Design and Analysis of Agricultural Experiments

Experimental design is first about agriculture, animal science, biology, chemistry, industry, education, etc. and then about Statistics and Mathematics. In fact, experimental design forms the backbone of agricultural sciences; to design a good experiment the researcher first needs to outline questions to be answered or needs one or more well defined hypotheses.

Some terms used in the design and analysis of agricultural experiments

Design

A set of steps that the researcher implements in any experiment in order to collect data, study the problem, or study the effect of a particular substance and find appropriate options.

Analysis

Its means study trends, styles and relationships using the data.

Experiment

An experiment is a procedure carried out to support or disproves a hypothesis.

Experimental Unit

The unit to which the treatment is applied.

Response

The outcome being measured.

Treatments

It is a set of factors that the researcher uses on the experimental units to measure their effect.

Treatment Structure

* Consists of the set of treatments, treatment combinations or populations the experimenter has selected to study and/or compare.

* Combining the treatment structure and design structure forms an experimental design.

Factor

A variable under the control of the experimenter. A factor has 2 or more levels.

Factor levels

They are all the values that the factor can take in different levels.

Control

It is an element that remains unchanged or unaffected by other impacts.

Experimental Error

Experimental Error is the random variation present in all experimental results. Different experimental units will give different responses to the same treatment, and it is often true that applying the same treatment over and over again to the same unit will result in different responses in different trials. Experimental error does not refer to conducting the wrong experiment or dropping test tubes.

important components of Experimental Design:

◆ Randomization
◆ Replication
◆ Blocks

Randomization

Randomization is the use of a known, understood probabilistic mechanism for the assignment of treatments to units. Other aspects of an experiment can also be randomized: for example, the order in which units is evaluated for their responses. Randomization is somewhat analogous to insurance, in that it is a precaution against disturbances that may or may not occur and that may or may not be serious if they do occur. Randomization is one of the most important elements of a well-designed experiment. Randomization generally costs little in time and trouble, but it can save us from disaster.

Replication

The number of times the treatment appears in the experiment.

Blocking

Experimental units are divided into subsets (blocks) so that units within the same block are more similar than units from different subsets or blocks.

Not:

If two units in the same block get different treatments, the treatments can be compared more precisely than if all the units in one block received one treatment, all in another received the second.

Statistical dispersion

Measures of Central Tendency

The Arithmetic Mean

Median

Mode

Range

Variance

Standard deviation

Coefficient of Variation