

Research Article



Estimating Sample Size and Fitting Multilevel Model in Agricultural Experiments

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Table 1: Sample size consideration for varying N, n, ρ and S.E of the estimate.

ρ= 0.1				ρ= 0.2					
Sample sizes	Cost	S.E	Sample sizes	Cost	S.E				
J*n	J	n	(n+c)J	Intercept	J*n	J	n	(n+c)J	Intercept
4320	216	20	4320	0.02591	7525	175	43	7525	0.02629
4326	206	21	4326	0.02633	7515	167	45	7515	0.02681
4312	196	22	4312	0.02681	7520	160	47	7520	0.02729
4324	188	23	4324	0.0272	7546	154	49	7546	0.02772
4320	180	24	4320	0.02764	7548	148	51	7548	0.02819
4325	173	25	4325	0.02804	7526	142	53	7526	0.0287
4316	166	26	4316	0.02848	7535	137	55	7535	0.02914
4320	160	27	4320	0.02887	7524	132	57	7524	0.02962
4312	154	28	4312	0.02929	7552	128	59	7552	0.03001
4321	149	29	4321	0.02966	7503	123	61	7503	0.03054
4320	144	30	4320	0.03005	7497	119	63	7497	0.03099

Table 2: Comparison of SRS and Two Stage Cluster sampling.

S.E	Simple random sampling		2 Stage cluster sampling (J, n)	
	ρ = 0		ρ = 0.1	ρ = 0.2
0.02	2500		9750	16980 (566, 30)
0.03	1111		4320(144, 30) 7552 (128, 59)	

Table 3(a): Coefficients of random intercept model.

	Value	Std.Error	Df	t-value	p-value
(Intercept) (CLRM)	801.191	4.442	399	180.367	0.000
(Intercept) (MLM)	801.191	4.822	396	166.161	0.000

Table 3(b): Comparison of CLRM and MLM (Sim 1).

Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
CLRM(1)	2	4722.80	4730.78	-2359.400			
MLM (2)	3	4724.76	4736.72	-2359.378	1 vs 2	0.0430	0.8356

Table 4(a): Coefficient of random intercept model (Sim 2).

	Value	Std.Error	DF	t-value	p-value
(Intercept)CLRM	469.4437	13.67558	399	34.32715	0.000
(Intercept)MLM	469.4437	88.5494	390	5.301489	0.000

Table 4(b): Comparison of CLRM and MLM (Sim 2).

Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
CLRM(1)	2	5620.157	5628.135	-2808.08			
MLM (2)	3	4528.582	4540.548	-2261.29	1vs2	1093.575	<.0001

Table 5(a): Coefficients of random intercept model (Sim 1).

	Value	Std. Error	t-value	P-value
Intercept	725.577	675.27	1.074	0.283
CLRM Covariate	0.133	0.161	0.825	0.410
Covariate 2	-0.053	0.135	-0.394	0.694
MLM Intercept	489.55	195.21	2.508	0.013
Covariate 1	-0.090	0.0417	-2.162	0.031
Covariate 2	-0.032	0.0347	-0.093	0.926

Table 5(b): Model Comparison of CLRM and MLM (Sim 1).

Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
CLRM	4	5634.41	5650.34	-2813.20			
MLM	8	4543.32	4575.19	-2263.66	1vs2	1099.08	<.0001

Table 6(a): Coefficients of random intercept model (Sim 2).

	Value	Std. Error	t-value	P-value
Intercept	133.061	709.355	0.187	0.851
CLRM Covariate 1	0.133	0.163	0.813	0.416
Covariate 2	0.066	0.142	0.466	0.641
MLM Intercept	489.55	195.70	2.508	0.013
Covariate 1	-0.090	0.0417	-2.162	0.031
Covariate 2	-0.032	0.0347	-0.093	0.926

Table 6(b): Model Comparison of CLRM and MLM (Sim 2).

Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
CLRM (1)	4	5634.41	5650.34	-2813.203			
MLM (2)	8	4543.32	4575.19	-2263.662	1vs2	1099.08	<.0001

Table 7(a): Coefficients of random intercept model (Sim 3).

	Value	Std. Error	t-value	P-value
Intercept	725.57	675.273	1.074	0.283
CLRM Covariate 1	0.133	0.161	0.825	0.410
Covariate 2	-0.053	0.135	-0.394	0.694
MLM Intercept	272.57	190.70	1.427	0.154
Covariate 1	0.134	0.0778	1.725	0.085
Covariate 2	0.037	0.0341	1.091	0.276

CLRM possess 397 df while MLM has 388 df.

Table 7(b): Model Comparison of CLRM and MLM (Sim 3).

Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
CLRM (1)	4	5606.31	5622.25	-2799.16			
MLM (2)	8	4571.76	4603.63	-2277.88	1 vs 2	1042.56	<.0001

Table 8(a): Coefficients of random intercept model (Sim 4).

	Value	Std. Error	t-value	p-value
Intercept	1206.36	745.54	1.62	0.106
CLRM Covariate 1	-0.5654	0.18	-3.10	0.002
Covariate 2	-0.1115	0.15	-0.75	0.453
MLM Intercept	654.37	203.25	3.22	0.0014
Covariate 1	-0.56	0.067	-0.23	0.8148
Covariate 2	-0.11	0.035	-0.31	0.7560

Table 8(b): Model Comparison of CLRM and MLM (Sim 4).

Model	df	AIC	BIC	logLik	Test	L.Ratio	p-value
CIRM (1)	4	5709.78	5725.72	-2850.89			
MLM (2)	8	4627.50	4659.37	-2305.75	1 vs 2	1090.28	<.0001