

Environment Information and Assessment Technical Report



GIS awareness
package
IN AGRICULTURAL RESEARCH

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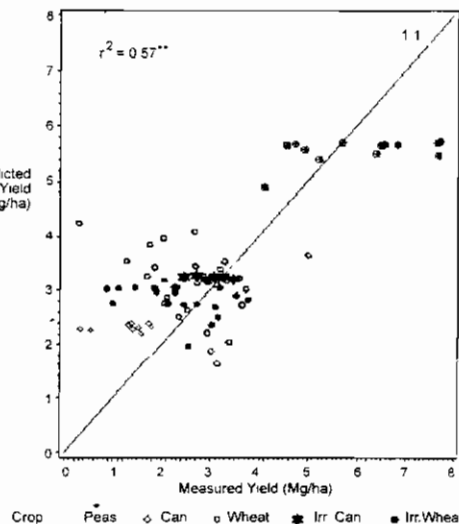
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Precision Farming - The EPIC Model

Objective

The Environmental Policy Integrated Climate (EPIC) Model is a soil/crop model composed of several simulation components for weather, hydrology, nutrient cycling, pesticide fate, tillage, crop growth, soil erosion, crop and soil management and economics. The objective of this study was to evaluate the EPIC model on a variable landscape site specific management basis and to develop a computer-based tool that would integrate the EPIC model with the GRASS GIS.

Alberta using a high-precision 3-D Differential GPS. The EPIC model was used on a sub-field, site-specific basis using soil profile information for various landscape transects, agronomic management and daily climatic data. The crop growth routines of this model were compared against two years of yield maps obtained from each field. The GISSMO interface provided an effective means of managing the various data layers for a field to utilize the EPIC model for each unique landscape-management polygon.



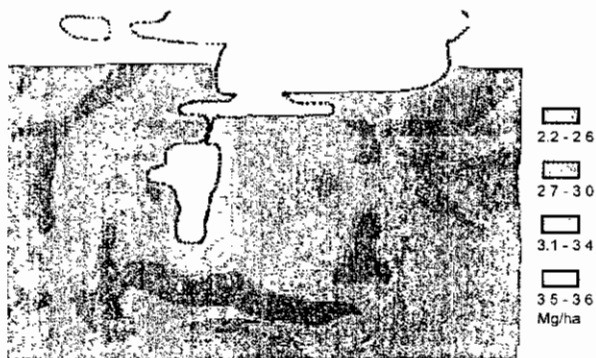
Relation between predicted and measured grain yield, using EPIC for all crops, fertilizer rates, etc.

Method

A research project was initiated using EPIC to study the development of optimal agronomic management on a site-specific basis. Crop yields were monitored during 1994 and 1995 at four sites in

Result

This study showed that the EPIC model can function as a good predictor of crop yields in Alberta using Canadian crop parameters, local station weather data, and site-specific soil investigations.



South Central ALBERTA:
1995 EPIC predicted wheat yield map at a site.

The potential benefit of using an integrated model is that other features of the model can then be used with little additional effort which may be very appealing for wide spread use in the agriculture industry. Models for nitrate and pesticide leaching, erosion and tillage are more likely to

be used if they come as part of an agronomic model that can be used for prescription mapping and risk assessment. A reliable model could also be used to test various management practices, climatic conditions and soil conditions on crop yields and soil conservation. Considerable work is still needed but the potential use of a model for site-specific farming is to provide a very powerful tool for farmers and researchers.



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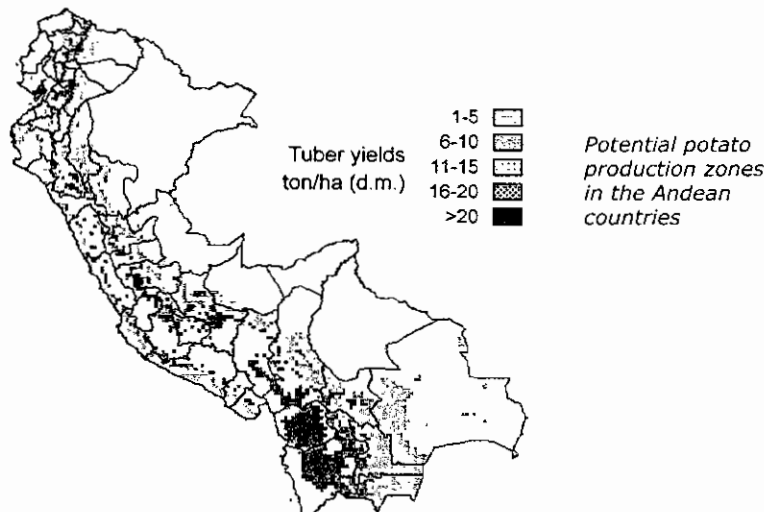
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Simulation Models for Studying Limiting Factors in Potato Production

Objective

GIS-linked simulation models can be used to study the effect of yield limiting factors on potato production. Both differences between areas and between cultivars can be assessed. With a crop growth model, standard varieties can be compared with either ideotyped or existing improved varieties. By linking a model to a GIS, the potential benefit of cultivar replacement can be studied over large regions.



Method

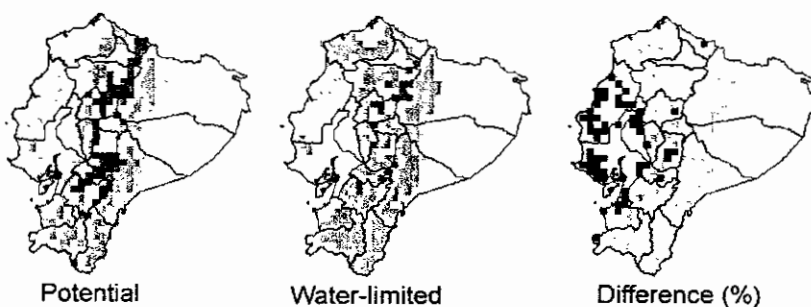
The simulation models are driven by weather data interpolated on a grid. Monthly values of minimum and maximum temperature are used to determine potential growing seasons for each grid cell, precipitation and potential evapotranspiration data are used to determine growing seasons for rainfed cropping.

In addition, monthly radiation data are used to calculate yields. The monthly values are supplied as inputs to a weather generator which produces years with different daily weather used by the potato growth simulation model. The work is carried out on a PC using IDRISI software.

Result

The GIS-linked simulation models are useful tools for:

- guiding crop improvement efforts,
- studying the importance of yield limiting factors,
- enabling a better estimation of the effect on yield of new varieties and their potential adoption.



<p>Tuber yield (d.m.) ton/ha</p> <p>1-5</p> <p>6-10</p> <p>11-15</p> <p>16-20</p> <p>>20</p>	<p>1-20</p> <p>21-40</p> <p>41-60</p> <p>61-80</p> <p>81-100</p>	<p>Percentage</p>
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Comparison of potential and rainfed potato yield in Ecuador



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