

## Stat 402A, Spring 2008 - Split plot studies

Here are descriptions of three studies. Each is a split plot study with two sizes of experimental unit. Some of the 'experimental' units are not randomly assigned to treatments.

Please try to figure out the skeleton ANOVA table for each study. I.e., write out the sources of variation and their d.f. Also, indicate the appropriate error for each treatment effect.

Study I: A study of the kinetics of standing up.

This study compares three GROUPs of patients: normal elderly, osteoarthritic elderly, and elderly with successful total knee arthroplasty (a surgical operation). There are 10 patients in each group. To measure the data, each patient sits in a chair and is asked to stand up. The response is DURATION, the length of time required to stand. The investigators believe that DURATION varies with chair HEIGHT. To evaluate this, each patient was measured at four chair heights. To recap: there are two treatment factors: GROUP (3 levels) and HEIGHT (4 levels) in a complete factorial structure. Each of the 30 people is measured four times, once at each chair height. (Don't worry about the order of testing here).

Study II:

This study evaluates whether IRRIGATION, FERTILIZATION, and WEEVIL control increase yield of early planted lentils in Aleppo, Syria. Data were collected at five irrigated farms and five dryland farms. Each farm had 3 (or more fields). If there were more than 3 fields, only 3 fields were used. Within each field, plots were randomly assigned to one of 3 amounts of fertilizer and either weevil spray or no insecticide. The response is the yield on each plot. To recap: three treatment factors: IRRIGATION (2 levels), FERTILIZATION (3 levels), and WEEVIL (2 levels) in a complete factorial design. Each farm has 3 fields. Each field has 6 plots. There are a total of 10 farms, 30 fields, and 180 observations.

Study III:

This study compares weed seed removal rates in different crops. A field at Marsden Farm was subdivided into four blocks. Within each block, plots were randomly assigned to one of four CROPs. Within each plot, four locations were randomly assigned to either PREDATOR exclusion (using a cage) or control. Within each plot, two locations had cages; two were controls. The response is the number of seeds eaten at each location. To recap: two treatment factors: CROP (4 levels) and PREDATOR (2 levels) in a complete factorial design. There are 4 blocks, a total of 16 plots, and a total of 64 locations.