Using previous experimental results to predict future yield data of some field crops

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The pres~nt investigation was carried out to study the effectsof a wide range of main agronOJldcvariables (N.P •. K. fertilizers,water regimes and planting dates },and the_interactions of thesevariabl.s with environmental factors on the yield response of twomajor Egyptian cereal crops, wheat and corn (maize). Also, to developa general prediction equation for each crop , evaluate the contributionof the controlled and uncontrolled variables affecting yield res~onseand determine the most important variables •Quantitative evaluations of applied factors -(controlled variables)and environmental variables (;une~n~rolledvariables) were all necessaryto develop a satisfactory r~lationshipbetween crop grain'yield and theresponsible variables .Thus~ expetiJaental sites were selected in awayto provide a sufficiently wider8Q.ge in each uncontrolled variable topermit inferences concerning the entire cultivation-areas in which thecrop was produced •'Data from a series of fertilizer, irrigation and ·planting dateexperiments incl,uding uncontrolled environmental variables were combinedto give a general predictiOll equatioD for each crop. Wheat y1.eld.dataused in th1.s study was obtaiJled f~ 37fiel.d expert-u distributedover the coUntry duz:ina theper:iOi f-roil-1971-1980 -• resulting in a totalof 332 yield _value ot..e"-tiou ...Qml ,data.COIlta1ned 364 yield valueobservations obtained froa 32 field experiments located in North andSouth Delta ,.and Middle Egypt during the same period aentioned above.Simple correlation and aultiple regression techniques were usedto fullfil the.objectives of this study. The general model for theprediction equation obtainedfromaultiple regression analysis is thequadratic fo~ as followswhere :y denotes the predicted yield in Ard./Fad.is the regression intercept •,b.~~~are the partial regression coefficients •are the independent (predictor) variables •i , j • 1,2, •••••• n andi' j ~or interaction terms •The t.portaDt reaults obtained fro. thiastudy could be summarizedas follows :(1) Simple correlation values between crop grain yield and the initialgroup of independent variabiea indicated that applied nitrogen ,irrigation .,.plant~~ate • precedina crop and aoil ~xture are.the.II08t iJIp~rtant variables in·wheat yield. produetion •.Meanwhile tfor corn yield production • the IIOst iJlportaDt variables are theapplied nitroaeD , irri&atioa and solI texture.(2) The effective UDcODtrol.lad ".nablea influenced Jdtrog8D response.''.are than aay other ••• i1.ecl faetctr • TId. ia t~ for theRo crops.(3) No response was found'to P and K fertilizers for wheat grain yield,while corn grain yield had a marked response for these two fertilizers(4) For corn, response to ei·ther P or K was influenced only by nitrogenapplication •(5) The response to nitrogen for wheat grain yield was governed byits interaction with irrigation , planting date, soil pH and soiltexture. whereas, for com grain yield, the.variables tha~ hadthe greatest influence on the r~sponse to nitrogen were,·irrigation, soil pH and 80il texture •(6) In aci4ition to influencing response to nitrogen, soil textureiafluenced response to irrigation for both of the studied crops.I(7) Yield response curves for nitrogen application indicated that thehighest grain yield per faddan for wheat wasobtdned when 100 KgH/fad. cOJlbined.wit1ilsix irrigations or when the 80il texture wasclaS8 ·five (clay 80il) • For corn,. the highest grain yield wasobtained frca the application of 120 Kg N/fad. cc.bined with thehigher value. for any. of the ._ two variables •(8) With each increaae·1a nitropu level .upto 100 r.aJPa4. for wheatan' up to 120 Ia!Fad. for CODa ,·there- V_ ml 1aereaae in" thepredicted arata" yi.e.U .'lha-lacreaae vas· f.a ._"creaa~lrate for__(9) For the ,two crops. it was found that lesser number of irrigationsare needed to reach maximum yield in soils that contain a higherportion of clay. and vice versa •(10) The

prediction equations for both wheat and corn proved to havevery good predictivevalue. as indicated by their relatively. ’.. . .. 2high values for the. coeff,icient ,0£ ’lDult~pledetermination (R).In addit:L9U. these equations’ seeJDtobe agr1culturallymeaningfulas th~y have sensible regression coefficients and explainas much yield variations as possible • This indicates clearlytheir overall closeness of fit to actual results •(11) This investigation identified some of the important factors thatshould be considered in,planning fertilizer and irrigation programmesfor wheat and corn yield ,studies ,.,~anwhile, the obtain~dresultscould be transformed into a useful practical recommendation forthe research’.worker and the farmer •