

# SAS Macro for the Generation and Randomization of MERC Designs for Type III CDC

Eldho Varghese, Cini Varghese, Seema Jaggi and Rajender Parsad  
ICAR-Indian Agricultural Statistics Research Institute, New Delhi

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Most of the work on designs for diallel cross experiments are done by taking only  $F_1$ 's into consideration (i.e., Type IV mating designs). For an experimenter, the interest may not lie only in comparing the  $F_1$ 's but in comparing  $F_1$ 's along with its parents. Furthermore, most of the work on diallel/ partial diallel cross experiments has been done under the assumption that the specific combining ability (sca) is negligible. A methodology has been developed by Varghese et al. (2016) for estimating gca effects free from sca effects under a row-column set-up **for Type III complete diallel mating designs**. Also, developed a class of Mating-Environmental Row-Column (MERC) designs which is variance balanced for estimating the contrasts pertaining to gca effects free from sca effects. Here, a program was developed for the generation and randomization of a class of Mating Environmental Row Column(MERC) design with parameters  $v = \frac{t(t+1)}{2}$ ,  $p = q = t$ ,  $r_1$ (Replication of selfings) = 1 and  $r_2$ ( Replication of  $F_1$ 's) = 2 which are

variance balanced for estimating elementary contrasts pertaining to general combining ability effects free from specific combining ability effects **considering  $F_1$ 's along with selfings** (Griffing's method III) using SAS IML in the form of a Macro so that user would be able to get the design by providing only number lines (t).

## MERC designs for type III mating experiments

**SAS Macro for generation of designs** (Varghese et al., 2016)

```
%let t=9; /*odd number of lines*/
proc iml;
c_no=comb(&t,2)+&t;
n_no=&t;
k=1;
d0=j(n_no,n_no,0);
do i=1 to n_no;
do j=1 to n_no;
d0[i,j]=mod((i-1)+j,n_no);
if d0[i,j]=0 then d0[i,j]=n_no;
end;
end;
print d0;
d01=j(n_no,n_no,0);
do i=1 to n_no;
do j=1 to n_no;
d01[i,j]=mod(d0[i,j]+(i-1),n_no);
if d01[i,j]=0 then d01[i,j]=n_no;
end;
end;
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print d01;
k=1;
d001=j(n_no*n_no,2,0);
do i=1 to n_no;
do j=1 to n_no;
d001[k,1]=d0[i,j];
d001[k,2]=d01[i,j];
k=k+1;
end;
end;
*print d001;
k=1;
x=j((n_no*n_no),2,0);
do i=1 to n_no;
do j=1 to n_no;
x[k,1]=i;
x[k,2]=j;
k=k+1;
end;
end;
*print x;
d0001=x||d001;
d002=j(n_no,5,0);
do i=1 to n_no;
do j=1 to 4;
d002[i,j]=d0001[i,j];
end;
d002[i,5]=i;
end;
*print d002;
d00001=j(((n_no-1)*n_no),4,0);
do i=1 to (n_no-1)*n_no;
do j=1 to 4;
d00001[i,j]=d0001[i+n_no,j];
end;
end;
*print d00001;
call sort(d00001, {3 4 1 2}, );
*print d00001;
d1=d00001;
do i=1 to (n_no-1)*n_no;
if d00001[i,3]>d00001[i,4] then
do;
d1[i,3]=d00001[i,4];
d1[i,4]=d00001[i,3];
end;
end;
*print d1;
call sort(d1, {3 4 1 2}, );
*print d1;
vec=j(n_no*(n_no-1),1,0);
d2=d1||vec;

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k=1;
do i=1 to ((n_no-1)*n_no)/2;
do j=1 to 2;
d2[k,5]=n_no+i;
k=k+1;
end;
end;
*print d2;
xx=d002//d2;
call sort(xx, {5 3 4 1 2}, );
*print xx;
*****code for generating designs*****
ww=j(n_no,n_no,0);
do i=1 to n_no;
do j=1 to n_no;
ww[i,j]=d0[i,j];
end;
end;
*print ww;
ww1=j(n_no,n_no,0);
do i=1 to n_no;
do j=1 to n_no;
ww1[i,j]=d01[i,j];
end;
end;
*print ww1;
ww_=char(ww,4,0);
ww1_=char(ww1,4,0);
www=j(nrow(ww),ncol(ww),'x');
MERC_design=ww_+www+ww1_;
print MERC_design;
*****Randomization*****
*****row-randomization*****
r=j(1,nrow(ww),0);
call randgen(r,'uniform');
*print r;
rr=rank(r);
*print rr;
ra=j(nrow(ww),ncol(ww),0);
random_row=char(ra,10,0);
do i=1 to nrow(ww);
do j=1 to ncol(ww);
random_row[i,j]= MERC_design[rr[i],j];
end;
end;
*print random_row;
*****/
*****column-randomization****
r=j(ncol(ww),1,0);

```

```

call randgen(r,'uniform');
*print r;
rr=rank(r);
*print rr;
Randomized_Layout=char(ra,10,0);
do i=1 to nrow(ww);
do j=1 to ncol(ww);
Randomized_Layout[i,j]= random_row[i,rr[j]];
end;
end;
print Randomized_Layout;
/*****

```

## SAS Output

MERC_design									
	COL1	COL2	COL3	COL4	COL5	COL6	COL7	COL8	COL9
ROW1	1 x 1	2 x 2	3 x 3	4 x 4	5 x 5	6 x 6	7 x 7	8 x 8	9 x 9
ROW2	2 x 3	3 x 4	4 x 5	5 x 6	6 x 7	7 x 8	8 x 9	9 x 1	1 x 2
ROW3	3 x 5	4 x 6	5 x 7	6 x 8	7 x 9	8 x 1	9 x 2	1 x 3	2 x 4
ROW4	4 x 7	5 x 8	6 x 9	7 x 1	8 x 2	9 x 3	1 x 4	2 x 5	3 x 6
ROW5	5 x 9	6 x 1	7 x 2	8 x 3	9 x 4	1 x 5	2 x 6	3 x 7	4 x 8
ROW6	6 x 2	7 x 3	8 x 4	9 x 5	1 x 6	2 x 7	3 x 8	4 x 9	5 x 1
ROW7	7 x 4	8 x 5	9 x 6	1 x 7	2 x 8	3 x 9	4 x 1	5 x 2	6 x 3
ROW8	8 x 6	9 x 7	1 x 8	2 x 9	3 x 1	4 x 2	5 x 3	6 x 4	7 x 5
ROW9	9 x 8	1 x 9	2 x 1	3 x 2	4 x 3	5 x 4	6 x 5	7 x 6	8 x 7

  

Randomized_Layout									
	COL1	COL2	COL3	COL4	COL5	COL6	COL7	COL8	COL9
ROW1	9 x 5	2 x 7	3 x 8	8 x 4	6 x 2	4 x 9	5 x 1	1 x 6	7 x 3
ROW2	3 x 2	5 x 4	6 x 5	2 x 1	9 x 8	7 x 6	8 x 7	4 x 3	1 x 9
ROW3	4 x 4	6 x 6	7 x 7	3 x 3	1 x 1	8 x 8	9 x 9	5 x 5	2 x 2
ROW4	1 x 7	3 x 9	4 x 1	9 x 6	7 x 4	5 x 2	6 x 3	2 x 8	8 x 5
ROW5	8 x 3	1 x 5	2 x 6	7 x 2	5 x 9	3 x 7	4 x 8	9 x 4	6 x 1
ROW6	7 x 1	9 x 3	1 x 4	6 x 9	4 x 7	2 x 5	3 x 6	8 x 2	5 x 8
ROW7	6 x 8	8 x 1	9 x 2	5 x 7	3 x 5	1 x 3	2 x 4	7 x 9	4 x 6
ROW8	5 x 6	7 x 8	8 x 9	4 x 5	2 x 3	9 x 1	1 x 2	6 x 7	3 x 4
ROW9	2 x 9	4 x 2	5 x 3	1 x 8	8 x 6	6 x 4	7 x 5	3 x 1	9 x 7

### *Research Paper:*

- **Eldho Varghese**, Cini Varghese and Seema Jaggi (2016). A Class of Efficient Row-Column Designs for Type III Diallel Cross Experiments with Specific Combining Abilities. *Journal of the Indian Society of Agricultural Statistics*, 70(2): 123–130.