

# **EXPERIMENTAL DESIGNS**

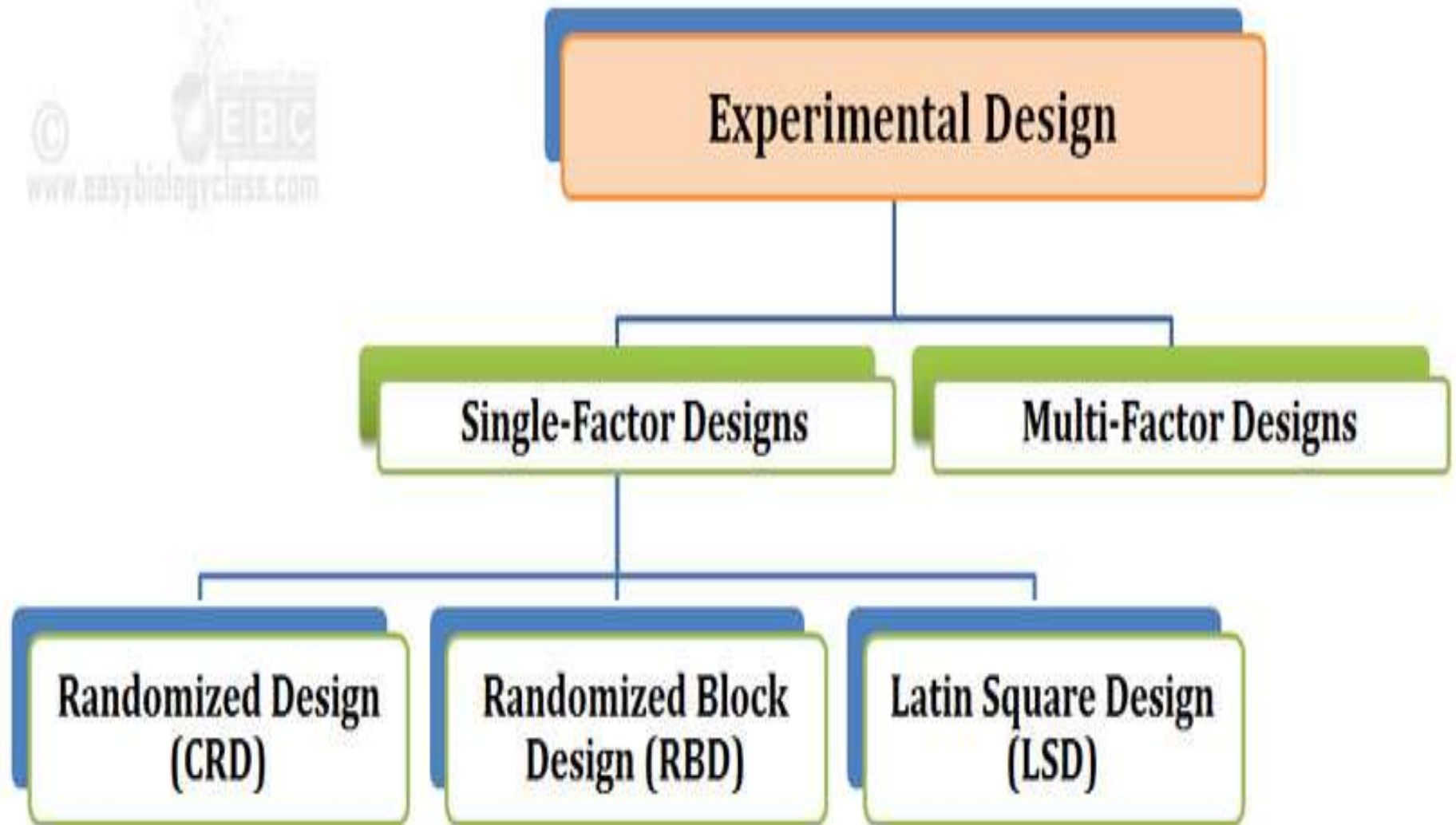
**UG –SBS-121**

**DEPARTMENT OF AGRICULTURAL ECONOMICS & STATISTICS**



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**Types of Experimental Designs**

# Terminology

- STATISTICAL EXPERIMENT –

An Experiment is a plan for the collection and analysis of Data.

- EXPERIMENTAL UNIT –

The smallest division of the experimental to which we apply the treatment and can make the observation on it is called **EXPERIMENTAL UNIT**. It is also called **EXPERIMENTAL PLOT**.

# Experimental Design Terminology

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- ❑ An **Experimental Unit** is the entity on which measurement or an observation is made. For example, subjects are experimental units in most studies.
  - ❑ **Homogeneous Experimental Units:** Units that are as uniform as possible on all characteristics that could affect the response.
  - ❑ A **Block** is a group of homogeneous experimental units.
  - ❑ A **Replication** is the repetition of an entire experiment or portion of an experiment under two or more sets of conditions.
  - ❑ A **Factor** is a controllable independent variable that is thought to influence the response.
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- TREATMENT –

The treatments are the objects of comparisons in an experiment.

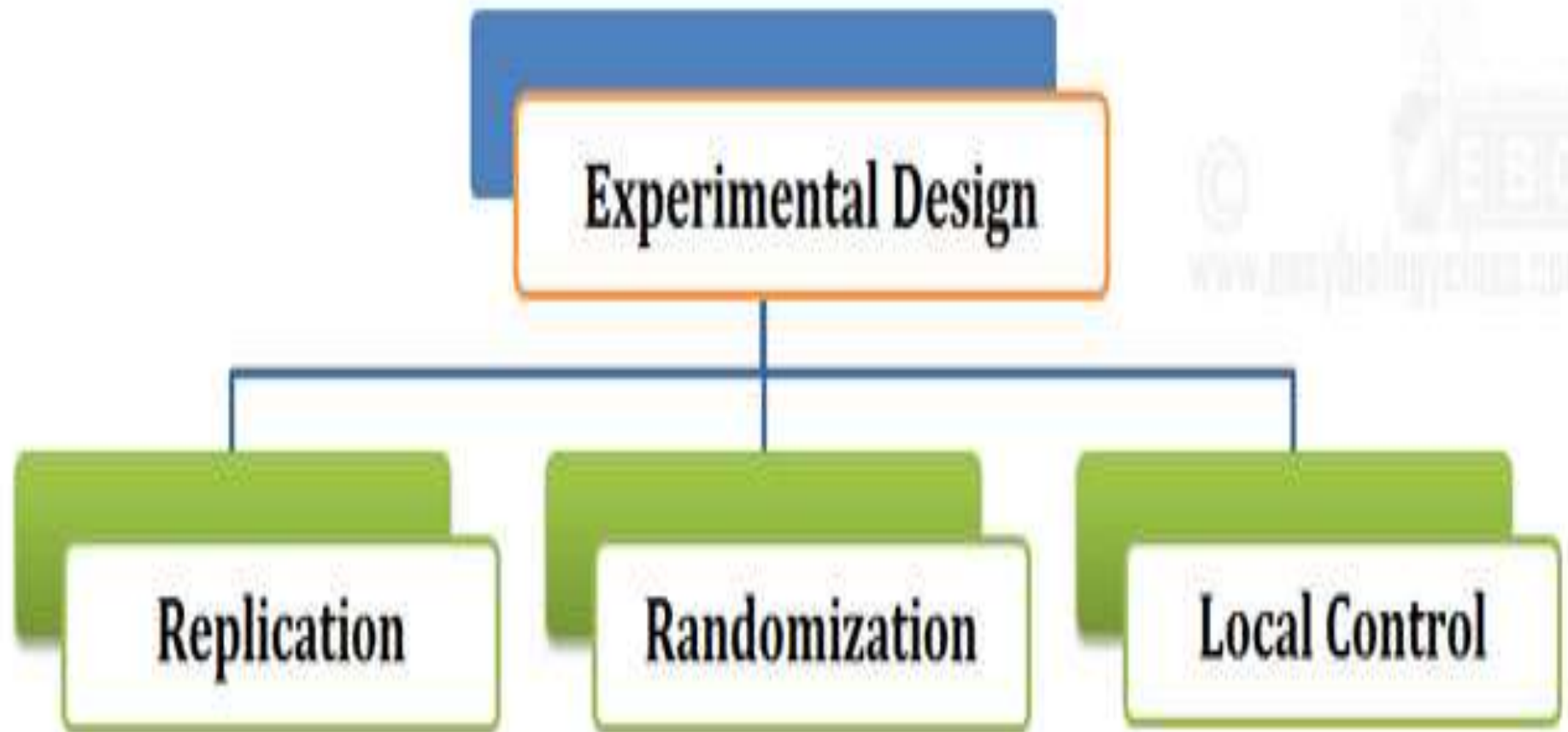
□ EXAMPLE: (i) Effects of different Fertilizers  
(ii) The yield of different varieties of a crop

- EXPERIMENTAL ERRORS –

The variation in responses (result) caused by the extraneous factor is termed as **EXPERIMENTAL ERRORS**.

# Principles of Experimental Design

(Ronald A. Fisher)



- **Professor Ronald A. Fisher** pioneered the design of experiment in statistics.
- According to Fisher, a **good experimental design** should be :
  - Increase the efficiency of design
  - Reduce the experimental errors.
- The increased efficiency and reduced experimental errors in experimental design are achieved by three basic principles. They are classically called the **“PRINCIPLES OF EXPERIMENTAL DESIGN”**, they are :
  - ❖ **REPLICATION**
  - ❖ **RANDOMIZATION**
  - ❖ **LOCAL-CONTROL**

## REPLICATION –

The repetition of the treatments under the investigation is called replication.

It helps to reduce the experimental errors.

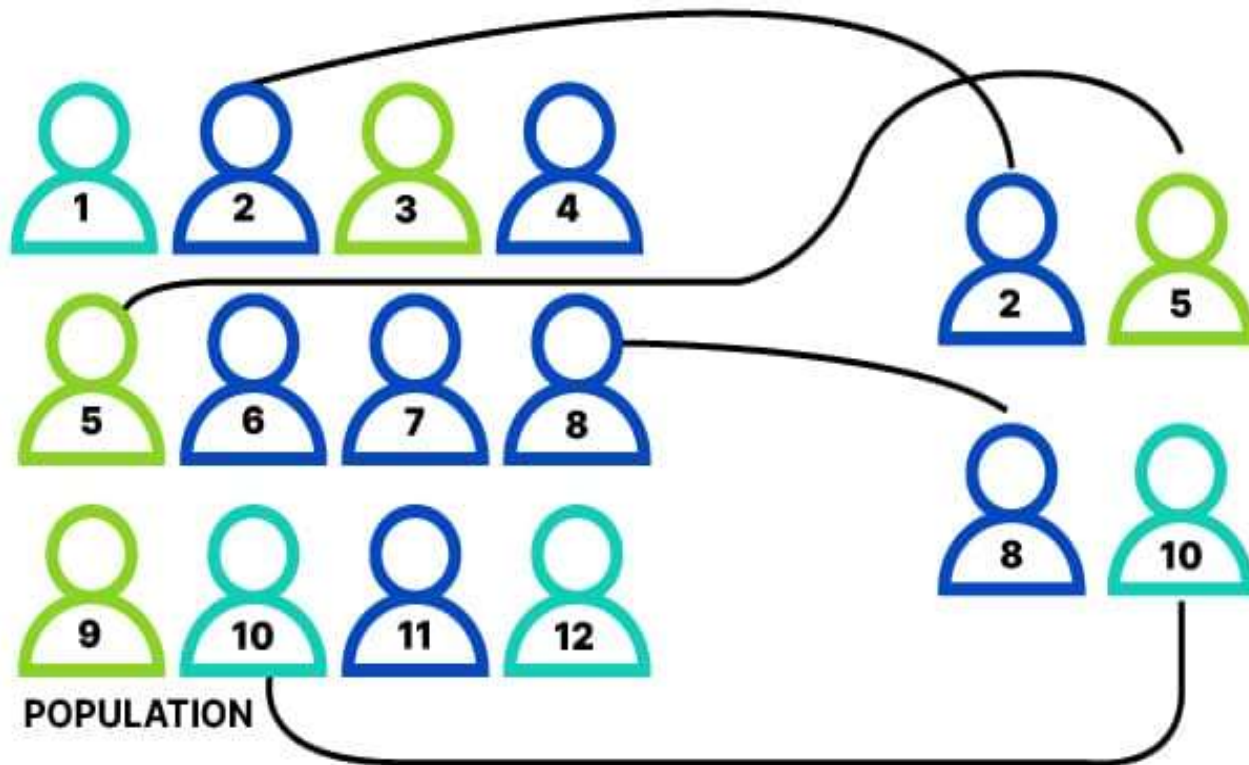
Rep 1  
Rep 2  
Rep 3

Plot 1	Treatment 1
Plot 2	Treatment 2
Plot 3	Treatment 3
Plot 4	Treatment 2
Plot 5	Treatment 3
Plot 6	Treatment 1
Plot 7	Treatment 3
Plot 8	Treatment 1
Plot 9	Treatment 2



# RANDOMIZATION

When all the treatments have an equal chance of being allocated to different experimental units is called randomization. In the absence of 'replication', the randomization will NOT be effective



# LOCAL CONTROL

- The process of reducing the experimental errors by providing the relatively heterogeneous experimental areas into homogenous units is called Local-control.
- The local-control will increase the efficiency of the experimental designs.
- Local-control can be used to reduce the extraneous errors.
- Reduction of extraneous errors reduced 'experimental errors'.

# Different types of Experimental Designs

Experimental designs are broadly classified into TWO categories:

- (i) Single-Factor Experiments
- (ii) Multi-factor Experiments

# Single-Factor Experiments:

- Single factor experiments are those experiments in which only a single factor varies while all others are kept constant.
- Here the treatments consist exclusively of the different levels of the single variable factor.
- All other factors are applied uniformly to all plots.
- **Examples of Single-Factor Experimental Designs:**
  - (1) **Completely Randomized Design (CRD)**
  - (2) **Randomized Block Design (RBD)**
  - (3) **Latin-Square Design (LSD)**

Thank  
you

