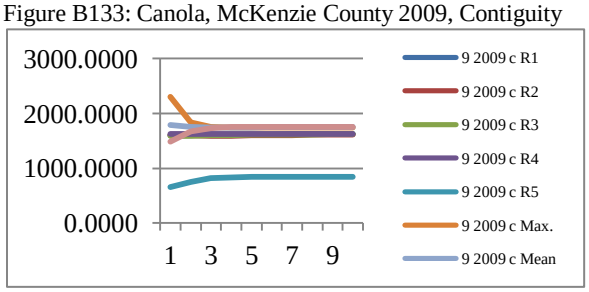


Figure B134: Canola, McKenzie County 2009, Distance

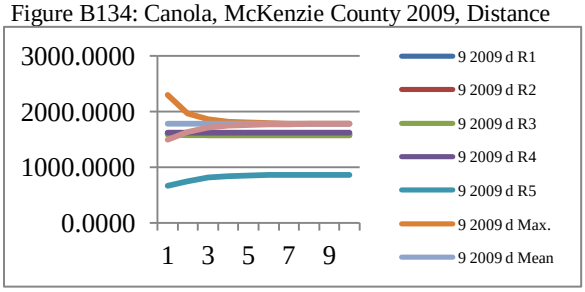


Figure B135: Canola, Williams County 2009, Contiguity

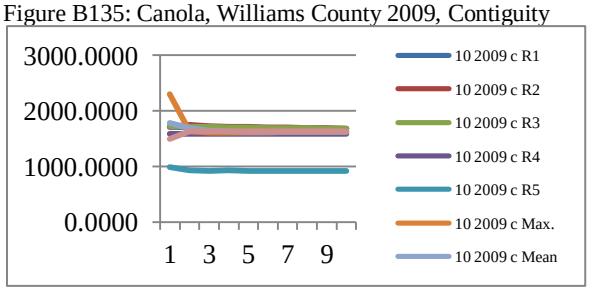


Figure B136: Canola, Williams County 2009, Distance

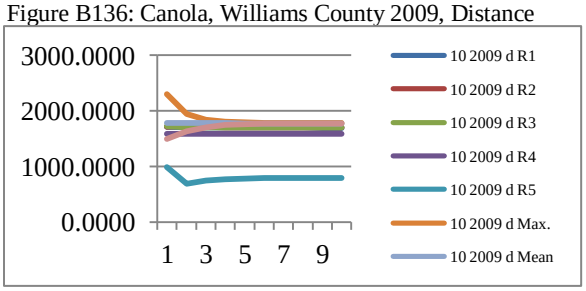


Figure B137: Canola, Dunn County 2009, Contiguity

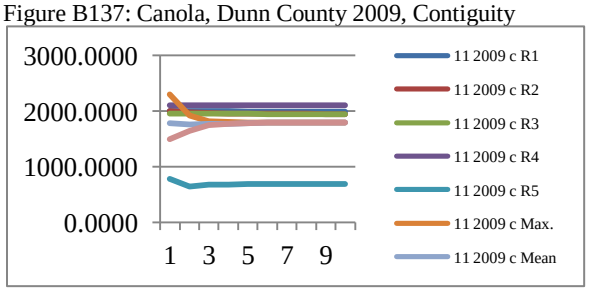


Figure B138: Canola, Dunn County 2009, Distance

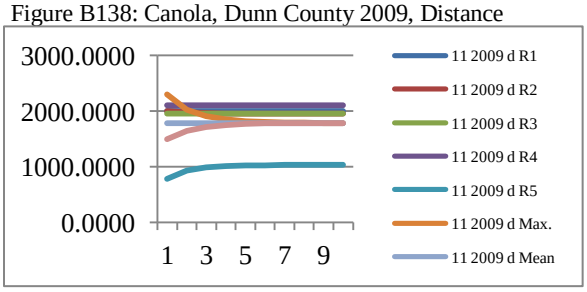


Figure B139: Canola, Eddy County 2009, Contiguity

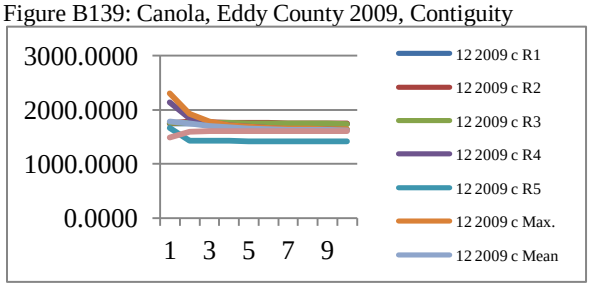


Figure B140: Canola, Eddy County 2009, Distance

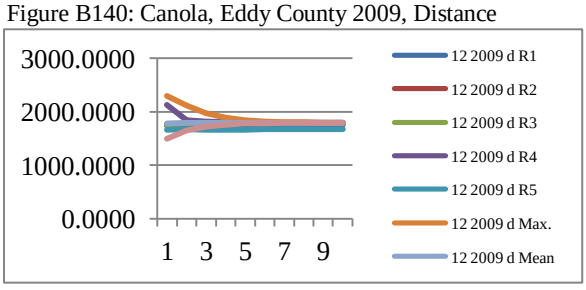


Figure B141: Canola, Golden Valley Cnty 2009, Contiguity

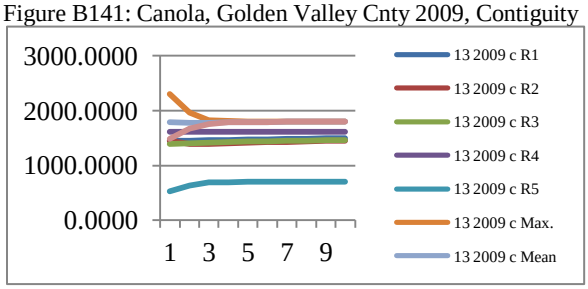


Figure B142: Canola, Golden Valley Cnty 2009, Distance

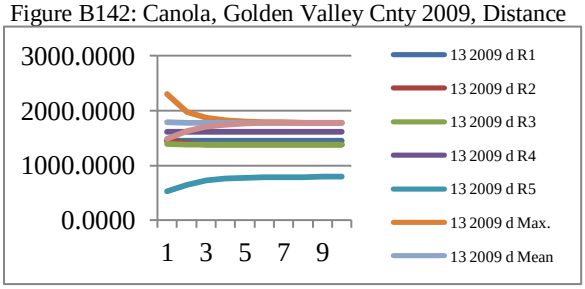


Figure B143: Canola, Kidder County 2009, Contiguity

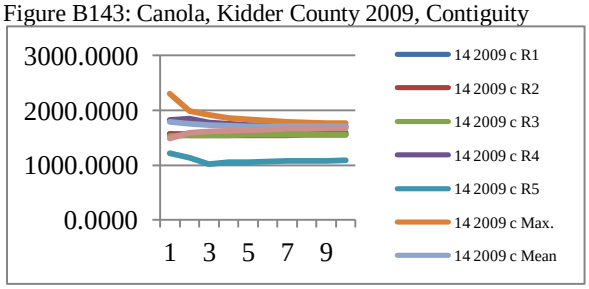


Figure B144: Canola, Kidder County 2009, Distance

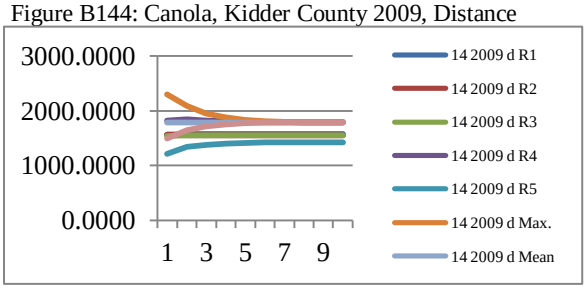


Figure B145: Canola, Pierce County 2009, Contiguity

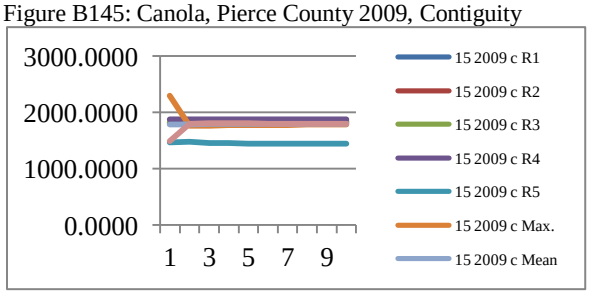


Figure B146: Canola, Pierce County 2009, Distance

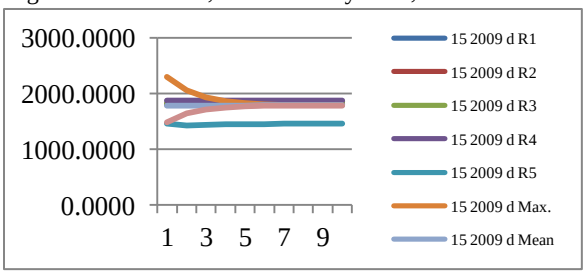


Figure B147: Canola, Foster County 2009, Contiguity

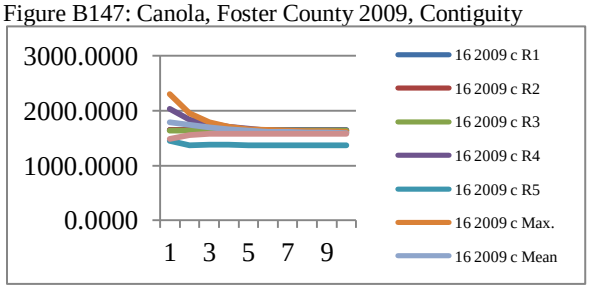


Figure B148: Canola, Foster County 2009, Distance

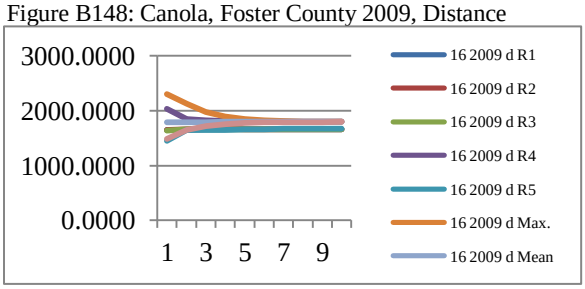


Figure B149: Canola, Logan County 2009, Contiguity

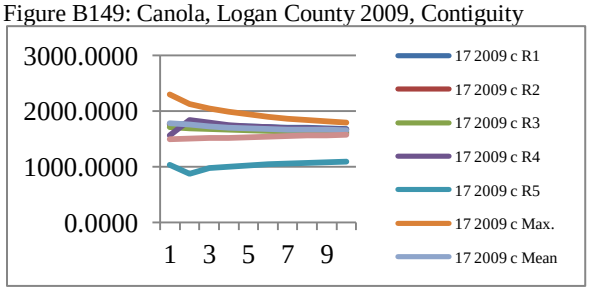


Figure B150: Canola, Logan County 2009, Distance

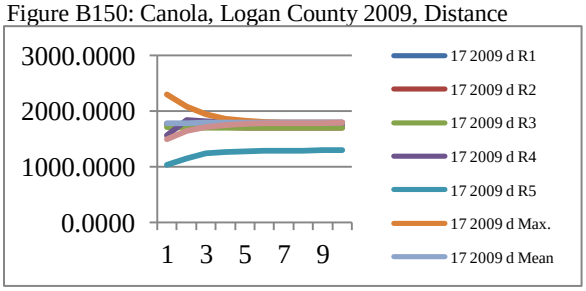


Figure B151: Canola, Mountrail County 2009, Contiguity

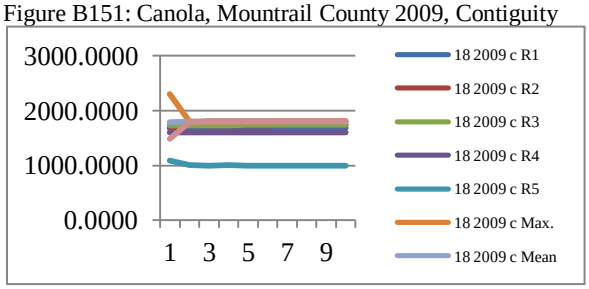


Figure B152: Canola, Mountrail County 2009, Distance

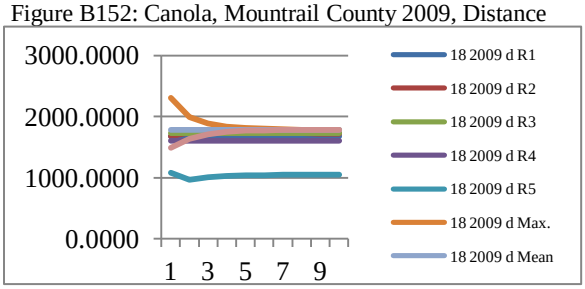


Figure B153: Canola, Sheridan County 2009, Contiguity

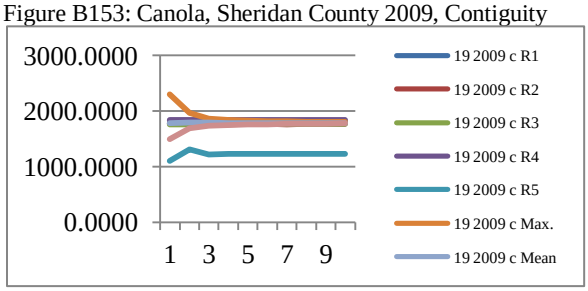


Figure B154: Canola, Sheridan County 2009, Distance

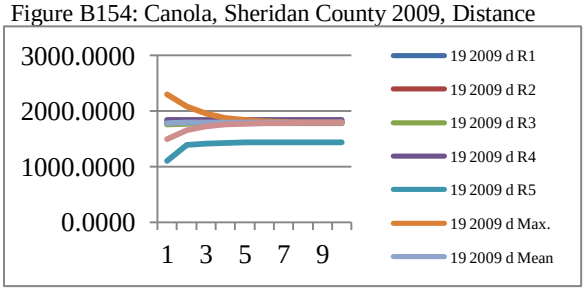


Figure B155: Canola, Towner County 2009, Contiguity

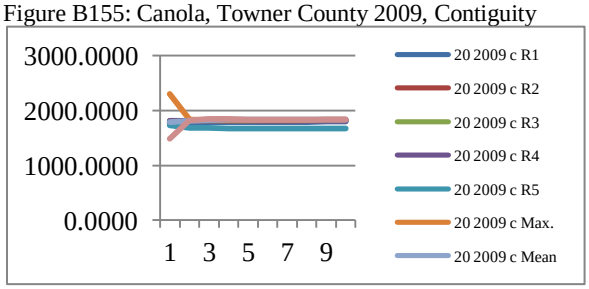


Figure B156: Canola, Towner County 2009, Distance

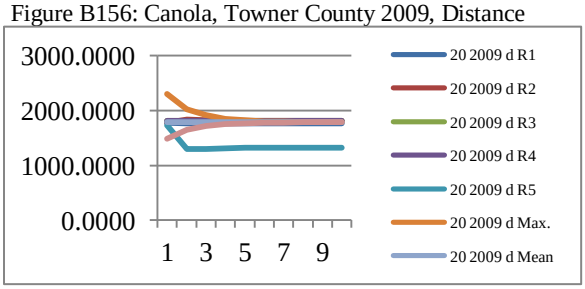


Figure B157: Canola, Slope County 2009, Contiguity

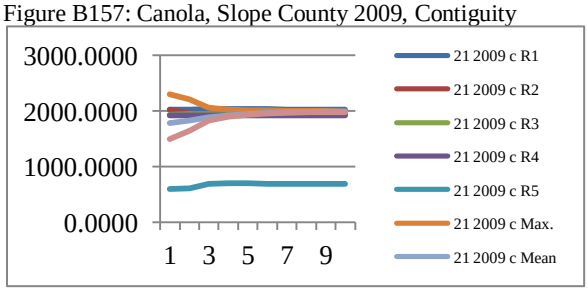


Figure B158: Canola, Slope County 2009, Distance

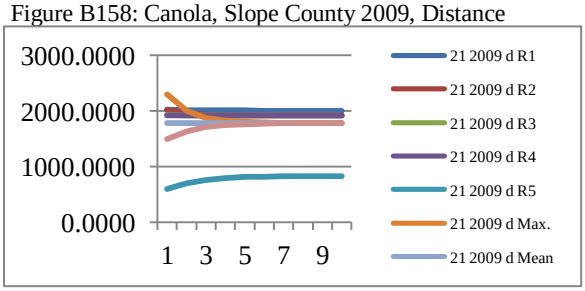


Figure B159: Canola, McLean County 2009, Contiguity

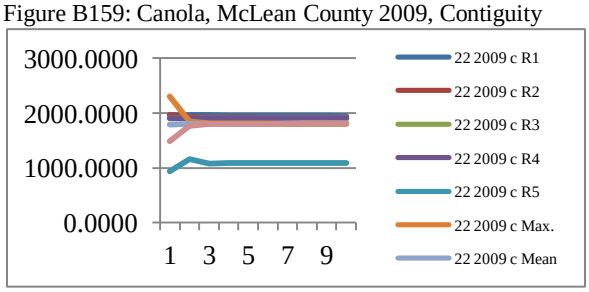


Figure B160: Canola, McLean County 2009, Distance

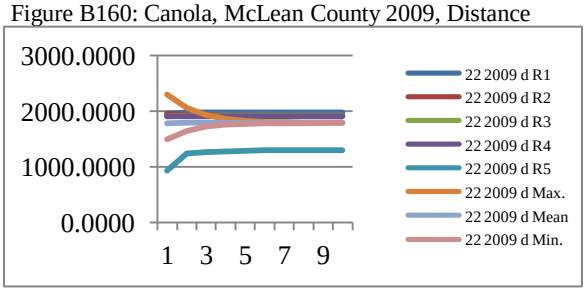


Figure B161: Canola, Morton County 2009, Contiguity

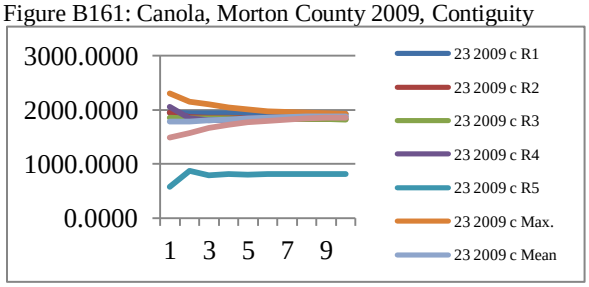


Figure B162: Canola, Morton County 2009, Distance

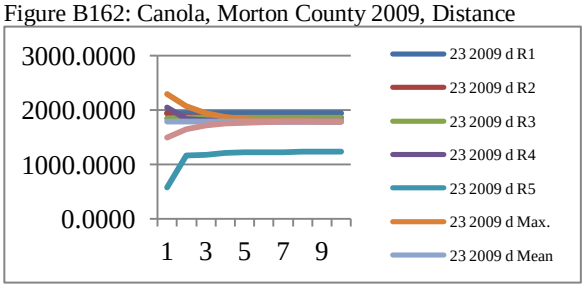


Figure B163: Canola, Ward County 2009, Contiguity

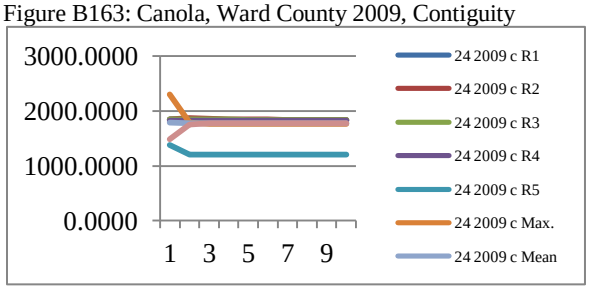


Figure B164: Canola, Ward County 2009, Distance

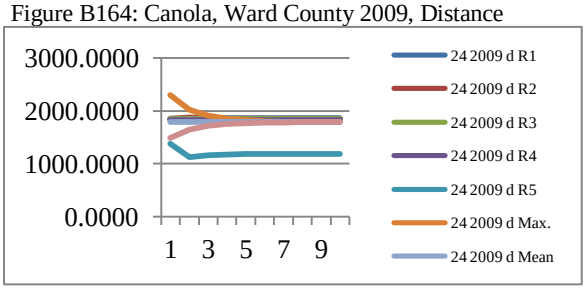


Figure B165: Canola, Bottineau County 2009, Contiguity

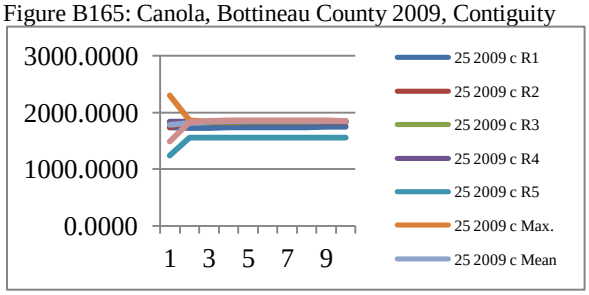


Figure B166: Canola, Bottineau County 2009, Distance

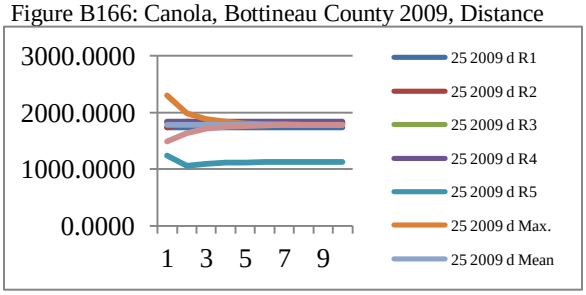


Figure B167: Canola, Grant County 2009, Contiguity

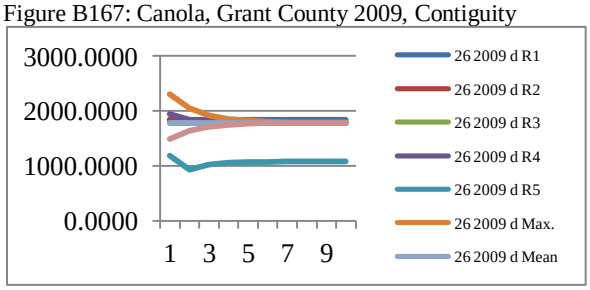


Figure B168: Canola, Grant County 2009, Distance

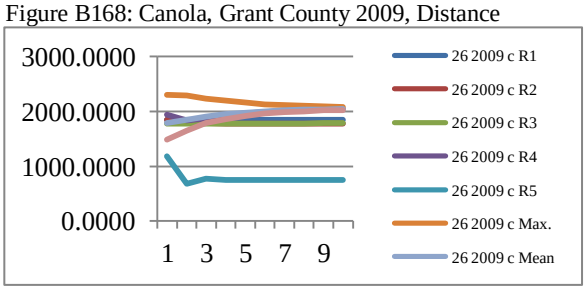


Figure B169: Canola, Pembina County 2009, Contiguity

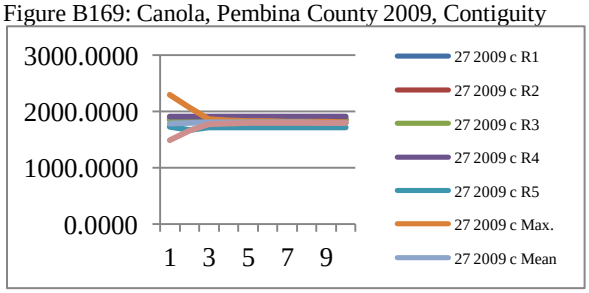


Figure B170: Canola, Pembina County 2009, Distance

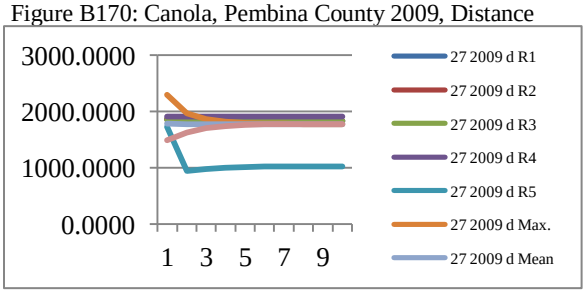


Figure B171: Canola, Sioux County 2009, Contiguity

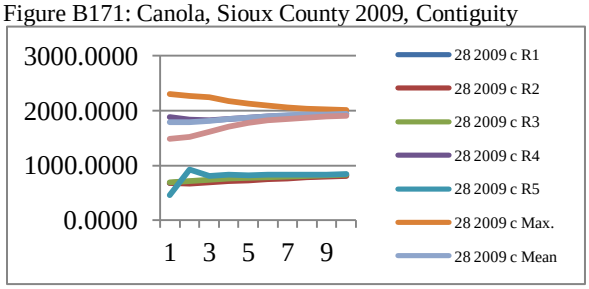


Figure B172: Canola, Sioux County 2009, Distance

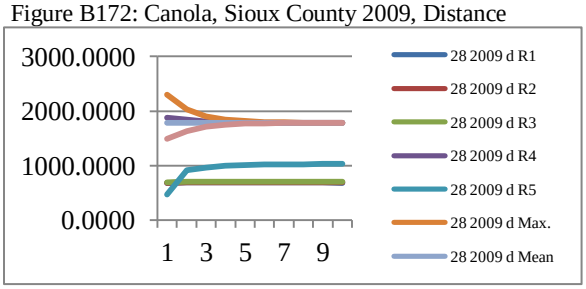


Figure B173: Canola, Cass County 2009, Contiguity

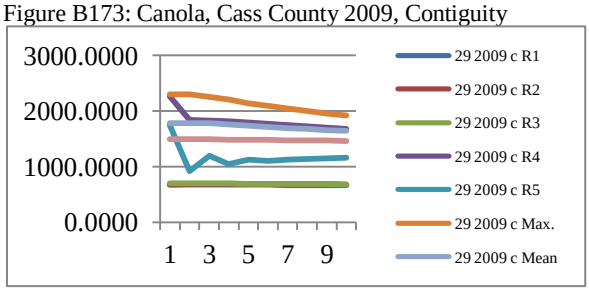


Figure B174: Canola, Cass County 2009, Distance

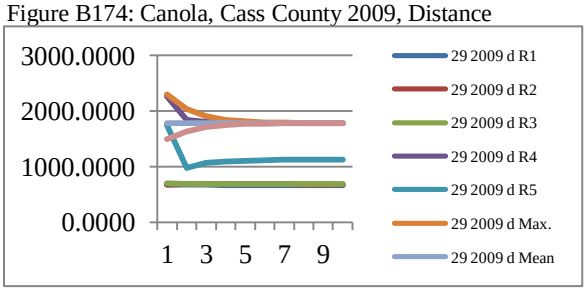


Figure B175: Canola, Adams County 2009, Contiguity

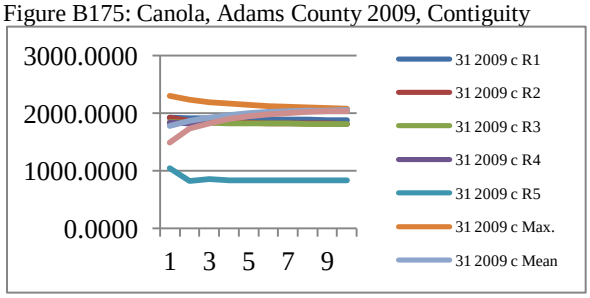


Figure B176: Canola, Adams County 2009, Distance

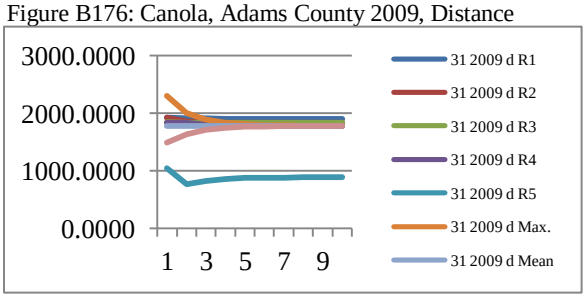


Figure B177: Canola, Barnes County 2009, Contiguity

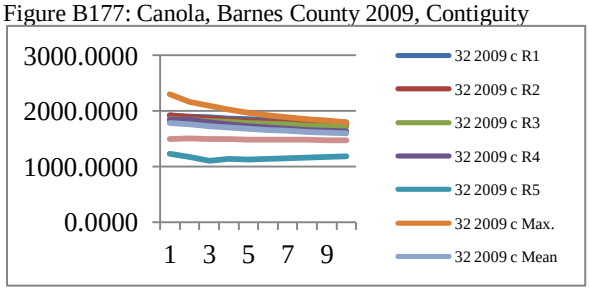


Figure B178: Canola, Barnes County 2009, Distance

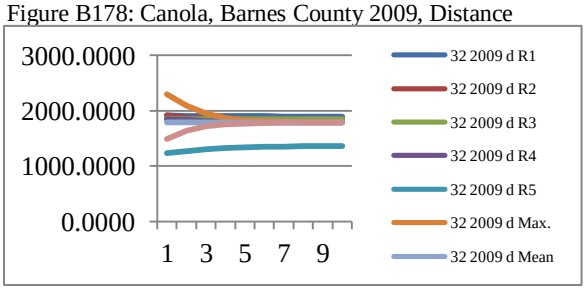


Figure B179: Canola, Dickey County 2009, Contiguity

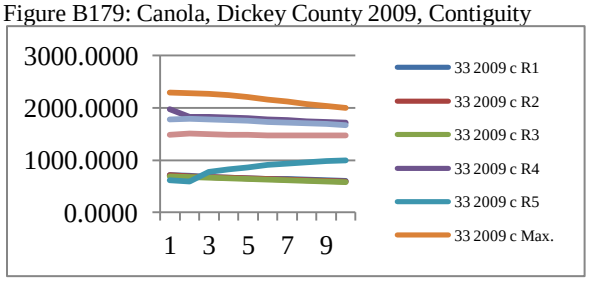


Figure B180: Canola, Dickey County 2009, Distance

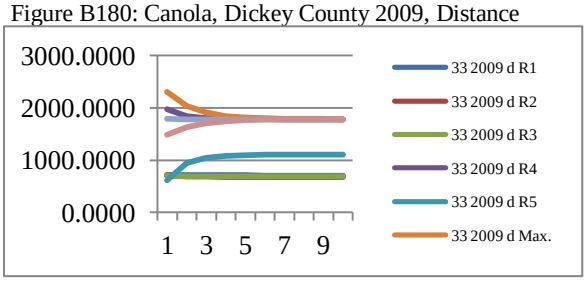


Figure B181: Canola, Griggs County 2009, Contiguity

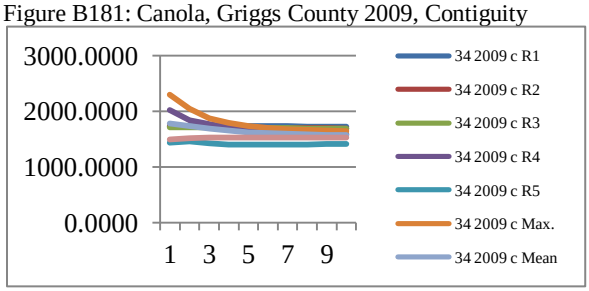


Figure B182: Canola, Griggs County 2009, Distance

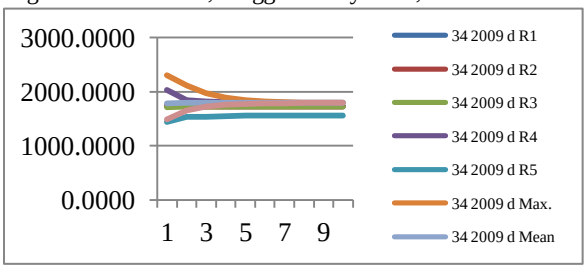


Figure B183: Canola, Oliver County 2009, Contiguity

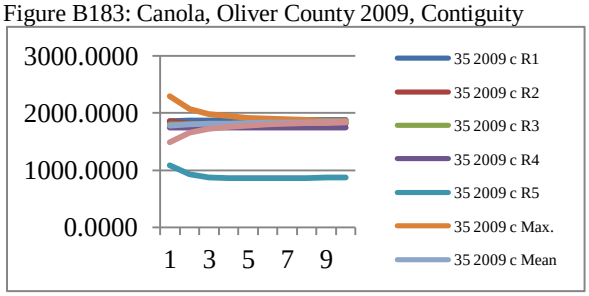


Figure B184: Canola, Oliver County 2009, Distance

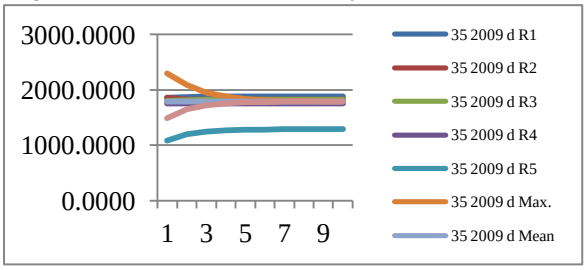


Figure B185: Canola, Billings County 2009, Contiguity

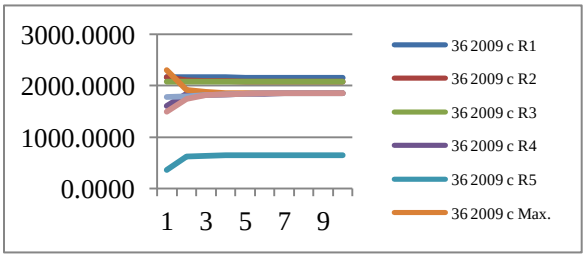


Figure B186: Canola, Billings County 2009, Distance

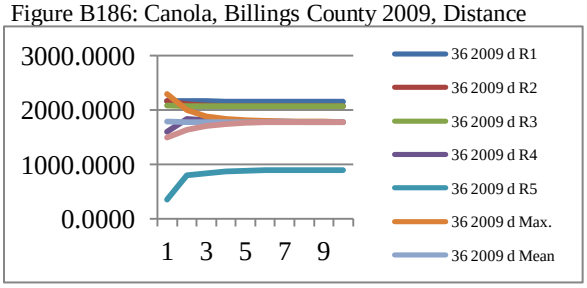


Figure B187: Canola, Grand Forks County 2009, Contiguity

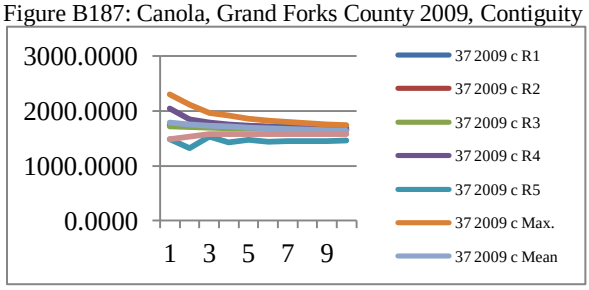


Figure B188: Canola, Grand Forks County 2009, Distance

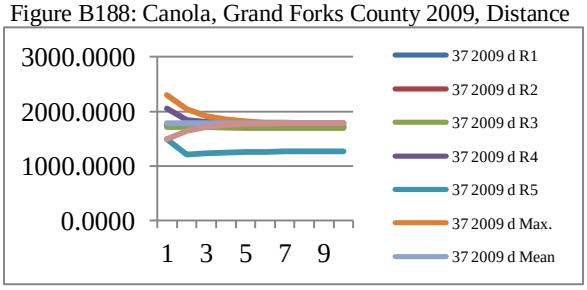


Figure B289: Canola, Steele County 2009, Contiguity

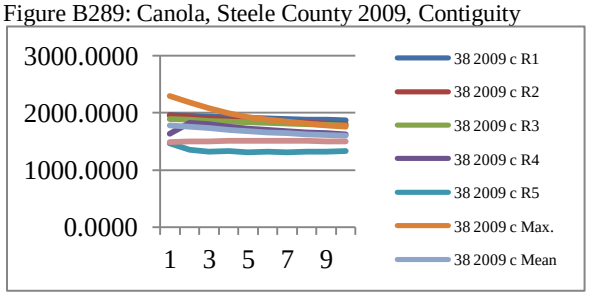


Figure B190: Canola, Steele County 2009, Distance

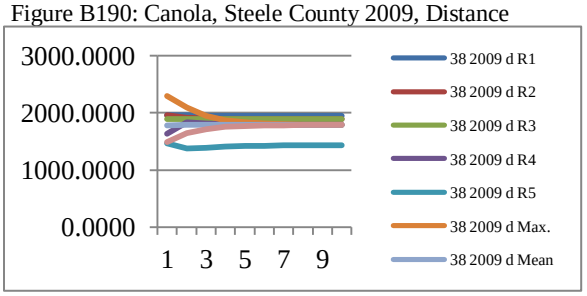


Figure B191: Canola, Divide County 2009, Contiguity

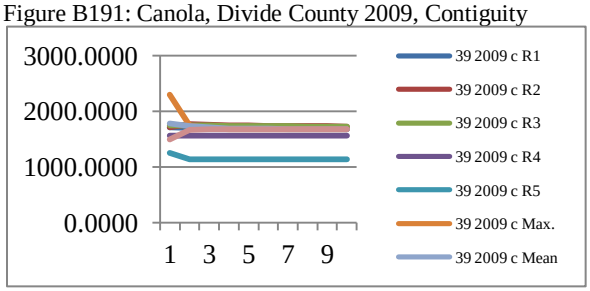


Figure B192: Canola, Divide County 2009, Distance

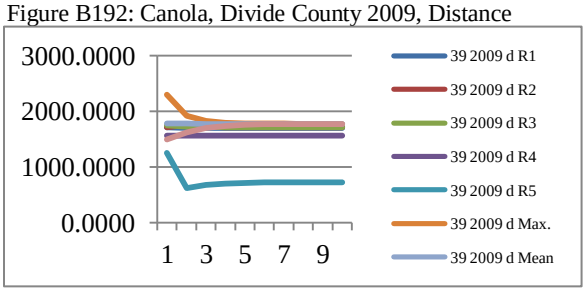


Figure B193: Canola, La Moure County 2009, Contiguity

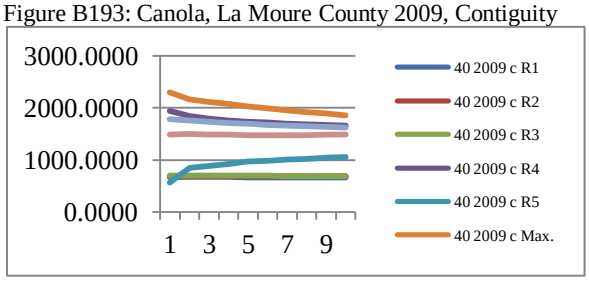


Figure B194: Canola, La Moure County 2009, Distance

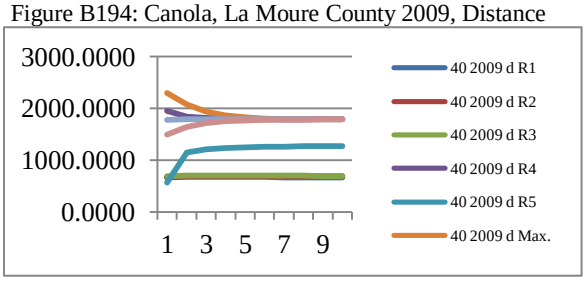


Figure B195: Canola, Ransom County 2009, Contiguity

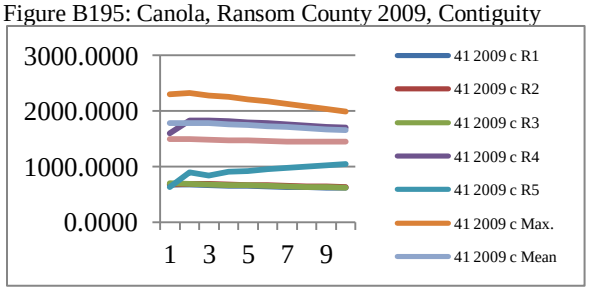


Figure B196: Canola, Ransom County 2009, Distance

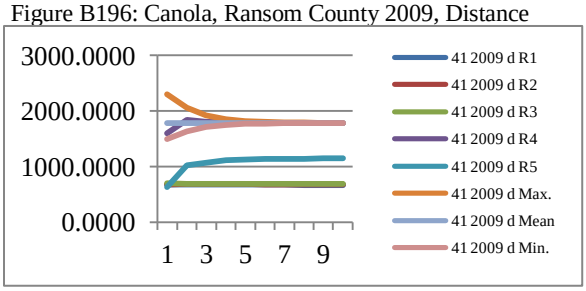


Figure B197: Canola, Stutsman County 2009, Contiguity

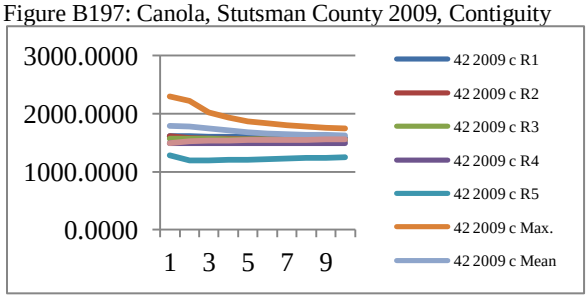


Figure B198: Canola, Stutsman County 2009, Distance

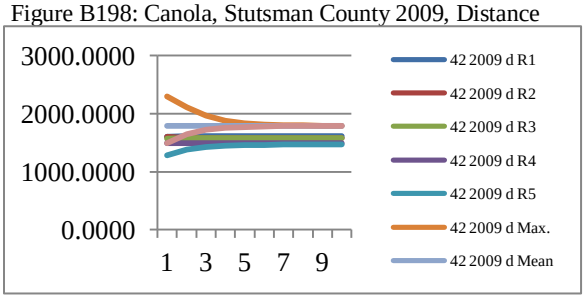


Figure B199: Canola, Burke County 2009, Contiguity

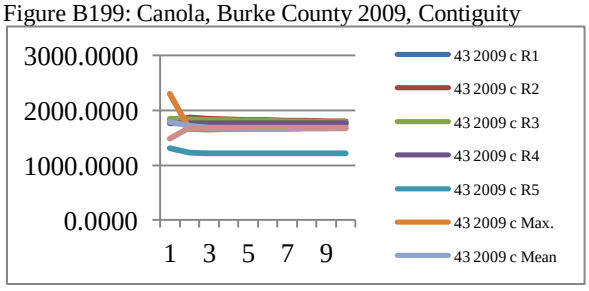


Figure B200: Canola, Burke County 2009, Distance

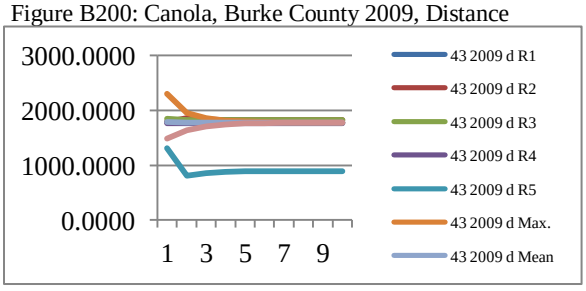


Figure B201: Canola, Burleigh County 2009, Contiguity

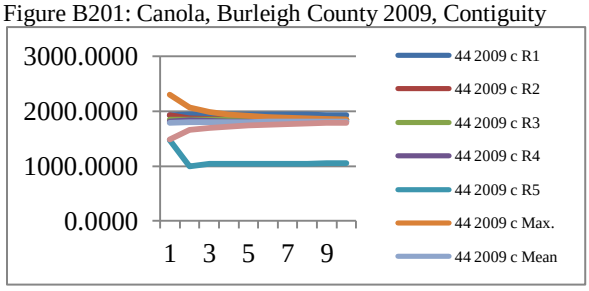


Figure B202: Canola, Burleigh County 2009, Distance

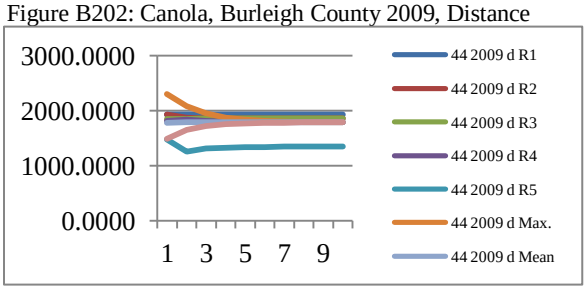


Figure B203: Canola, Cavalier County 2009, Contiguity

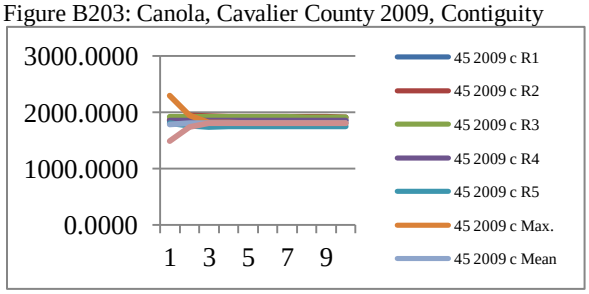


Figure B204: Canola, Cavalier County 2009, Distance

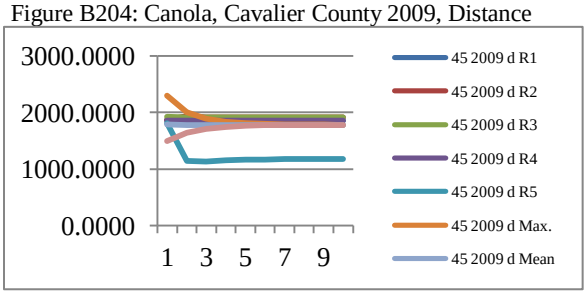


Figure B205: Canola, Hettinger County 2009, Contiguity

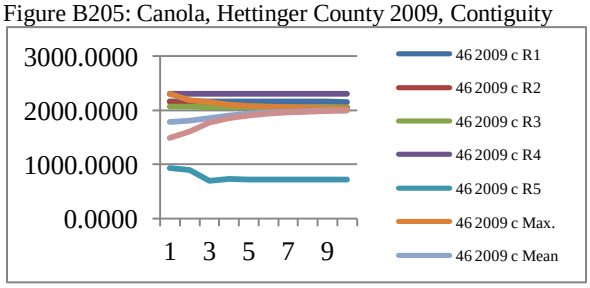


Figure B206: Canola, Hettinger County 2009, Distance

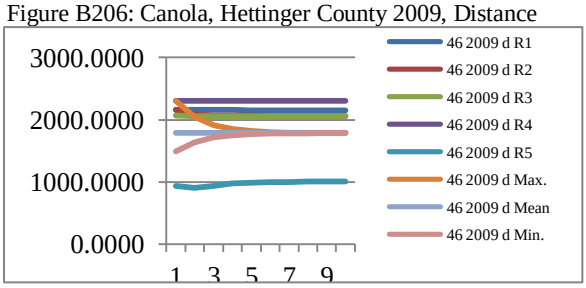


Figure B207: Canola, McIntosh County 2009, Contiguity

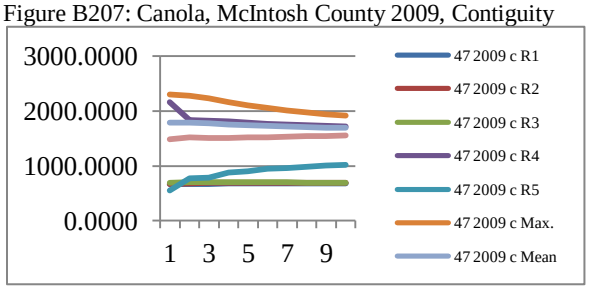


Figure B208: Canola, McIntosh County 2009, Distance

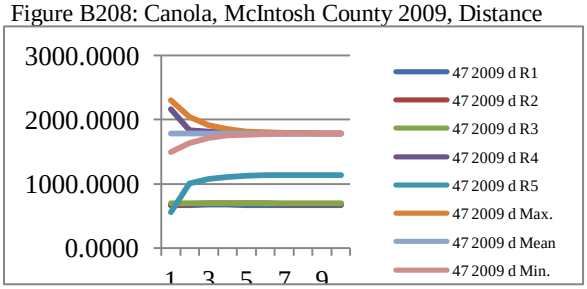


Figure B209: Canola, Nelson County 2009, Contiguity

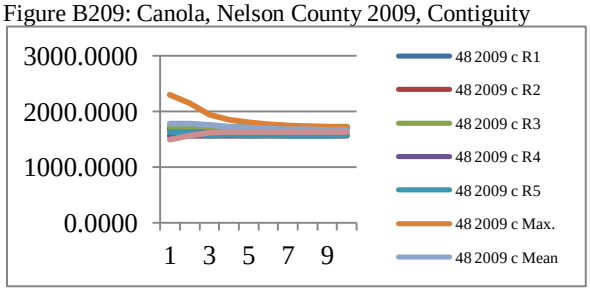


Figure B210: Canola, Nelson County 2009, Distance

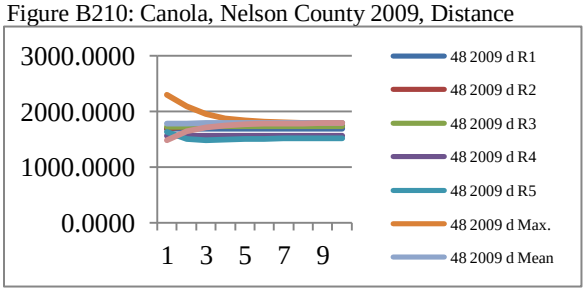


Figure B211: Canola, Ramsey County 2009, Contiguity

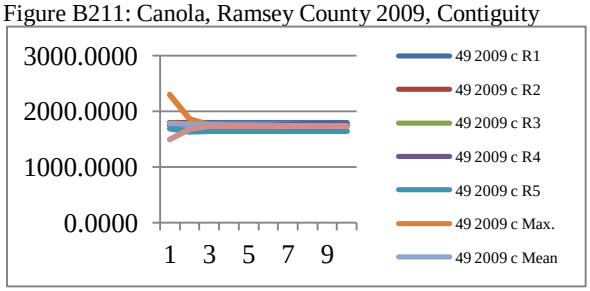


Figure B212: Canola, Ramsey County 2009, Distance

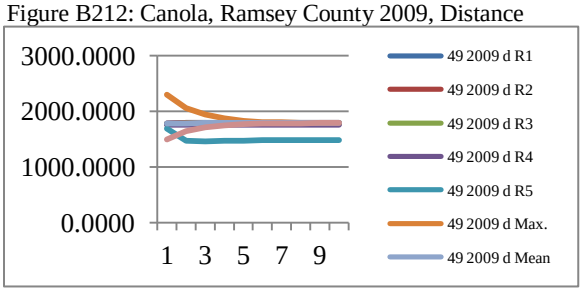


Figure B213: Canola, Rolette County 2009, Contiguity

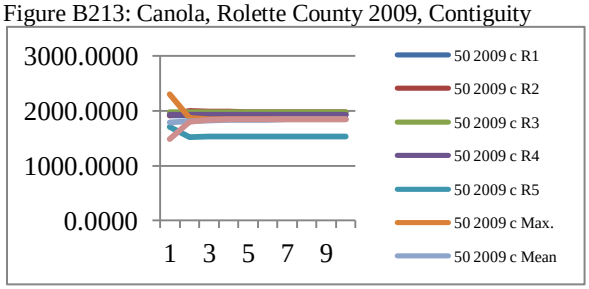


Figure B214: Canola, Rolette County 2009, Distance

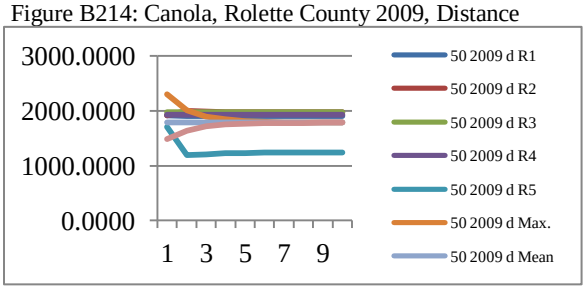


Figure B215: Canola, Stark County 2009, Contiguity

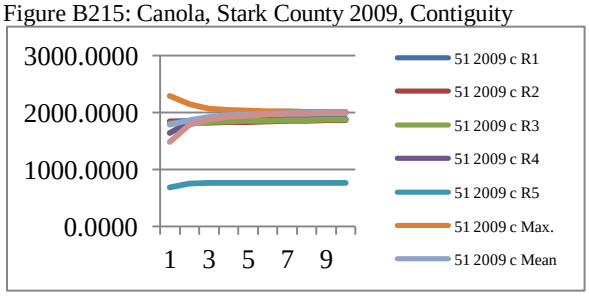


Figure B216: Canola, Stark County 2009, Distance

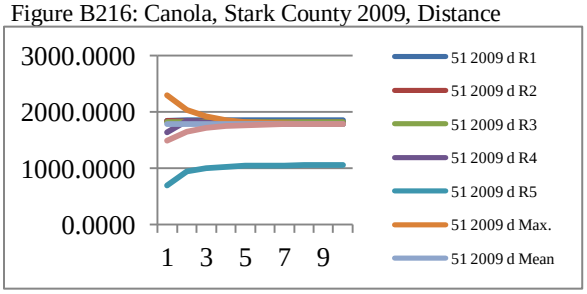


Figure B217: Canola, Mercer County 2009, Contiguity

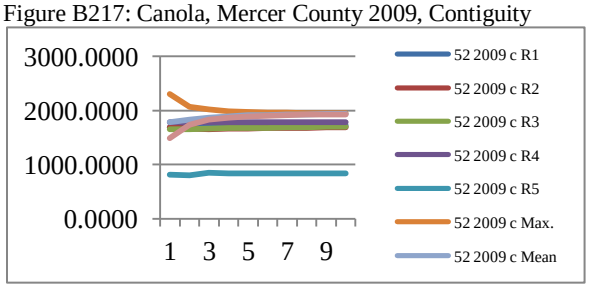


Figure B218: Canola, Mercer County 2009, Distance

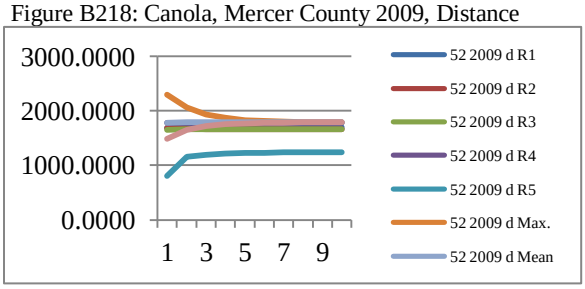


Figure B219: Canola, Traill County 2009, Contiguity

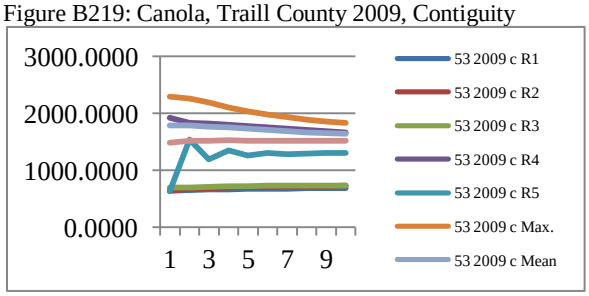


Figure B220: Canola, Traill County 2009, Distance

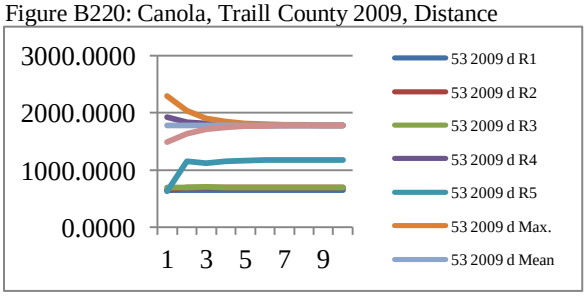


Figure B221: Canola, Emmons County 2010, Contiguity

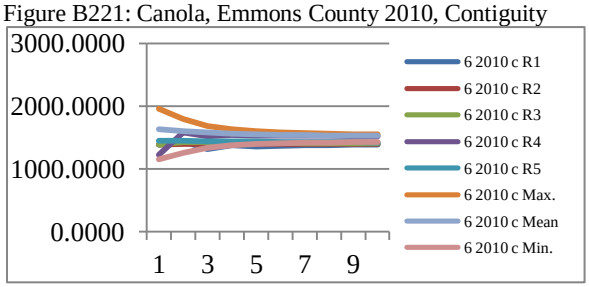


Figure B222: Canola, Emmons County 2010, Distance

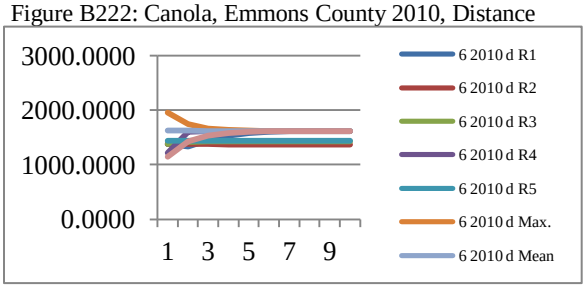


Figure B223: Canola, Sargent County 2010, Contiguity

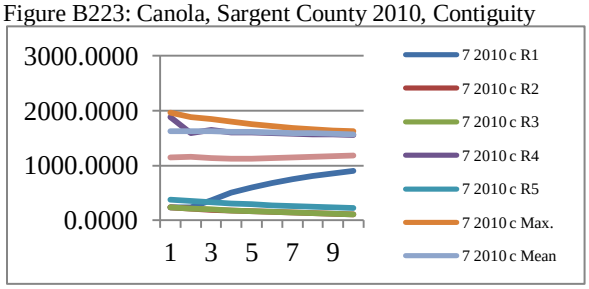


Figure B224: Canola, Sargent County 2010, Distance

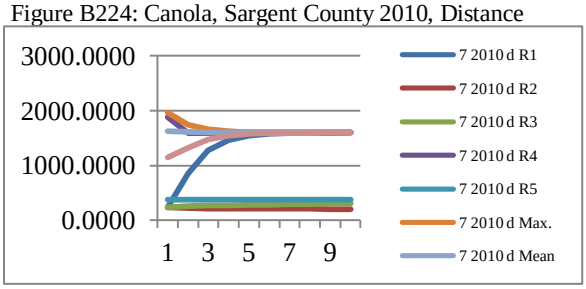


Figure B225: Canola, Richland County 2010, Contiguity

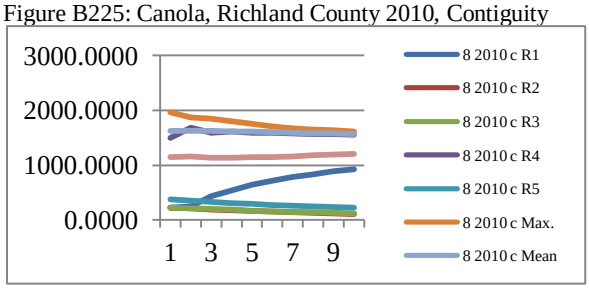


Figure B226: Canola, Richland County 2010, Distance

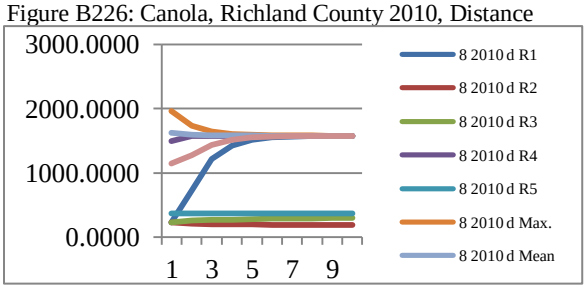


Figure B227: Canola, Golden Valley Cnty 2010, Contiguity

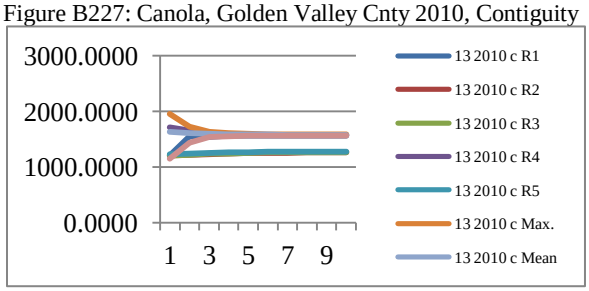


Figure B228: Canola, Golden Valley Cnty 2010, Distance

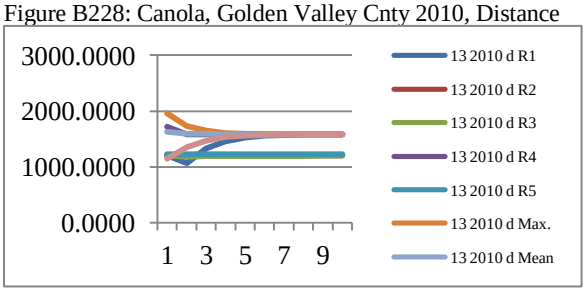


Figure B229: Canola, Logan County 2010, Contiguity

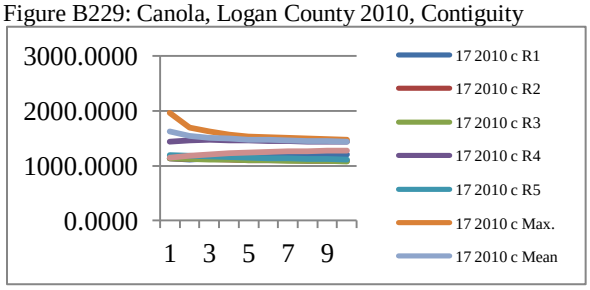


Figure B230: Canola, Logan County 2010, Distance

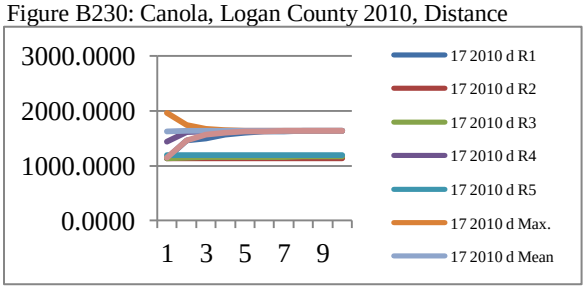


Figure B231: Canola, Morton County 2010, Contiguity

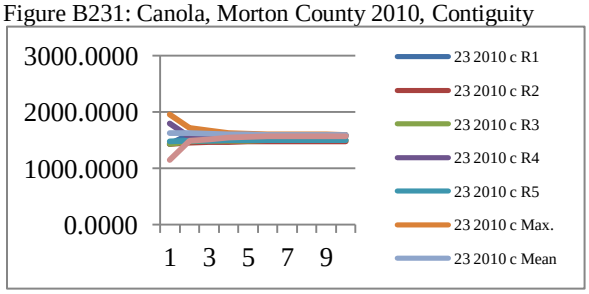


Figure B232: Canola, Morton County 2010, Distance

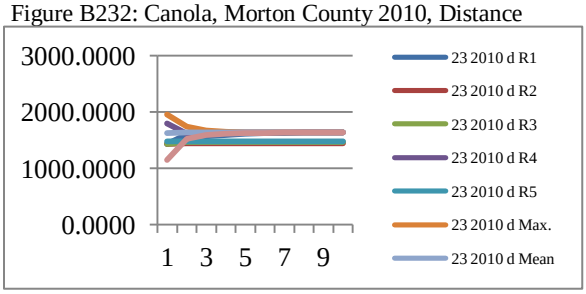


Figure B233: Canola, Sioux County 2010, Contiguity

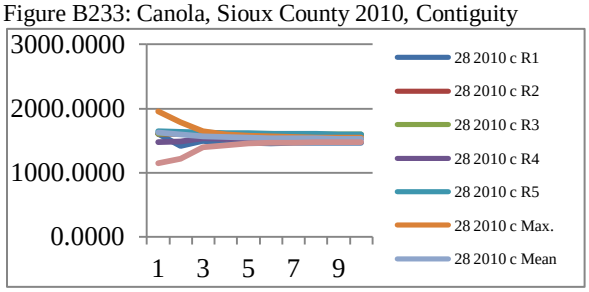


Figure B234: Canola, Sioux County 2010, Distance

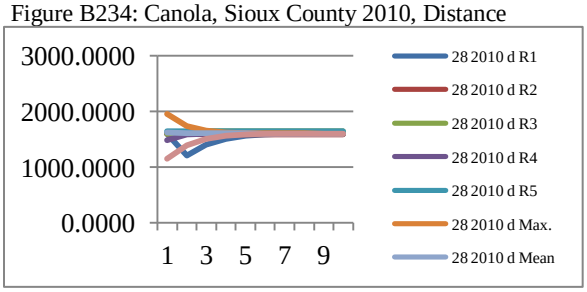


Figure B235: Canola, Cass County 2010, Contiguity

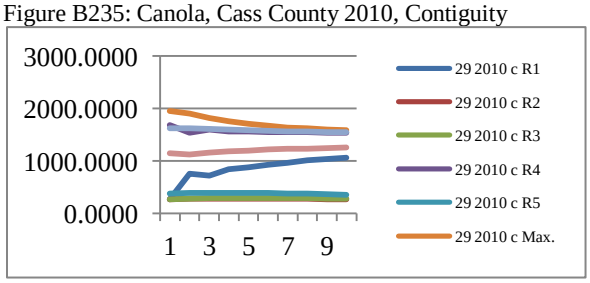


Figure B236: Canola, Cass County 2010, Distance

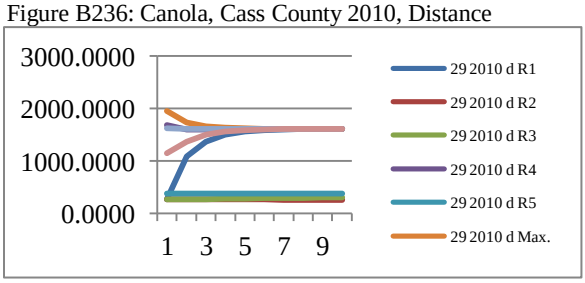


Figure B237: Canola, Adams County 2010, Contiguity

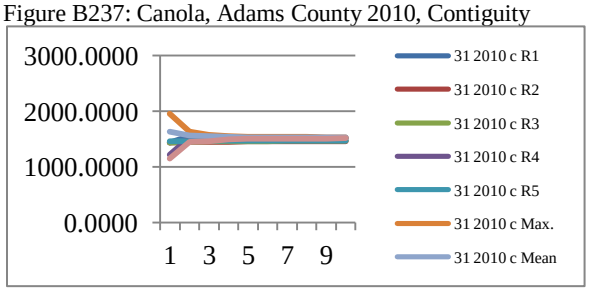


Figure B238: Canola, Adams County 2010, Distance

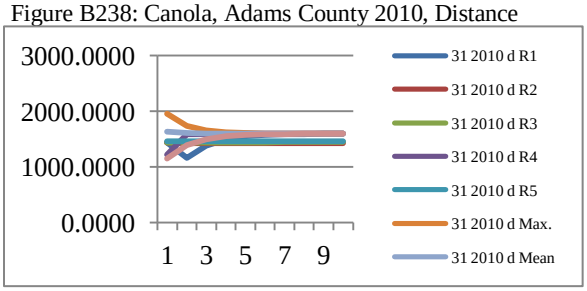


Figure B239: Canola, Barnes County 2010, Contiguity

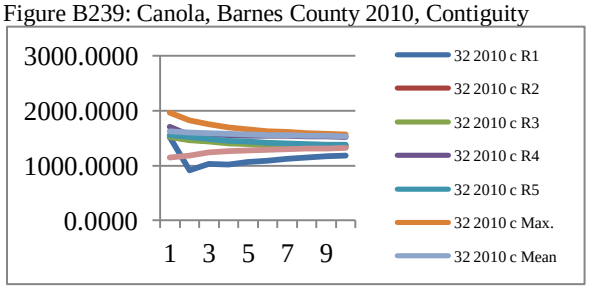


Figure B240: Canola, Barnes County 2010, Distance

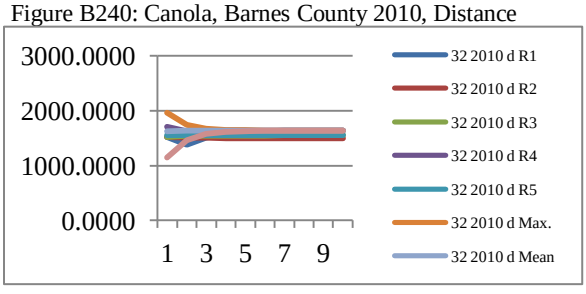


Figure B241: Canola, Dickey County 2010, Contiguity

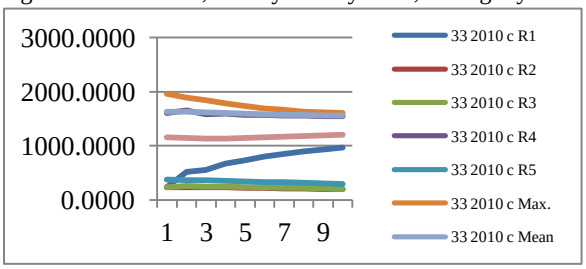


Figure B242: Canola, Dickey County 2010, Distance

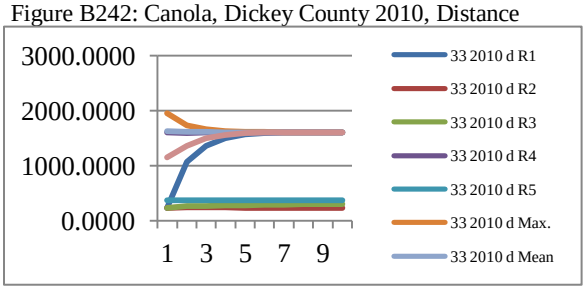


Figure B243: Canola, Griggs County 2010, Contiguity

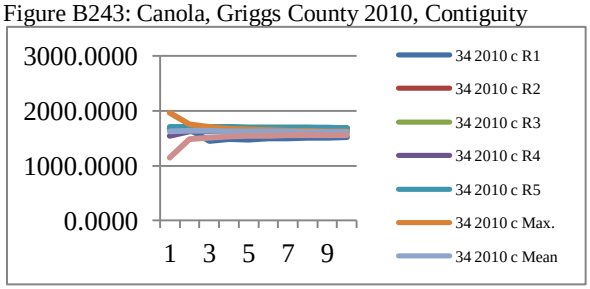


Figure B244: Canola, Griggs County 2010, Distance

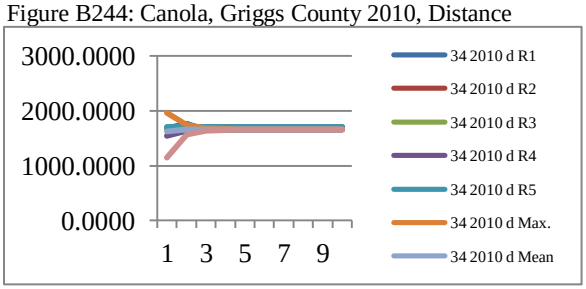


Figure B245: Canola, Billings County 2010, Contiguity

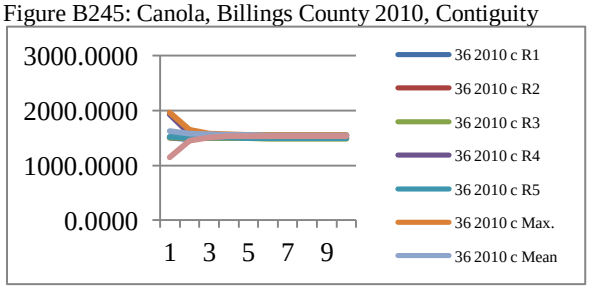


Figure B246: Canola, Billings County 2010, Distance

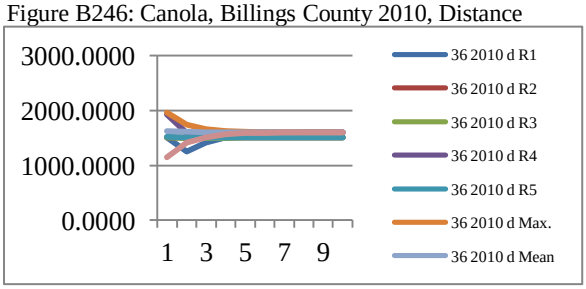


Figure B247: Canola, Steele County 2010, Contiguity

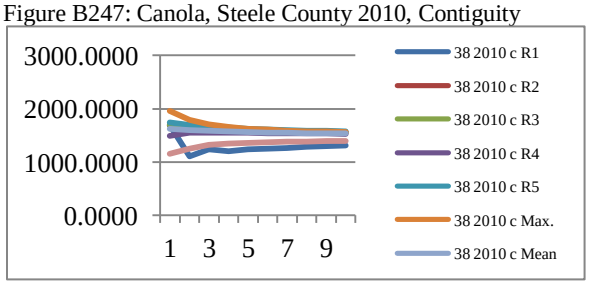


Figure B248: Canola, Steele County 2010, Distance

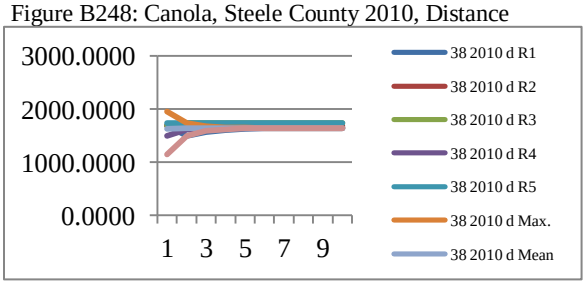


Figure B249: Canola, La Moure County 2010, Contiguity

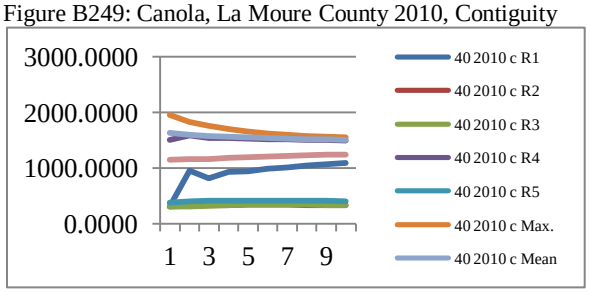


Figure B250: Canola, La Moure County 2010, Distance

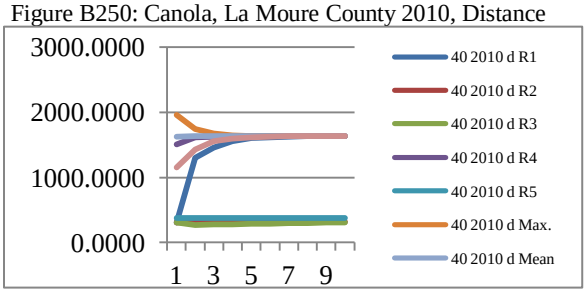


Figure B251: Canola, Ransom County 2010, Contiguity

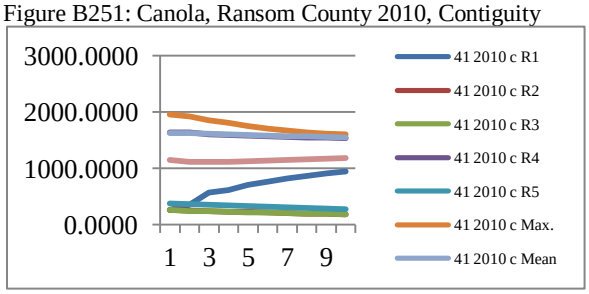


Figure B252: Canola, Ransom County 2010, Distance

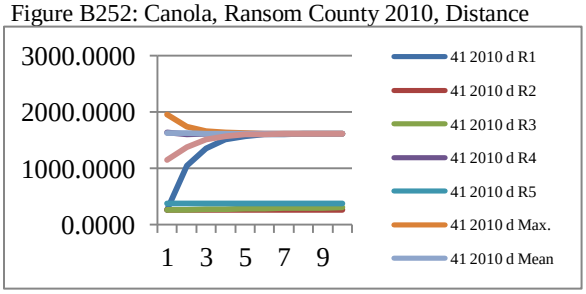


Figure B253: Canola, McIntosh County 2010, Contiguity

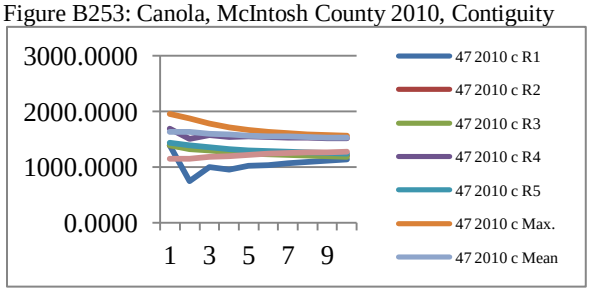


Figure B254: Canola, McIntosh County 2010, Distance

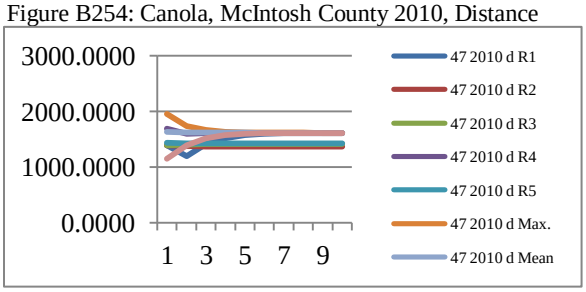


Figure B255: Canola, Traill County 2010, Contiguity

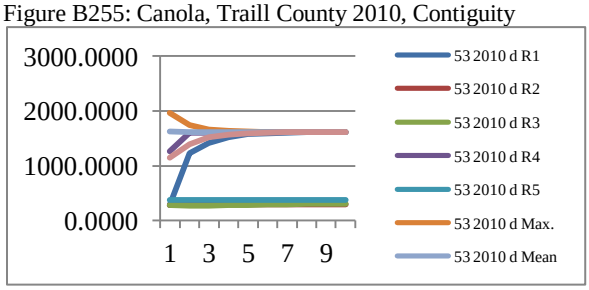


Figure B256: Canola, Traill County 2010, Distance

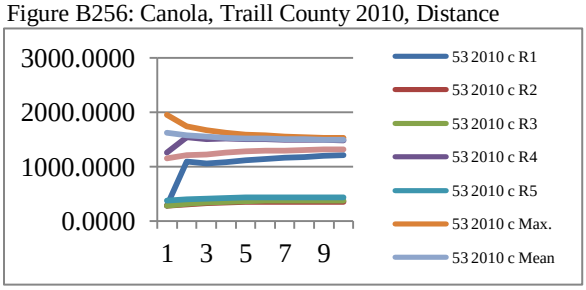


Figure B257: Corn for Grain, Renville County 2008, Cont.

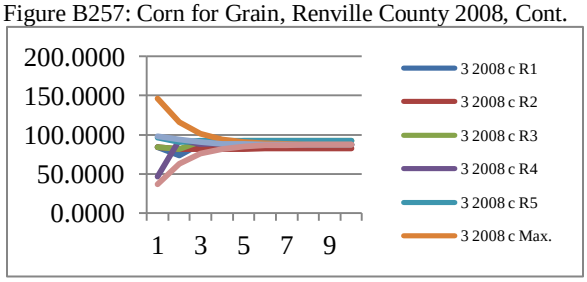


Figure B258: Corn for Grain, Renville County 2008, Dist.

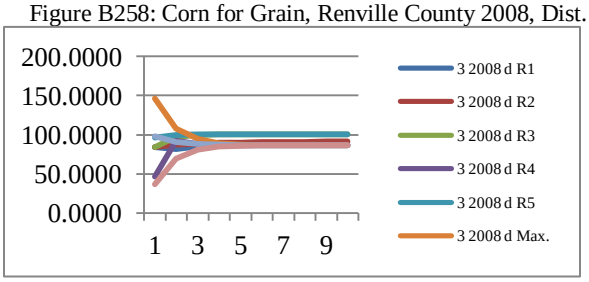


Figure B259: Corn for Grain, Gdn Valley Cnty 2008, Cont.

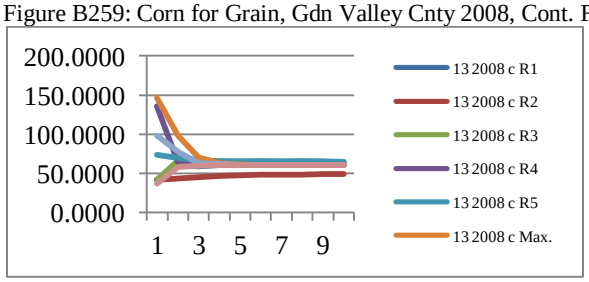


Figure B260: Corn for Grain, Gdn Valley Cnty 2008, Dist.

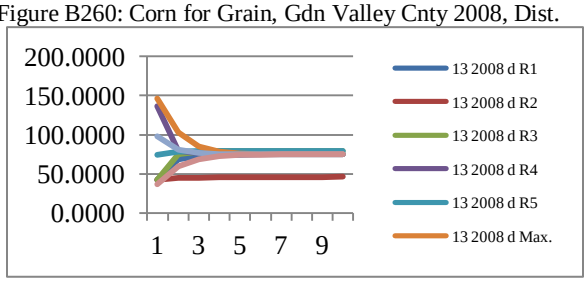


Figure B261: Corn for Grain, Kidder County 2008, Cont.

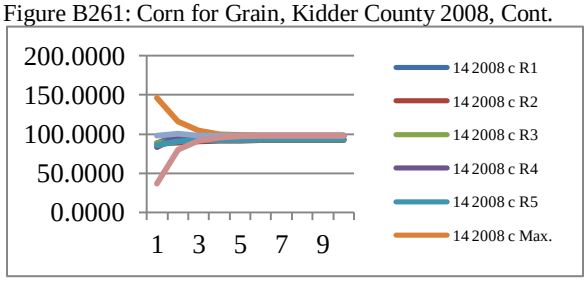


Figure B262: Corn for Grain, Kidder County 2008, Dist.

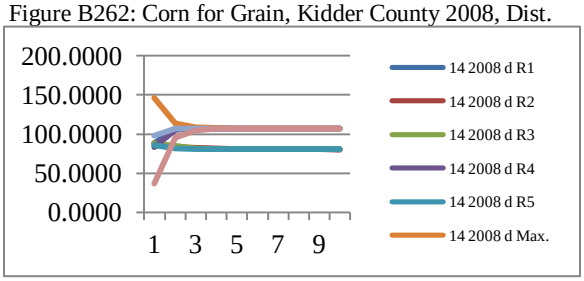


Figure B263: Corn for Grain, Mountrail County 2008, Cont.

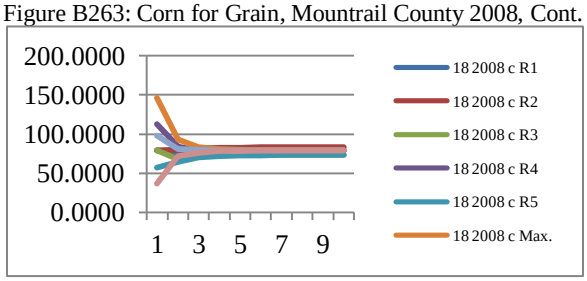


Figure B264: Corn for Grain, Mountrail County 2008, Dist.

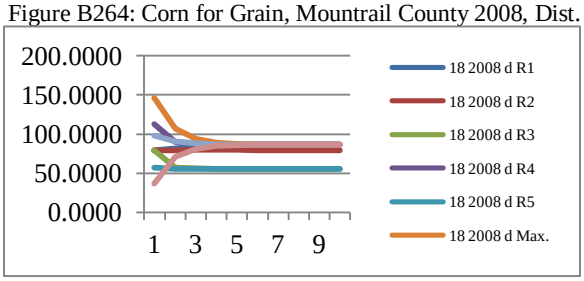


Figure B265: Corn for Grain, Sheridan County 2008, Cont.

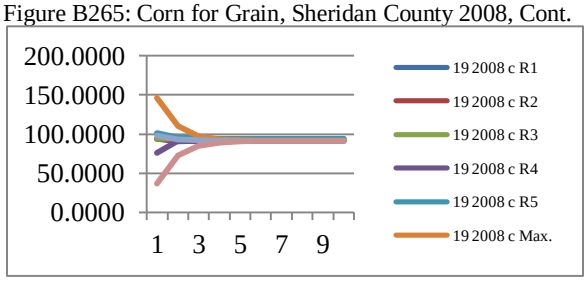


Figure B266: Corn for Grain, Sheridan County 2008, Dist.

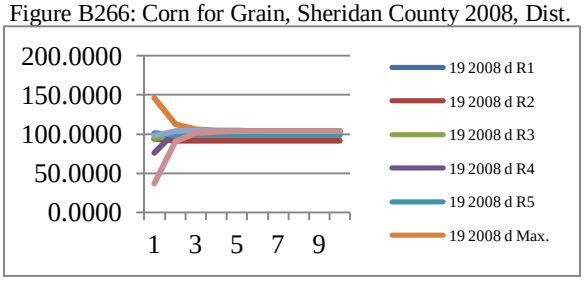


Figure B267: Corn for Grain, Towner County 2008, Cont.

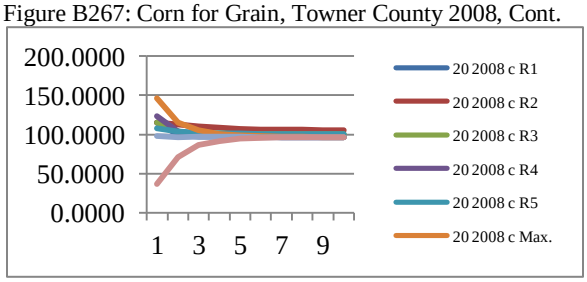


Figure B268: Corn for Grain, Towner County 2008, Dist.

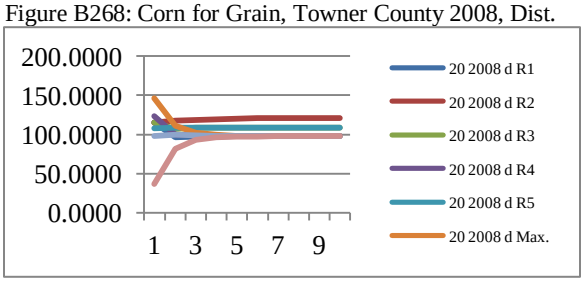


Figure B269: Corn for Grain, Bottineau County 2008, Cont.

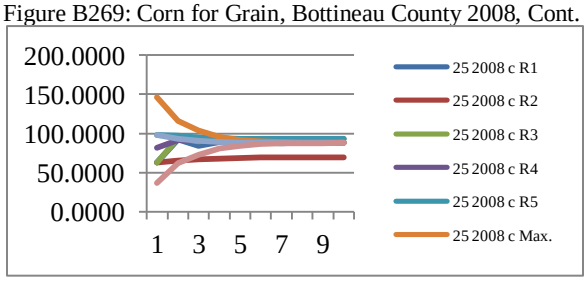


Figure B270: Corn for Grain, Bottineau County 2008, Dist.

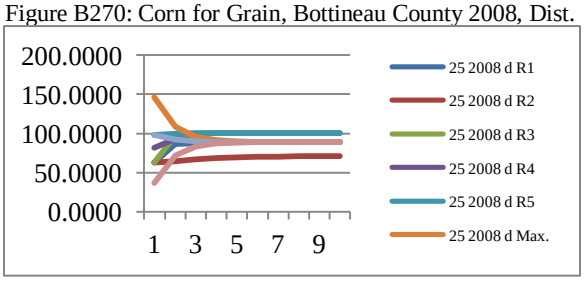


Figure B271: Corn for Grain, Sioux County 2008, Cont.

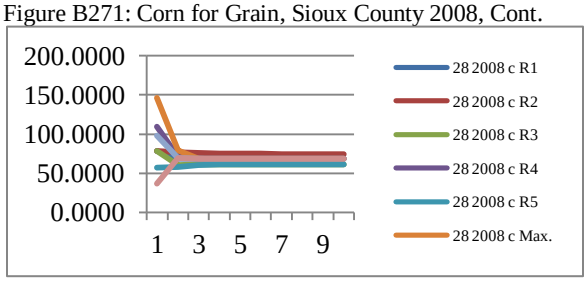


Figure B272: Corn for Grain, Sioux County 2008, Dist.

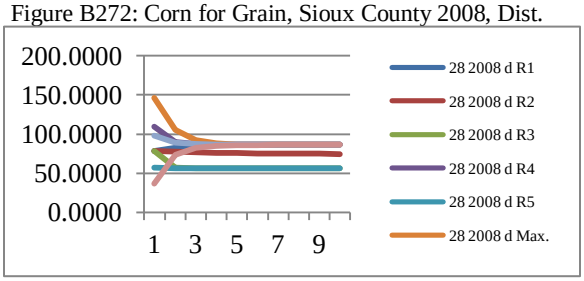


Figure B273: Corn for Grain, Billings County 2008, Cont.

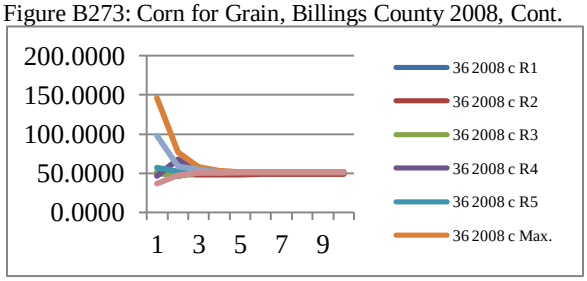


Figure B274: Corn for Grain, Billings County 2008, Dist.

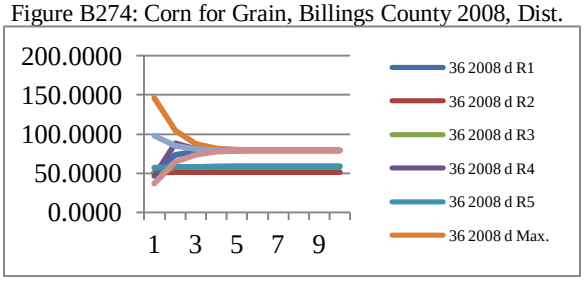


Figure B275: Corn for Grain, Burke County 2008, Cont.

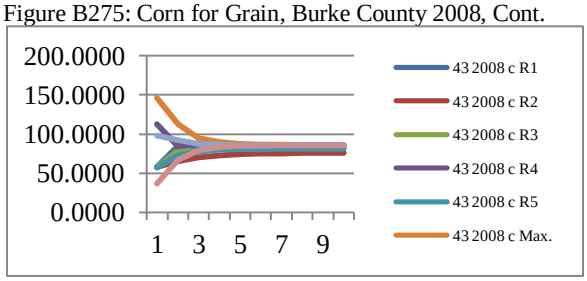


Figure B276: Corn for Grain, Burke County 2008, Dist.

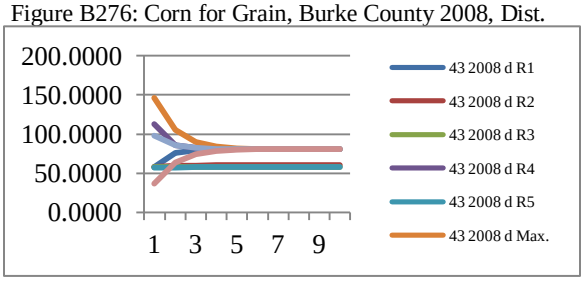


Figure B277: Corn for Grain, Burleigh County 2008, Cont.

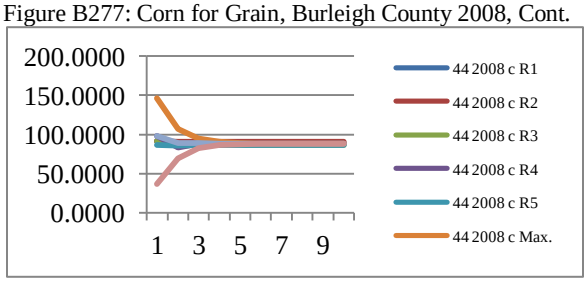


Figure B278: Corn for Grain, Burleigh County 2008, Dist.

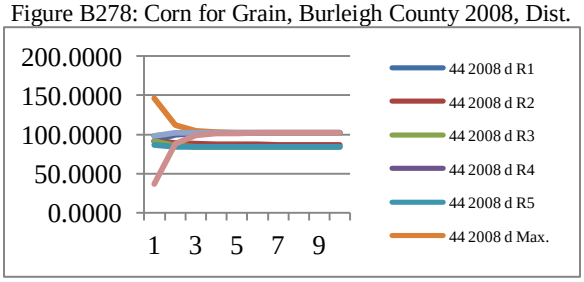


Figure B279: Corn for Grain, Cavalier County 2008, Cont.

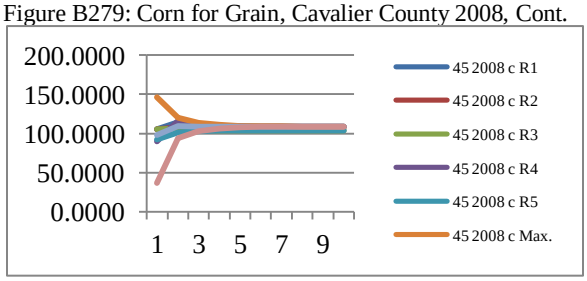


Figure B280: Corn for Grain, Cavalier County 2008, Dist.

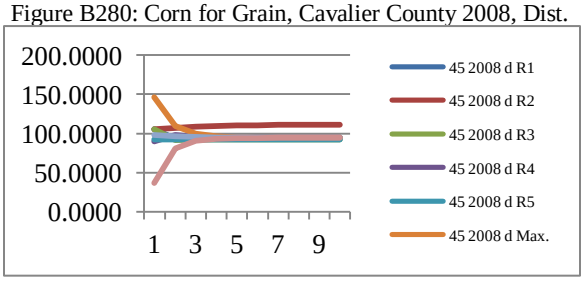


Figure B281: Corn for Grain, Rolette County 2008, Cont.

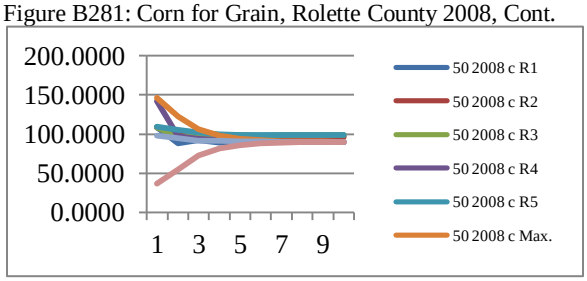


Figure B282: Corn for Grain, Rolette County 2008, Dist.

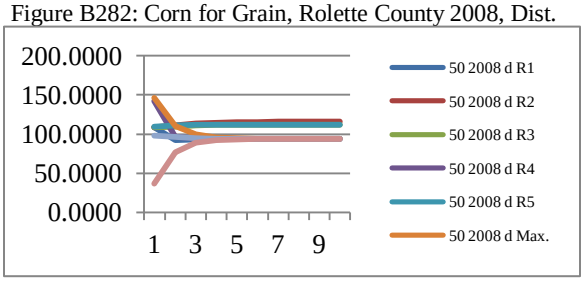


Figure B283: Corn for Grain, McHenry County 2009, Cont.

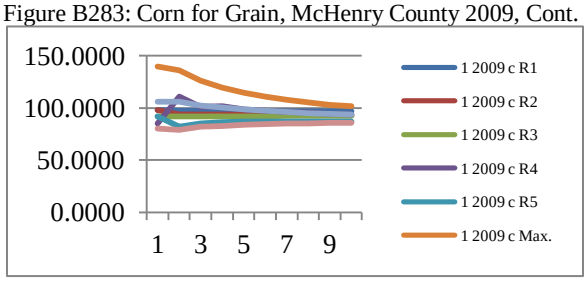


Figure B284: Corn for Grain, McHenry County 2009, Dist.

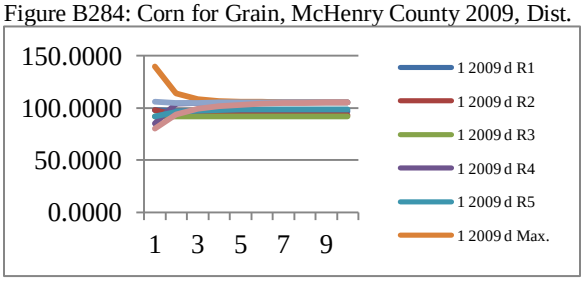


Figure B285: Corn for Grain, Walsh County 2009, Cont.

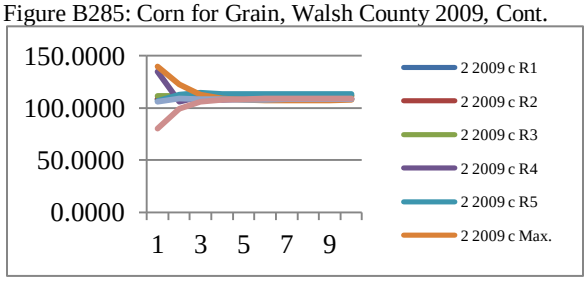


Figure B286: Corn for Grain, Walsh County 2009, Dist.

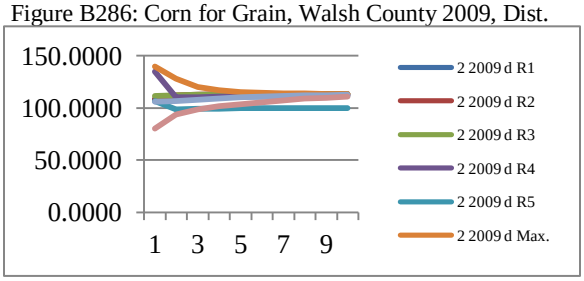


Figure B287: Corn for Grain, Renville County 2009, Cont.

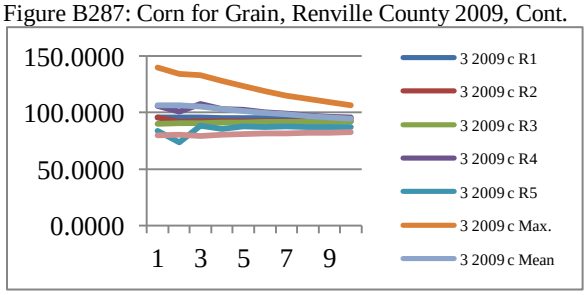


Figure B288: Corn for Grain, Renville County 2009, Dist.

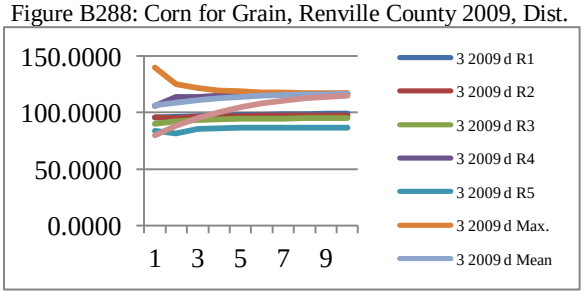


Figure B289: Corn for Grain, Wells County 2009, Cont.

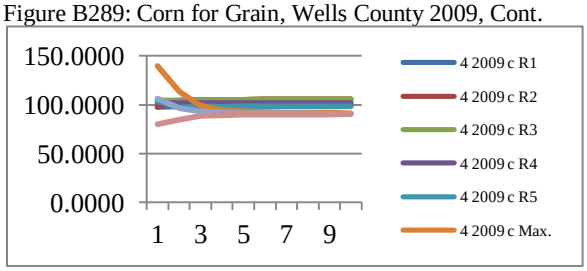


Figure B290: Corn for Grain, Wells County 2009, Dist.

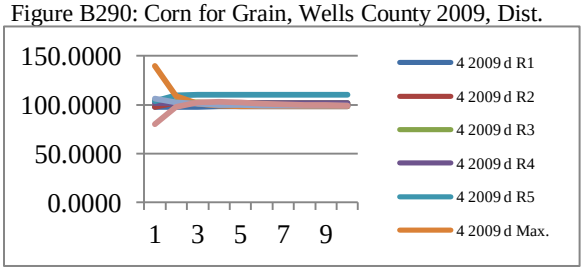


Figure B291: Corn for Grain, Bowman Cnty 2009, Cont.

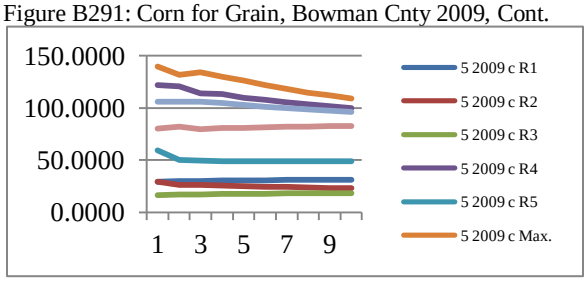


Figure B292: Corn for Grain, Bowman Cnty 2009, Dist.

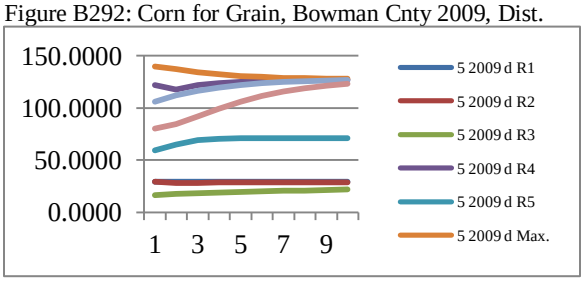


Figure B293: Corn for Grain, Emmons County 2009, Cont.

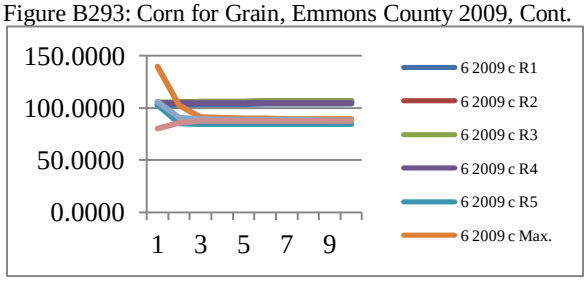


Figure B294: Corn for Grain, Emmons County 2009, Dist.

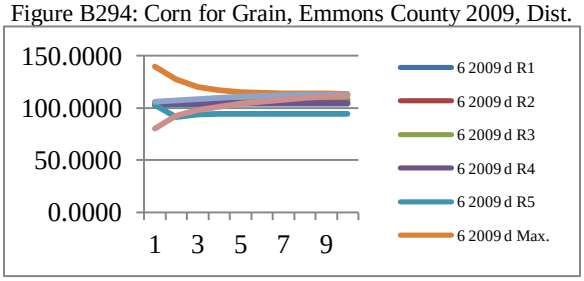


Figure B295: Corn for Grain, Sargent County 2009, Cont.

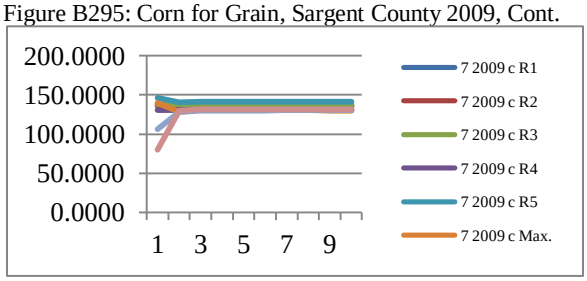


Figure B296: Corn for Grain, Sargent County 2009, Dist.

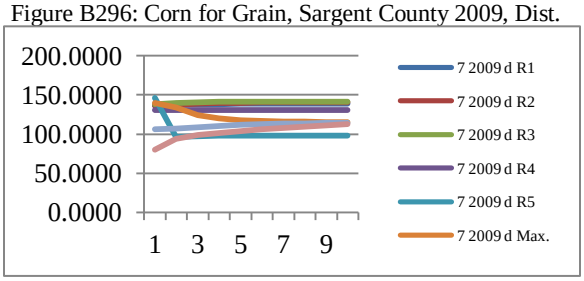


Figure B297: Corn for Grain, Richland County 2009, Cont.

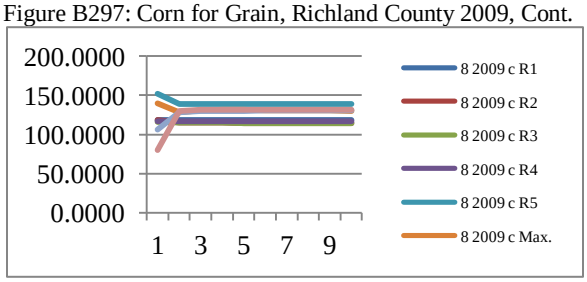


Figure B298: Corn for Grain, Richland County 2009, Dist.

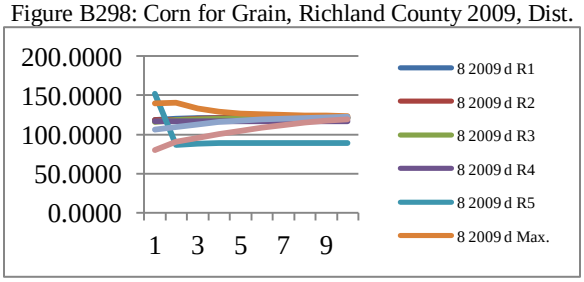


Figure B299: Corn for Grain, McKenzie County 2009, Cont.

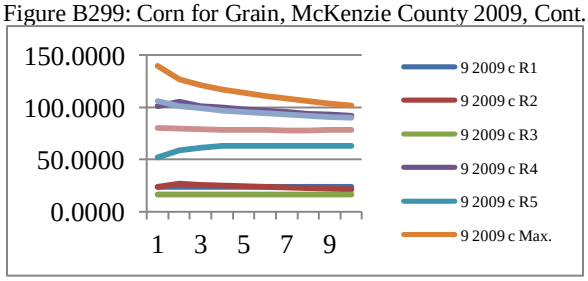


Figure B300: Corn for Grain, McKenzie County 2009, Dist.

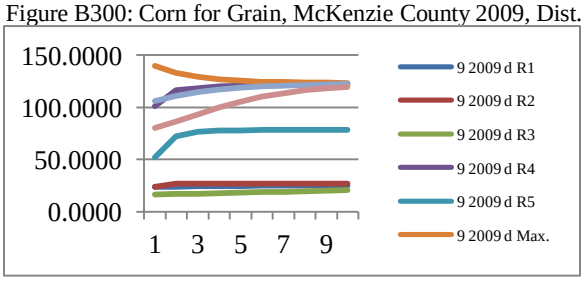


Figure B301: Corn for Grain, Williams County 2009, Cont.

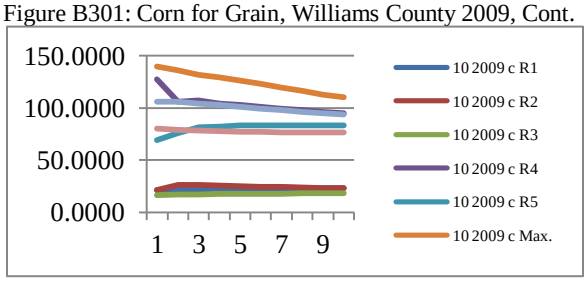


Figure B302: Corn for Grain, Williams County 2009, Dist.

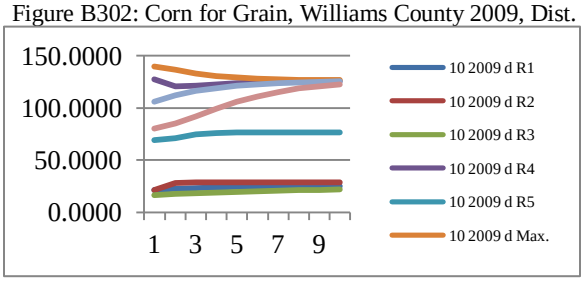


Figure B303: Corn for Grain, Dunn County 2009, Cont.

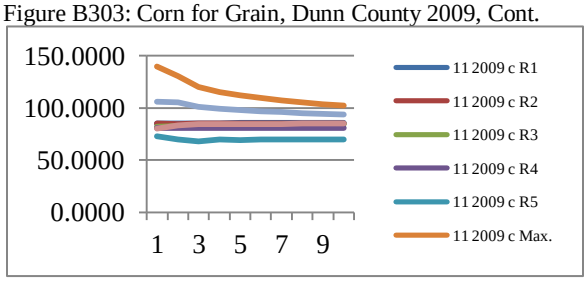


Figure B304: Corn for Grain, Dunn County 2009, Dist.

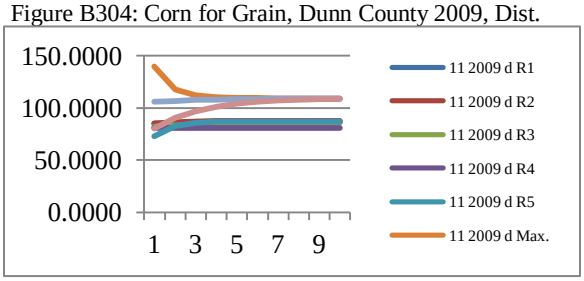


Figure B305: Corn for Grain, Eddy County 2009, Cont.

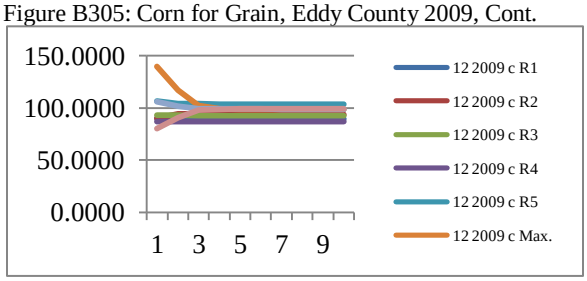


Figure B306: Corn for Grain, Eddy County 2009, Dist.

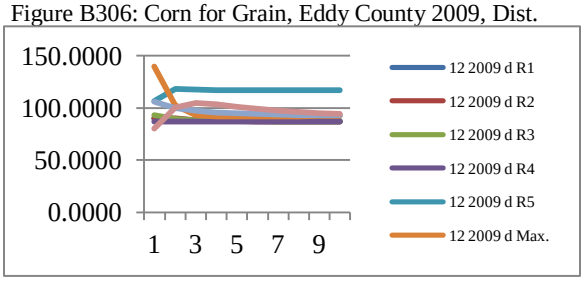


Figure B307: Corn for Grain, Gden Valley Cnty 2009, Cont.

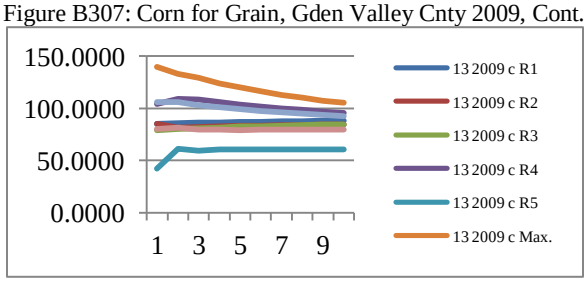


Figure B308: Corn for Grain, Gden Valley Cnty 2009, Dist.

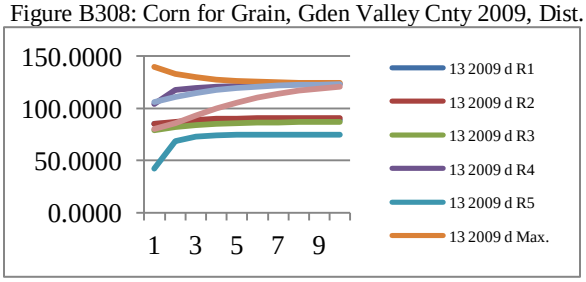


Figure B309: Corn for Grain, Kidder County 2009, Cont.

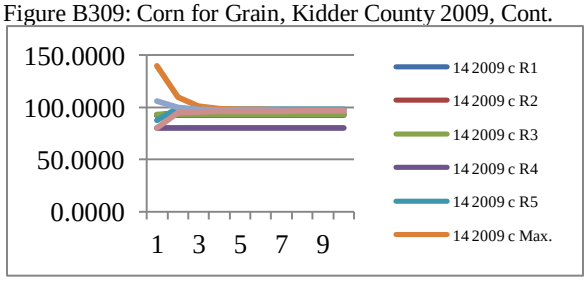


Figure B310: Corn for Grain, Kidder County 2009, Dist.

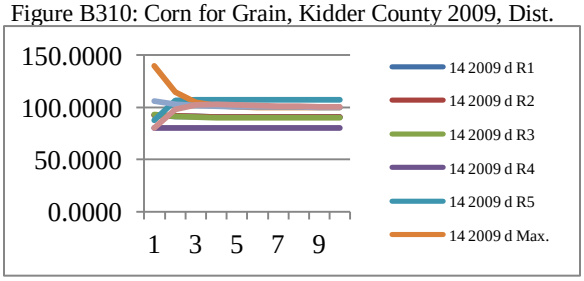


Figure B311: Corn for Grain, Pierce County 2009, Cont.

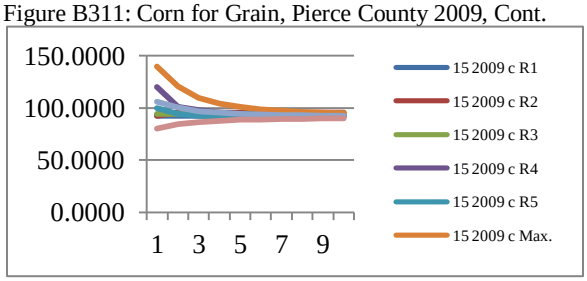


Figure B312: Corn for Grain, Pierce County 2009, Dist.

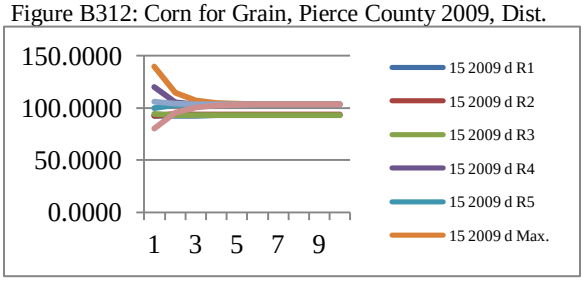


Figure B313: Corn for Grain, Foster County 2009, Cont.

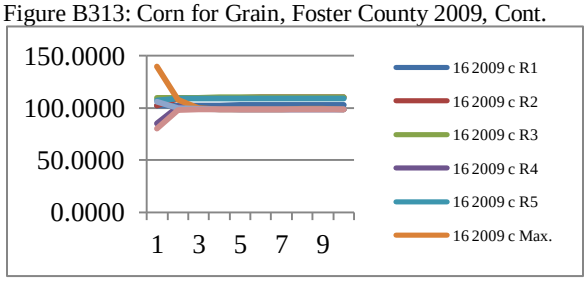


Figure B314: Corn for Grain, Foster County 2009, Dist.

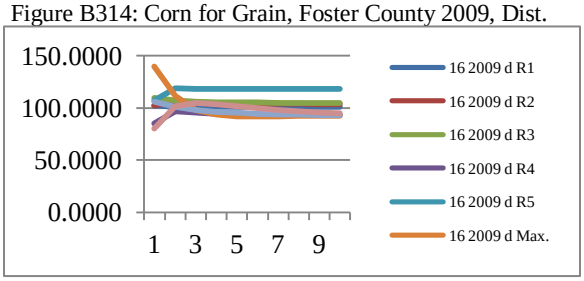


Figure B315: Corn for Grain, Logan County 2009, Cont.

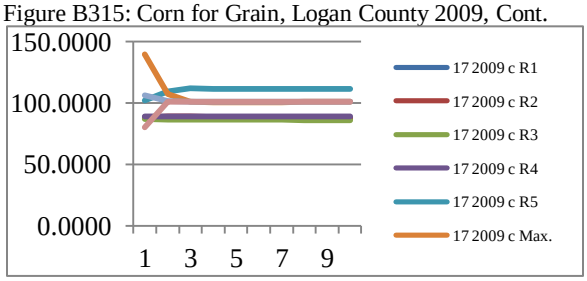


Figure B316: Corn for Grain, Logan County 2009, Dist.

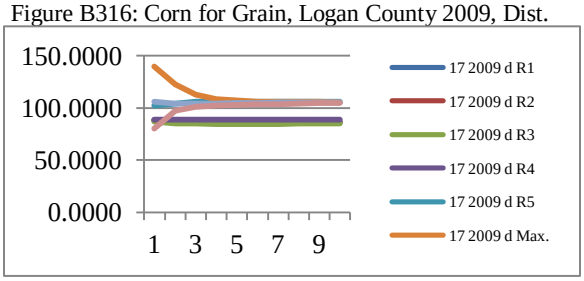


Figure B317: Corn for Grain, Mountrail County 2009, Cont.

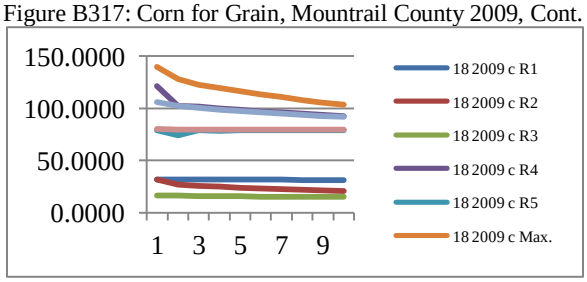


Figure B318: Corn for Grain, Mountrail County 2009, Dist.

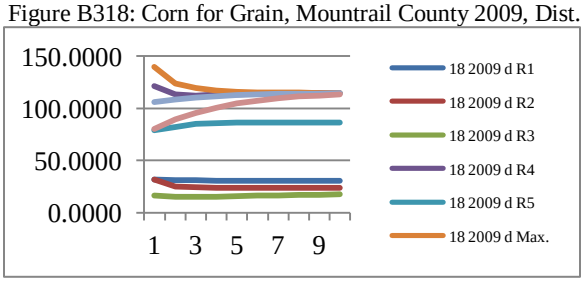


Figure B319: Corn for Grain, Sheridan County 2009, Cont.

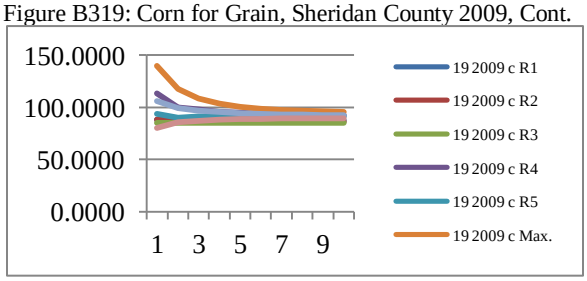


Figure B320: Corn for Grain, Sheridan County 2009, Dist.

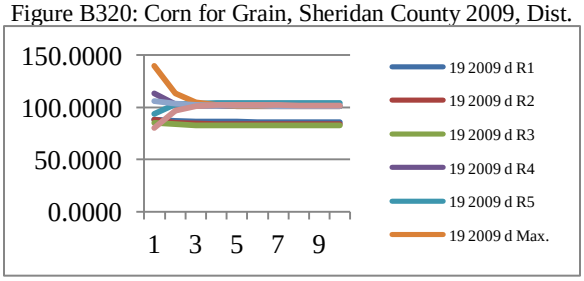


Figure B321: Corn for Grain, Towner County 2009, Cont.

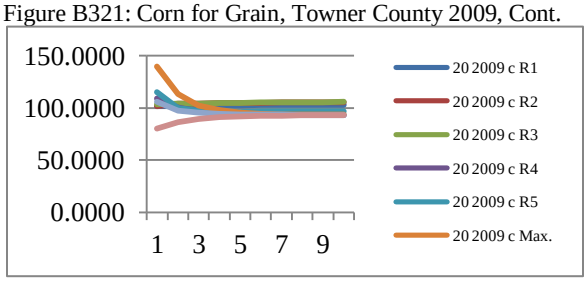


Figure B322: Corn for Grain, Towner County 2009, Dist.

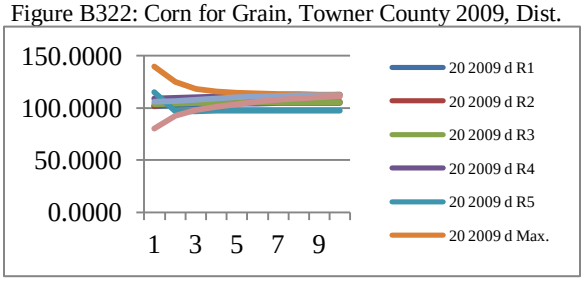


Figure B323: Corn for Grain, Slope County 2009, Cont.

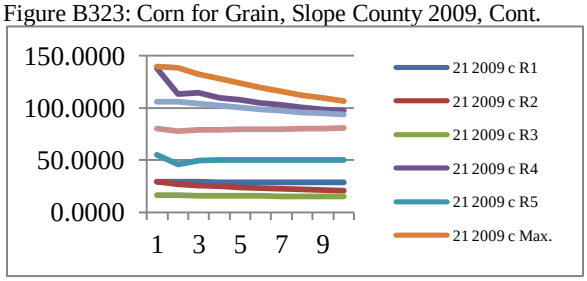


Figure B324: Corn for Grain, Slope County 2009, Dist.

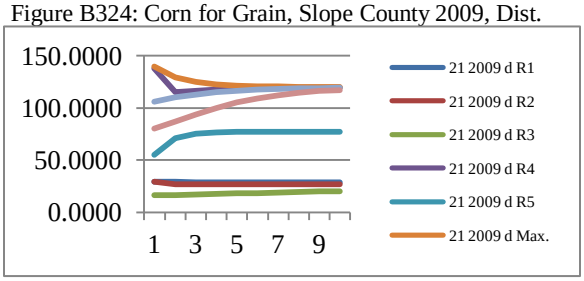


Figure B325: Corn for Grain, McLean County 2009, Cont.

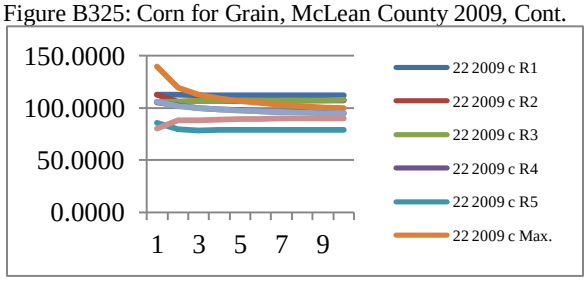


Figure B326: Corn for Grain, McLean County 2009, Dist.

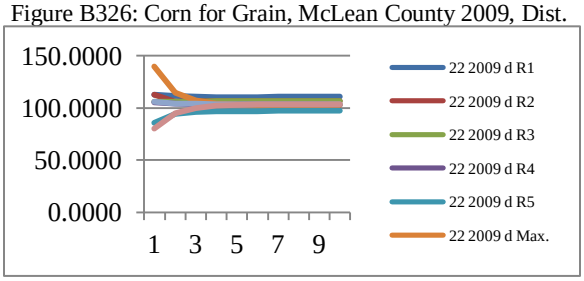


Figure B327: Corn for Grain, Morton County 2009, Cont.

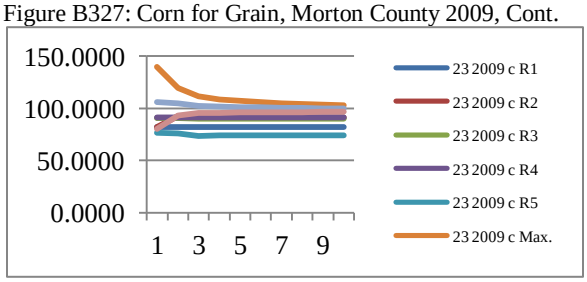


Figure B328: Corn for Grain, Morton County 2009, Dist.

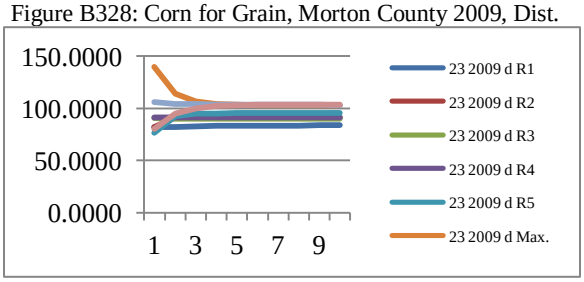


Figure B329: Corn for Grain, Ward County 2009, Cont.

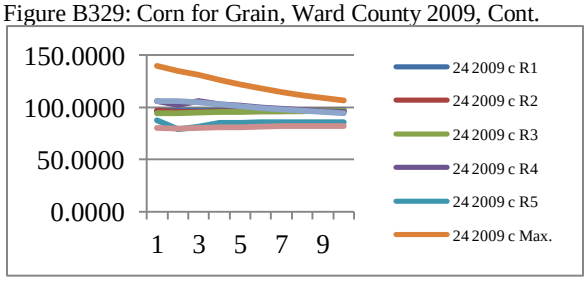


Figure B330: Corn for Grain, Ward County 2009, Dist.

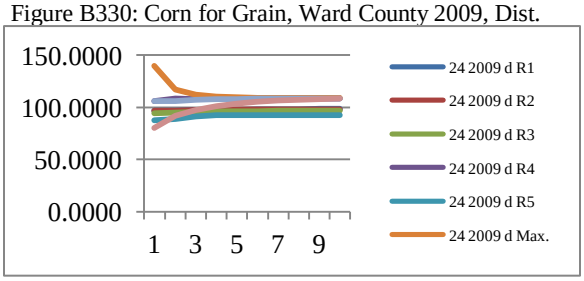


Figure B331: Corn for Grain, Bottineau County 2009, Cont.

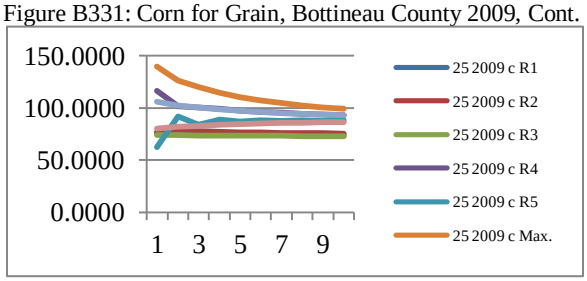


Figure B332: Corn for Grain, Bottineau County 2009, Dist.

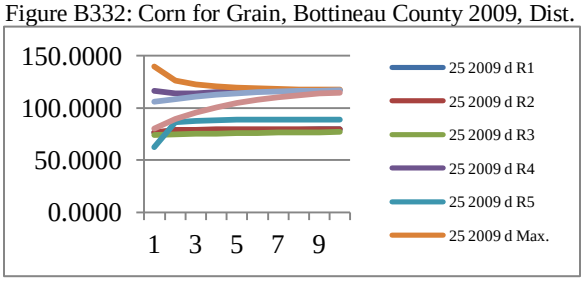


Figure B333: Corn for Grain, Grant County 2009, Cont.

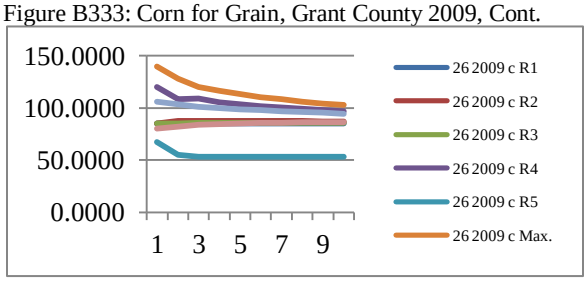


Figure B334: Corn for Grain, Grant County 2009, Dist.

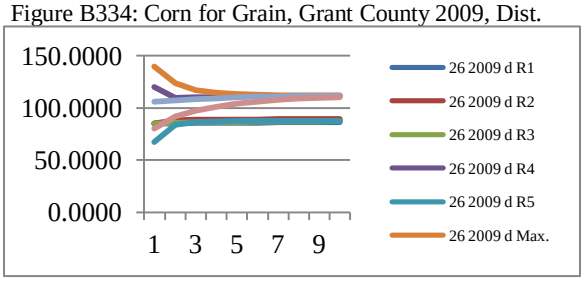


Figure B335: Corn for Grain, Pembina County 2009, Cont.

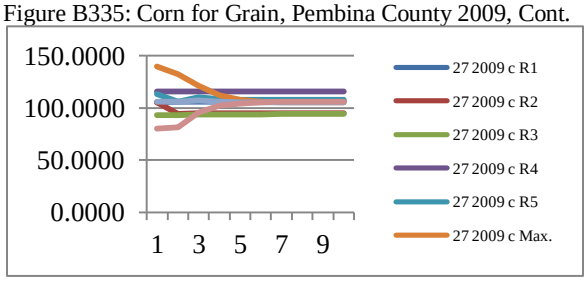


Figure B336: Corn for Grain, Pembina County 2009, Dist.

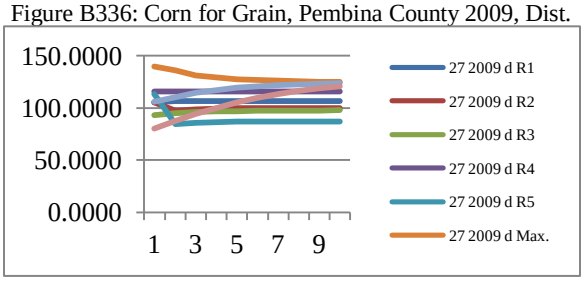


Figure B337: Corn for Grain, Sioux County 2009, Cont.

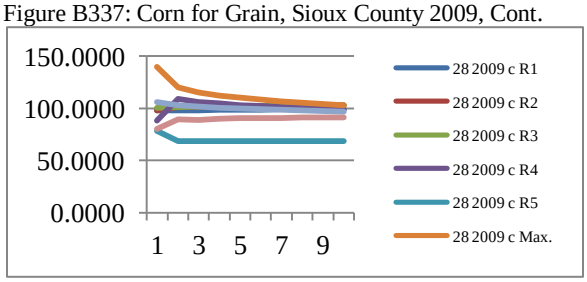


Figure B338: Corn for Grain, Sioux County 2009, Dist.

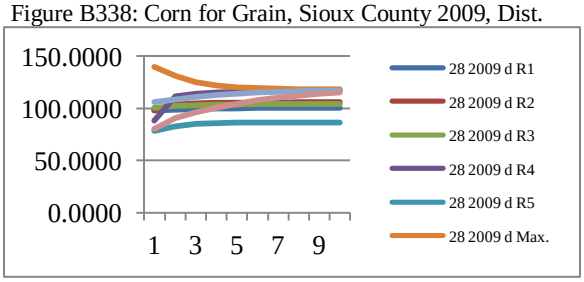


Figure B339: Corn for Grain, Cass County 2009, Cont.

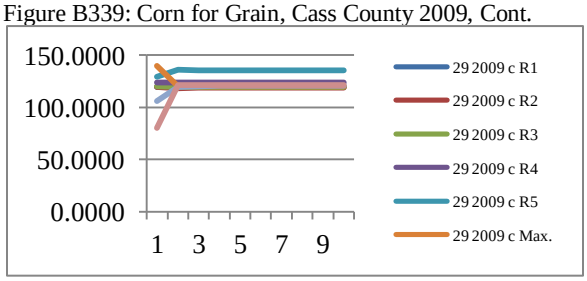


Figure B340: Corn for Grain, Cass County 2009, Dist.

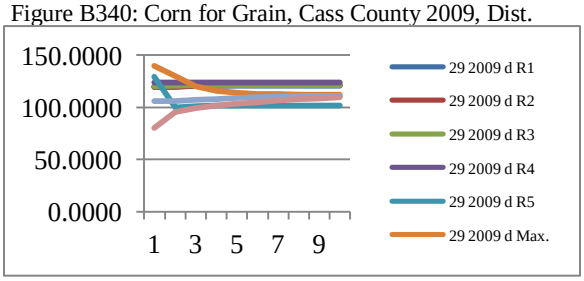


Figure B341: Corn for Grain, Benson County 2009, Cont.

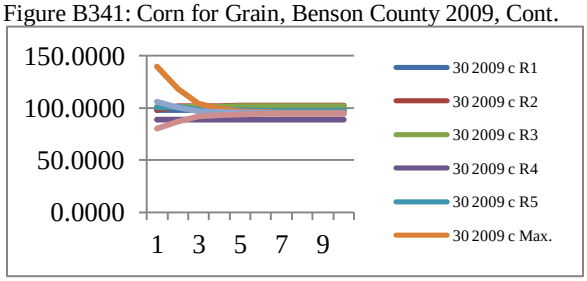


Figure B342: Corn for Grain, Benson County 2009, Dist.

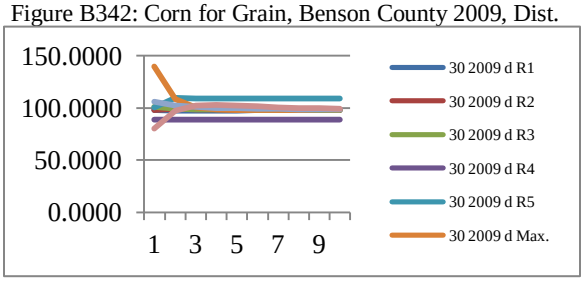


Figure B343: Corn for Grain, Adams County 2009, Cont.

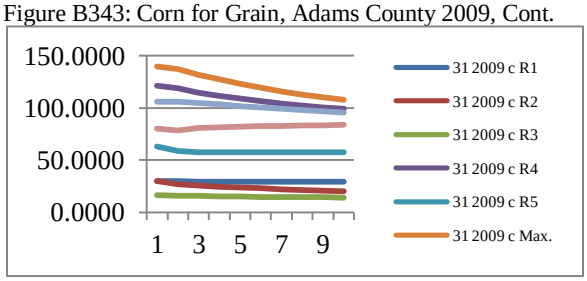


Figure B344: Corn for Grain, Adams County 2009, Dist.

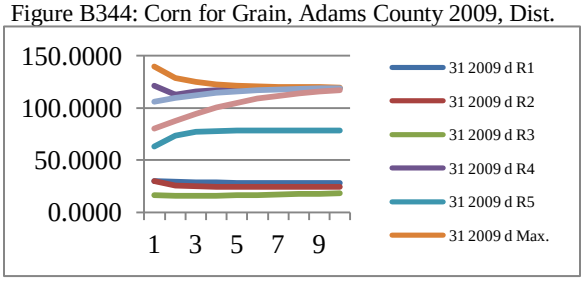


Figure B345: Corn for Grain, Barnes County 2009, Cont.

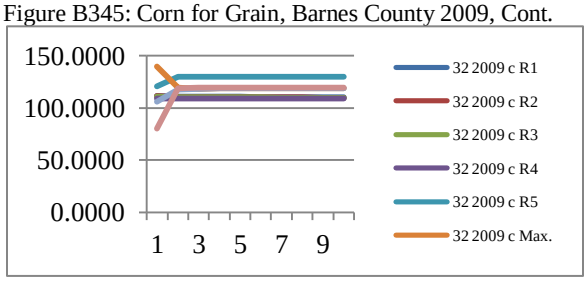


Figure B346: Corn for Grain, Barnes County 2009, Dist.

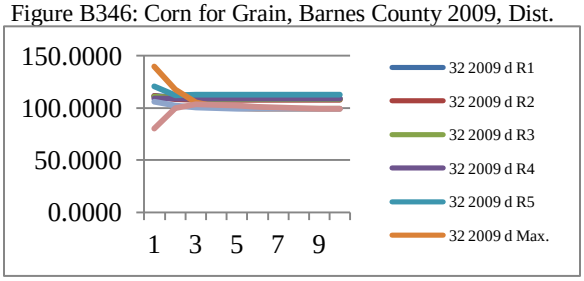


Figure B347: Corn for Grain, Dickey County 2009, Cont.

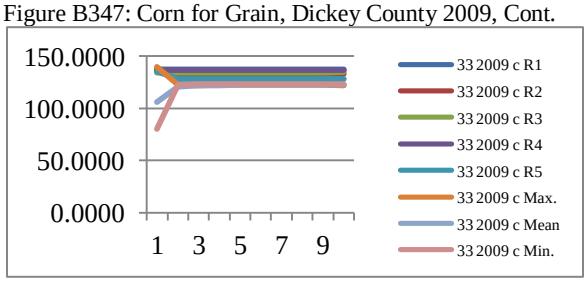


Figure B348: Corn for Grain, Dickey County 2009, Dist.

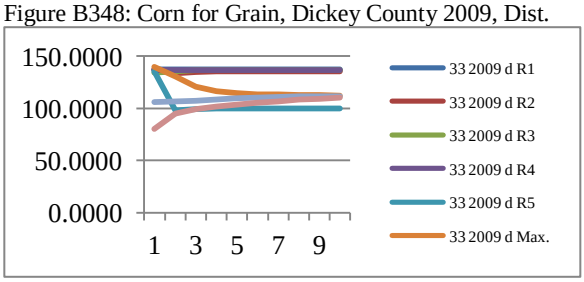


Figure B349: Corn for Grain, Griggs County 2009, Cont.

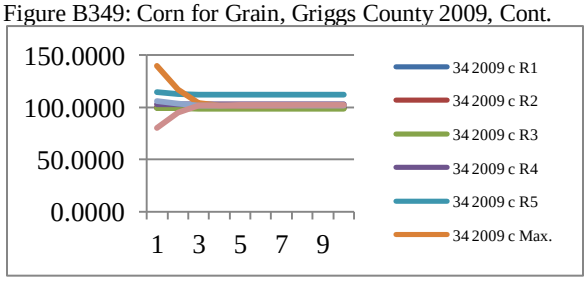


Figure B350: Corn for Grain, Griggs County 2009, Dist.

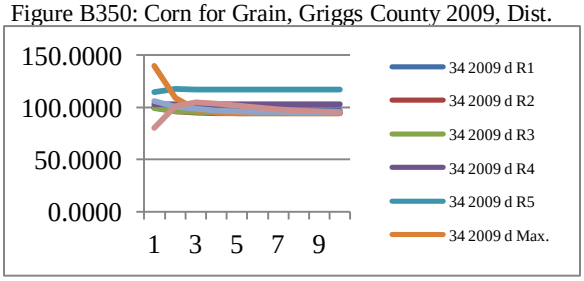


Figure B351: Corn for Grain, Oliver County 2009, Cont.

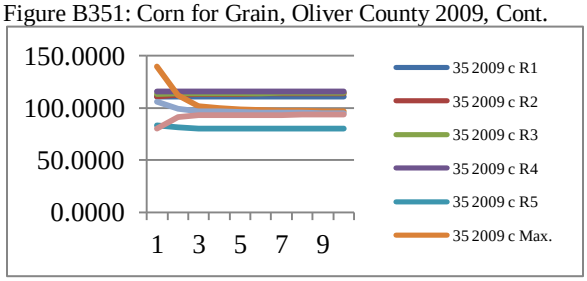


Figure B352: Corn for Grain, Oliver County 2009, Dist.

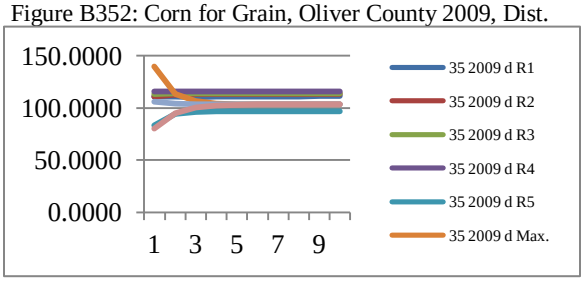


Figure B353: Corn for Grain, Billings County 2009, Cont.

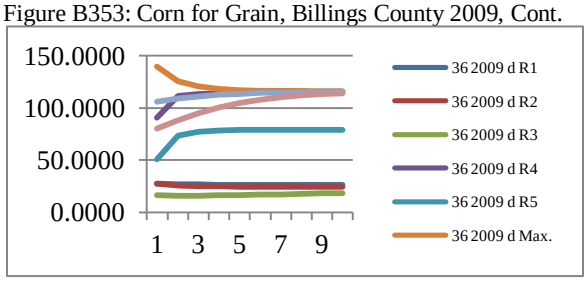


Figure B354: Corn for Grain, Billings County 2009, Dist.

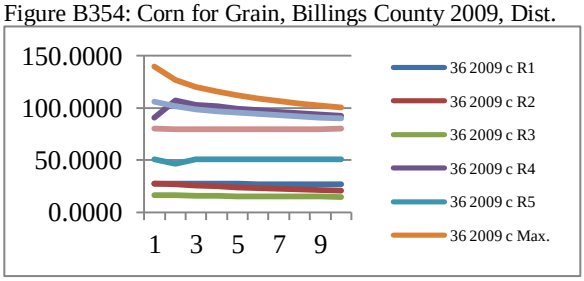


Figure B355: Corn for Grain, Grand Forks Cnty 2009, Cont.

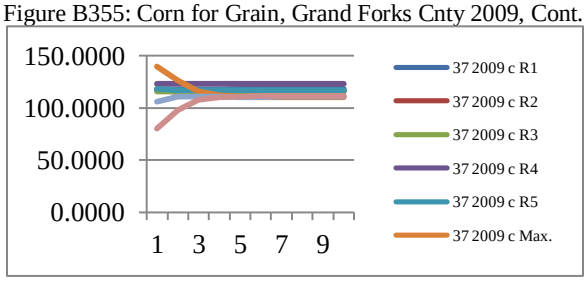


Figure B356: Corn for Grain, Grand Forks Cnty 2009, Dist.

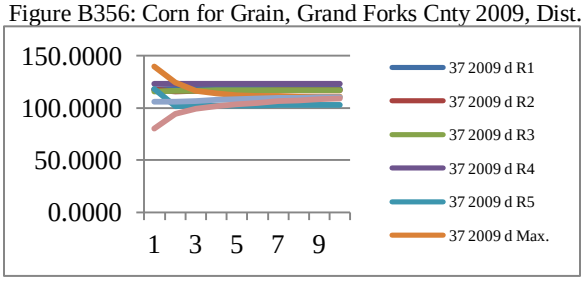


Figure B357: Corn for Grain, Steele County 2009, Cont.

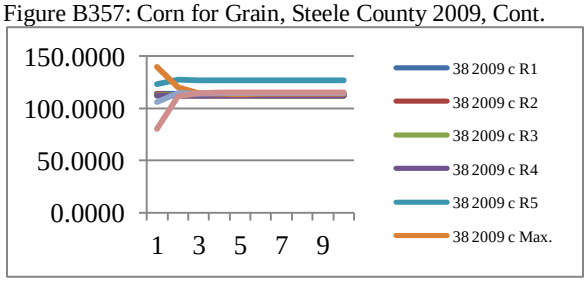


Figure B358: Corn for Grain, Steele County 2009, Dist.

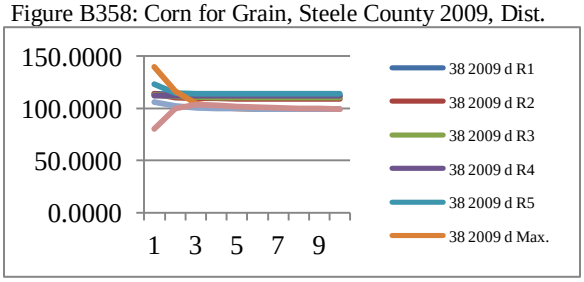


Figure B359: Corn for Grain, Divide County 2009, Cont.

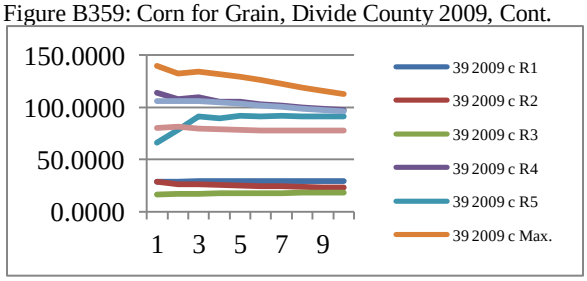


Figure B360: Corn for Grain, Divide County 2009, Dist.

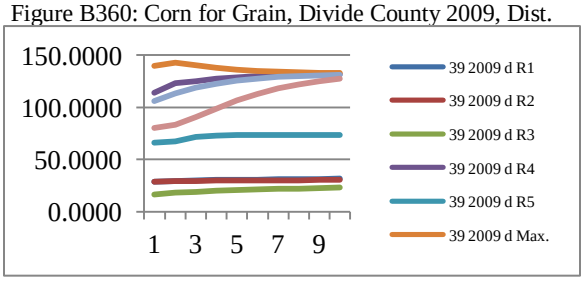


Figure B361: Corn for Grain, La Moure County 2009, Cont.

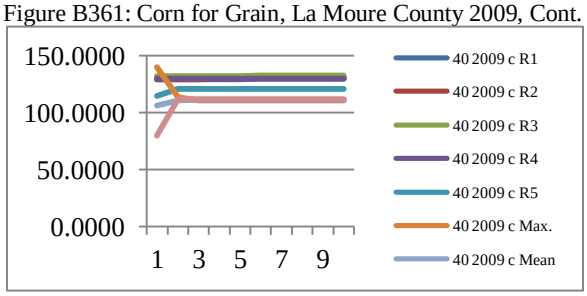


Figure B362: Corn for Grain, La Moure County 2009, Dist.

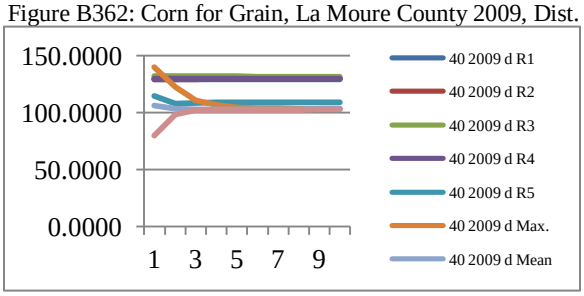


Figure B363: Corn for Grain, Ransom County 2009, Cont.

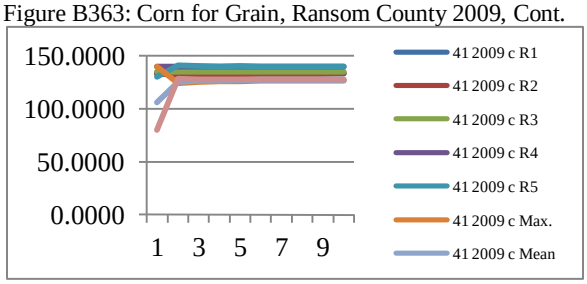


Figure B364: Corn for Grain, Ransom County 2009, Dist.

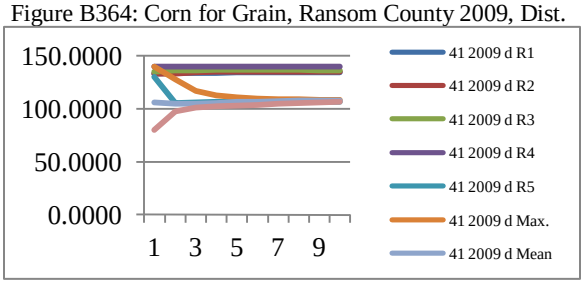


Figure B365: Corn for Grain, Stutsman County 2009, Cont.

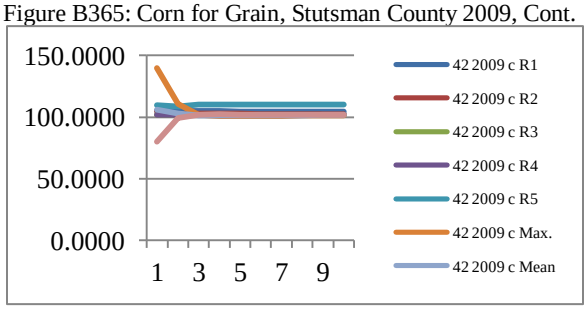


Figure B366: Corn for Grain, Stutsman County 2009, Dist.

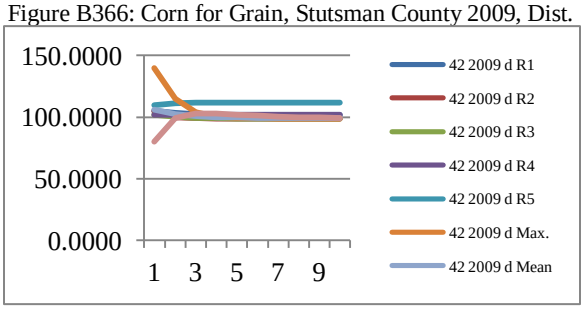


Figure B367: Corn for Grain, Burke County 2009, Cont.

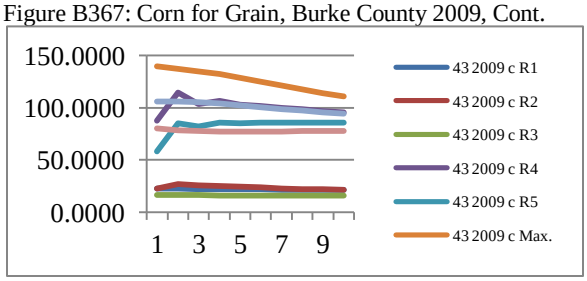


Figure B368: Corn for Grain, Burke County 2009, Dist.

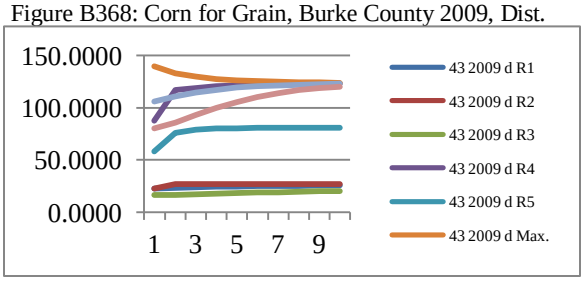


Figure B369: Corn for Grain, Burleigh County 2009, Cont.

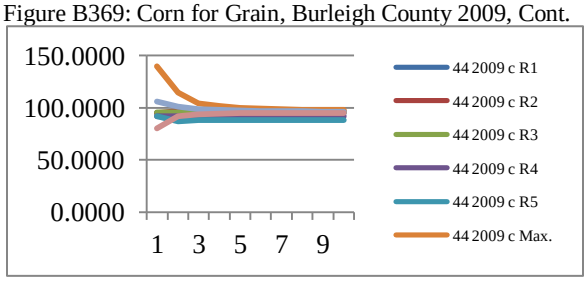


Figure B370: Corn for Grain, Burleigh County 2009, Dist.

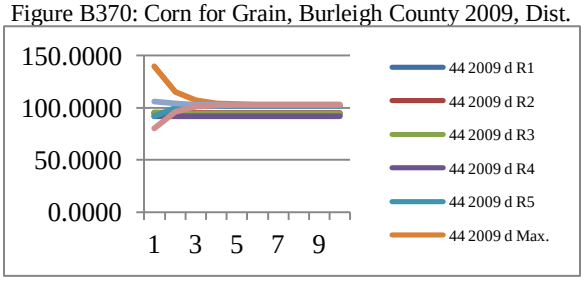


Figure B371: Corn for Grain, Cavalier County 2009, Cont.

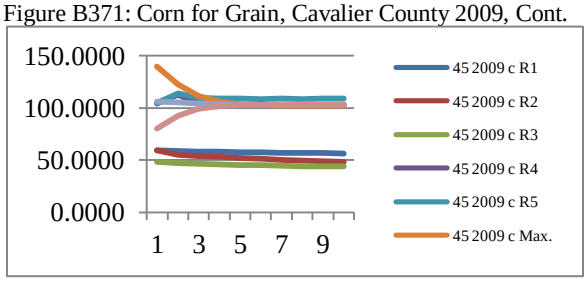


Figure B372: Corn for Grain, Cavalier County 2009, Dist.

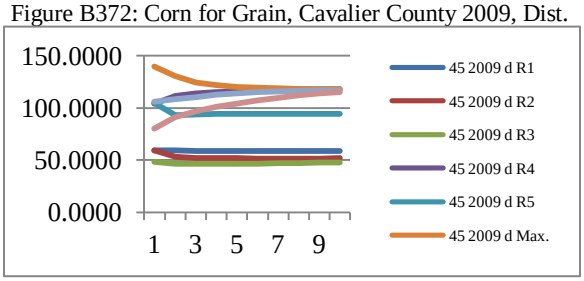


Figure B373: Corn for Grain, Hettinger County 2009, Cont.

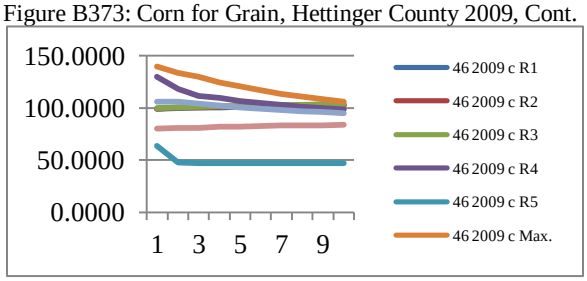


Figure B374: Corn for Grain, Hettinger County 2009, Dist.

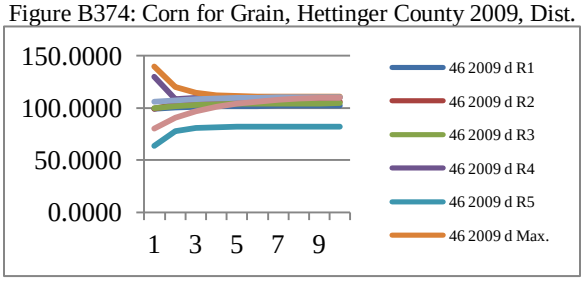


Figure B375: Corn for Grain, McIntosh County 2009, Cont.

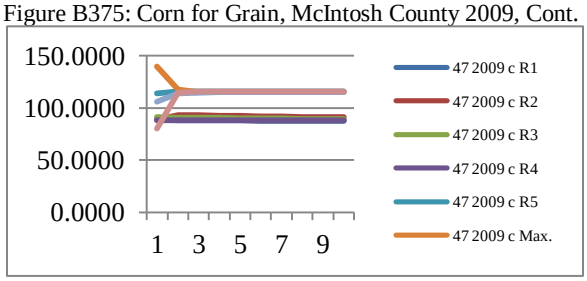


Figure B376: Corn for Grain, McIntosh County 2009, Dist.

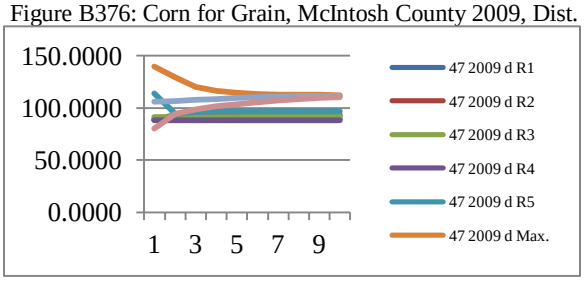


Figure B377: Corn for Grain, Nelson County 2009, Cont.

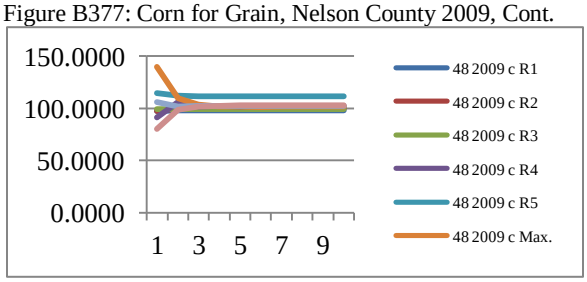


Figure B378: Corn for Grain, Nelson County 2009, Dist.

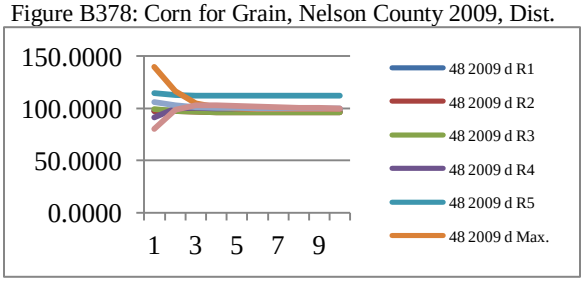


Figure B379: Corn for Grain, Ramsey County 2009, Cont.

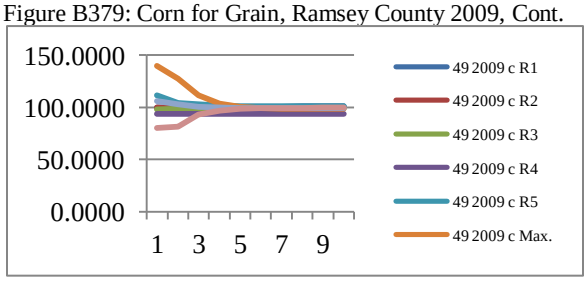


Figure B380: Corn for Grain, Ramsey County 2009, Dist.

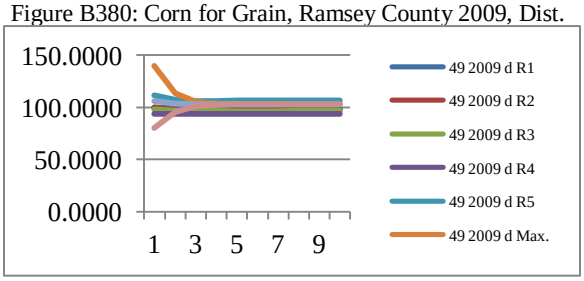


Figure B381: Corn for Grain, Rolette County 2009, Cont.

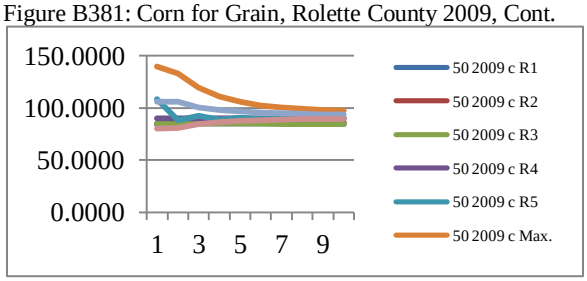


Figure B382: Corn for Grain, Rolette County 2009, Dist.

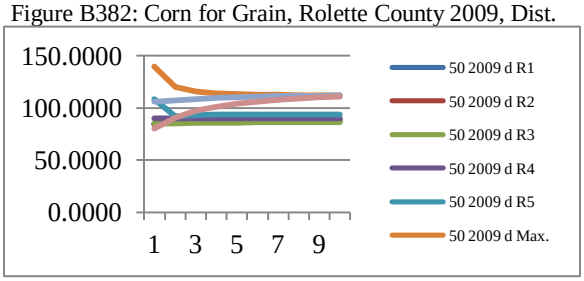


Figure B383: Corn for Grain, Stark County 2009, Cont.

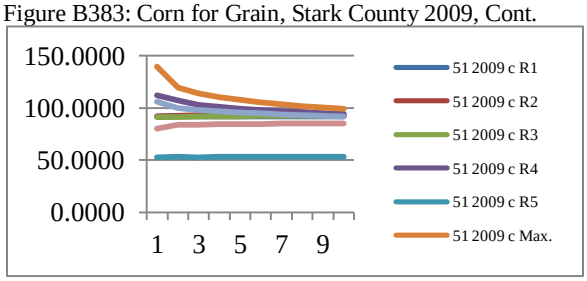


Figure B384: Corn for Grain, Stark County 2009, Dist.

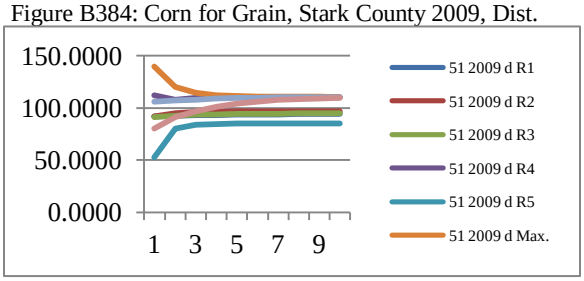


Figure B385: Corn for Grain, Mercer County 2009, Cont.

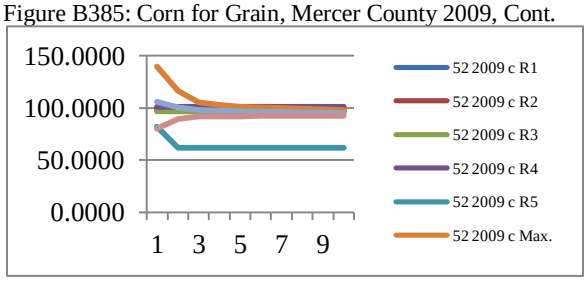


Figure B386: Corn for Grain, Mercer County 2009, Dist.

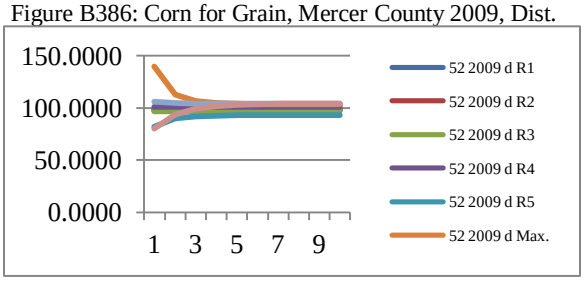


Figure B387: Corn for Grain, Traill County 2009, Cont.

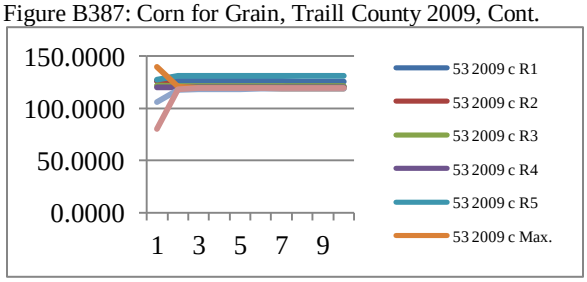


Figure B388: Corn for Grain, Traill County 2009, Dist.

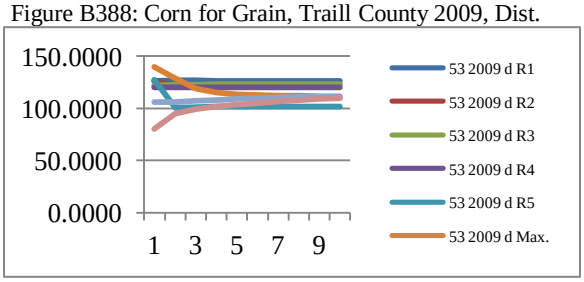


Figure B389: Corn for Grain, McKenzie County 2010, Cont.

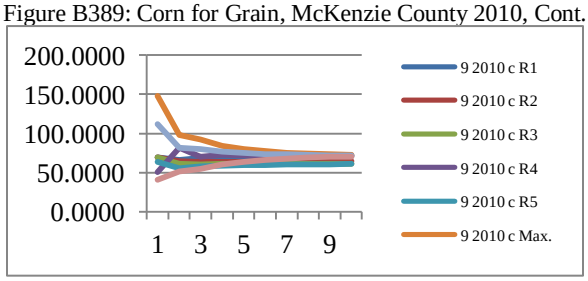


Figure B390: Corn for Grain, McKenzie County 2010, Dist.

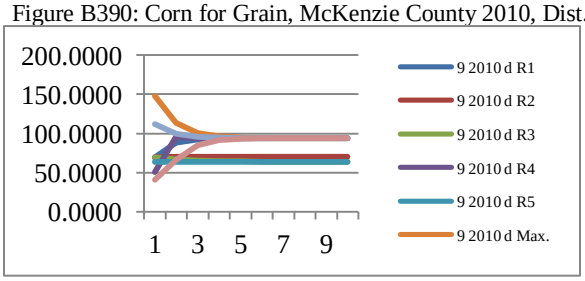


Figure B391: Corn for Grain, Williams County 2010, Cont.

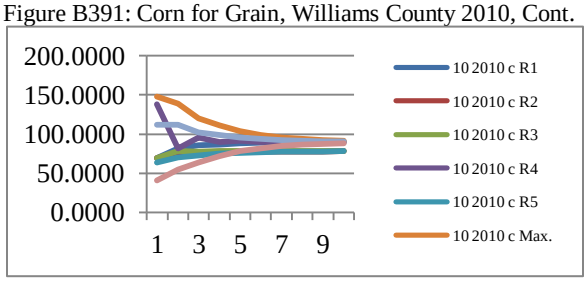


Figure B392: Corn for Grain, Williams County 2010, Dist.

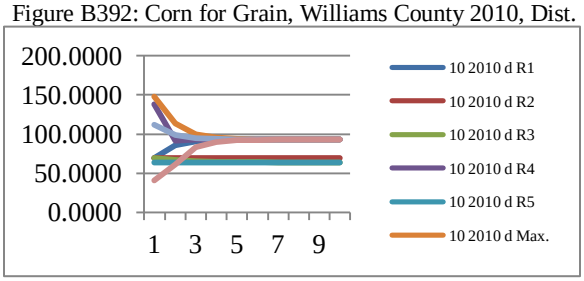


Figure B393: Corn for Grain, Mountrail County 2010, Cont.

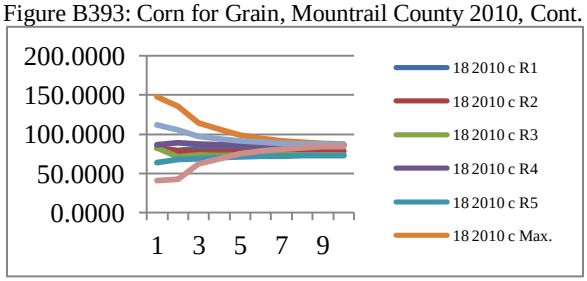


Figure B394: Corn for Grain, Mountrail County 2010, Dist.

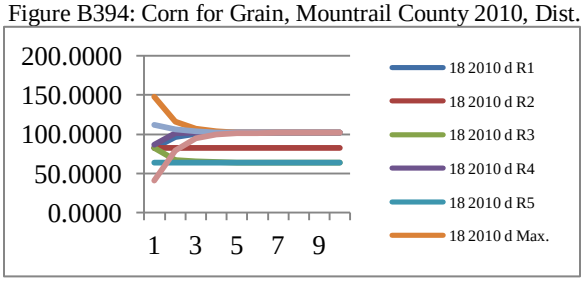


Figure B395: Corn for Grain, McLean County 2010, Cont.

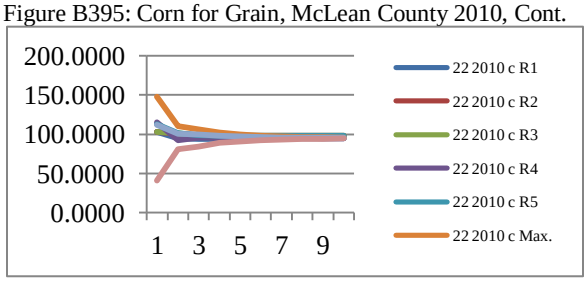


Figure B396: Corn for Grain, McLean County 2010, Dist.

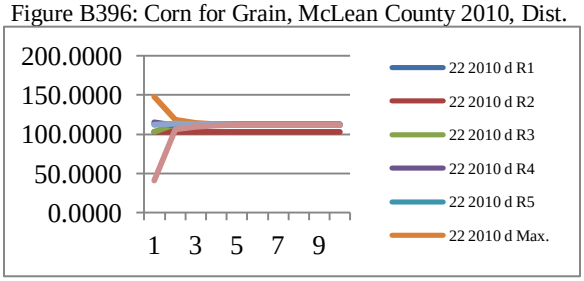


Figure B397: Corn for Grain, Ward County 2010, Cont.

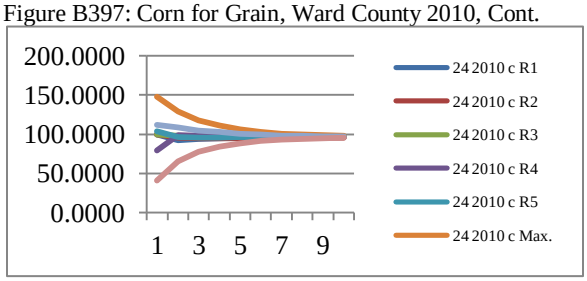


Figure B398: Corn for Grain, Ward County 2010, Dist.

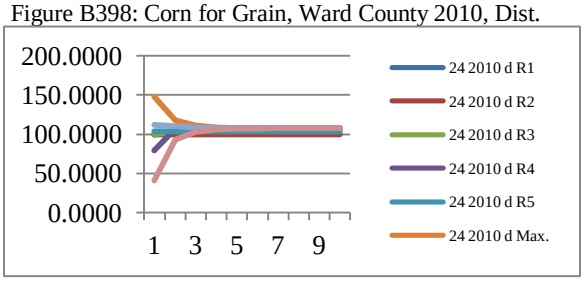


Figure B399: Corn for Grain, Adams County 2010, Cont.

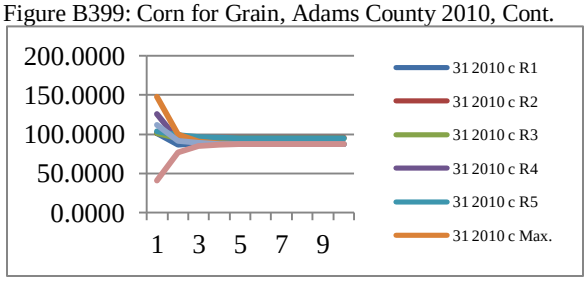


Figure B400: Corn for Grain, Adams County 2010, Dist.

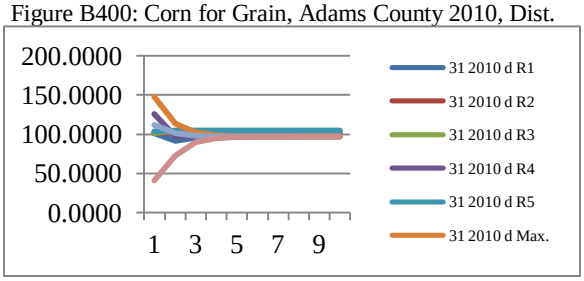


Figure B401: Corn for Grain, Burke County 2010, Cont.

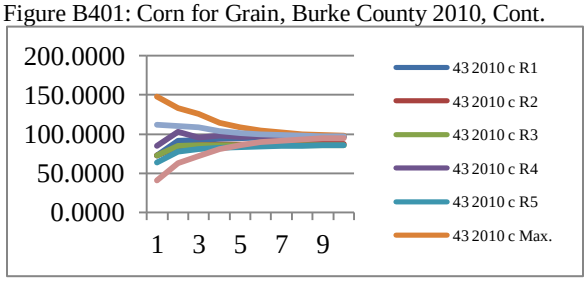


Figure B402: Corn for Grain, Burke County 2010, Dist.

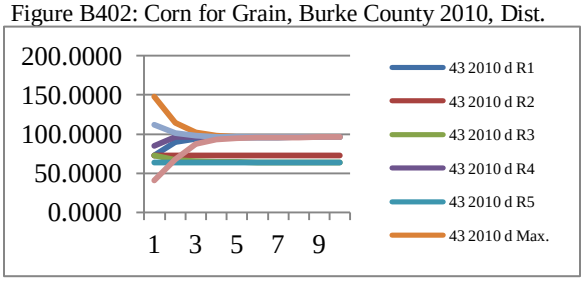


Figure B403: Corn for Grain, Hettinger County 2010, Cont.

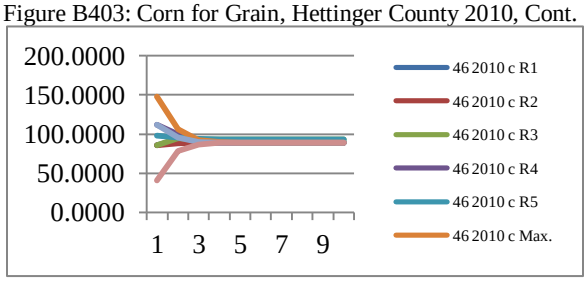


Figure B404: Corn for Grain, Hettinger County 2010, Dist.

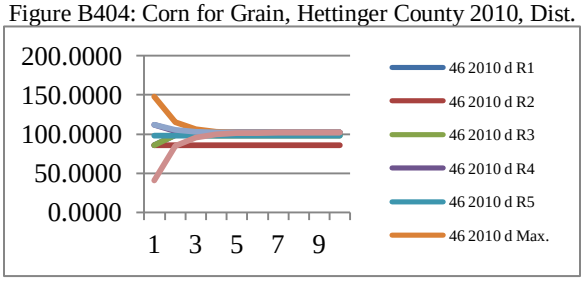


Figure B405: Flaxseed, Bowman County 2008, Contiguity

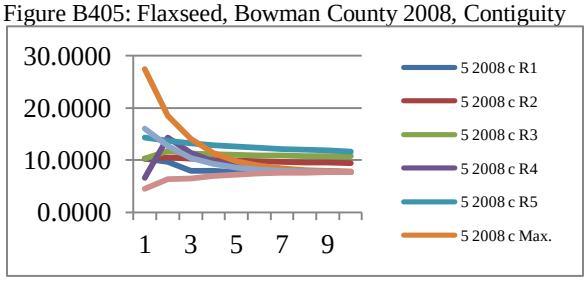


Figure B406: Flaxseed, Bowman County 2008, Distance

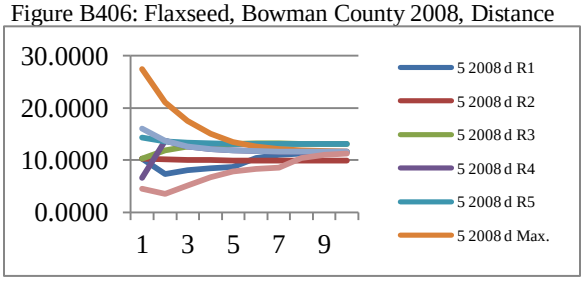


Figure B407: Flaxseed, Emmons County 2008, Contiguity

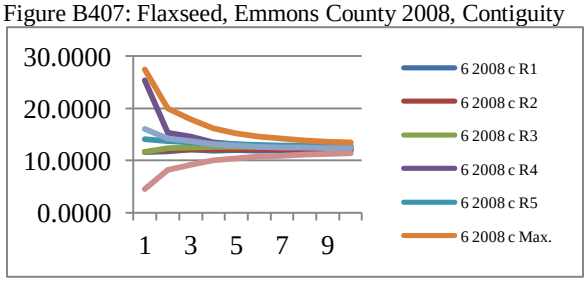


Figure B408: Flaxseed, Emmons County 2008, Distance

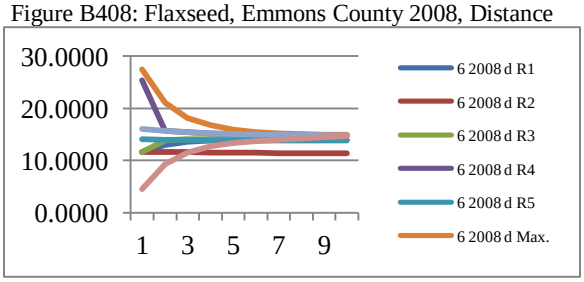


Figure B409: Flaxseed, Sargent County 2008, Contiguity

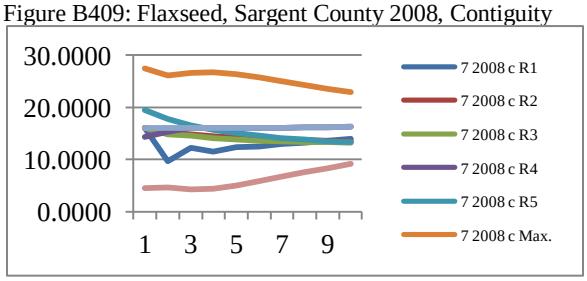


Figure B410: Flaxseed, Sargent County 2008, Distance

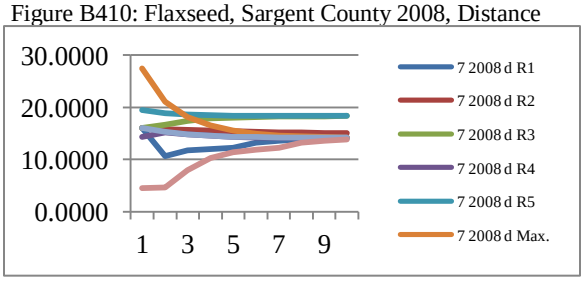


Figure B411: Flaxseed, Richland County 2008, Contiguity

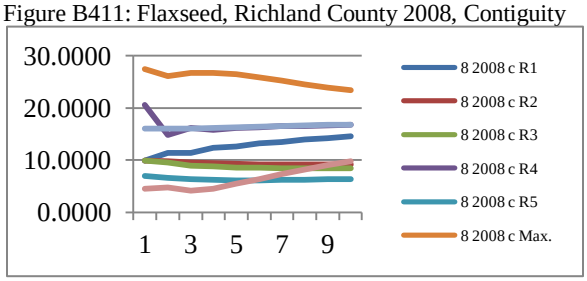


Figure B412: Flaxseed, Richland County 2008, Distance

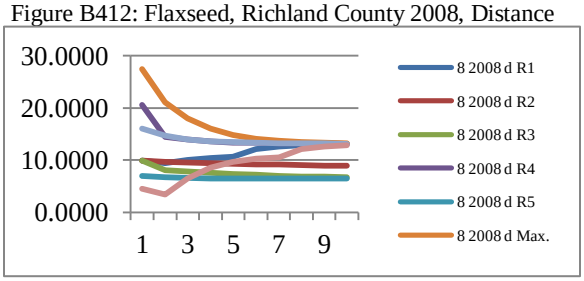


Figure B413: Flaxseed, McKenzie County 2008, Contiguity

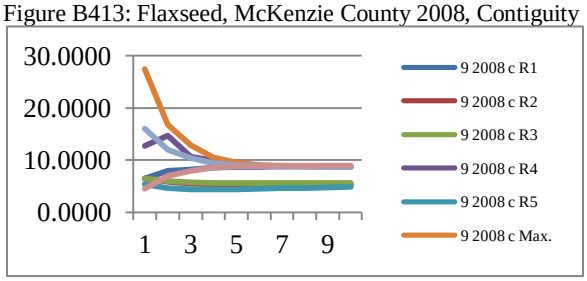


Figure B414: Flaxseed, McKenzie County 2008, Distance

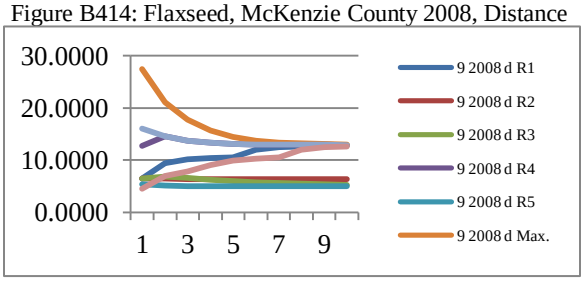


Figure B415: Flaxseed, Dunn County 2008, Contiguity

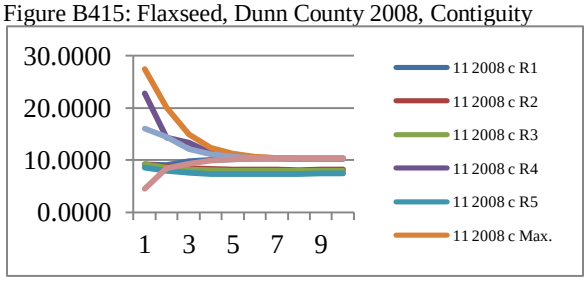


Figure B416: Flaxseed, Dunn County 2008, Distance

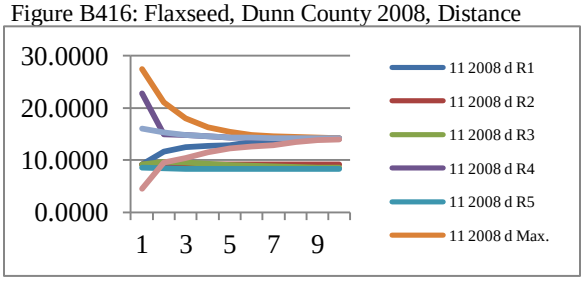


Figure B417: Flaxseed, Logan County 2008, Contiguity

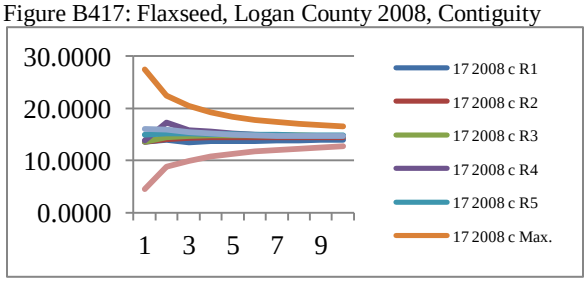


Figure B418: Flaxseed, Logan County 2008, Distance

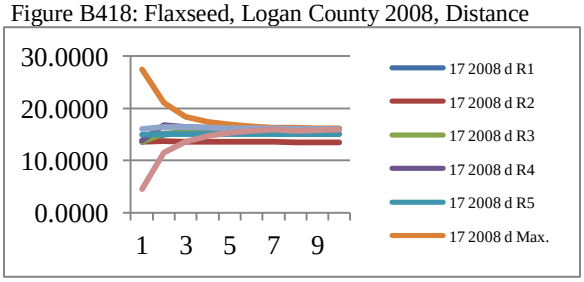


Figure B419: Flaxseed, Grant County 2008, Contiguity

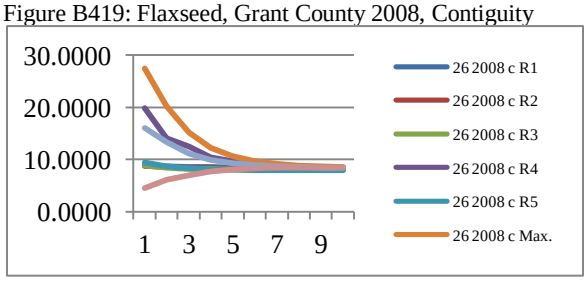


Figure B420: Flaxseed, Grant County 2008, Distance

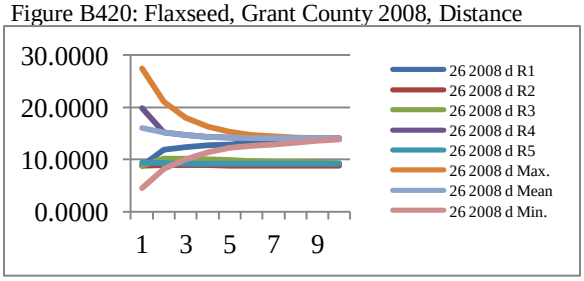


Figure B421: Flaxseed, Pembina County 2008, Contiguity

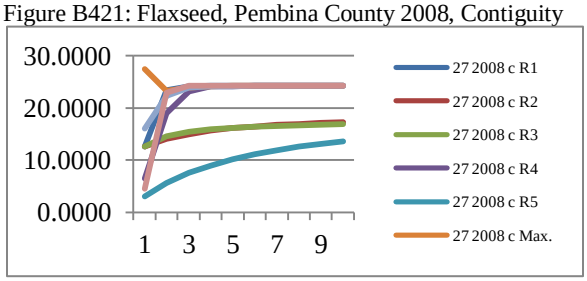


Figure B422: Flaxseed, Pembina County 2008, Distance

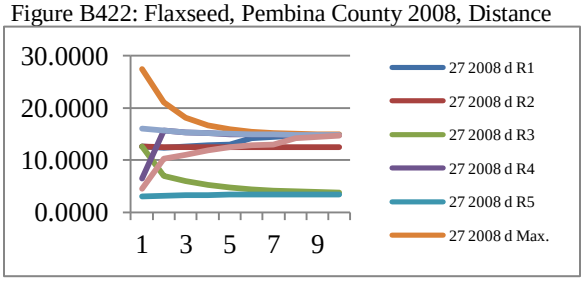


Figure B423: Flaxseed, Sioux County 2008, Contiguity

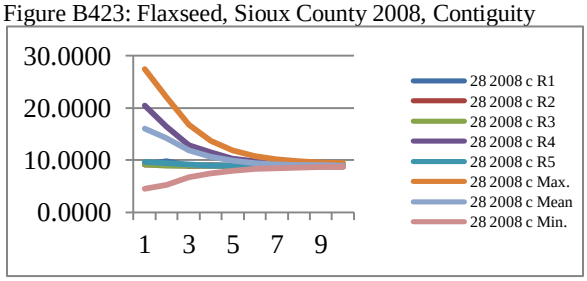


Figure B424: Flaxseed, Sioux County 2008, Distance

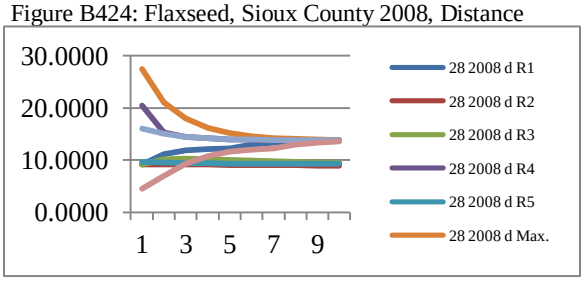


Figure B425: Flaxseed, Cass County 2008, Contiguity

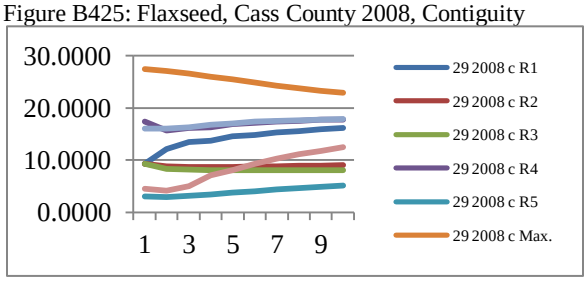


Figure B426: Flaxseed, Cass County 2008, Distance

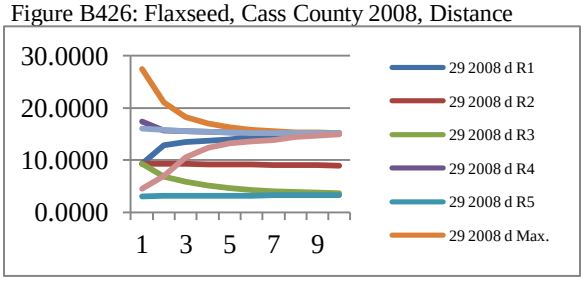


Figure B427: Flaxseed, Adams County 2008, Contiguity

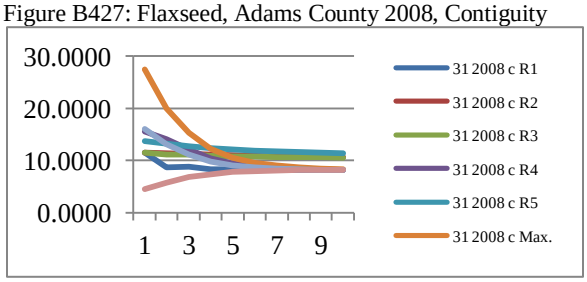


Figure B428: Flaxseed, Adams County 2008, Distance

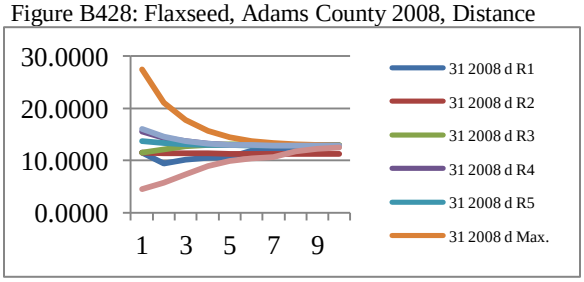


Figure B429: Flaxseed, Barnes County 2008, Contiguity

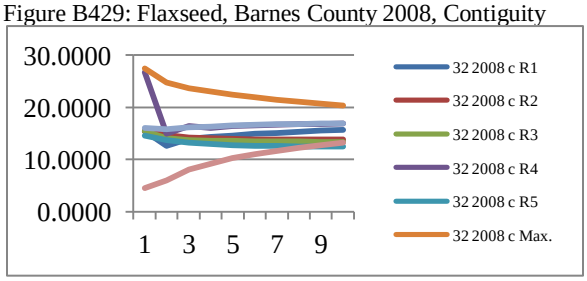


Figure B430: Flaxseed, Barnes County 2008, Distance

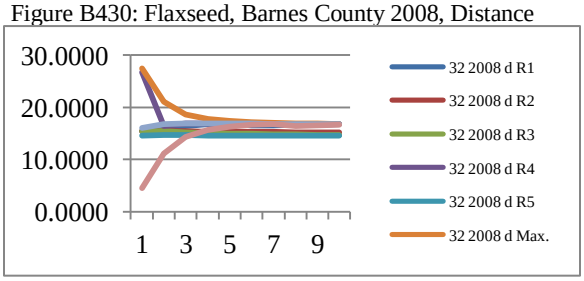


Figure B431: Flaxseed, Dickey County 2008, Contiguity

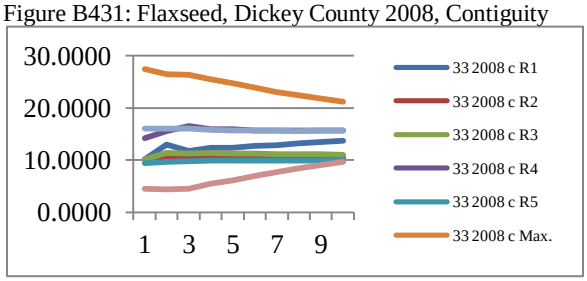


Figure B432: Flaxseed, Dickey County 2008, Distance

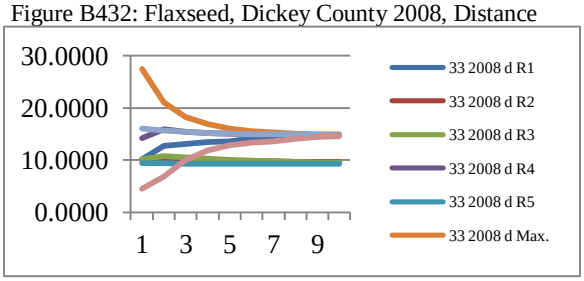


Figure B433: Flaxseed, Griggs County 2008, Contiguity

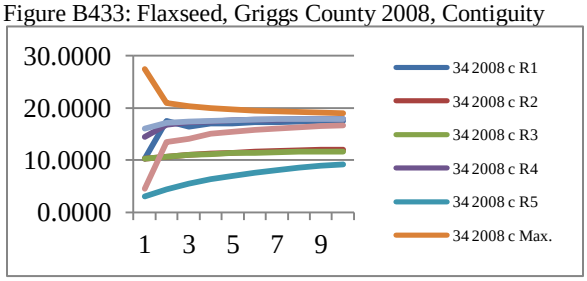


Figure B434: Flaxseed, Griggs County 2008, Distance

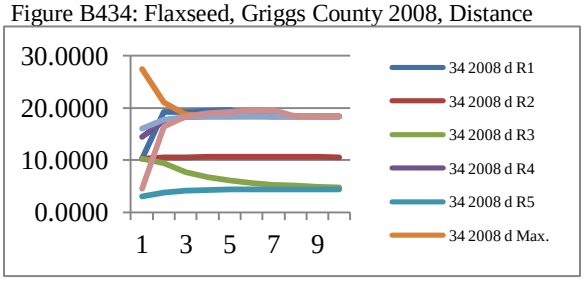


Figure B435: Flaxseed, Billings County 2008, Contiguity

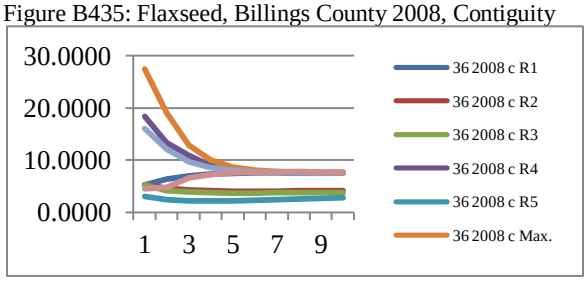


Figure B436: Flaxseed, Billings County 2008, Distance

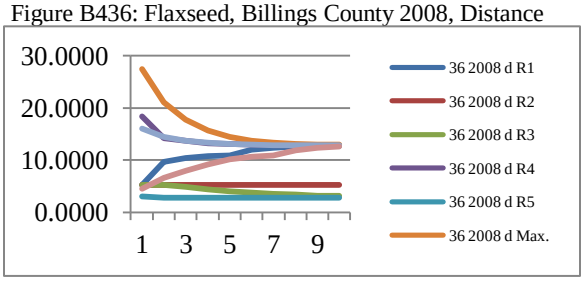


Figure B437: Flaxseed, Grand Forks Cnty 2008, Contiguity

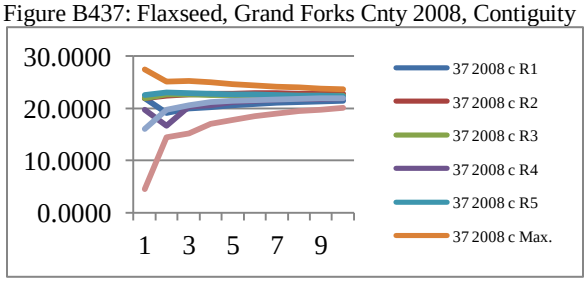


Figure B438: Flaxseed, Grand Forks Cnty 2008, Distance

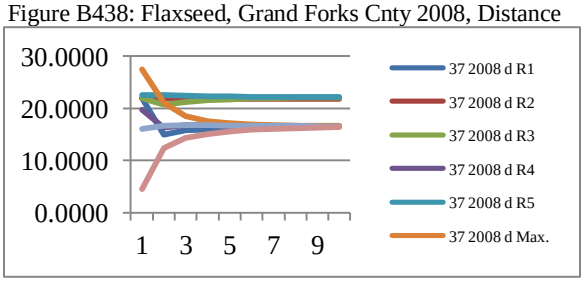


Figure B439: Flaxseed, Steele County 2008, Contiguity

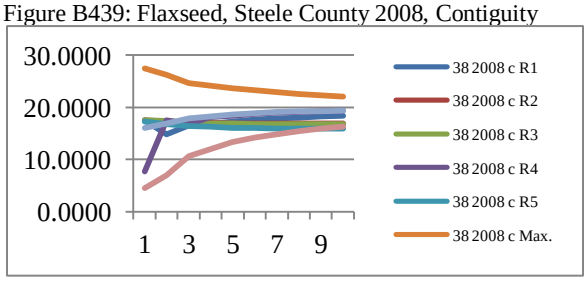


Figure B440: Flaxseed, Steele County 2008, Distance

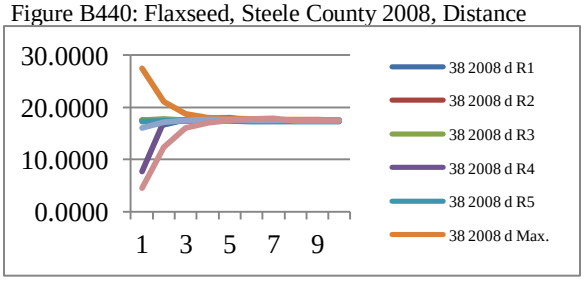


Figure B441: Flaxseed, La Moure County 2008, Contiguity

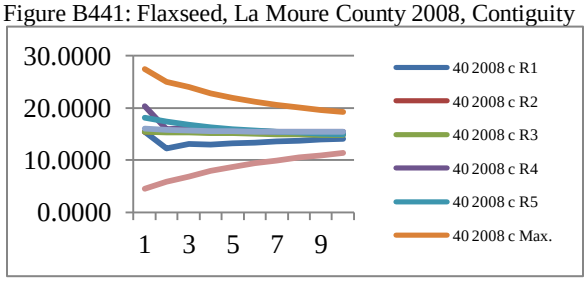


Figure B442: Flaxseed, La Moure County 2008, Distance

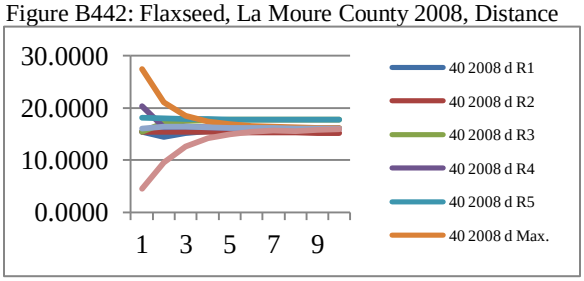


Figure B443: Flaxseed, Ransom County 2008, Contiguity

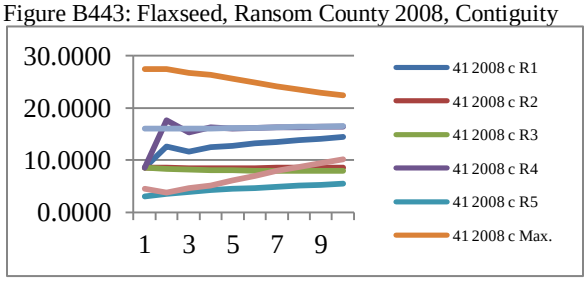


Figure B444: Flaxseed, Ransom County 2008, Distance

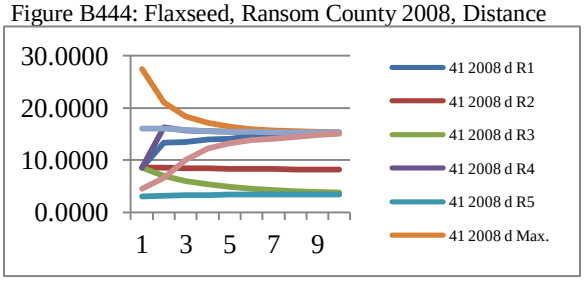


Figure B445: Flaxseed, McIntosh County 2008, Contiguity

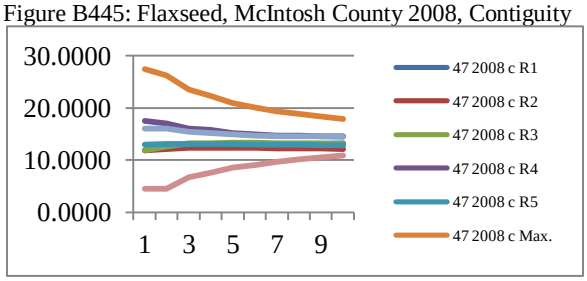


Figure B446: Flaxseed, McIntosh County 2008, Distance

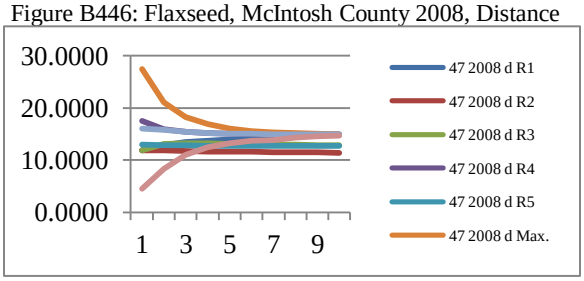


Figure B447: Flaxseed, Stark County 2008, Contiguity

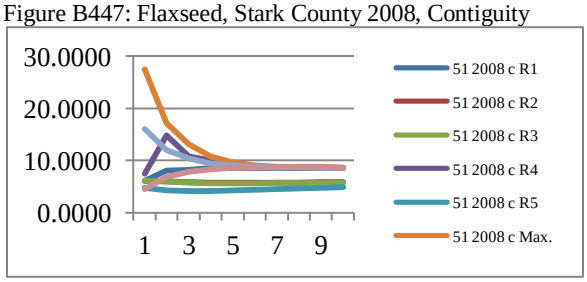


Figure B448: Flaxseed, Stark County 2008, Distance

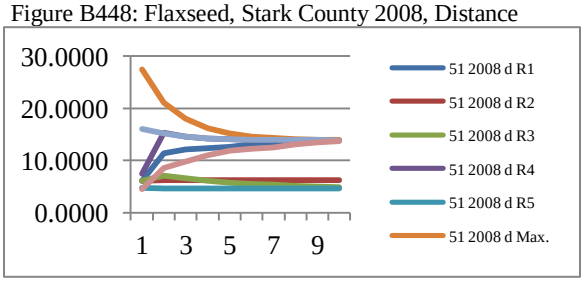


Figure B449: Flaxseed, Traill County 2008, Contiguity

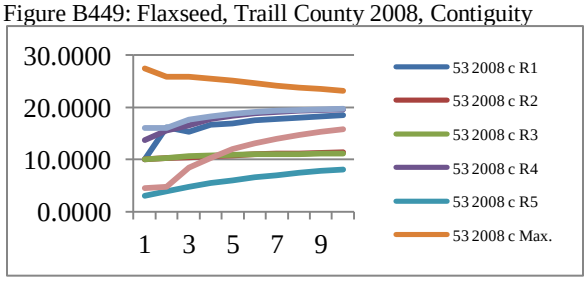


Figure B450: Flaxseed, Traill County 2008, Distance

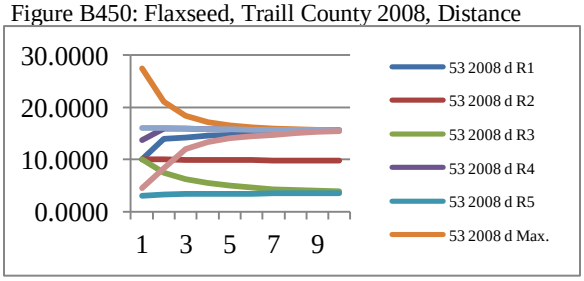


Figure B451: Flaxseed, McHenry County 2009, Contiguity

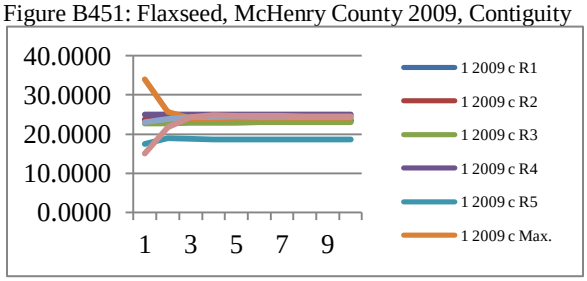


Figure B452: Flaxseed, McHenry County 2009, Distance

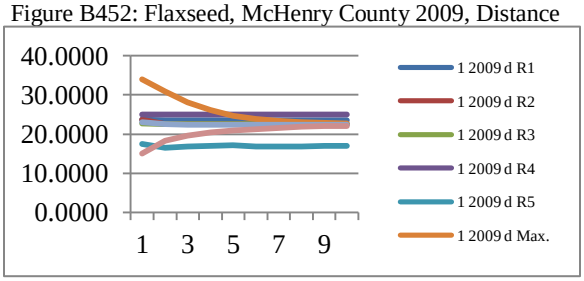


Figure B453: Flaxseed, Walsh County 2009, Contiguity

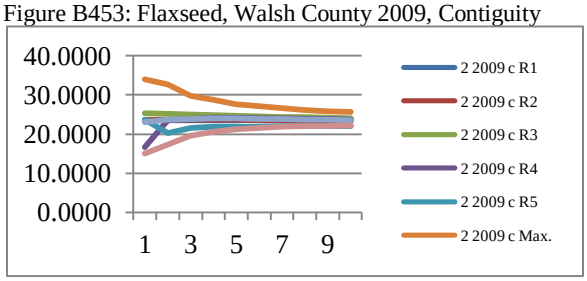


Figure B454: Flaxseed, Walsh County 2009, Distance

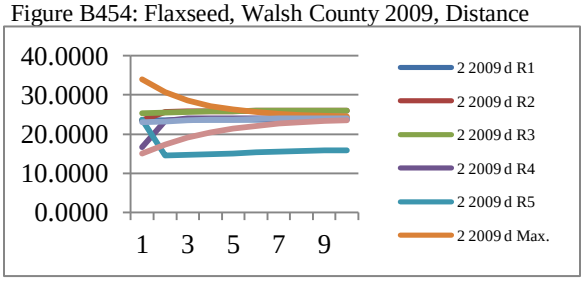


Figure B455: Flaxseed, Renville County 2009, Contiguity

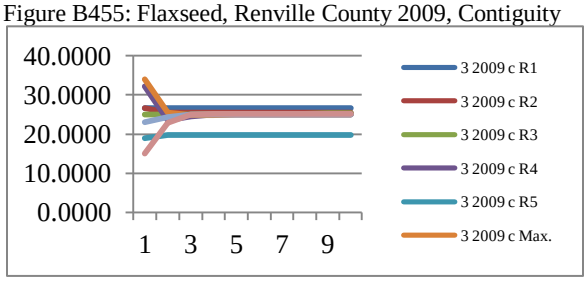


Figure B456: Flaxseed, Renville County 2009, Distance

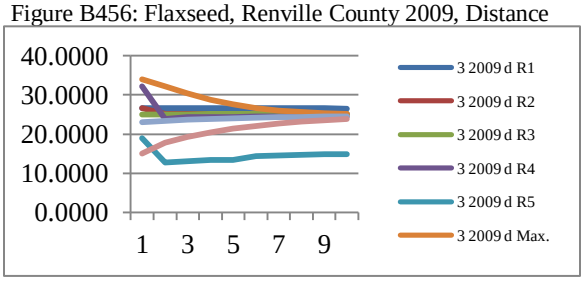


Figure B457: Flaxseed, Wells County 2009, Contiguity

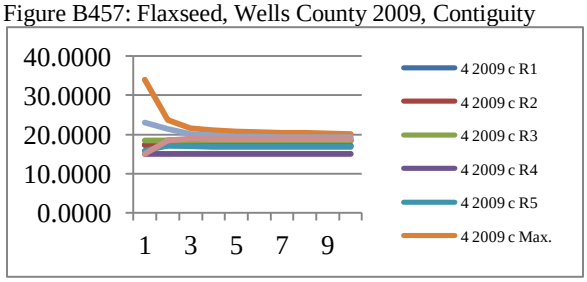


Figure B458: Flaxseed, Wells County 2009, Distance

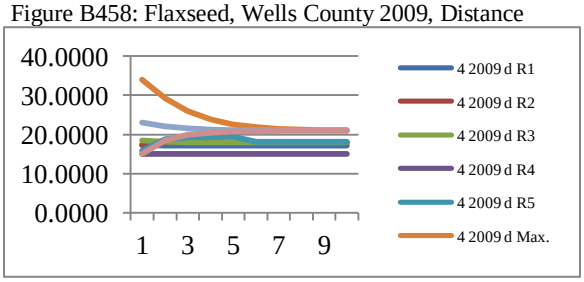


Figure B459: Flaxseed, Bowman County 2009, Contiguity

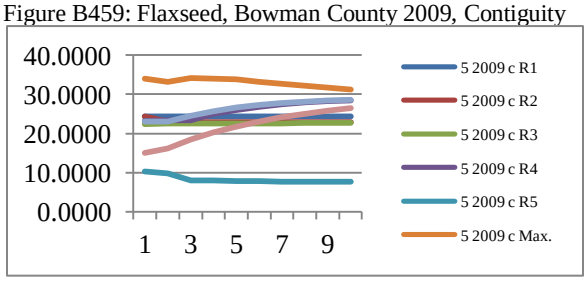


Figure B460: Flaxseed, Bowman County 2009, Distance

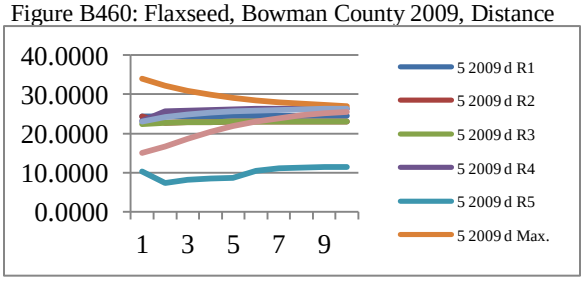


Figure B461: Flaxseed, Emmons County 2009, Contiguity

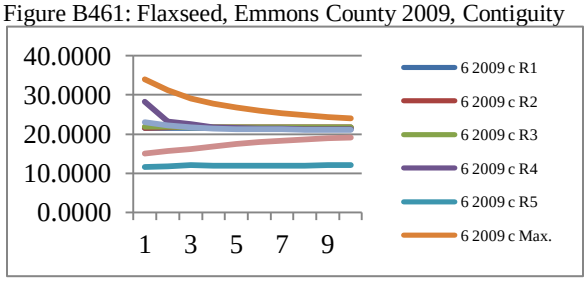


Figure B462: Flaxseed, Emmons County 2009, Distance

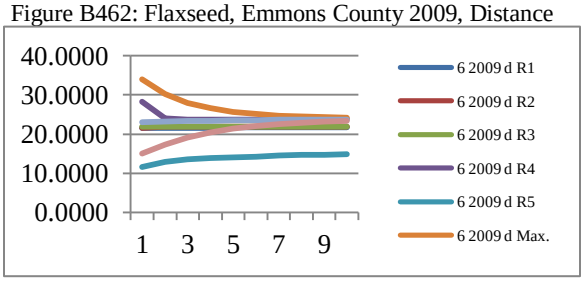


Figure B463: Flaxseed, Sargent County 2009, Contiguity

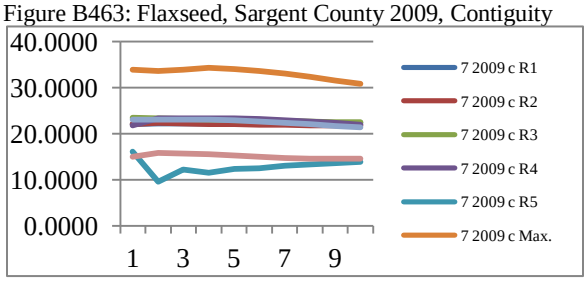


Figure B464: Flaxseed, Sargent County 2009, Distance

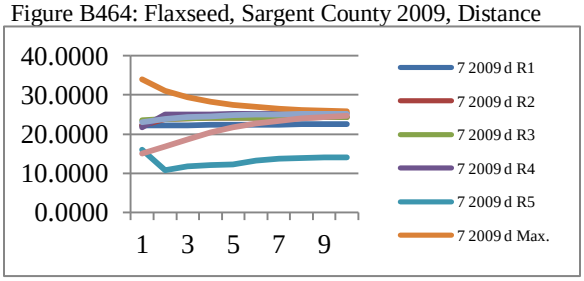


Figure B465: Flaxseed, Richland County 2009, Contiguity

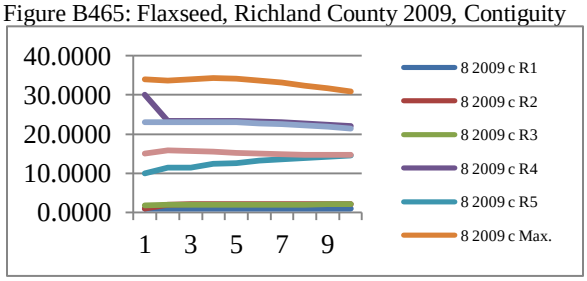


Figure B466: Flaxseed, Richland County 2009, Distance

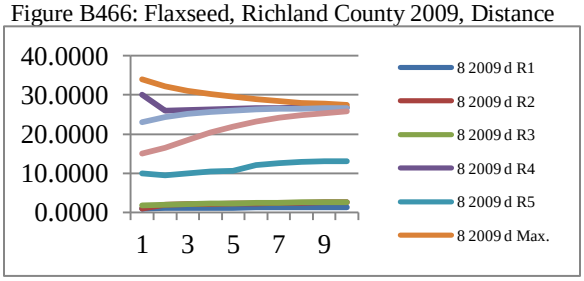


Figure B467: Flaxseed, McKenzie County 2009, Contiguity

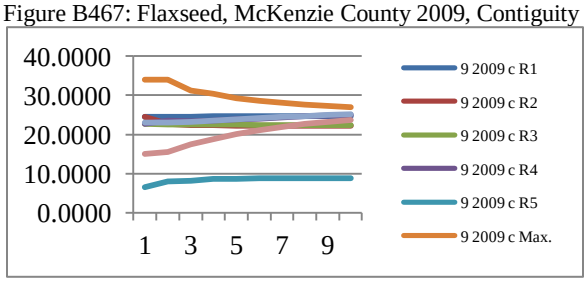


Figure B468: Flaxseed, McKenzie County 2009, Distance

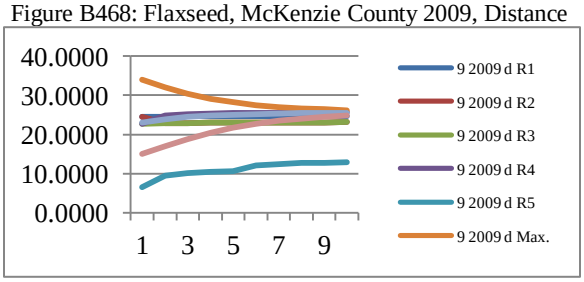


Figure B469: Flaxseed, Williams County 2009, Contiguity

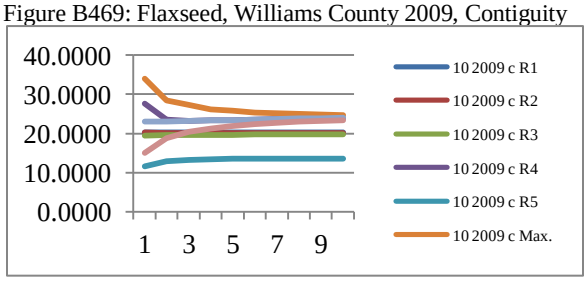


Figure B470: Flaxseed, Williams County 2009, Distance

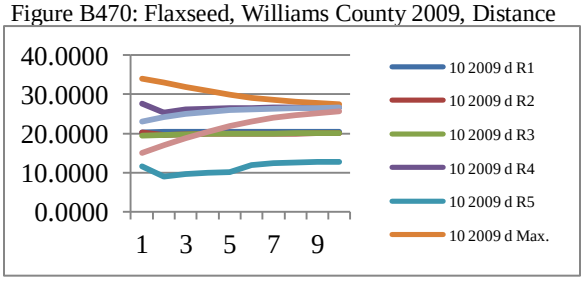


Figure B471: Flaxseed, Dunn County 2009, Contiguity

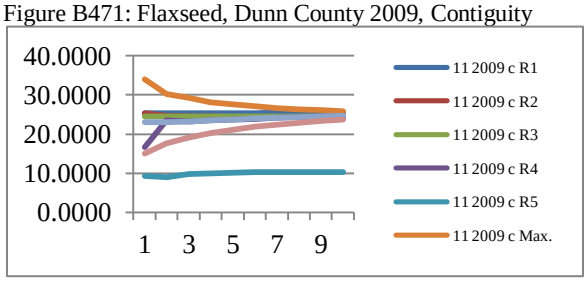


Figure B472: Flaxseed, Dunn County 2009, Distance

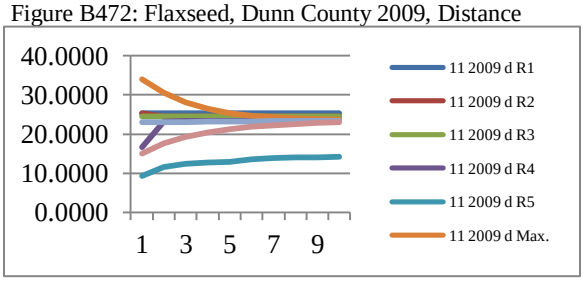


Figure B473: Flaxseed, Eddy County 2009, Contiguity

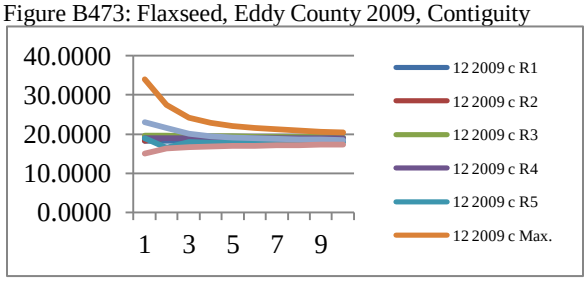


Figure B474: Flaxseed, Eddy County 2009, Distance

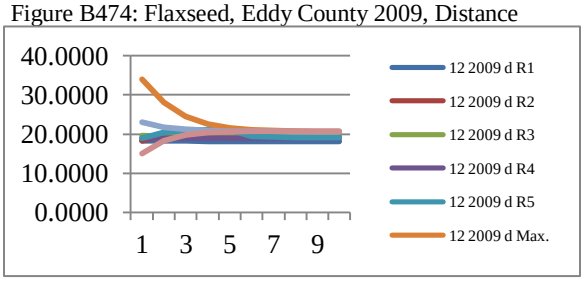


Figure B475: Flaxseed, Golden Valley County 2009, Conti.

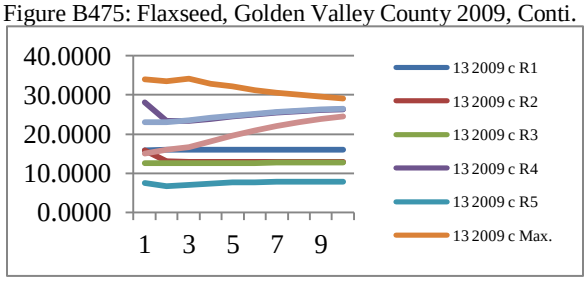


Figure B476: Flaxseed, Golden Valley County 2009, Dist.

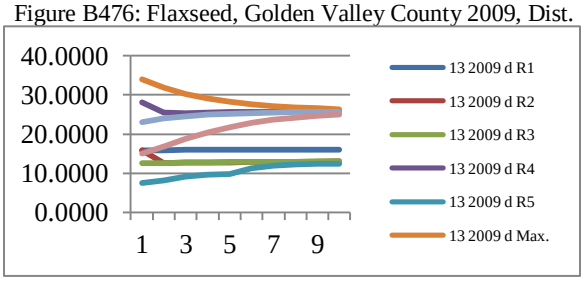


Figure B477: Flaxseed, Kidder County 2009, Contiguity

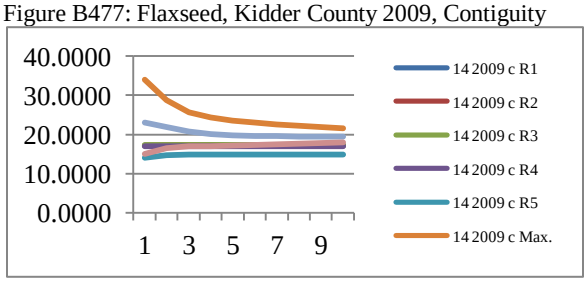


Figure B478: Flaxseed, Kidder County 2009, Distance

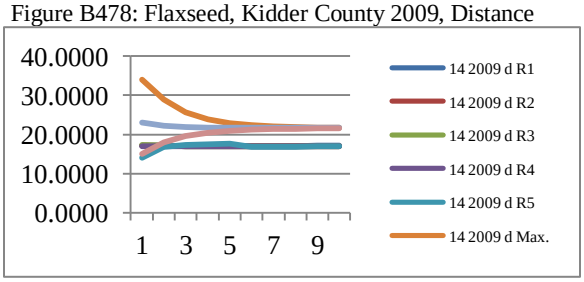


Figure B479: Flaxseed, Pierce County 2009, Contiguity

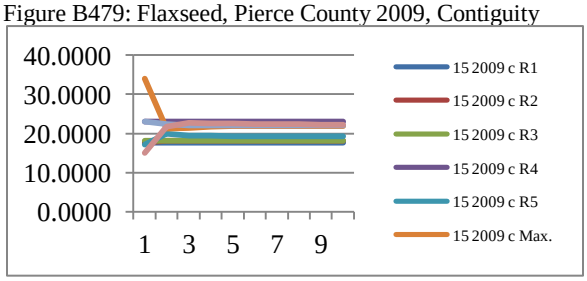


Figure B480: Flaxseed, Pierce County 2009, Distance

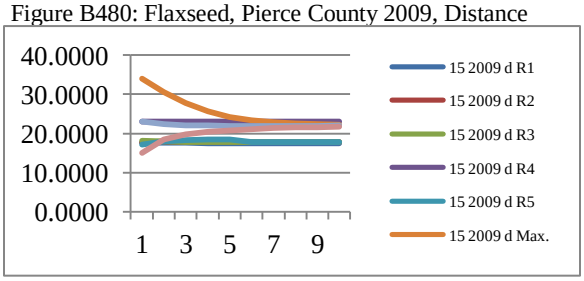


Figure B481: Flaxseed, Foster County 2009, Contiguity

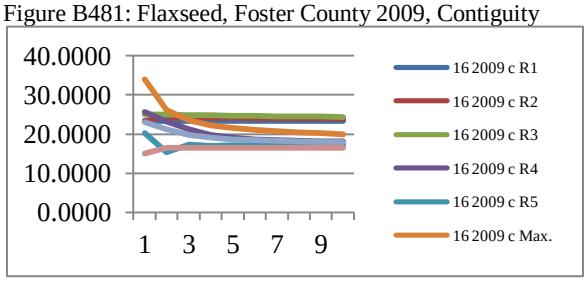


Figure B482: Flaxseed, Foster County 2009, Distance

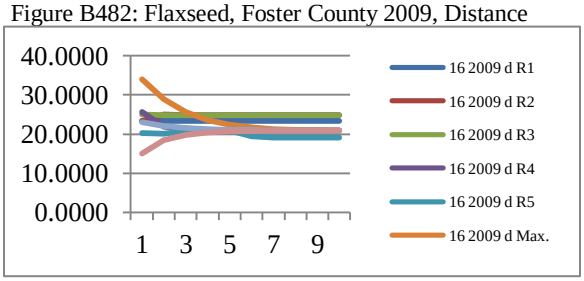


Figure B483: Flaxseed, Logan County 2009, Contiguity

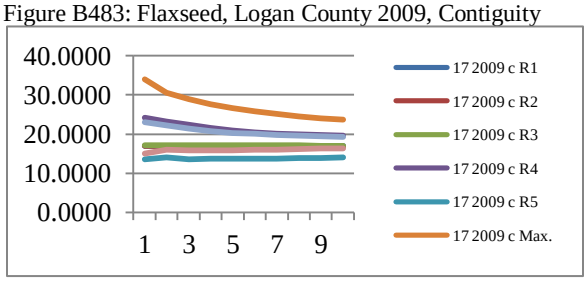


Figure B484: Flaxseed, Logan County 2009, Distance

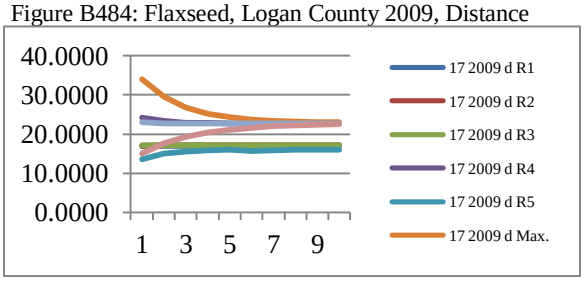


Figure B485: Flaxseed, Mountrail County 2009, Contiguity

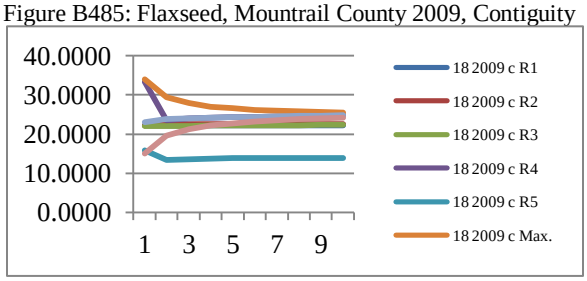


Figure B486: Flaxseed, Mountrail County 2009, Distance

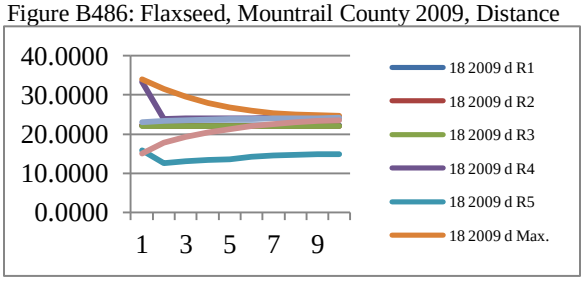


Figure B487: Flaxseed, Sheridan County 2009, Contiguity

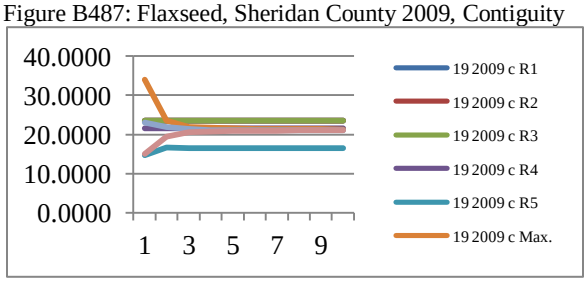


Figure B488: Flaxseed, Sheridan County 2009, Distance

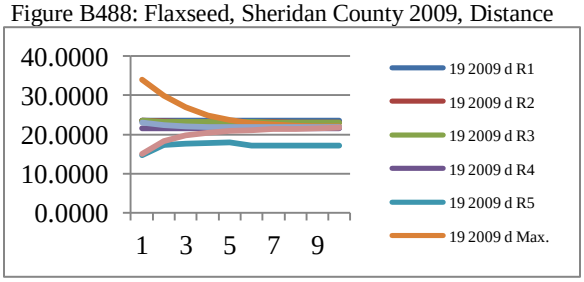


Figure B489: Flaxseed, Towner County 2009, Contiguity

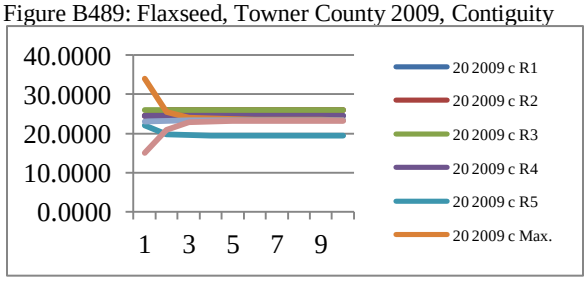


Figure B490: Flaxseed, Towner County 2009, Distance

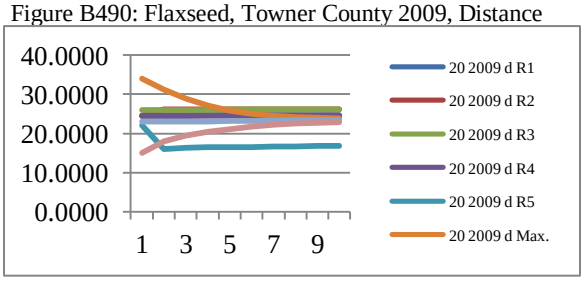


Figure B491: Flaxseed, Slope County 2009, Contiguity

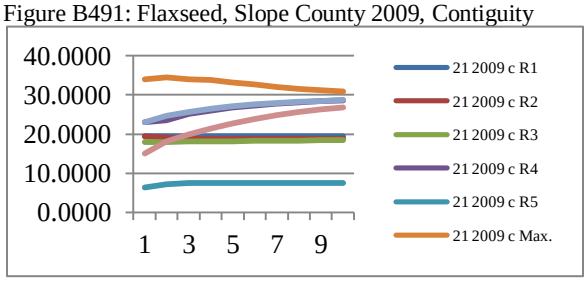


Figure B492: Flaxseed, Slope County 2009, Distance

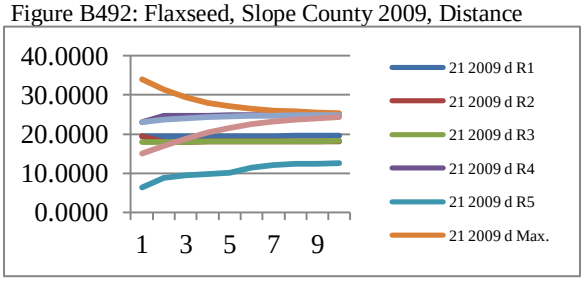


Figure B493: Flaxseed, McLean County 2009, Contiguity

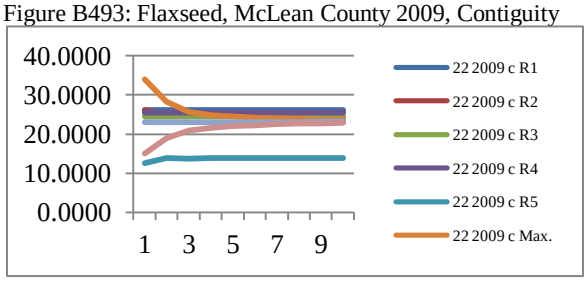


Figure B494: Flaxseed, McLean County 2009, Distance

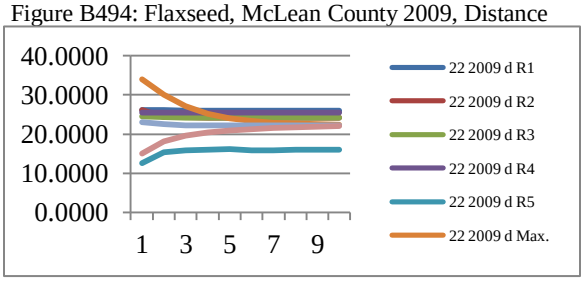


Figure B495: Flaxseed, Morton County 2009, Contiguity

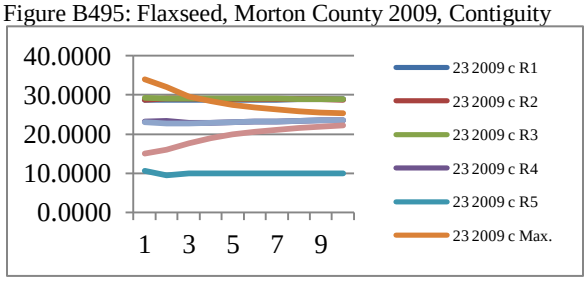


Figure B496: Flaxseed, Morton County 2009, Distance

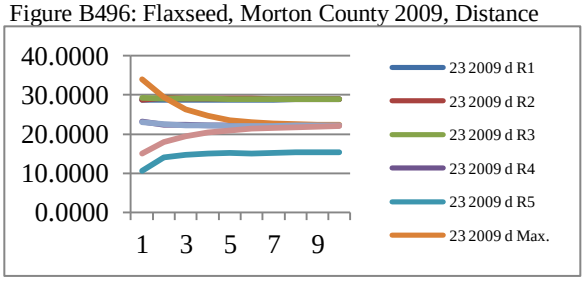


Figure B497: Flaxseed, Ward County 2009, Contiguity

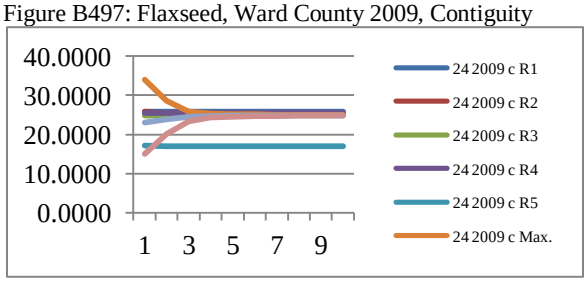


Figure B498: Flaxseed, Ward County 2009, Distance

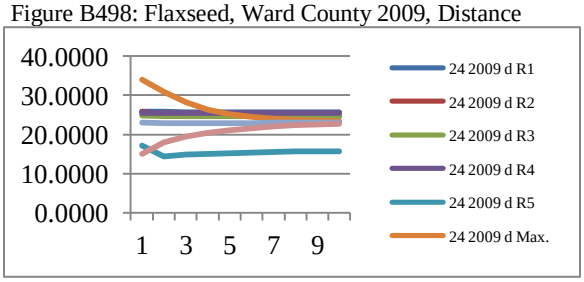


Figure B499: Flaxseed, Bottineau County 2009, Contiguity

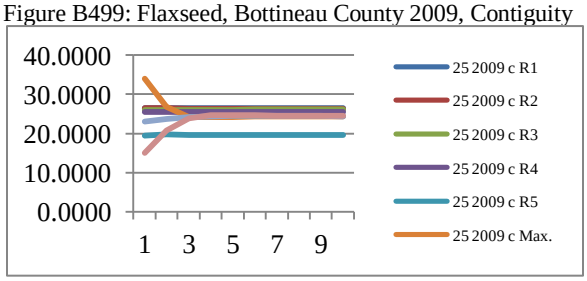


Figure B500: Flaxseed, Bottineau County 2009, Distance

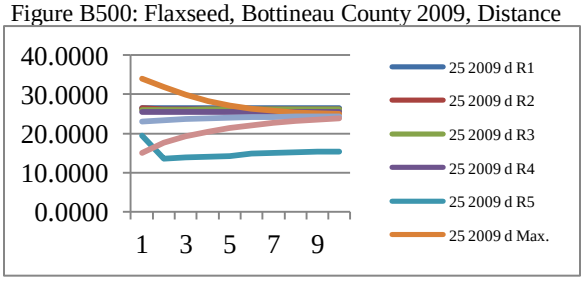


Figure B501: Flaxseed, Grant County 2009, Contiguity

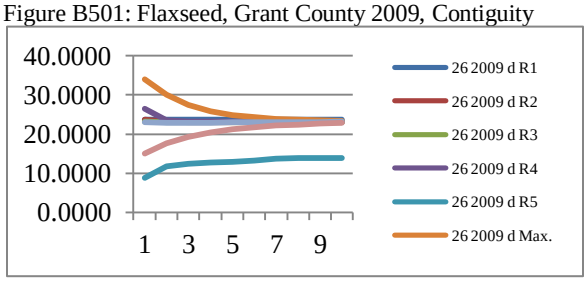


Figure B502: Flaxseed, Grant County 2009, Distance

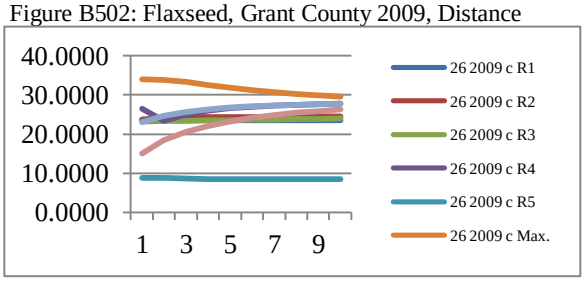


Figure B503: Flaxseed, Pembina County 2009, Contiguity

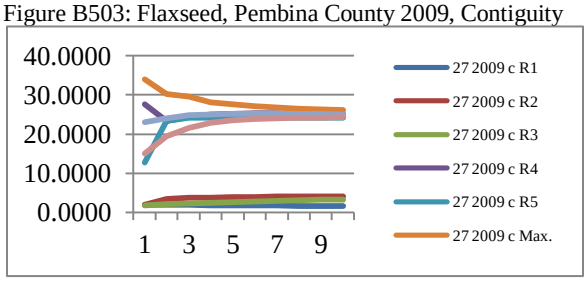


Figure B504: Flaxseed, Pembina County 2009, Distance

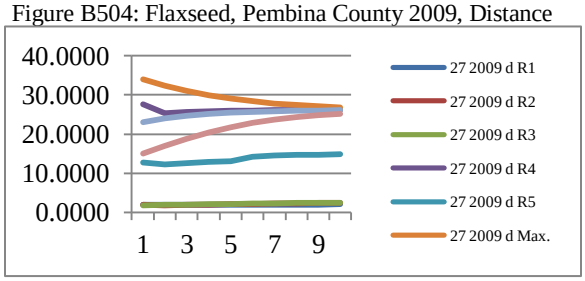


Figure B505: Flaxseed, Sioux County 2009, Contiguity

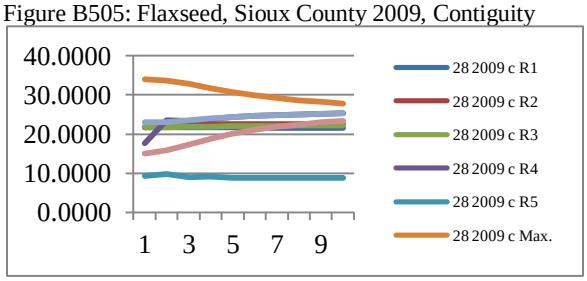


Figure B506: Flaxseed, Sioux County 2009, Distance

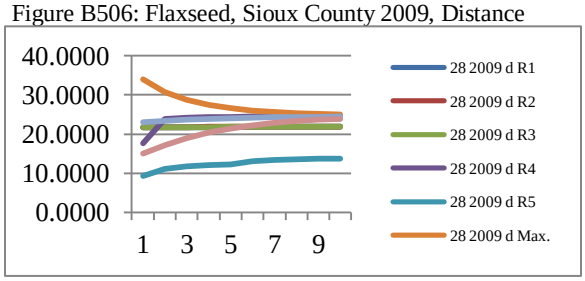


Figure B507: Flaxseed, Cass County 2009, Contiguity

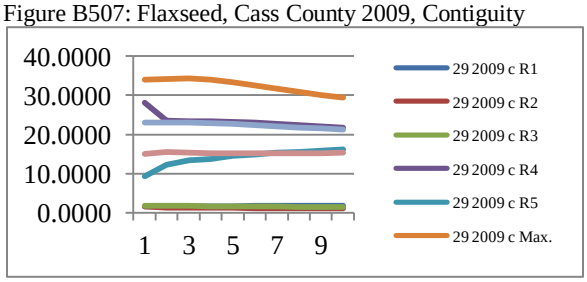


Figure B508: Flaxseed, Cass County 2009, Distance

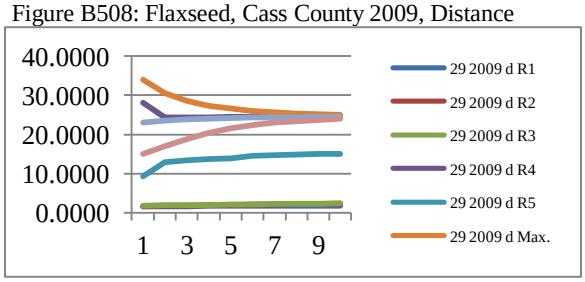


Figure B509: Flaxseed, Adams County 2009, Contiguity

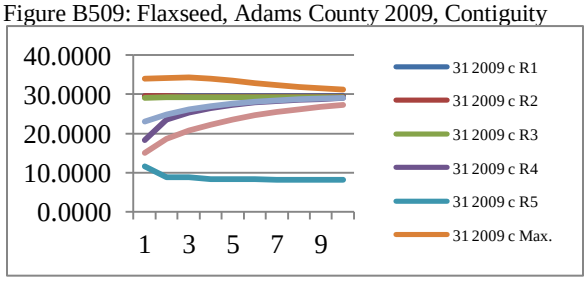


Figure B510: Flaxseed, Adams County 2009, Distance

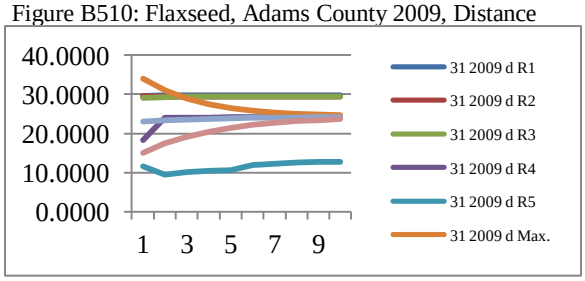


Figure B511: Flaxseed, Barnes County 2009, Contiguity

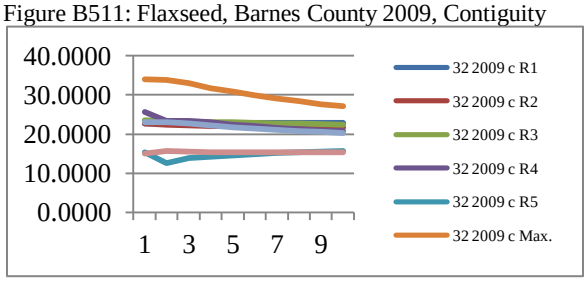


Figure B512: Flaxseed, Barnes County 2009, Distance

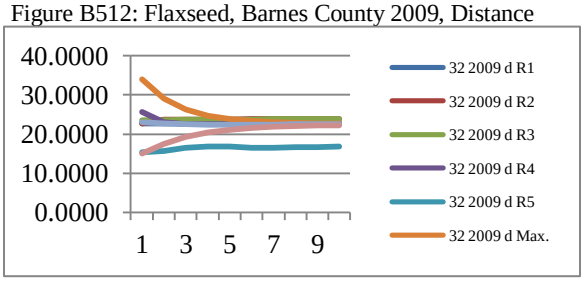


Figure B513: Flaxseed, Dickey County 2009, Contiguity

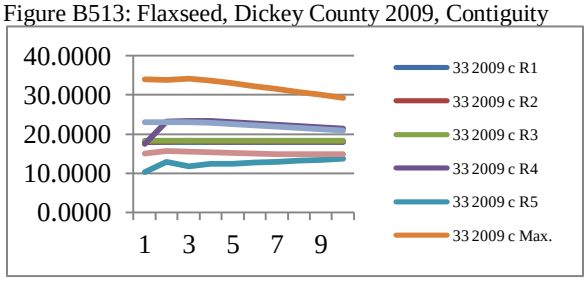


Figure B514: Flaxseed, Dickey County 2009, Distance

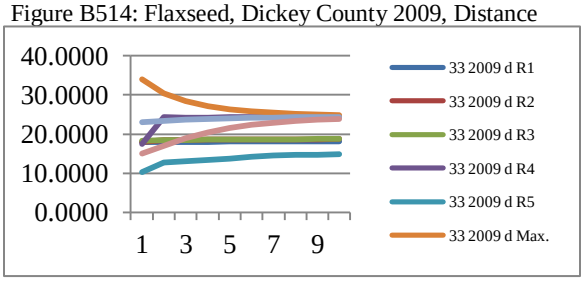


Figure B515: Flaxseed, Griggs County 2009, Contiguity

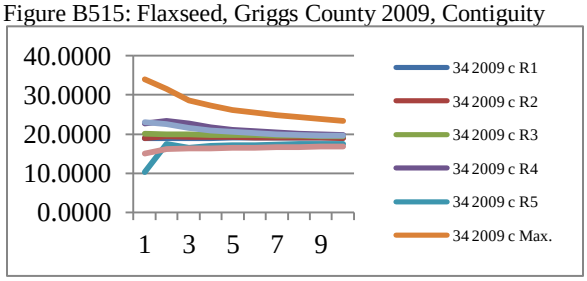


Figure B516: Flaxseed, Griggs County 2009, Distance

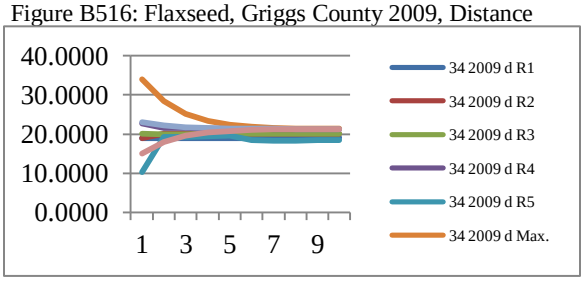


Figure B517: Flaxseed, Oliver County 2009, Contiguity

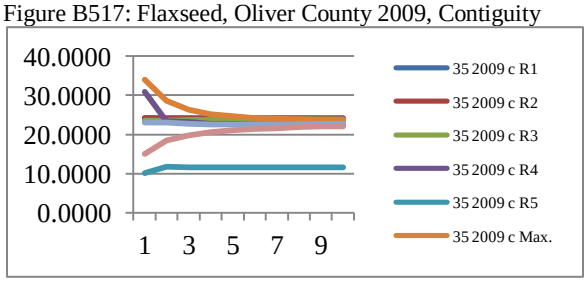


Figure B518: Flaxseed, Oliver County 2009, Distance

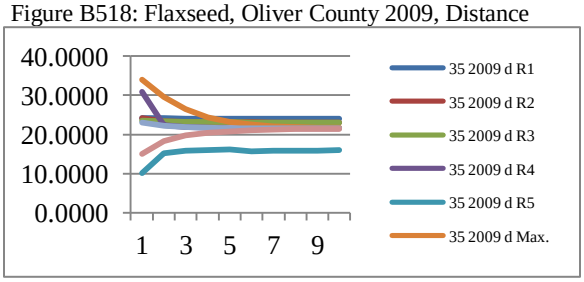


Figure B519: Flaxseed, Billings County 2009, Contiguity

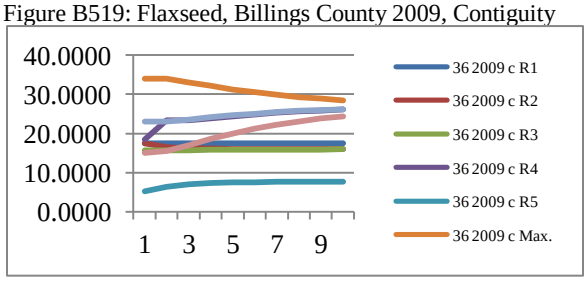


Figure B520: Flaxseed, Billings County 2009, Distance

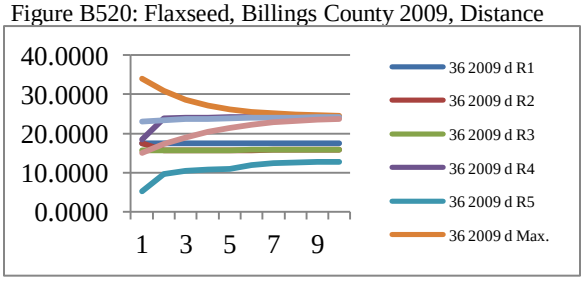


Figure B521: Flaxseed, Grand Forks Cnty 2009, Contiguity

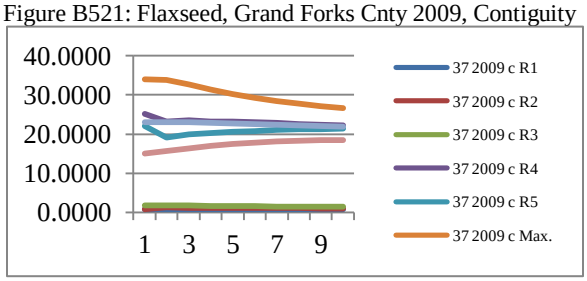


Figure B522: Flaxseed, Grand Forks Cnty 2009, Distance

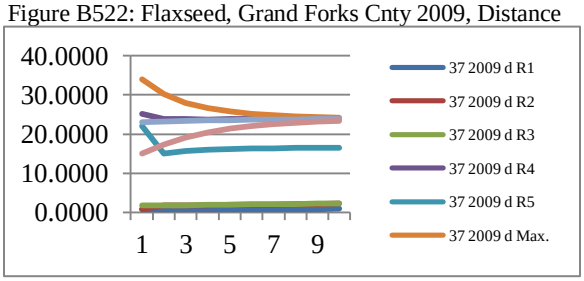


Figure B523: Flaxseed, Steele County 2009, Contiguity

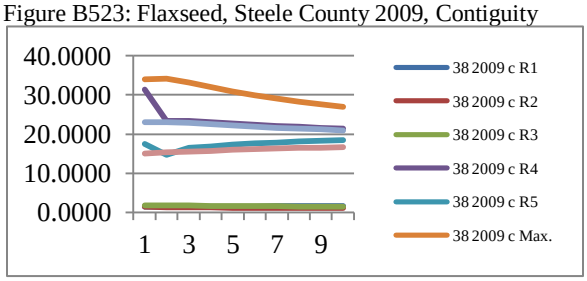


Figure B524: Flaxseed, Steele County 2009, Distance

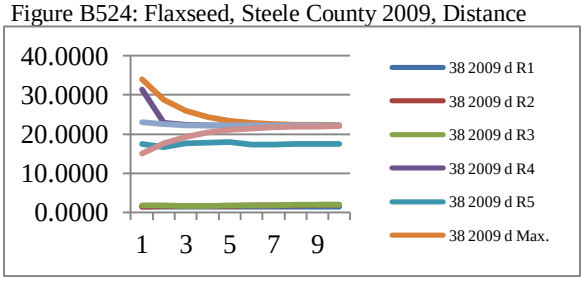


Figure B525: Flaxseed, Divide County 2009, Contiguity

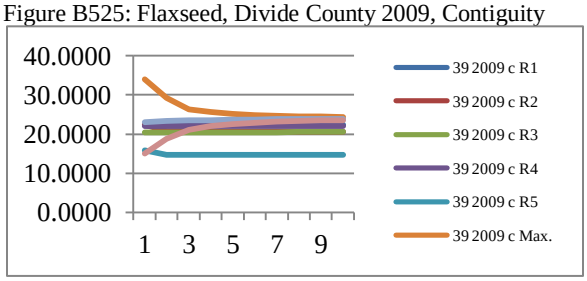


Figure B526: Flaxseed, Divide County 2009, Distance

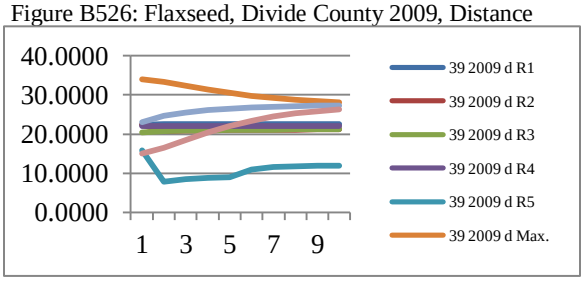


Figure B527: Flaxseed, La Moure County 2009, Contiguity

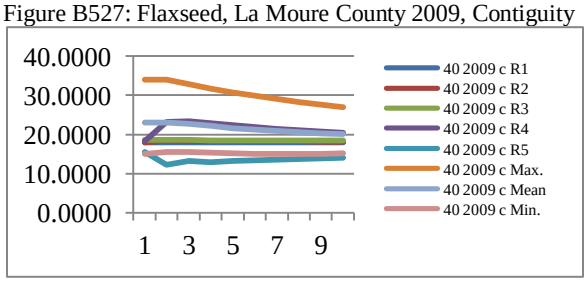


Figure B528: Flaxseed, La Moure County 2009, Distance

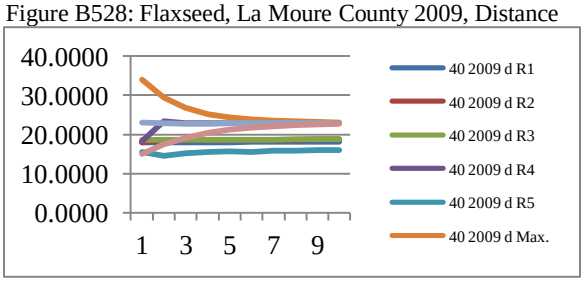


Figure B529: Flaxseed, Ransom County 2009, Contiguity

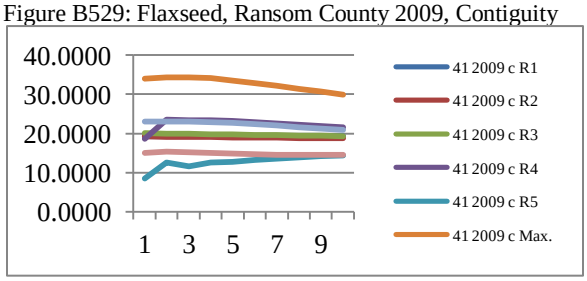


Figure B530: Flaxseed, Ransom County 2009, Distance

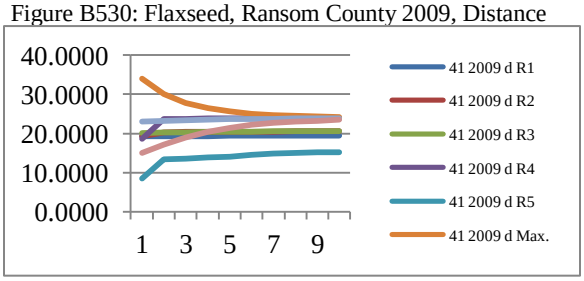


Figure B531: Flaxseed, Stutsman County 2009, Contiguity

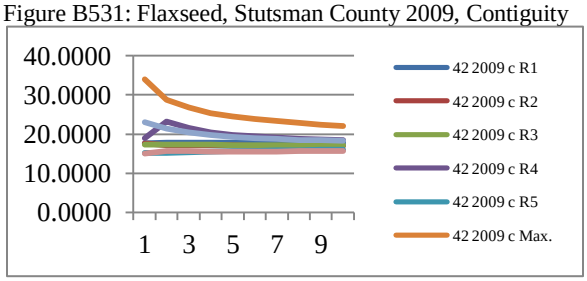


Figure B532: Flaxseed, Stutsman County 2009, Distance

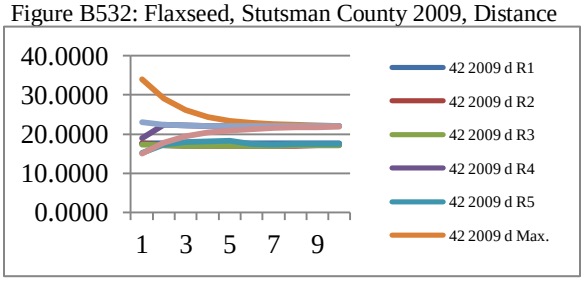


Figure B533: Flaxseed, Burke County 2009, Contiguity

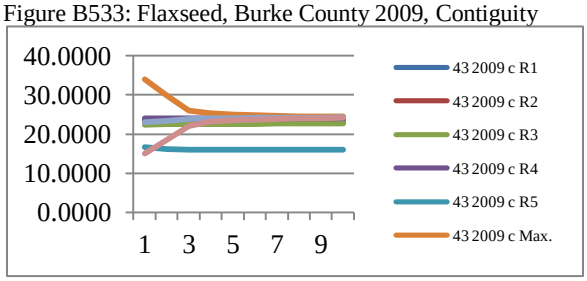


Figure B534: Flaxseed, Burke County 2009, Distance

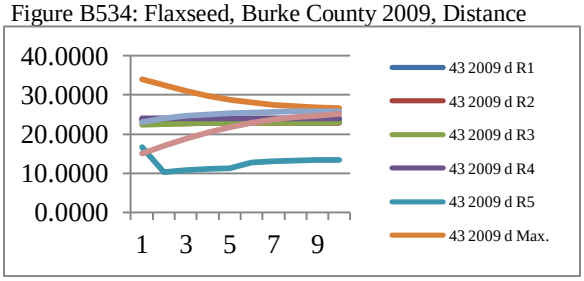


Figure B535: Flaxseed, Burleigh County 2009, Contiguity

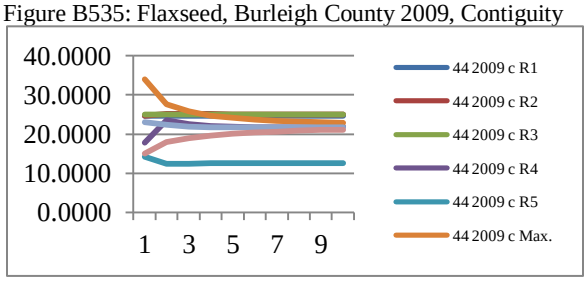


Figure B536: Flaxseed, Burleigh County 2009, Distance

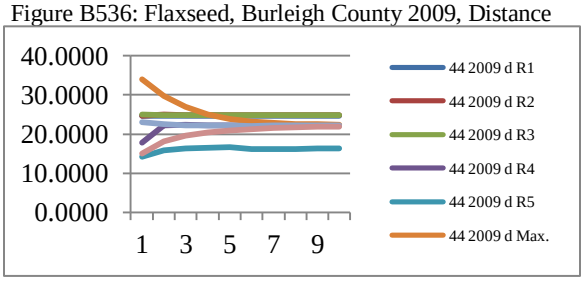


Figure B537: Flaxseed, Cavalier County 2009, Contiguity

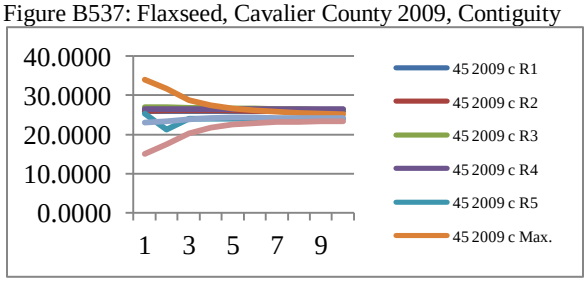


Figure B538: Flaxseed, Cavalier County 2009, Distance

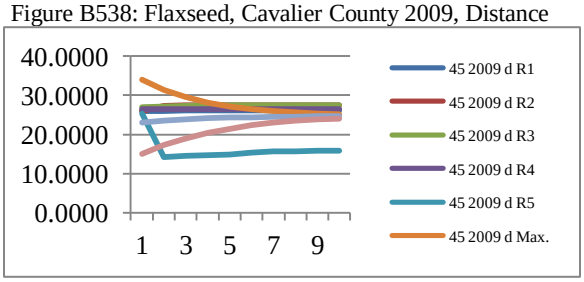


Figure B539: Flaxseed, Hettinger County 2009, Contiguity

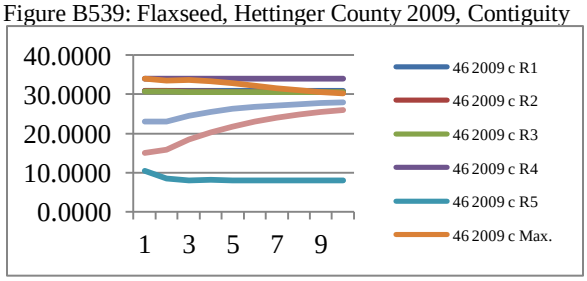


Figure B540: Flaxseed, Hettinger County 2009, Distance

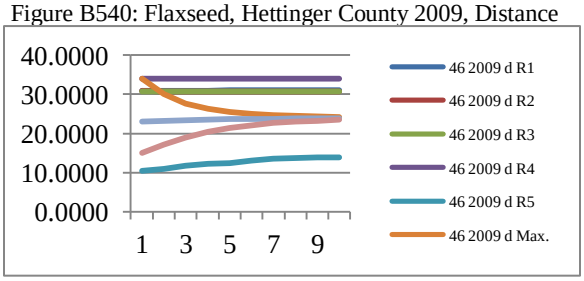


Figure B541: Flaxseed, McIntosh County 2009, Contiguity

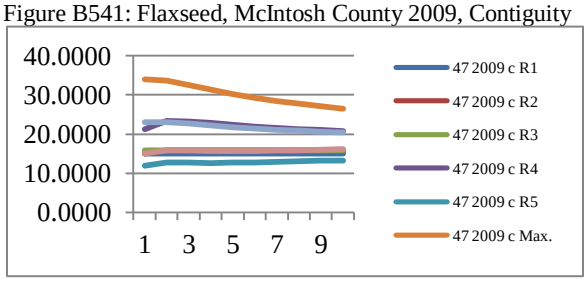


Figure B542: Flaxseed, McIntosh County 2009, Distance

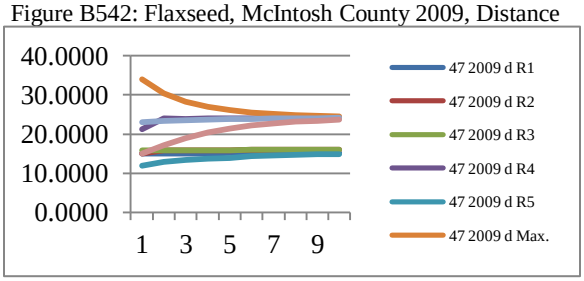


Figure B543: Flaxseed, Nelson County 2009, Contiguity

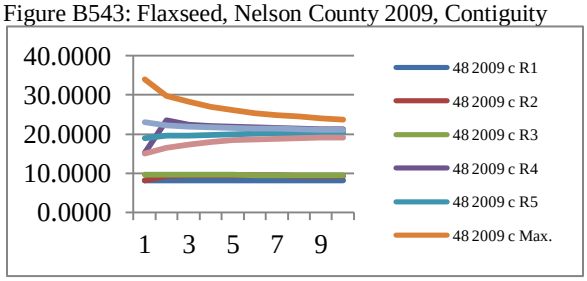


Figure B544: Flaxseed, Nelson County 2009, Distance

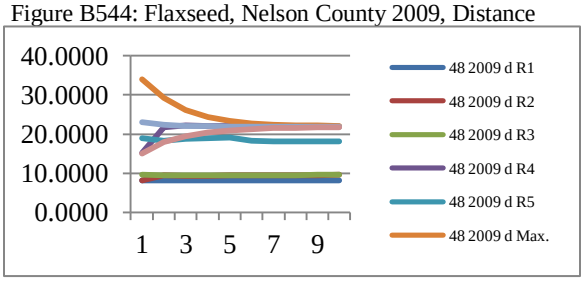


Figure B545: Flaxseed, Ramsey County 2009, Contiguity

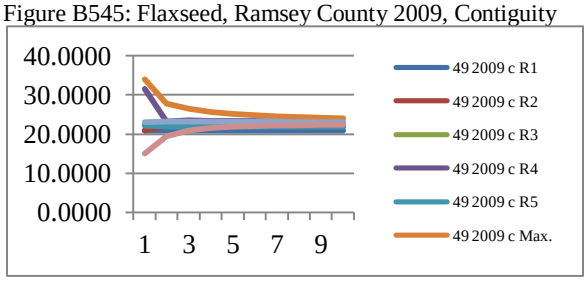


Figure B546: Flaxseed, Ramsey County 2009, Distance

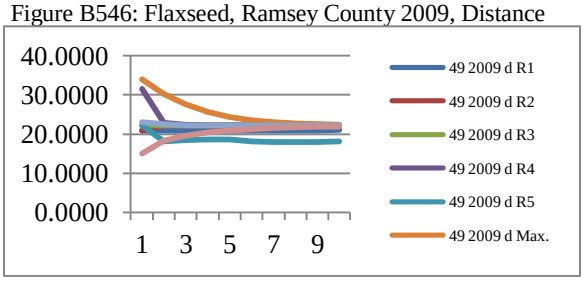


Figure B547: Flaxseed, Rolette County 2009, Contiguity

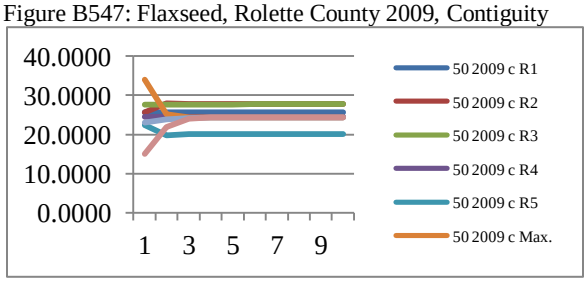


Figure B548: Flaxseed, Rolette County 2009, Distance

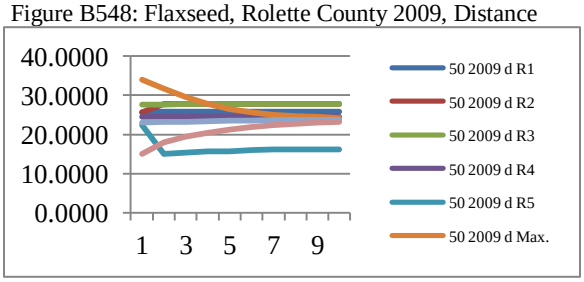


Figure B549: Flaxseed, Stark County 2009, Contiguity

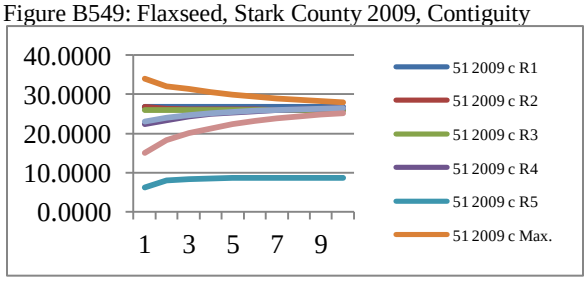


Figure B550: Flaxseed, Stark County 2009, Distance

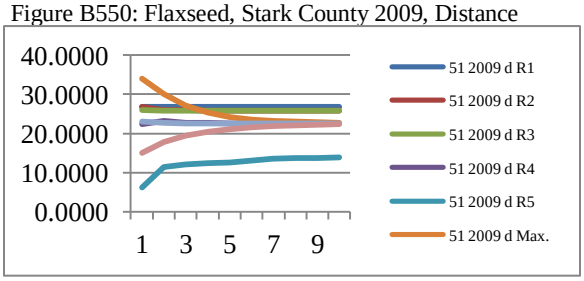


Figure B551: Flaxseed, Mercer County 2009, Contiguity

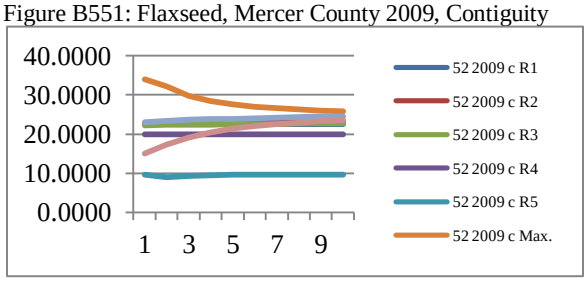


Figure B552: Flaxseed, Mercer County 2009, Distance

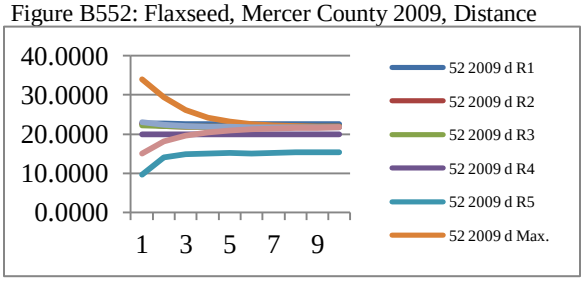


Figure B553: Flaxseed, Traill County 2009, Contiguity

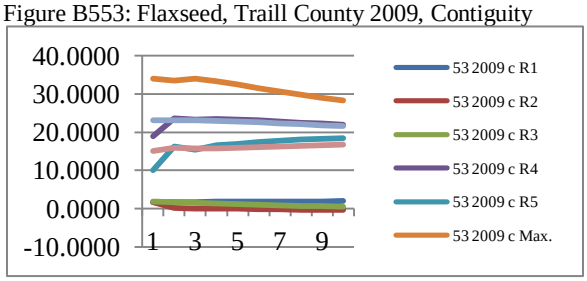


Figure B554: Flaxseed, Traill County 2009, Distance

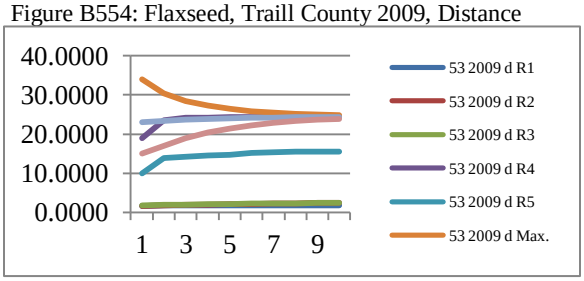


Figure B555: Flaxseed, Bowman County 2010, Contiguity

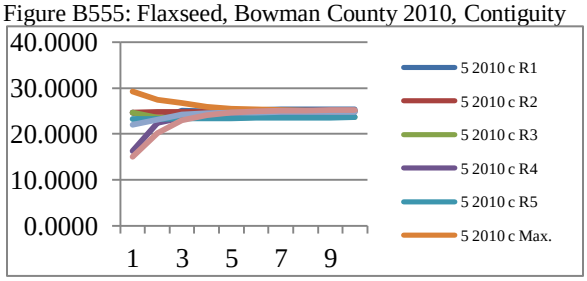


Figure B556: Flaxseed, Bowman County 2010, Distance

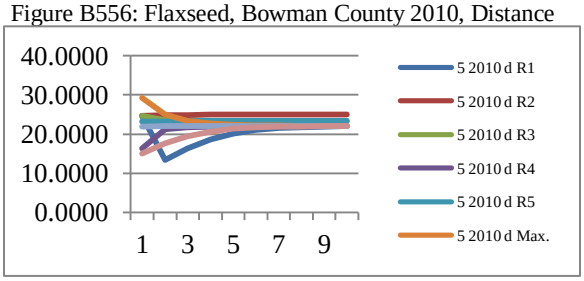


Figure B557: Flaxseed, Sargent County 2010, Contiguity

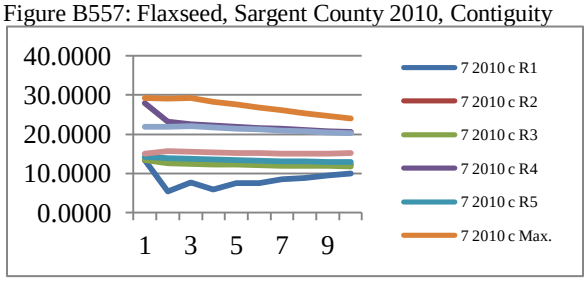


Figure B558: Flaxseed, Sargent County 2010, Distance

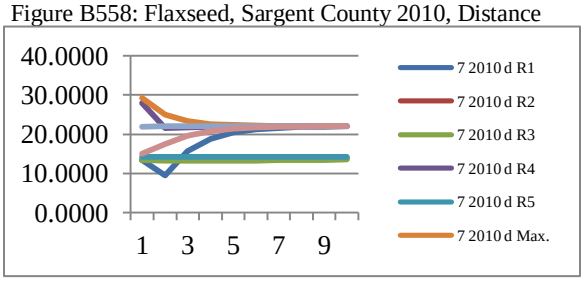


Figure B559: Flaxseed, Richland County 2010, Contiguity

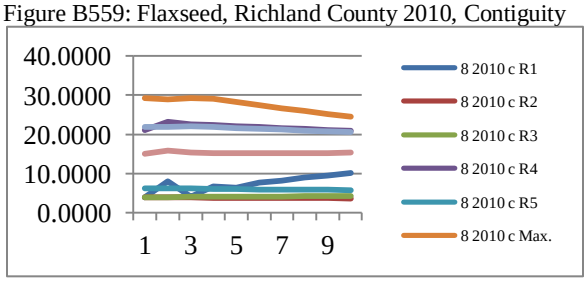


Figure B560: Flaxseed, Richland County 2010, Distance

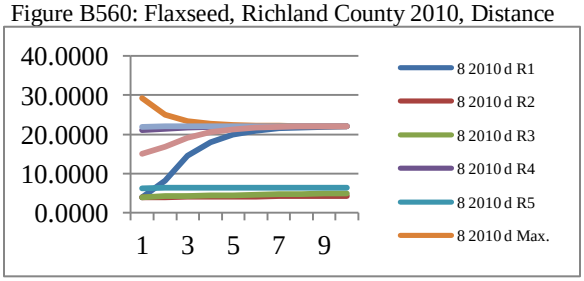


Figure B561: Flaxseed, Eddy County 2010, Contiguity

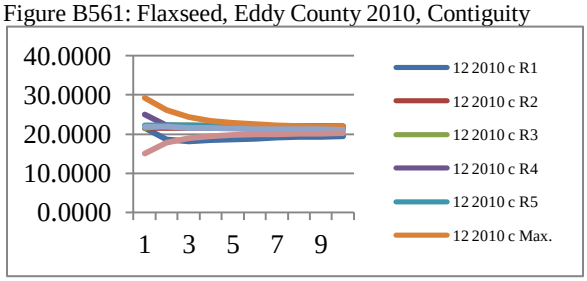


Figure B562: Flaxseed, Eddy County 2010, Distance

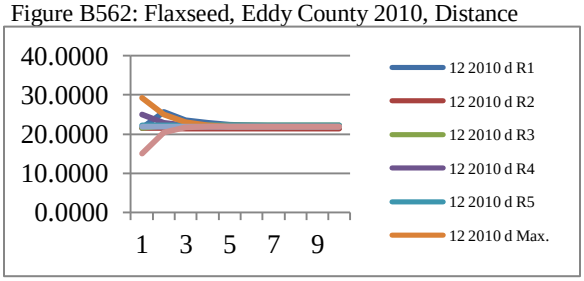


Figure B563: Flaxseed, Golden Valley County 2010, Cont.

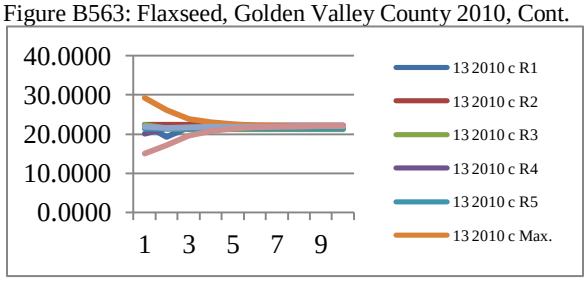


Figure B564: Flaxseed, Golden Valley County 2010, Dist.

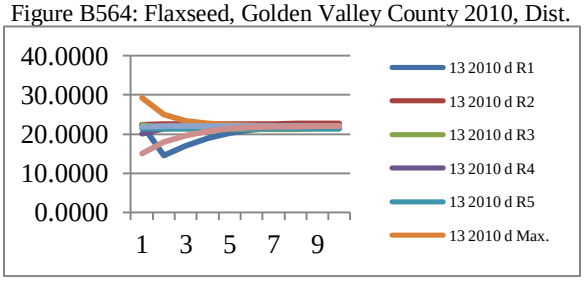


Figure B565: Flaxseed, Foster County 2010, Contiguity

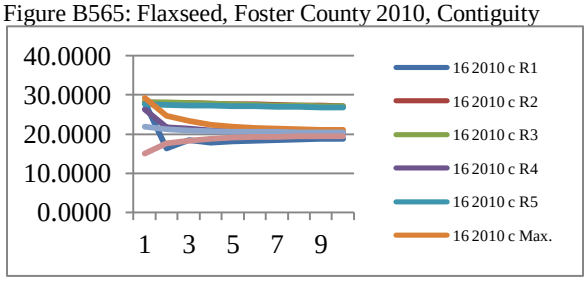


Figure B566: Flaxseed, Foster County 2010, Distance

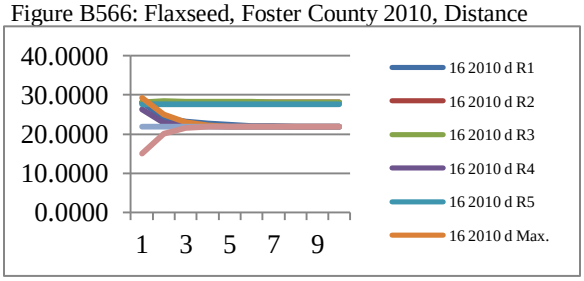


Figure B567: Flaxseed, Slope County 2010, Contiguity

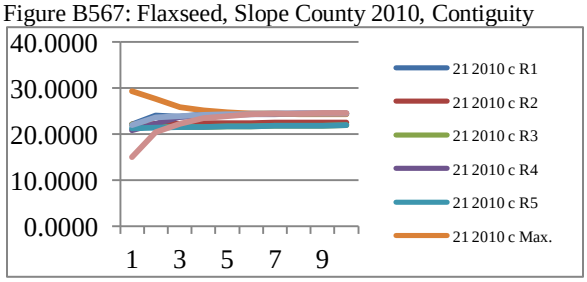


Figure B568: Flaxseed, Slope County 2010, Distance

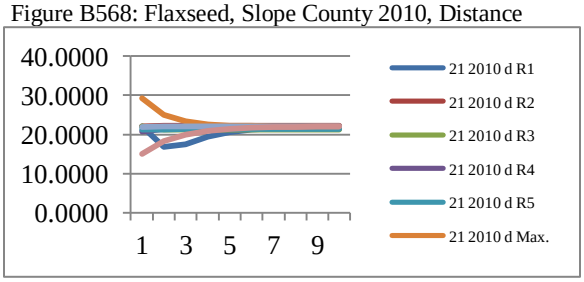


Figure B569: Flaxseed, Morton County 2010, Contiguity

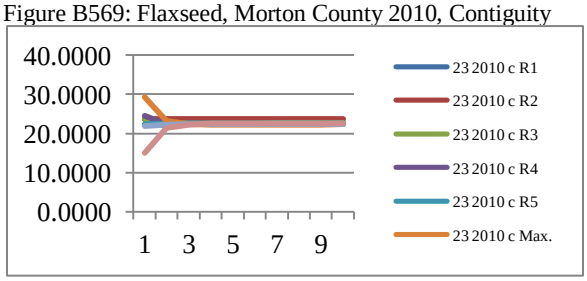


Figure B570: Flaxseed, Morton County 2010, Distance

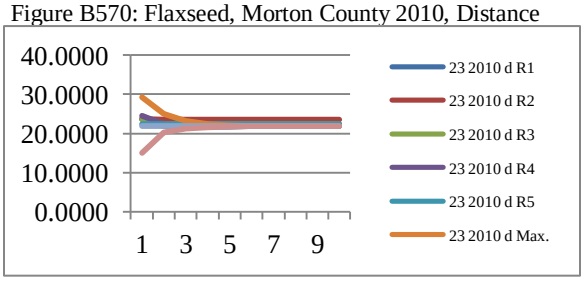


Figure B571: Flaxseed, Pembina County 2010, Contiguity

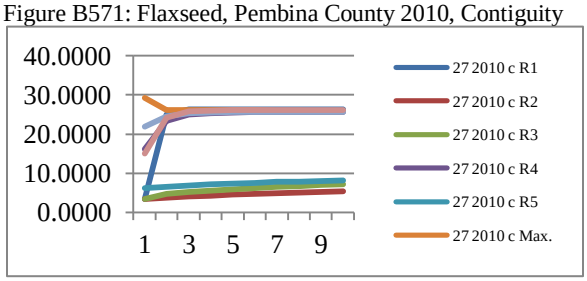


Figure B572: Flaxseed, Pembina County 2010, Distance

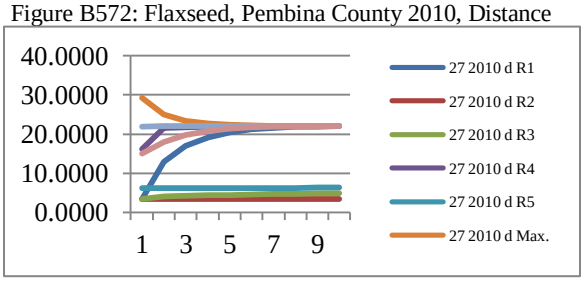


Figure B573: Flaxseed, Sioux County 2010, Contiguity

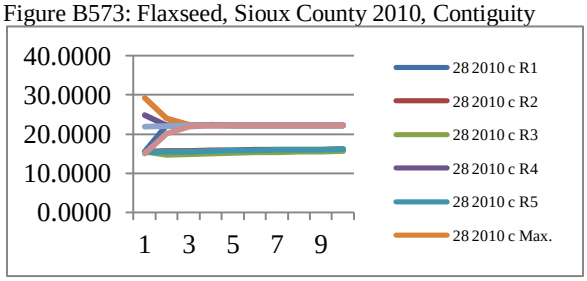


Figure B574: Flaxseed, Sioux County 2010, Distance

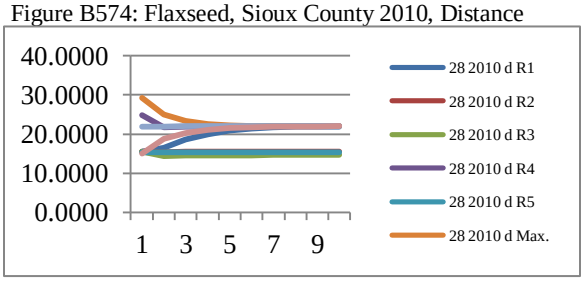


Figure B575: Flaxseed, Cass County 2010, Contiguity

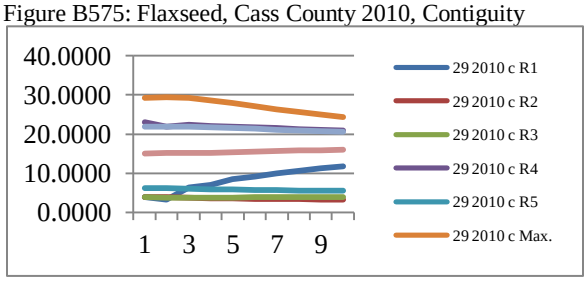


Figure B576: Flaxseed, Cass County 2010, Distance

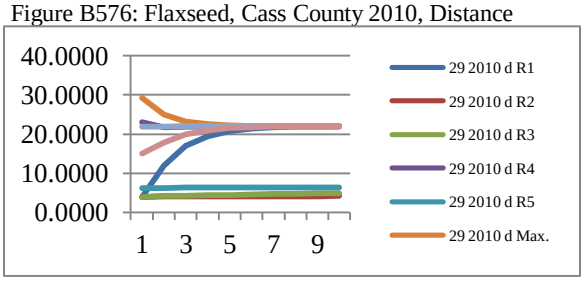


Figure B577: Flaxseed, Barnes County 2010, Contiguity

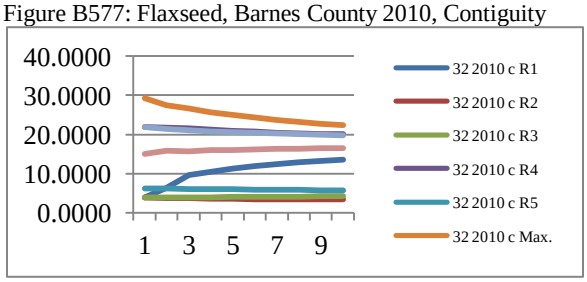


Figure B578: Flaxseed, Barnes County 2010, Distance

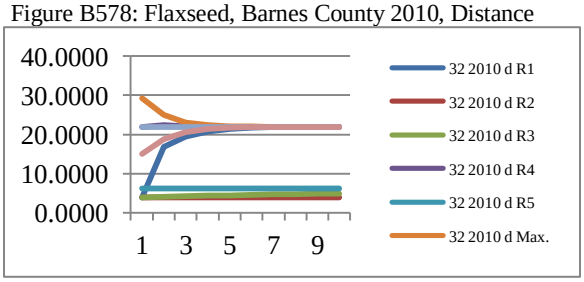


Figure B579: Flaxseed, Dickey County 2010, Contiguity

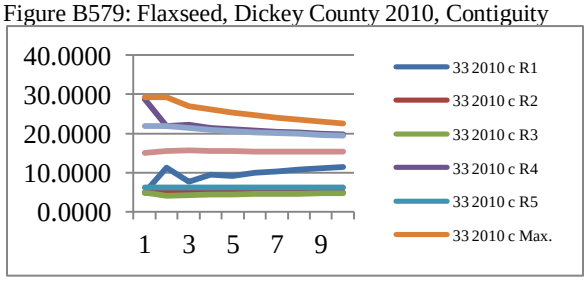


Figure B580: Flaxseed, Dickey County 2010, Distance

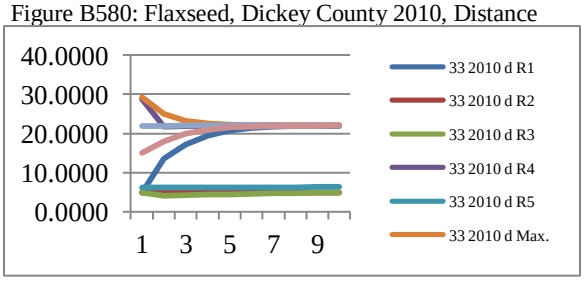


Figure B581: Flaxseed, Griggs County 2010, Contiguity

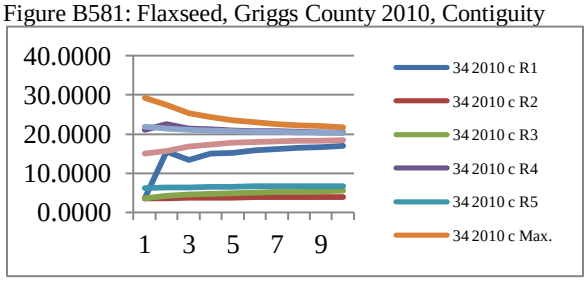


Figure B582: Flaxseed, Griggs County 2010, Distance

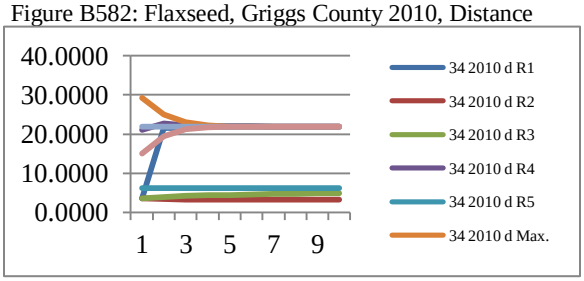


Figure B583: Flaxseed, Billings County 2010, Contiguity

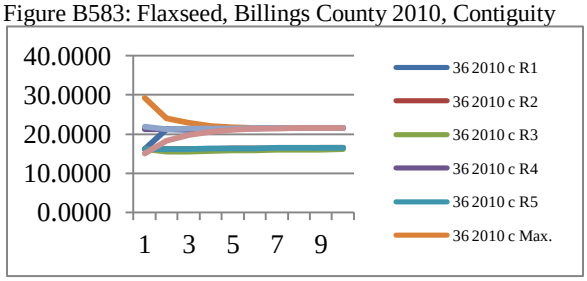


Figure B584: Flaxseed, Billings County 2010, Distance

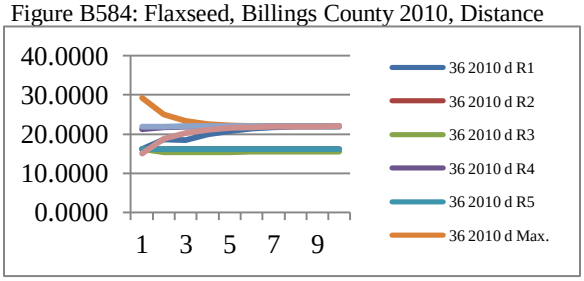


Figure B585: Flaxseed, Grand Forks Cnty 2010, Contiguity

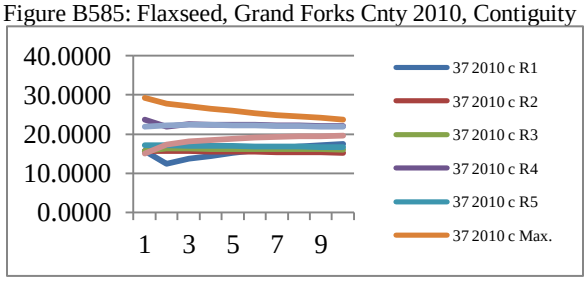


Figure B586: Flaxseed, Grand Forks Cnty 2010, Distance

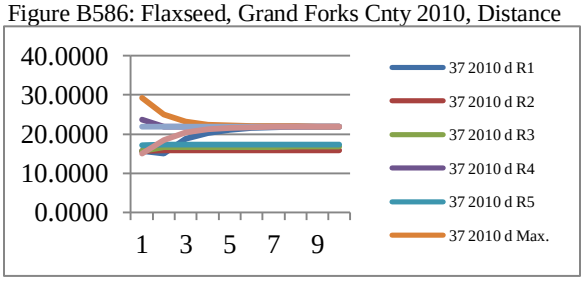


Figure B587: Flaxseed, Steele County 2010, Contiguity

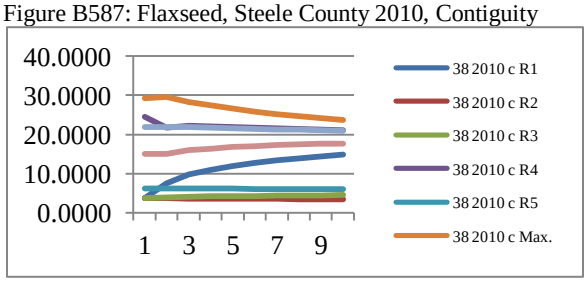


Figure B588: Flaxseed, Steele County 2010, Distance

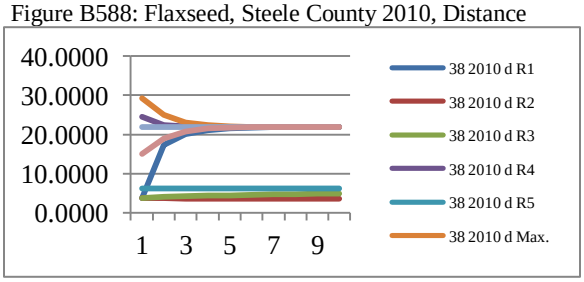


Figure B589: Flaxseed, La Moure County 2010, Contiguity

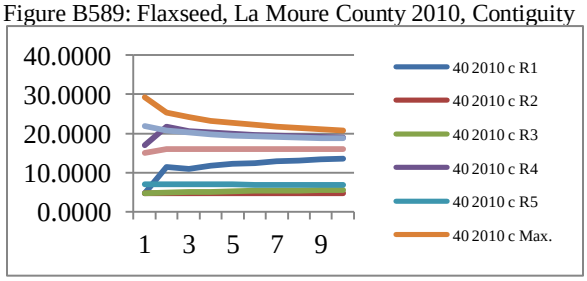


Figure B590: Flaxseed, La Moure County 2010, Distance

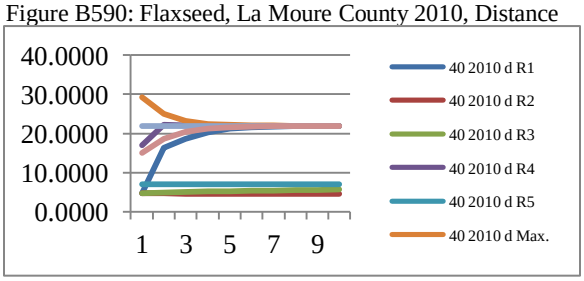


Figure B591: Flaxseed, Ransom County 2010, Contiguity

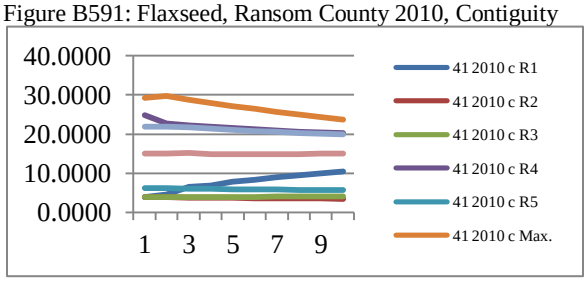


Figure B592: Flaxseed, Ransom County 2010, Distance

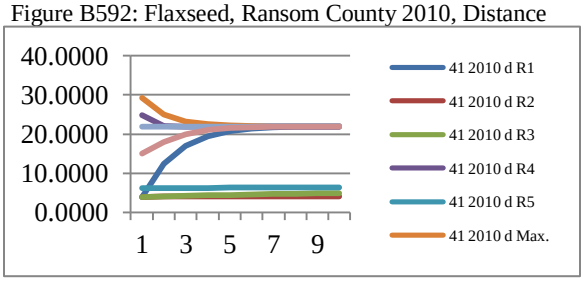


Figure B593: Flaxseed, McIntosh County 2010, Contiguity

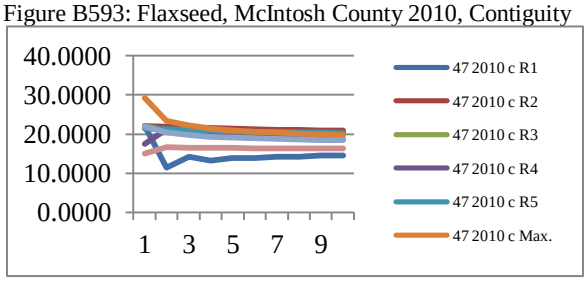


Figure B594: Flaxseed, McIntosh County 2010, Distance

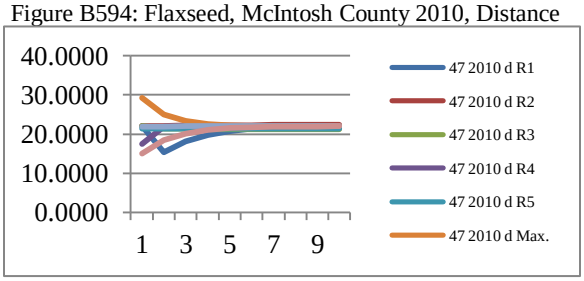


Figure B595: Flaxseed, Nelson County 2010, Contiguity

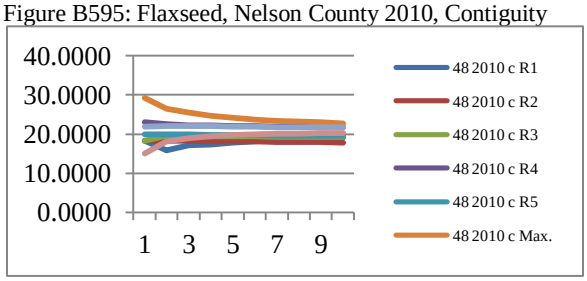
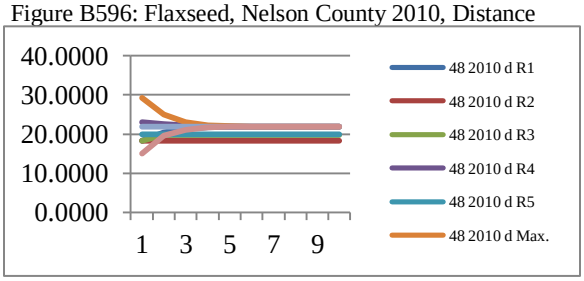


Figure B596: Flaxseed, Nelson County 2010, Distance



APPENDIX C. EQUATIONS

Equation C1. $NASS = \beta_1^x RMA + \beta_2^x LAT + \epsilon$[7]

Weather variable generic regression—latitude

Equation C2. $NASS = \beta_1^x RMA + \beta_2^x LNG + \epsilon$

Weather variable generic regression—longitude

Equation C3. $NASS = \beta_1^x RMA + \beta_2^x ELV + \epsilon$

Weather variable generic regression—elevation

Equation C4. $NASS = \beta_1^x RMA + \beta_2^x MXT + \epsilon$

Weather variable generic regression—maximum temperature

Equation C5. $NASS = \beta_1^x RMA + \beta_2^x MNT + \epsilon$

Weather variable generic regression—minimum temperature

Equation C6. $NASS = \beta_1^x RMA + \beta_2^x AVT + \epsilon$

Weather variable generic regression—average temperature

Equation C7. $NASS = \beta_1^x RMA + \beta_2^x BST + \epsilon$

Weather variable generic regression—base soil temperature

Equation C8. $NASS = \beta_1^x RMA + \beta_2^x TST + \epsilon$

Weather variable generic regression—turf soil temperature

Equation C9. $NASS = \beta_1^x RMA + \beta_2^x AVW + \epsilon$

Weather variable generic regression—average wind speed

Equation C10. $NASS = \beta_1^x RMA + \beta_2^x MXW + \epsilon$

Weather variable generic regression—maximum wind speed

[7] Tables explaining the weather and crop variable abbreviations are available on pages 13-15. A discussion of the weather variable generic regressions is located on page 20.

Equation C11. $NASS = \beta_1^x RMA + \beta_2^x SRD + \epsilon$

Weather variable generic regression—solar radiation

Equation C12. $NASS = \beta_1^x RMA + \beta_2^x AVP + \epsilon$

Weather variable generic regression—average evapotranspiration

Equation C13. $NASS = \beta_1^x RMA + \beta_2^x TLP + \epsilon$

Weather variable generic regression—total evapotranspiration

Equation C14. $NASS = \beta_1^x RMA + \beta_2^x RNF + \epsilon$

Weather variable generic regression—rainfall

Equation C15. $NASS = \beta_1^x RMA + \beta_2^x DPT + \epsilon$

Weather variable generic regression—dew point

Equation C16. $NASS = \beta_1^x RMA + \beta_2^x WCH + \epsilon$

Weather variable generic regression—wind chill

Equation C17. $NASS = \beta_1^x RMA + \beta_2^x LAT + \beta_3^x LNG + \epsilon$

Weather variable generic regression—latitude and longitude

Equation C18. $NASS = \beta_1^x RMA + \beta_2^x MXT + \beta_3^x MNT + \beta_3^x AVT + \epsilon$

Weather variable generic regression—maximum, minimum, and average temperatures

Equation C19. $NASS = \beta_1^x RMA + \beta_2^x BST + \beta_3^x TST + \epsilon$

Weather variable generic regression—base and turf soil temperatures

Equation C20. $NASS = \beta_1^x RMA + \beta_2^x AVW + \beta_3^x MXW + \epsilon$

Weather variable generic regression—average and maximum wind speeds

Equation C21. $NASS = \beta_1{}^x RMA + \beta_2{}^x AVP + \beta_3{}^x TLP + \epsilon$

Weather variable generic regression—average and total evapotranspiration

Equation C22. $NASS = \beta_1{}^x RMA + \beta_2{}^x AVP + \beta_3{}^x TLP + \beta_3{}^x DPT + \epsilon$

Weather variable generic regression—average and total evapotranspiration and dew point

Equation C23. $NASS = \beta_1{}^x RMA + \beta_2{}^x DPT + \beta_3{}^x RNF + \epsilon$

Weather variable generic regression—dew point and rainfall