Week-05-L-06

Agricultural Statistics in Practice

Stability & Sustainability Analysis

MS Excel Demonstration for measurement of yield sustainability

Dr. Amandeep Singh

Imagineering Laboratory
Indian Institute of Technology Kanpur

Example

- An experiment with five nutrient treatments was conducted in rice for seventeen consecutive years to study the yield sustainability of the nutrient treatments.
- Following table gives the yield of rice (q/ha) in response to different nutrient treatments over the year of experimentation.
- Using all the measures of sustainability find out the most sustainable treatment in terms of yield.
- Also, find whether the most sustainable treatment is the best treatment or not.

G x E

Example

Year	T_1	T_2	T_3	T_4	T_5
1	15.00	23.10	26.50	27.10	32.60
2	16.20	25.80	25..60	30.60	33.60
3	15.95	27.60	29.20	29.30	34.90
4	14.00	28.10	26.90	30.50	34.10
5	14.60	32.10	27.00	29.80	33.60
6	13.50	29.93	27.70	33.20	37.53
7	11.20	25.10	25.50	31.30	37.80
8	10.20	20.70	27.50	28.70	36.90
9	10.10	19.30	26.80	27.20	39.50
10	13.00	22.70	28.50	29.10	37.20

Example

Year	T_1	T_2	T_3	T_4	T_5
11	13.00	21.90	29.20	28.90	38.30
12	15.10	26.30	32.60	32.80	35.20
13	16.20	29.20	33.40	34.30	35.30
14	17.40	31.80	34.20	35.60	36.40
15	16.20	33.40	43.40	37.30	33.70
16	15.90	32.60	33.90	36.30	37.10
17	18.37	29.59	31.37	33.92	35.45

Solution

- First, the average, maximum, median and the standard deviation for the given data set for each treatment are worked out separately. Using the method as discussed earlier, the regression coefficients for the measures 2, 3, 4, and 5 are worked out. The regression coefficients according to measure 2, 3, 4, and 5 are $b_i, c_i, b_i' \; and \; c_i'$ respectively

Solution

Year	T_1	T_2	T_3	T_4	T_5
1	15	23.1	26.5	27.1	32.6
2	16.2	25.8	25..60	30.6	33.6
other observations……					
16	15.9	32.6	33.9	36.3	37.1
17	18.4	29.59	31.37	33.92	35.45
Average	14.5	27.01	29.96	31.53	35.83
SD	2.39	4.383	4.53	3.158	1.951
Y_{max}	18.4	33.4	43.4	37.3	39.5
Median	15	27.6	28.5	30.6	35.45
b_i	0.7	1.575	1.625	1.247	-0.15
b'_i					
c_i					
c'_i					

Solution

- Using the quantities calculated, that is average, median, standard deviation, maximum and the regression coefficients in the sustainability index formulae sustainability indices for different treatments are worked out and presented in the following table.

Solution

Sustainability Index	*Inference*	*Treatment*				
		T_1	T_2	T_3	T_4	T_5
SI(01)	Higher the SI value higher is sustainability	0.658	0.678	0.586	0.761	***0.85***
SI(02)	Higher the SI value higher is sustainability	1.422	0.635	0.616	0.802	***6.655***
SI(03)	Higher the SI value higher is sustainability	1.048	0.453	0.760	0.844	***1.506***
SI(04)	Higher the SI value higher is the sustainability	1.855	0.677	0.658	0.781	***4.861***
SI(05)	Higher the SI value higher is the sustainability	1.401	0.388	1.104	0.867	***1.843***
SI(06)	Lower the SI value higher is the sustainability	0.270	0.236	0.449	0.183	***0.102***

In the sixth measure, lower the value of the sustainability higher is the sustainability of the treatment. However, more research is needed to measure sustainability different areas on different aspects.

Conclusion

- It can be seen from the above table that treatment five is by far the most sustainable treatment irrespective of the measure of sustainability. Observing further, it's also seen that treatment five produced highest yield over the period of experimentation. Hence, treatment five is not only the most sustainable treatment but also the best treatment.

Thank You