Available online at www.elixirpublishers.com (Elixir International Journal)

Agriculture

Elixir Agriculture 97 (2016) 41845-41847

ISSN: 2229-712X

Zoning of soil's salinity by using Kriging,Cokriging methods, inverse distanceweight method of and kriging regression

Nasiri Abouzar[1], Shojaei Saeed[2,*], Ali asghari[2], Absalan Yahya[1], Shirokova V. Alekcandrovna[1] and Zareie Sajad[1]

[1]State University of Land Use Planning, Moscow, Russia (105064, Moscow, Street Kazakova, 15.

[2]Young Researchers Club, Zahedan Branch, Islamic Azad University, Zahedan, Iran.

ARTICLE INFO

Article history:

Received: 10 May 2016;
Received in revised form:
4 August 2016;
Accepted: 9 August 2016;

Keywords

Geostatistical,
Soil,
Model,
Salinity.

ABSTRACT

In recent years most of countries particularly pay attention on soil's salinity because reducing water quality,reducing efficient of agronomy products and extension of desertification are come from that phenomenon.Iran is one of only three countries where is encountered to soil's salinity.one of ways to control salinity is investigation range and addition of it in an area, and in the next step prevention and elimination of problem will be considered.The research has been done in Zahedan's area in order to examination of soil's salinity(electricity transfer) with exploitation of geostatistical procedure.Geostatistical factors are used by Kriching, Cokriching, inverse distance weight method and Krichingregression.The 300 points have been done in order to determination of amount of electricity transfer in horizontal and vertical state by electromagnetic inductor device.Three depths of 0-30,30-60 and 60-90 cm have been investigated.According to obtained results the least sum of error in three depths in Kriging regression than three others method illustrate how the method is high benefit and accurate and the method has been chosen to determination of soil's salinity.Coefficient of soil salinity in regression model in 0-30,30-60 and 60-90 depths have been obtained 0.22,0.27 and 0.32 respectively.According to obtained map, whatever we go down from surface to depth of soil, salinity becomes lower soit has to be more considered to harvest and cultivate.According to low cost and high accuracy of the Kriging regression method, it can be used for zoning of soil's salinity.

Introduction

Extension of soil's salinity is an important issue in most of countries.Salination rate of land in some countries such as Iran, Egypt and Argentina is 30% more than other countries and among of 19 million hectare of agriculture land in Iran almost 50% have salinity and sodium problem[1].Of 6.8 million hectares those are suffered to different degrees of salinity, 4.3 million hectaredon not have other limitations except of salinity[2].Nowadays,researches are trying to monitor saline area by using different methods to recognize and mapping from this type of soil. In a same research, Taghizadeh-Mehrjardi et al [3], have done a numeralability of electric transfer by using Kriging regression model in Ardakan area. Aim of the research is preparation of salinity soil's map in Sistan area.At the first by using of Kriging,Cokriging, inverse distance weight method and Kriging regression accuracy of salinities' estimate has been measured and finally by exploitation of the best method geostatistical of salinities' map is extracted.

Materials and Methods

The study has been done in Zabol city in state of Sistan Baloochestan.Geographic coordinate of the area is 42 ″61˚0′ to 61˚ 46′ 12″ of eastern longitude and 30˚ 41′ 22″ to 31˚ 12′ 21″ of northern latitude,average rain is 61.01 ml.To proper sampling of studied area, at the first 300 count have been read in vertical and horizontal state by using electromsgnetic inductor device.Then the points have been covered to attached layers by using usual Kriging with local variogram[3].

In the next step,obtained external electric transfer (in two states) to determinate sampled points from soil has been used by utilization Hypercube technic[4]. In every specified place by Hypercube technic,sampling of soil has been done in 0-30,30-60 and 60-90 depths. After preparation samples had been done, electric transfer was measured in saturated extract[5].Geostatistical models(Kriging, Cokriging, inverse distance weight method and kriging regression) have been used to do the research (Table 1).

Error square radical, explanation coefficient and error average have been used to assessment of model (Table 2).
EMv: electric transfer of outward in vertical state; EMh: electric transfer of outward in horizontal state

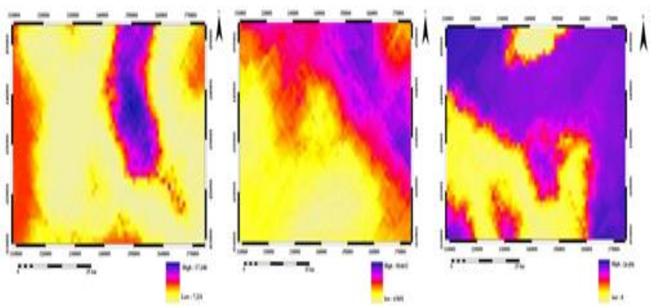

Figure 1. maps of electric transfer's ability by using Kriging regression model(from right to left respectively: in depths of :0-30,30,60 and 60-90 cm).

Tele:
E-mail address: s_shojaei@ut.ac.ir

Table 1.Used geostatistical models.

Kriging	In which, Z*(xi): approximate term,λ_i: weight or quantity importance depend on i sample and z(x_i): are amount of measured variable [6].	$Z^*(x_i) = \sum_{i=1}^{n} \lambda_i z(x_i)$
Cokriging	In which, Z*(xi): is the approximated amount for x_i point ,λ_i: is the related weight to z,λ_k : is the related to auxiliary variable y,z(xi):is the observed amount of main variable and y(x_k):is the observed amount of auxiliary variable. In which, Y(zy) h :is the mutual variogram between y and z , z(xi): is the observed	$Z^*(x_i) = \sum_{i=1}^{n} \lambda_{ii}. x_i \sum_{k=1}^{n} \lambda_k. y(x_k)$ Y(zy)h =1/2n[z(xi + h) – z(xi)]×[y(xk – y(xk))]
Inverse Distance Weight (IDW)	In which h_{ij}:is the distanse difference between site node (i) and node vicinity point (i),$\hat{Z}_J$:is the amount of approximated Z parameter ,zj: is the real amount of Z parameter in vicinity of node, d_{ij} :is the distance between site node of (i) and vicinity of point of (i) node , □ : is the given power , **σ**: is the coefficient of smoother [7].	$\hat{Z}_J = \frac{\sum_{i=1}^{N} \frac{Z_i}{h_{ij}^{\beta}}}{\sum_{i=1}^{N} \frac{1}{h_{ij}^{\beta}}}$ $h_{ij} = \sqrt{d + \sigma^2}$
kriging regression	1. Finding the nearest neighbor points respect to point that predict is done in it. 2. Determining experimental variogram by using neighbor points. 3. Fitting proper model to experimental variogram. 4. Pridicting amount of salinity in assigned point [8].	

TABLE 2.Assessment models of geostatistical models' methods

$ME = \frac{1}{n}\sum_{i=1}^{n}(X_o - X_e)$	$R^2 = \left[\frac{\sum((X_e - \bar{X}_e)(X_o - \bar{X}_o))}{\sqrt{\sum((X_e - \bar{X}_e)^2 (X_o - \bar{X}_o)^2)}}\right]^2$	$RMSE = \left[\frac{\sum(X_o - X_e)^2}{n}\right]^{1/2}$

Results and Discussion

The electric transfer's amount of three depths and the electric transfer's amount of outward are shown in table 3.

TABLE 3. Statistical summary of electric transfer's amount in three depths and the electric transfer's amount of outward.

Depth	Coefficient of changes	Deviation of standard	average	maximum	Minimm
0-30	43/15	4/88	11/31	27/92	5/91
30-60	37/23	3/82	10/26	23/11	5/90
60-90	33/36	3/39	10/10	23/71	6/56
EMv	35/18	47/42	134/80	266/00	69/00
EMh	41/34	43/56	105/39	217/00	47/00

According to obtained results from difference depths of salinity (table 3) it can be resulted that data have many changes in domain of salinity, indicating that data are un-uniform[9].It seems that using undesirable water (high electric transfer) leads soil to become more saline [10].In a same research, Taghizadeh-Mehrjardi et al [3], have done anumeral ability of electric transfer by using Kriging regression model in Ardakan area. The results illustrated that how Kriging regression model with localvariogram were benefit.The Kriging regression predict percent of error in horizontal state and the error was 21 and 28 less that when they used Cokriging and Kriging respectively.

Conclusions

According to obtained results the least error average and sum of squares error than others geostatistical models are related to Kriging regression model and the model is used to prepare map of soil salinity. According to obtained map, salinity in margin of Hamoon lake is further and whatever we go away from lake amount of salinity becomes less. Also by coming up from depth to surface of soil, salinity becomes less. (Figure 1).

References

[1] Daempanah, R., Haghnia, Gh.,Alizadeh, A., and Karimi, A. (2011). Mapping salinity and sodicity ofsurface soil by remote sensing and geostatistic methods in South Side of MahValatcounty,Journal of Water and Soil, 25(3), 498-508, (In persian).

[2] Moameni, A. (2011). Geographic distribution and salinity levels of the soil resources of Iran, IranianJournal of Soil Research, 24 (3), 203-215.

[3] Taghizadeh-Mehrjardi, R., Sarmadian, F., Rousta, M. G., Rahimian, M. H., Omid, M. &Tomanian, N. (2014). Digital zoning electrical conductivity apparent using regression kriging and local variogram in Ardekan. Journal of Soil management and sustainable production, 4(4), 1-28. (In Farsi)

[4] Minasny, B. and McBratney, A.B. (2006). A conditioned Latin hypercube method for sampling in the presence of ancillary information. Computers and Geosciences, 32, 1378–1388.

[5] Shojaei, S. (2015). The effect of unconventional waters rehabilitation and soil degradation in arid areas (case study: Zabol). MSc thesis. University of Tehran. Page 133.

[6] McBratney, A.B., Mendonca-Santos, M.L., &Minasny, B. (2003). On digital soil mapping. Geoderma, 117, 3-25.

[7] Davis, J.C. (1986). Statistics and data analysis in geology. Wiley & Sons, New York, 646paper.
[8] Sampson, D., Richards, M., Szpiro, A.A., Bergen, S., Sheppard, L., Larson, T. V.& Kaufman, J.D. (2013). A regionalized national universal kriging model using Partial Least Squares regression for estimating annual PM2.5 concentrations in epidemiology. AtmEnvironment, 75, 383-392.
[9] Shakouri, M. Shabanpour, M., Asadi, H., Davatgar, N., and Babazadeh, Sh. (2011). Evaluation efficiency spatial interpolation techniques in mapping organic carbon and bulk density paddy soils of Guilan, Journal of Water and Soil Conservation, 18 (2), 195-209, (In Farsi).
[10] Abdolazimi, M. et al. (2013). Using Kriging method in assessing the situation and sodium salt: Case study soils around Lake Tashk&Bakhtegan, Fars province. Iranian journal of geology, seventh year, Number twenty-fifth. Pp. 35-48.