

Q & A: THE USE OF A NEW DATA REPORTING PROCEDURE BY NTEP

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May 9, 2013

1. What is the new data reporting procedure that NTEP is now using?

The new procedure is called 'LPI' for short (stands for *Location Performance Index*). This index reflects results from a new statistical procedure that was developed and tested by statisticians at the University of Massachusetts and Cornell University over the last ten years. In contrast, the statistical procedure NTEP has been using since its inception, ANOVA (Analysis of Variance), has been used for statistical analysis of agricultural experiments since the 1930's.

2. Why did NTEP feel the need to change its data reporting procedure?

Because NTEP trials are evaluated at many locations across the U.S., cultivars and experimental selections (called genotypes) vary in their performance, based primarily on the location (environment) in which they are tested. These differences in performance result from what is termed a 'genotype by environment interaction' (G x E for short). In other words, different climatic conditions, weather patterns, soil types, diseases, etc. among the locations affect the performance of the grasses NTEP tests. The traditional ANOVA procedure is not designed to adequately analyze the way the genotypes interact with the different environments. LPI was developed to more accurately report the 'G x E' interactions in crop yield trials.

3. How is the LPI different than what NTEP has used in the past?

The LPI identifies the genotypes (or turfgrass entries in this case) and how they interact with each environment (trial location), captures true structure in those interactions (in a data form), and improves the accuracy of the statistical analysis. The result of this additional analysis is that a more accurate representation of each cultivar's performance is represented in the data. For those who use NTEP data reported by the LPI, the greater accuracy provides more reliable plant recommendations. In contrast, ANOVA does not capture the G x E interaction structure because ANOVA cannot analyze it. As a result, true cultivar differences that exist as a result of genotypes (cultivars) interacting with the trial locations, is ignored when using ANOVA. Therefore, one that looks at data analyzed by ANOVA, particularly where several locations are grouped together, will get an inaccurate and unreliable picture of turfgrass performance.

4. If the LPI is so much better, why did NTEP wait until now to start using it?

In 1999, NTEP funded five research projects of different statistical methods in an effort to improve our data analysis. Results from the computer simulation study of past NTEP trials showed that the LPI increased statistical accuracy anywhere from 50 to 500% over ANOVA (depending on the species). Due to these promising results, a field validation study was established to evaluate which statistical method, LPI or ANOVA, would more accurately report the top cultivars, when planted at various locations. The field validation study confirmed what was seen in the computer simulations. At this point, the NTEP Policy Committee voted recently to implement this new reporting procedure, almost ten years after the initial research project began.

5. For what trials is NTEP using the LPI?

NTEP has decided to start using the LPI only on new trials, where no data has yet been statistically analyzed. One caveat, not every trial is a candidate for the LPI. A test procedure is conducted on a data set to determine if there is a significant statistical gain in accuracy by using the LPI. If not, the traditional ANOVA procedure will be used.

6. What differences in data, if any, we will notice with this new procedure?

First, the LPI is only reporting *turfgrass quality data*. Second, since the LPI basically 'adjusts' means (by reanalyzing them), data that is found in tables where several trial locations are listed, may look different than data on a page with only a single trial location.

7. Sometimes, I may look at turfgrass quality data on a state page (for instance, by going to <http://www.ntep.org/states/states.htm> and clicking on a state), and the data in the 2008 data table may look different than it is in the national data table. Is this correct?

Yes, as noted above, when the LPI reports the G x E interactions, then the means for each location may be 'adjusted'. Therefore, the turfgrass quality data in a table on a state web page is analyzed using the traditional ANOVA procedure because that is the appropriate procedure where data from only one trial location is present. However, when data from multiple trial locations are analyzed together (the statistical term is 'pooled'), then the LPI is the more appropriate procedure.

8. If the turfgrass quality data on a state web page is different from the data in an LPI grouping, which data should I consider the most accurate, and therefore best to use?

Since the LPI reporting data are 'adjusted' and therefore, more accurate, these are the most appropriate to use. Therefore, we recommend that a user consult the turfgrass quality data reported in an LPI group instead of the turfgrass quality data in a state web page. Also, if your state is not represented in any of the LPI groupings of state locations, then choose an LPI group with a location and management level closest to your planting conditions. The other data on a state web page (i.e. genetic color, leaf texture, disease, etc.) is perfectly appropriate to use since the LPI reporting procedure is not utilized for this data. Please keep in mind, that for now, these recommendations are only valid for trials where the LPI is utilized (see Question 5 above).

9. Why are the turfgrass quality LSD values for each state location in a table the same using the new procedure (LPI), when in the past each state had a different LSD value?

Because of the way the LPI reanalyzes and then 'adjusts' means, the procedure pools all the data for locations resulting in a unified (single) LSD value. The ability to achieve greater accuracy and more reliable planting recommendations using the LPI is based on pooling of all the data. This is a normal and valid outcome of utilizing the LPI.

10. In the past, NTEP data included an 'Appendix' table. What happened to the 'Appendix' table?

The Appendix table included an average of the data from all trial locations, plus a measure (percentage) of trial locations where each entry finished in the top 25% of all entries. However, since the LPI reanalyzes and 'adjusts' means so that trial locations that are statistically correlated are grouped together, the turfgrass quality means of the different 'environments' (see question 8) are what should be used when evaluating turfgrass performance. Therefore, because of the LPI reporting, the information in the Appendix table is no longer statistically valid and not included.

11. Are there any things that we need to know to interpret the data, versus what we have used in the past?

Even though the LPI procedure itself does not compute LSD (Least Significant Difference) values and C. V. (Coefficient of Variation) values, NTEP is computing those to add to the LPI reporting. Therefore, use and interpretation of the data is the same for the end-user, albeit more statistically accurate than ever before.