

## Randomized Block Design (RDB)

Comparison trial of 6 treatments with 4 blocks  
(Example: 6 forage crops with 4 replications)

The experimental design is used to compare different treatments (different crops, in this case) so they are statistically comparable. One of the simplest experimental designs is the Randomized Block Design (RBD).

- 1) Divide the experimental field in homogeneous blocks of equal size. In Figure 1 an experimental field has been divided in 4 blocks. In each block (1, 2, 3, 4) each treatment will be set, having 4 replications in the field.
- 2) Divide each block into a number of plots equal to the number of treatments. For instance, to make a comparison between 6 different crops (A, B, C, D, E, F), each block will be divided into 5 plots, each having a minimum area of 7 m<sup>2</sup> (Figure 2).
- 3) Assign randomly the treatments to a plot in the block. Repeat the operation for all the blocks (Figure 2).
- 4) Number the plots in ascending order, starting from the first block.
- 5) Weight the amount of seeds to sow in each plot, according to the rate of seeding showed by crops. Table 1 shows an example based on a plot area of 7.5 m<sup>2</sup> (1.5 m wide and 5 m of length).
- 6) Level the soil in each plot to make a good seedbed and subsequently make linear furrows, using a rope and a hoe, spacing 15 cm from each other. Sow precisely the same amount of seed in every furrow to a depth of 1.5 cm. After planting, close the furrows with a rake. Assure germination and establishment with adequate irrigation.

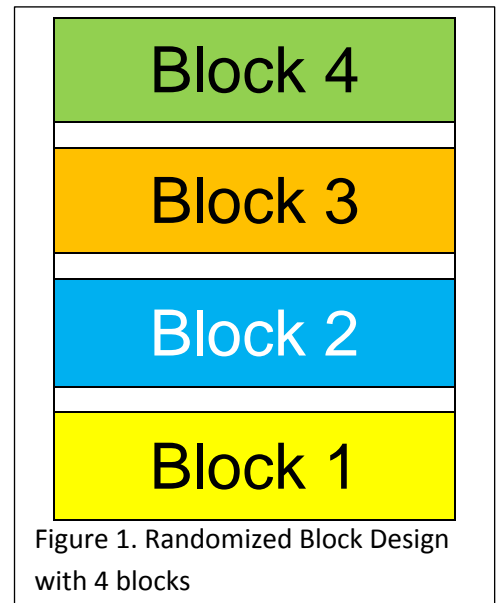


Figure 1. Randomized Block Design with 4 blocks

### Surveys to carry out after seeding

- 1) **Emerged Plants:** Count the number of emerged plants in two or three central rows in each plot, at least four different times: 5 - 10 - 15 and 20 days after sowing. If this is too much trouble, give a percentage of coverage of the row (e.g.: in a meter along the row, seedlings are present for 80%).
- 2) **Weeding:** manually weeding the plots every week without damaging the crop, taking the weeds out of the plots.
- 3) **Mowing:** mow the plants of two or three rows of the plot in a known area, and place them on a towel, for which you know the tare weight.
- 4) **Plot's yield:** to weigh immediately the mowed biomass in each plot. Write the weight, the date of mowing, the tools used for the operation and the weather conditions.

A	D	C	B	E	F
19	20	21	22	23	24
C	B	F	E	D	A
13	14	15	16	17	18
F	E	B	C	A	D
7	8	9	10	11	12
B	F	D	A	E	C
1	2	3	4	5	6

Figure 2. Randomized Block Design with 6 thesis.

- 5) **Sampling:** place a representative portion (500-700 g) of freshly mowed forage in PE bags of size 30 × 50 cm, on which report the number of the plot, the treatment (crop) and the date. Close the bag with cord tight, bringing out as much air as possible. Do not puncture the bag: in the case, replace it. Place the bag in the shade, until the transport to the laboratory, which must be made in the shortest possible time to avoid forage losses due to at respiration processes.
- 6) **Drying:** to put the sample in paper bags of known weight. To weigh individual samples and place them in an oven at 105 °C for 8 hours. Weigh the samples after drying and calculate the percentage of dry matter.
- 7) **Data analysis:** calculate the fodder production (fresh and dried) for each plot, and convert this data into a production per hectare (Table 2). Do the analysis of variance or send data to [lab.agronomia-pc@unicatt.it](mailto:lab.agronomia-pc@unicatt.it) or directly at professor Vincenzo Tabaglio [vincenzo.tabaglio@unicatt.it](mailto:vincenzo.tabaglio@unicatt.it)
- 8) **Soil Analysis:** To sampling the soil in which you conduct the experimental trial, see the sheet *UCSC-AGR01: "Soil Sampling Guidelines"*.

**Table 1. Seeding data**

Forages	Inter-row (cm)	Sowing depth (cm)	Rate of seed (kg ha <sup>-1</sup> )	Rate of seed in 7.5 m <sup>2</sup> (g)
A. Alfalfa ( <i>Medicago sativa</i> )	15	1-1.5	40	30.0
B. Red Clover ( <i>Trifolium pratense</i> )	15	1-1.5	30	22.5
C. Crimson Clover ( <i>Trifolium incarnatum</i> )	15	1-1.5	30	22.5
D. Berseem Clover ( <i>Trifolium alexandrinum</i> )	15	1-1.5	25	18.8
E. Birdsfoot Trefoil ( <i>Lotus corniculatus</i> )	15	1-1.5	10	7.5
F. Mix of seven species	15	1-1.5	100	75

**Table 2. Example of yield determination**

Plot	Block	Thesis	Width of mowing m	Length of mowing m	Harvest area m <sup>2</sup>	Gross Fresh Weight kg	Tare kg	Net Fresh Weight kg	Yield kg/m <sup>2</sup>	Yield t/ha	Net Weight Fresh sample g	Net Weight Dry sample g	Dry matter %	Dry matter t/ha
1	1	B	0.45	5.0	2.25	5.5	0.5	5.0	2.2	22.2	500	98	19.6	4.4
2	1	F	0.45	5.0	2.25	5.7	0.5	5.2	2.3	23.1	500	100	20.0	4.6
3	1	D	0.45	5.0	2.25	4.3	0.5	3.8	1.7	16.9	500	99	19.8	3.3
4	1	A	0.45	5.0	2.25	4.8	0.5	4.3	1.9	19.1	500	101	20.2	3.9
5	1	E	0.45	5.0	2.25	3.9	0.5	3.4	1.5	15.1	500	97	19.4	2.9
6	1	C	0.45	5.0	2.25	5.7	0.5	5.2	2.3	23.1	500	99	19.8	4.6
7	2	F	0.45	5.0	2.25	5.9	0.5	5.4	2.4	24.0	500	101	20.2	4.8
8	2	E	0.45	5.0	2.25	4.5	0.5	4.0	1.8	17.8	500	98	19.6	3.5
9	2	B	0.45	5.0	2.25	4.9	0.5	4.4	2.0	19.6	500	100	20.0	3.9
10	2	C	0.45	5.0	2.25	4.0	0.5	3.5	1.6	15.6	500	98	19.6	3.0
11	3	A	0.45	5.0	2.25	5.4	0.5	4.9	2.2	21.8	500	98	19.6	4.3
12	2	D	0.45	5.0	2.25	5.6	0.5	5.1	2.3	22.7	500	100	20.0	4.5
13	3	C	0.45	5.0	2.25	4.6	0.5	4.1	1.8	18.2	500	99	19.8	3.6
14	3	B	0.45	5.0	2.25	4.8	0.5	4.3	1.9	19.1	500	101	20.2	3.9
15	3	F	0.45	5.0	2.25	3.8	0.5	3.3	1.5	14.7	500	97	19.4	2.8
16	3	E	0.45	5.0	2.25	5.8	0.5	5.3	2.4	23.6	500	99	19.8	4.7
17	3	D	0.45	5.0	2.25	6.0	0.5	5.5	2.4	24.4	500	101	20.2	4.9
18	3	A	0.45	5.0	2.25	4.5	0.5	4.0	1.8	17.8	500	98	19.6	3.5
19	4	A	0.45	5.0	2.25	4.4	0.5	3.9	1.7	17.3	500	100	20.0	3.5
20	4	D	0.45	5.0	2.25	3.7	0.5	3.2	1.4	14.2	500	98	19.6	2.8
21	4	C	0.45	5.0	2.25	6.0	0.5	5.5	1.9	19.2	500	101	20.2	4.9
22	4	B	0.45	5.0	2.25	4.5	0.5	4.0	1.5	15.3	500	98	19.6	3.5
23	4	E	0.45	5.0	2.25	4.4	0.5	3.9	2.4	24.3	500	100	20.0	3.5
24	4	F	0.45	5.0	2.25	3.7	0.5	3.2	2.4	24.6	500	98	19.6	2.8

- Gross Fresh production = Mown biomass in the plot's area + towel's weight (tare)
- Net fresh production = Gross Fresh production – Tare
- Yield (kg/m<sup>2</sup>) = Net fresh production / harvest area
- Ideal sample's weight is about 500 - 700 g
- Dry matter % determination (% d.m.) = (Net weight dry sample / Net weight fresh sample) × 100