

April 17, 1942

Dear Bliss,

I have just read your ^{interesting} letter of March 19th. With respect to the soil phosphate test, what is wrong with the analysis? -

	d.f.	S.S.
Collaborator	17	nil
Soils	30	
Remainder	510	

If the mean square for soils exceeded that for remainder you have evidence of significant agreement between collaborators. Equally the ~~the~~ ^{mean} mean square can be used to give the standard error of a soil mean, on the arbitrary scale of the table I don't see how you can divide 510 by 18 because if there were only one observer there would be nothing to compare.

There are some difficulties about the question of the precision of a maximum. Using three points only with values a, b and c, I suppose the estimate is

$$10\% + 2 \left\{ \frac{c - a}{2(2b - a - c)} \right\}$$

Here both the numerator and the denominator are subject to error, of which you have an estimate. The errors are, however, uncorrelated, so that you can take

$$v\left(\frac{N}{D}\right) = \frac{N^2}{D^2} \left\{ \frac{v(N)}{N^2} + \frac{v(D)}{D^2} \right\}$$

Supposing that a, b & c have all the same estimated variance of s, and that their variance is independent, this comes to

$$\frac{N^2}{D^2} \left\{ \frac{2}{N^2} + \frac{24}{D^2} \right\} s^2$$

There is a similar but more complicated expression of course for the maximum of the cubic, which I certainly should not worry about from the point of view of precision. In your case I suppose D is very much larger than its standard error, else this large sample formula for the variance of a quotient would be comparatively useless.

I cannot find your reference to p. 155 of Statistical Methods: probably I have not the right edition at hand.

I am very glad to have your personal news, and especially to hear that things are going so well. I had already sent off a copy of the Negative Binomial paper. I think its relation to a distribution of true frequencies of the same type as χ^2 , a Eulerian integral, which is what Pearson's type ~~II~~ ^{III} simplifies to if the terminus is given at zero, is natural and direct, but ~~not~~ comparing different distributions of this type, as always when there is more than one parameter, involves the consideration of what it is that is to be compared, i.e., the mean, or k , or some combination of the two, such as the frequency of exceeding some typical value.

Yours sincerely