Agricultural Statistics in Practice

Stability & Sustainability Analysis

Problem of measuring stability

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Introduction

DNA

Phenotype

- Multi-trials assess variety performance across situations.

  Trials

- Situations are treated as environments.

- Non-significant [genotype-environment] effects indicate consistent performance.

  [G x E]

- Significant interaction raises stability concerns and identifies promising genotypes for exploitation.

  Stability
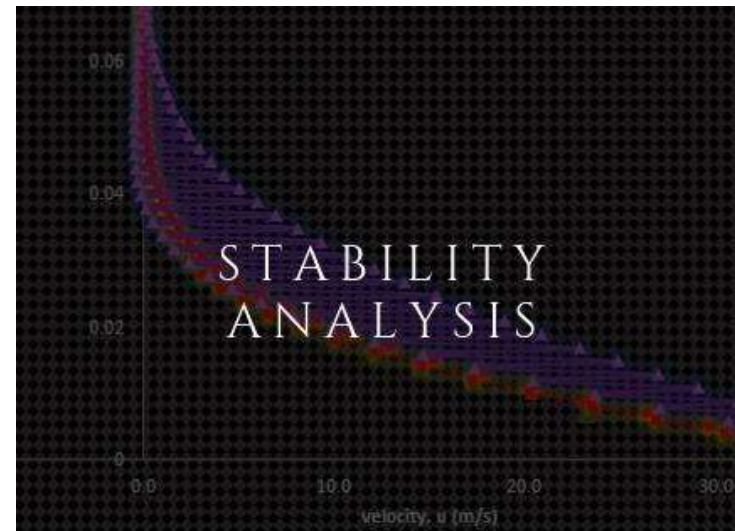
Thus, measuring stability

- is crucial and

- the problem of measuring stability comes into picture.

Cultivar

STABILITY ANALYSIS

Introduction

Distance between two genotypes.

Linear regression and mean-based methods like

- Comstock and Robinson Model (1952)
- Wricke Model (1962)
- Finlay and Russell Model (1963)
- Eberhart and Russell Model (1966)
- Perkins and Jinks Model (1968)
- Hanson's Method Stability (1970)

STABILITY ANALYSIS
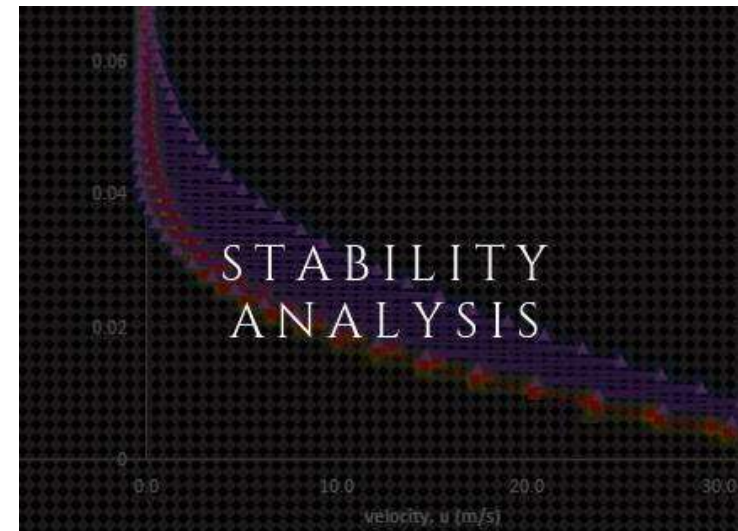
Types of Models

- **Comstock and Robinson Model:** A simple model for stability analysis of crop genotypes that estimates the genotypic stability and adaptability using ANOVA.

- **Wricke Model:** A regression-based model that estimates the genotype-environment interaction and stability of crop cultivars by decomposing the total variation into linear and non-linear components.

- **Finlay and Russell Model:** A biplot-based model that estimates the genotype-environment interaction and stability of crop cultivars by fitting a regression line to the mean performance of the cultivars across environments.

between

Types of Models

- **Eberhart and Russell Model:** An 'environment index' is introduced for each and every environment and a new linear-response parameter is added while partitioning the variation due to genotype and environment. (G E)

- **Perkins and Jinks Model:** A mixed-model-based model that estimates the genotype-environment interaction and stability of crop cultivars by accounting for both fixed and random effects of genotypes and environments.

- **Hanson's Method Stability:** A graphical approach to stability analysis that involves plotting the mean yield of each genotype across environments and drawing a line connecting the means to assess the stability and adaptability of the genotypes.
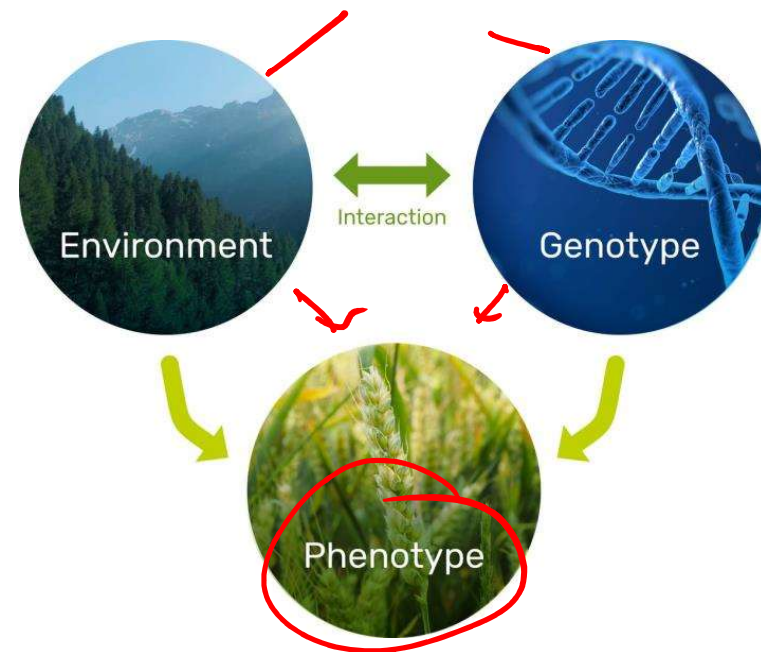
Features of Stability Analysis

- **Identify Stable Genotypes**: Helps to find genotypes performing consistently across different environments, which is crucial for developing cultivars that can perform well under different conditions.

- **Facilitates cultivar recommendation**: Stability analysis enables selection of cultivars that are not only high-yielding but also stable across different environments, which can aid in development of cultivar recommendations for specific regions.

- **Facilitates breeding programs**: Stability analysis can aid in identification of parents with stable performance, which is important in developing breeding populations for specific environments.

Environment — Interaction — Genotype — Phenotype
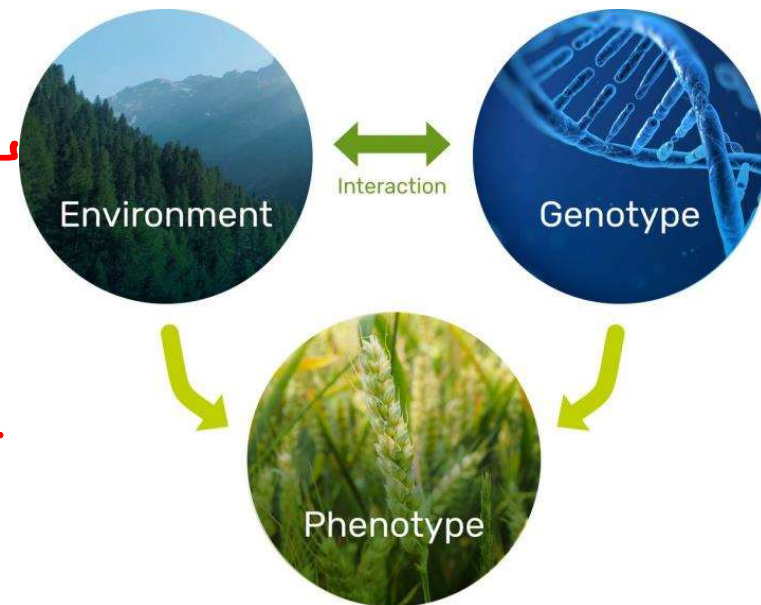
Features of Stability Analysis

- **Reduces risk**: Reduces risk of crop failure due to environmental variability, by identifying genotypes that are stable across different environments.

- **Saves resources**: By identifying stable genotypes, stability analysis can aid in the efficient allocation of resources for crop improvement programs, reducing the need for extensive testing across multiple environments.

Thank You