Case Study 1, Part 2

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```
library(gstat)
```

```
## Warning: package 'gstat' was built under R version 3.3.2
```

```
#library(geoR)
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.3.2
```

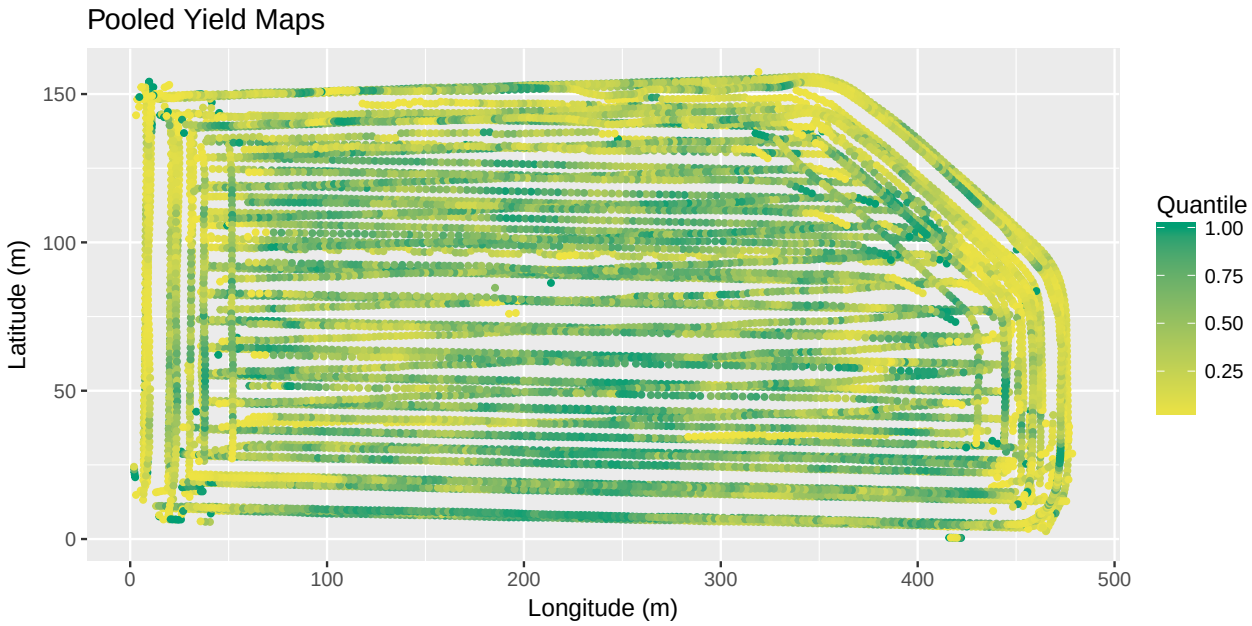
```
cbPalette <- c("#999999", "#E69F00", "#56B4E9", "#009E73", "#0072B2", "#D55E00", "#F0E442","#CC79A7","#
```

Now we examine the spatial correlation structure and determine if the fields must be analyzed independently or if they can be pooled into a single unit. I don't want to drop any data points, so I'll be continuing with Quantile

```
load(file="Pooled.Rda")
```

```
Pooled.dat <- rbind(Corn2013.dat,Corn2015.dat,Soybean2014.dat,Soybean2016.dat)
```

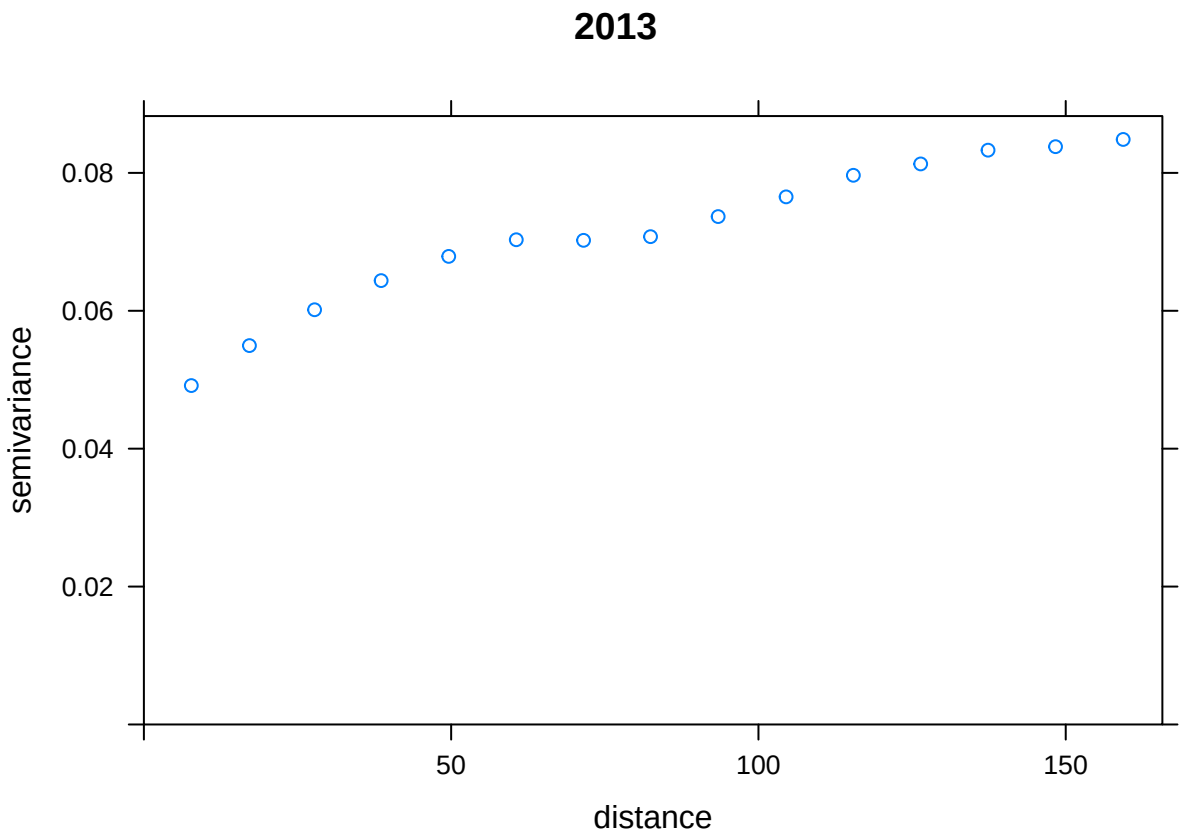
```
ggplot(Pooled.dat, aes(Easting,Northing)) +
geom_point(aes(colour = Quantile),size=1) +
scale_colour_gradient(low=cbPalette[7], high=cbPalette[4]) +
labs(colour = "Quantile", x="Longitude (m)", y="Latitude (m)", title = "Pooled Yield Maps")
```



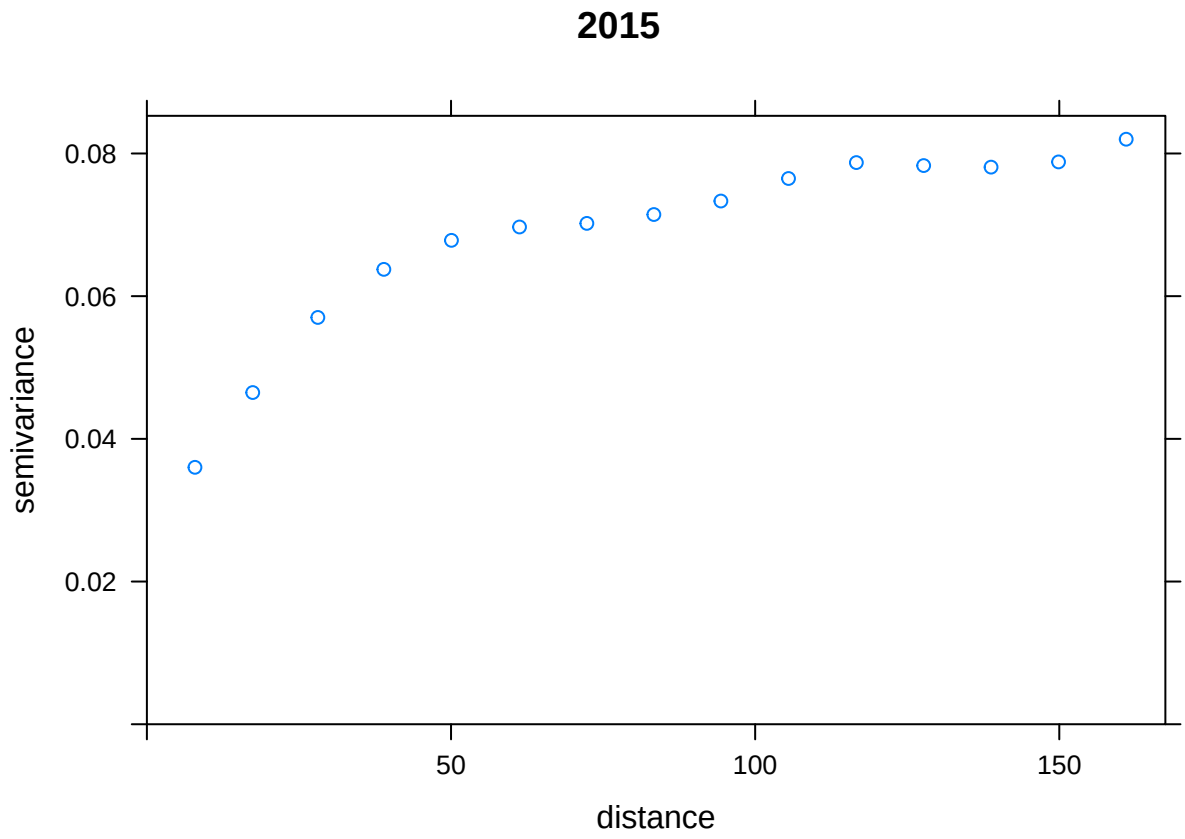
Variograms

Individual Maps

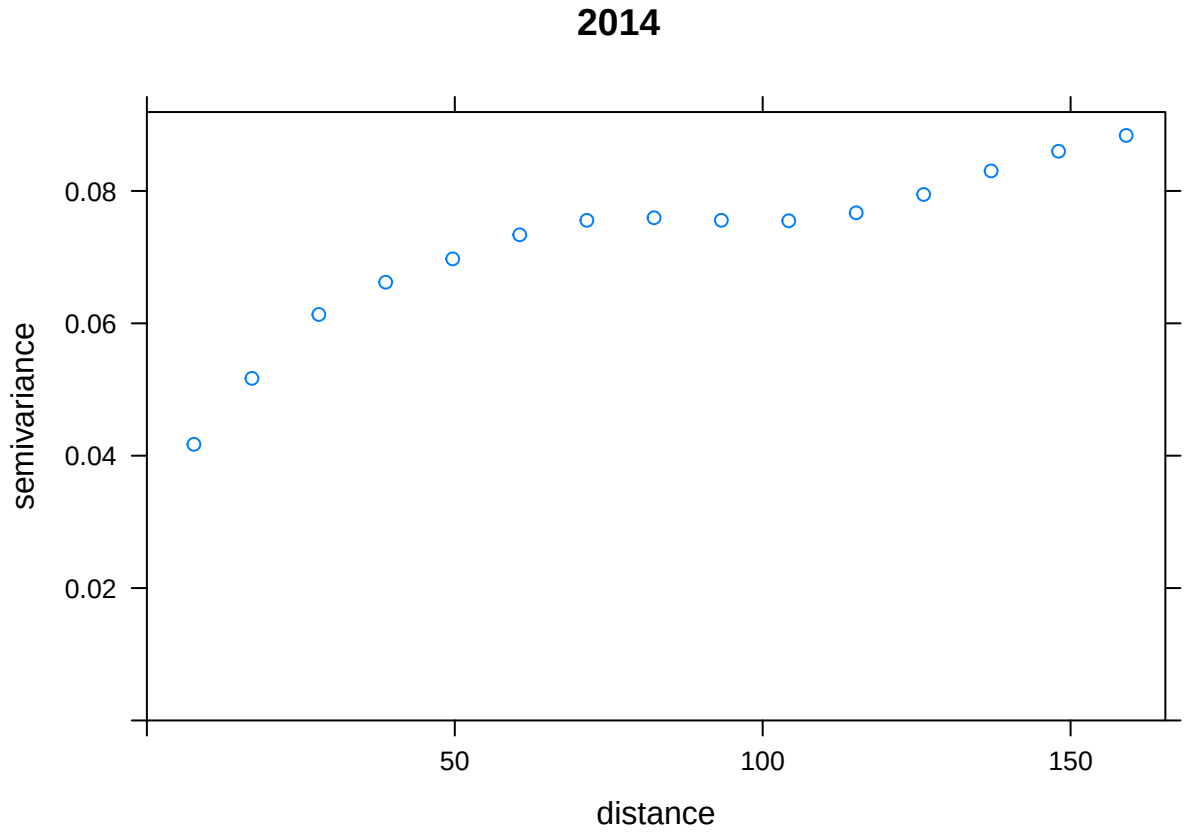
```
Corn2013.var <- variogram(Quantile~1,
                          locations=~Easting+Northing,
                          data=Corn2013.dat)
Corn2015.var <- variogram(Quantile~1,
                          locations=~Easting+Northing,
                          data=Corn2015.dat)
Soybean2014.var <- variogram(Quantile~1,
                          locations=~Easting+Northing,
                          data=Soybean2014.dat)
Soybean2016.var <- variogram(Quantile~1,
                          locations=~Easting+Northing,
                          data=Soybean2016.dat)
par(mfrow=c(2,2))
plot(Corn2013.var,main="2013")
```



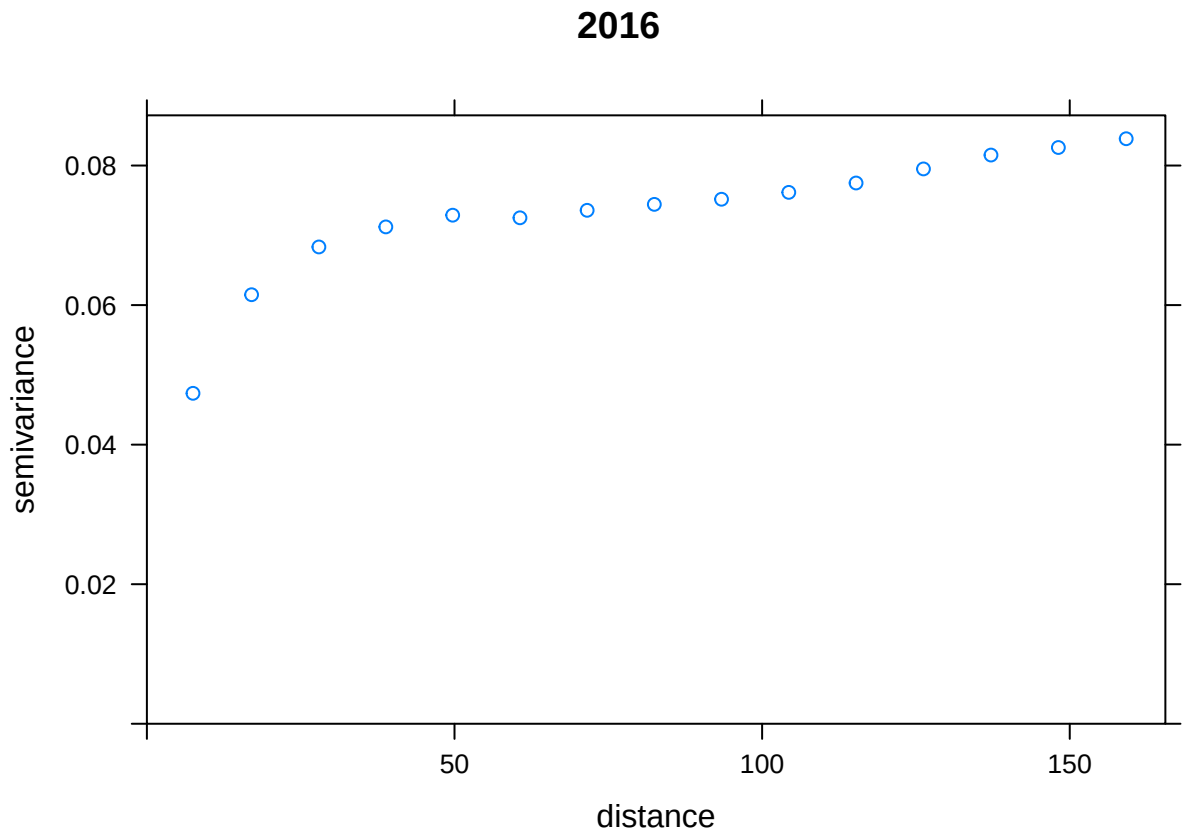

```
plot(Corn2015.var,main="2015")
```




```
plot(Soybean2014.var,main="2014")
```



```
plot(Soybean2016.var,main="2016")
```



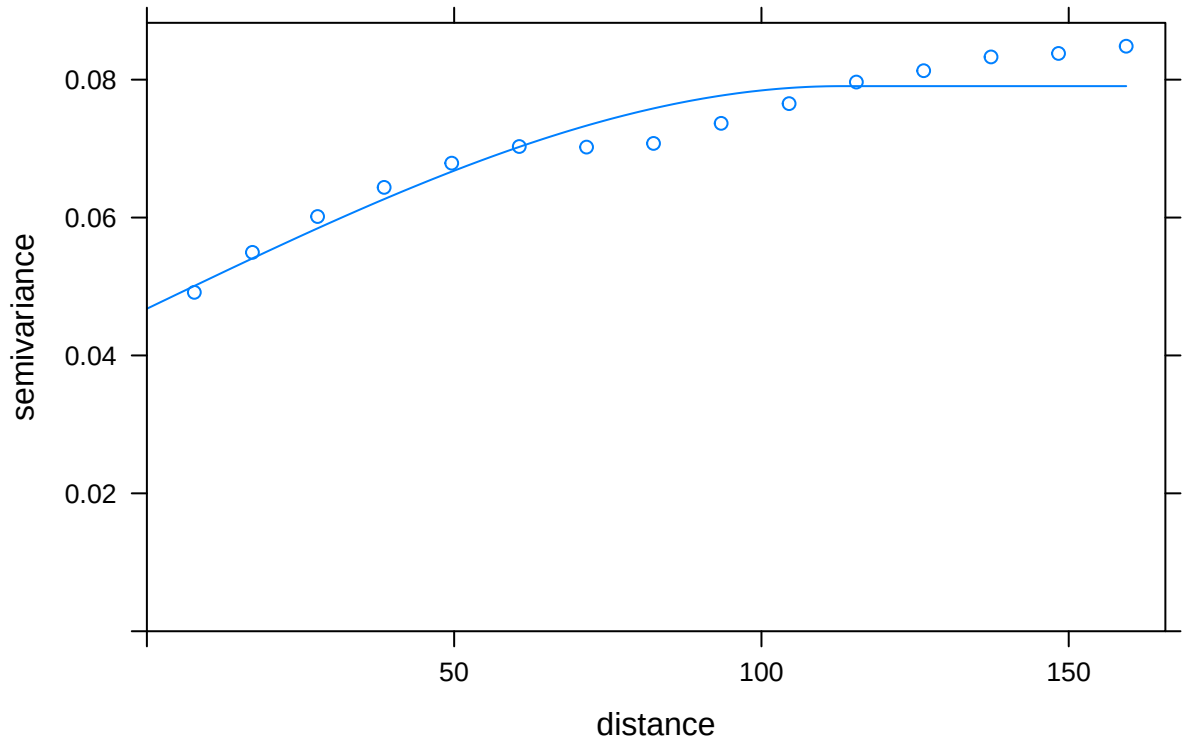

```
par(mfrow=c(1,1))
```

The variograms look quite similar, but we'll check by fitting a spherical model to each.

```
print(Corn2013.vgm <- fit.variogram(Corn2013.var, vgm(.8,"Sph",50,.2)))
```

```
##   model      psill    range
## 1   Nug 0.04677762   0.0000
## 2   Sph 0.03228514 113.0569
```

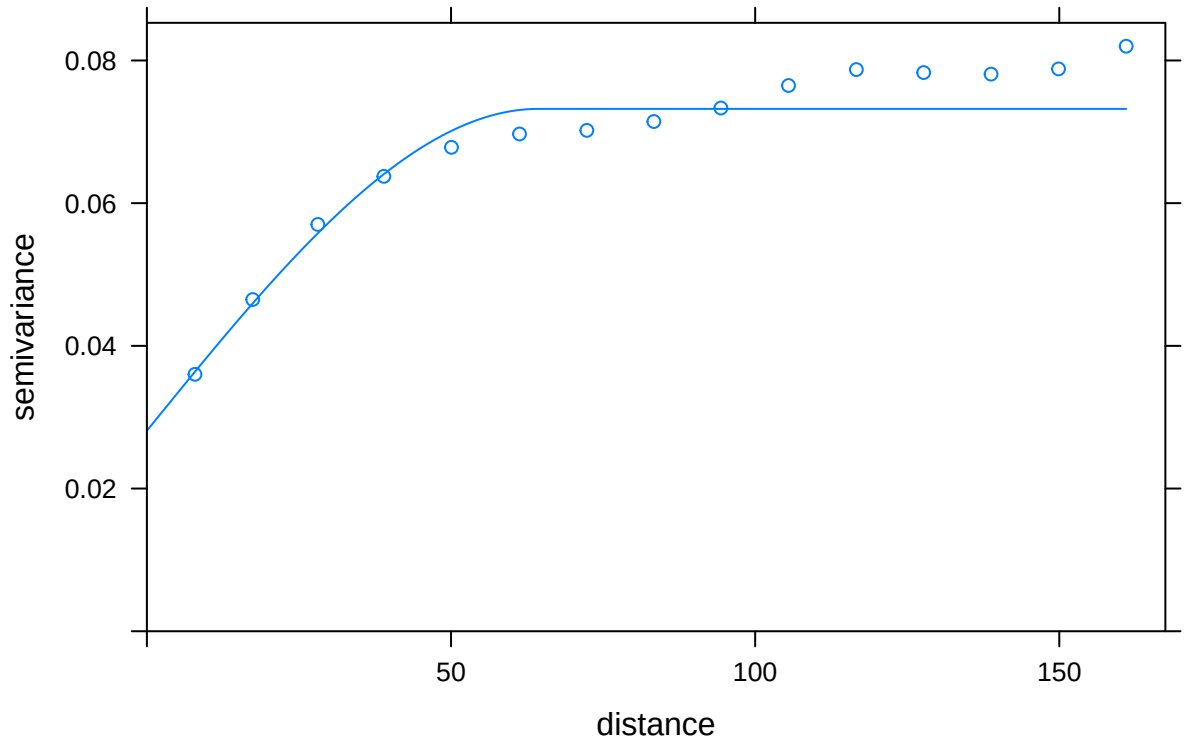
```
plot(Corn2013.var,model=Corn2013.vgm,main="Corn 2013")
```




```
print(Corn2015.vgm <- fit.variogram(Corn2015.var, vgm(.8,"Sph",50,.2)))
```

```
##   model      psill    range
## 1   Nug 0.02810023  0.00000
## 2   Sph 0.04511421 64.33307
```

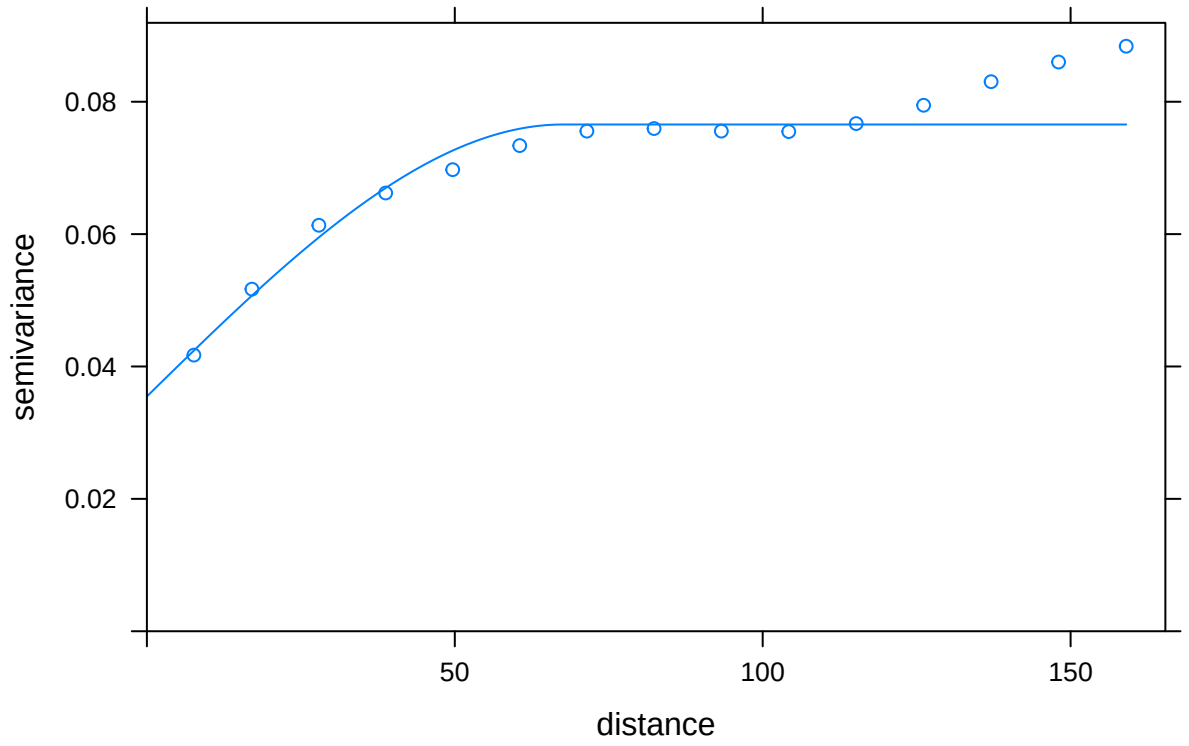
```
plot(Corn2015.var,model=Corn2015.vgm,main="Corn 2015")
```




```
print(Soybean2014.vgm <- fit.variogram(Soybean2014.var, vgm(.8,"Sph",50,.2)))
```

```
##   model      psill    range
## 1   Nug 0.03547373  0.00000
## 2   Sph 0.04108822 67.53938
```

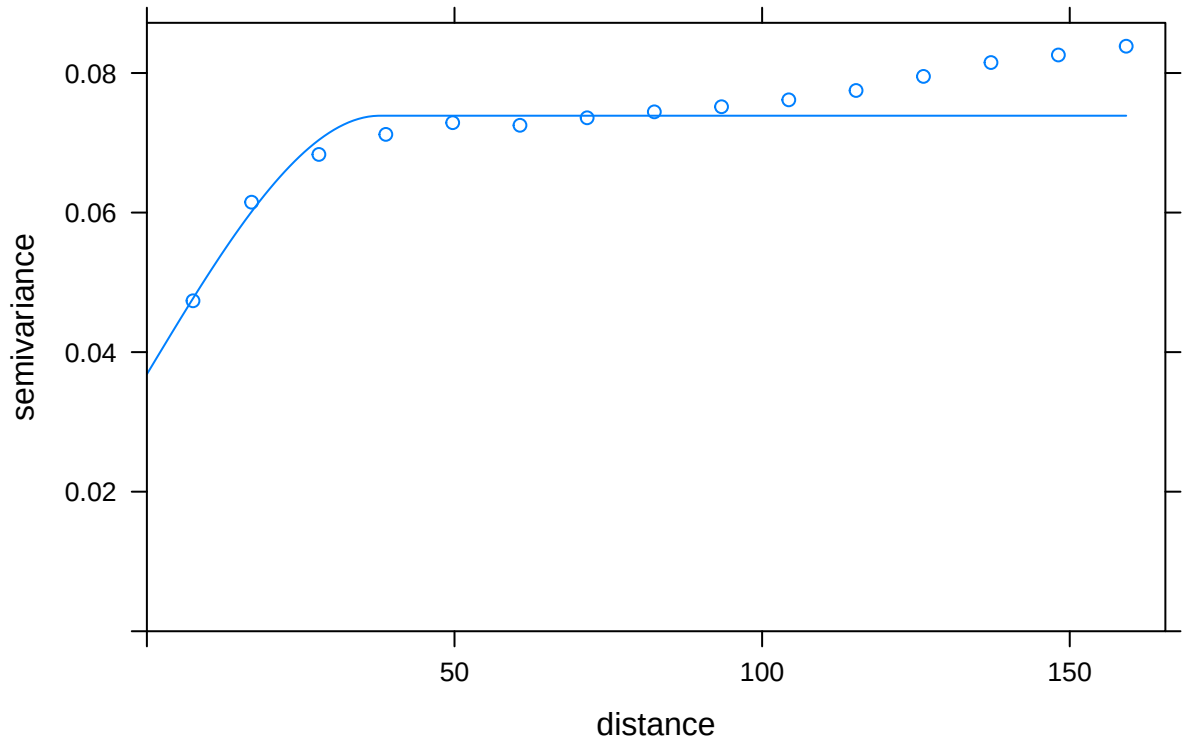
```
plot(Soybean2014.var,model=Soybean2014.vgm,main="Soybean 2014")
```




```
print(Soybean2016.vgm <- fit.variogram(Soybean2016.var, vgm(.8,"Sph",50,.2)))
```

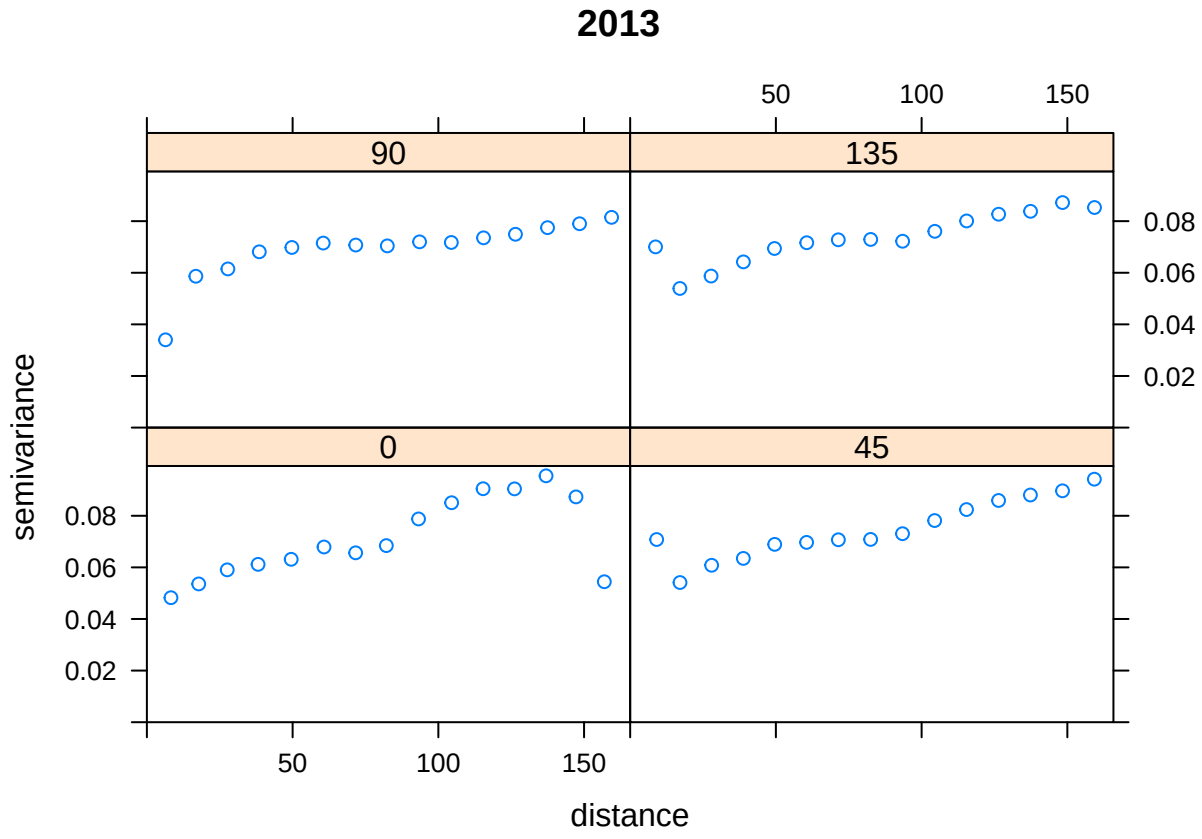
```
##   model      psill    range
## 1   Nug 0.03683531  0.00000
## 2   Sph 0.03704380 37.86937
```

```
plot(Soybean2016.var,model=Soybean2016.vgm,main="Soybean 2016")
```

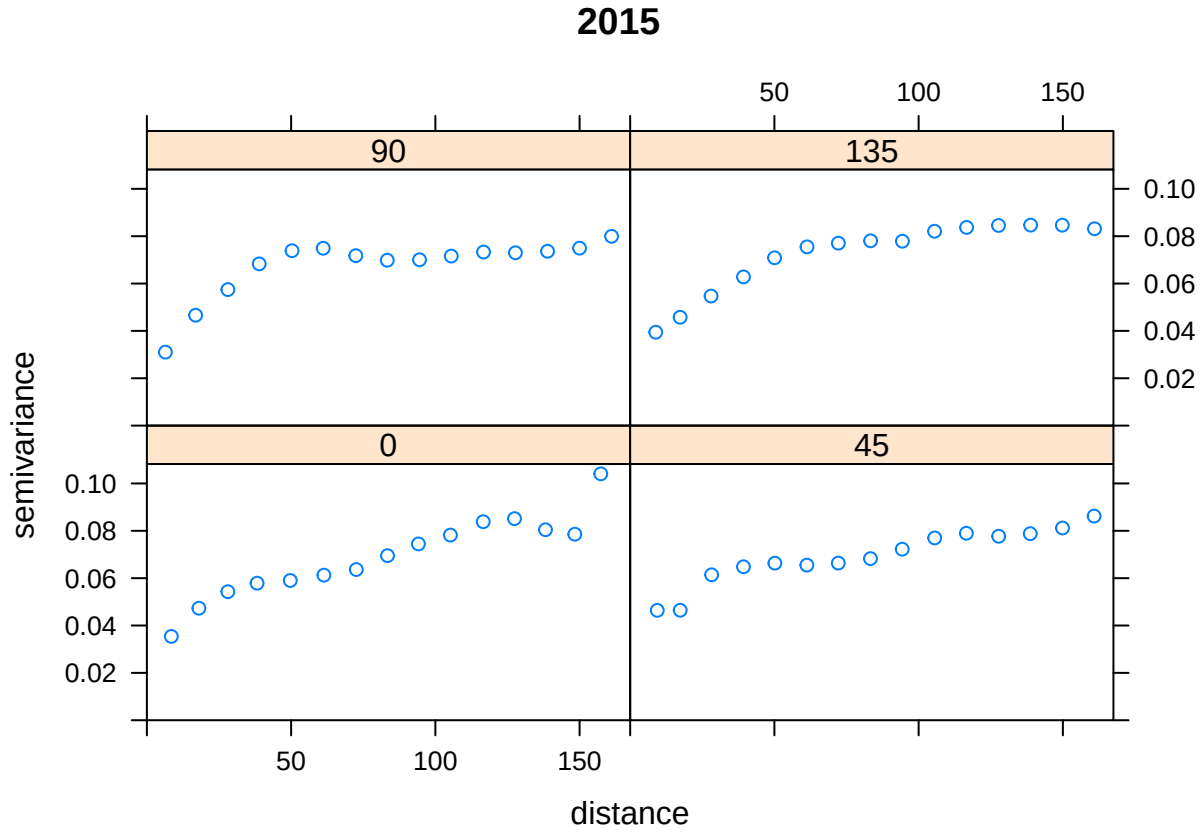


Now check for anisotropy

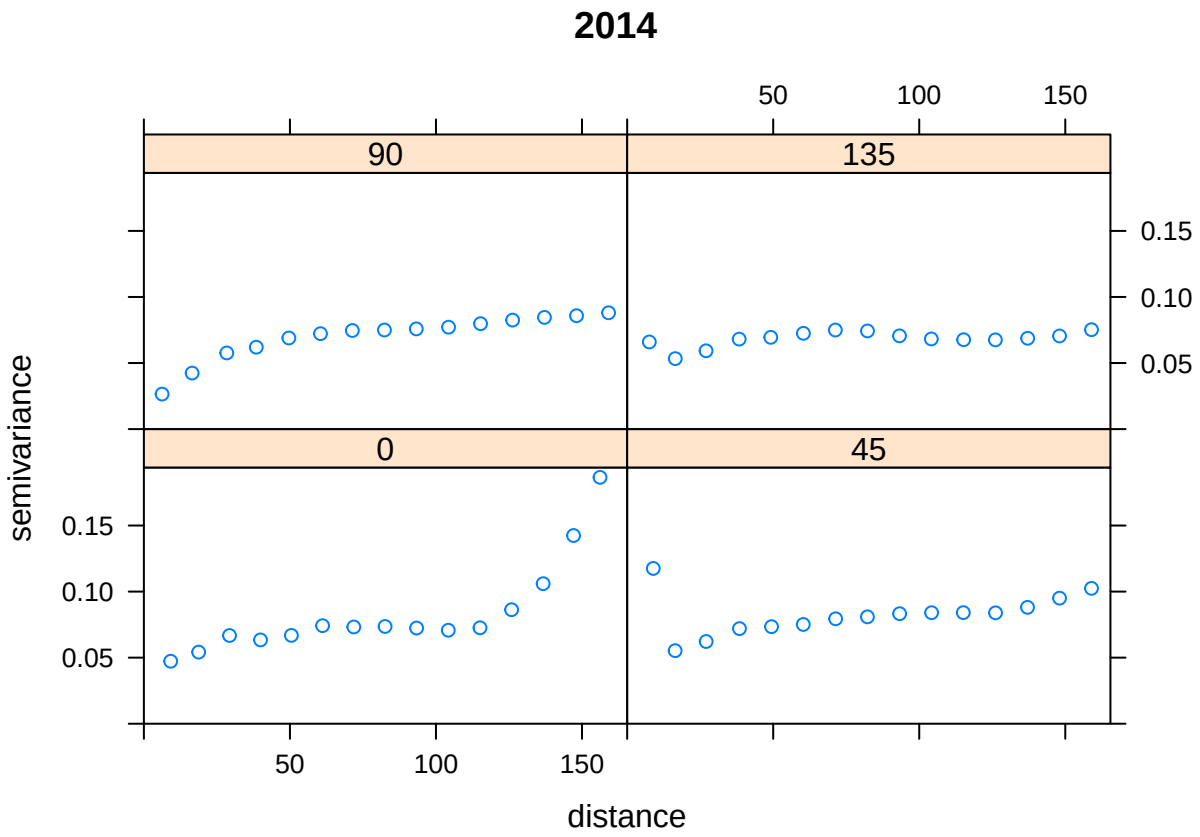
```
Corn2013.ani.var <- variogram(Quantile~1,
                        locations=~Easting+Northing,
                        data=Corn2013.dat, alpha=c(0,45,90,135))
Corn2015.ani.var <- variogram(Quantile~1,
                        locations=~Easting+Northing,
                        data=Corn2015.dat, alpha=c(0,45,90,135))
Soybean2014.ani.var <- variogram(Quantile~1,
                        locations=~Easting+Northing,
                        data=Soybean2014.dat, alpha=c(0,45,90,135))
Soybean2016.ani.var <- variogram(Quantile~1,
                        locations=~Easting+Northing,
                        data=Soybean2016.dat, alpha=c(0,45,90,135))
plot(Corn2013.ani.var,main="2013")
```



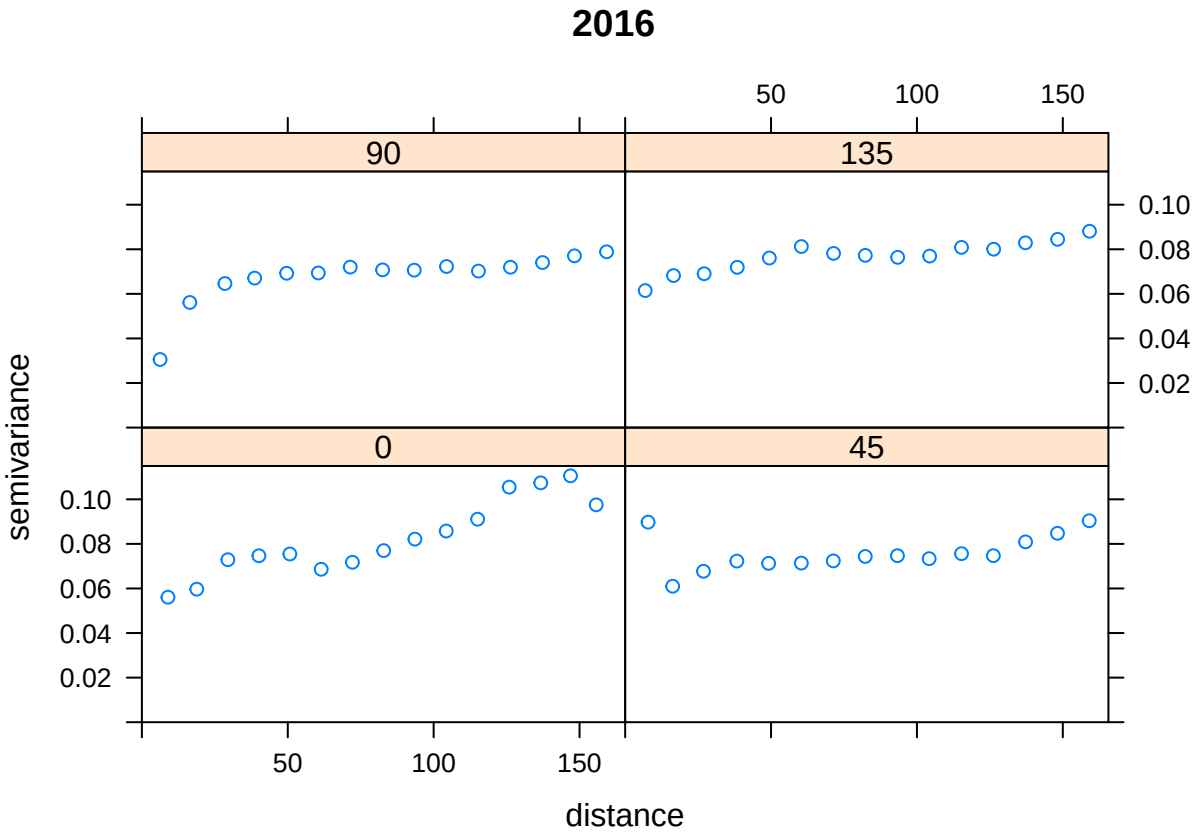

```
plot(Corn2015.ani.var,main="2015")
```



```
plot(Soybean2014.ani.var,main="2014")
```




```
plot(Soybean2016.ani.var,main="2016")
```



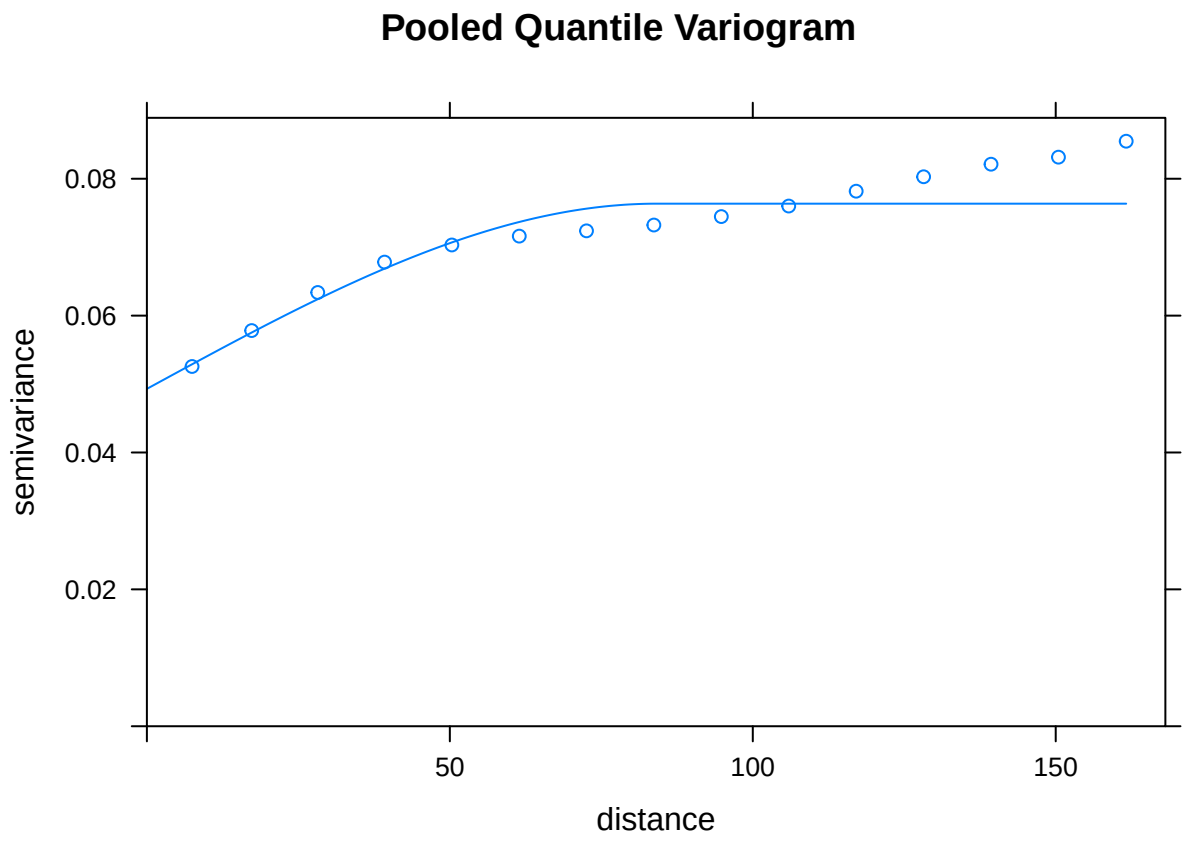
Pooled Maps

There might be some aligment issues, suggested by the high correlation over short distance at 45, as seen in Sobyean 2014 and 2016; perhaps this is a crop related issue. However, I don't think (this is a personal judgement) that they are so great as to prevent us from combining these data. So, we produce a variogram for the pooled map:

```
Pooled.var <- variogram(Quantile~1,
                        locations=~Easting+Northing,
                        data=Pooled.dat)
print(Pooled.vgm <- fit.variogram(Pooled.var, vgm(.8,"Sph",50,.2)))
```

```
##   model      psill    range
## 1   Nug 0.04929855  0.00000
## 2   Sph 0.02705934 84.08103
```

```
plot(Pooled.var,model=Pooled.vgm,main="Pooled Quantile Variogram")
```




```
save(Pooled.var,Pooled.vgm,file="Variograms.Rda")
```