digiSoft CIS Based DSTs

Socioeconomic Benefits from Climate Forecasts for Action

BY Digitron Software

1. B J Garanganga - Agro-Meteorology Specialist
2. T Nyakutambwa - CIS Software Specialist

DAY 2, Session 1:

Modelling on CAMDT software

Model descriptions
(*assumption and uncertainties*)
Model analysis
(simulation and validation)

Validation Workshop on:

Analysing and Validating Crop Capability Prediction Model for Malawi, Mozambique and Zimbabwe

LILONGWE, Malawi

24 – 26 November 2021

Modelling and simulation

Systems are cycles of interacting components such that a change in one component affect changes in other components.

- A change in weather to warm and humid may lead to the more rapid development of a plant disease, a loss in yield of a crop, and consequent financial loss by farmers.
- Prediction of complex systems depends on integrating information into statistical and simulation models.
- Modelling enables one to predict the behaviour of design while keeping the expense at a minimum.

Agricultural systems are basically modified ecosystems that need to be managed through systems models which are possible only through classical engineering expertise.

Assumptions

A model is a schematic representation of the conception of a system or a set of equations, which represents the behaviour of a system.

Climate-agricultural systems are complex interactions between the components that are not completely understood.

In the crop capability prediction model the following assumptions made are:

- Fidelity in seasonal climate forecasting: good hit rate
- Thresholds of above/below normal probabilities
- Crop cultivars used will replaced by local ones after calibration work
- Limitations of predictability

Assumptions of high quality seasonal climate forecasts

Using contingency table to establish reliability

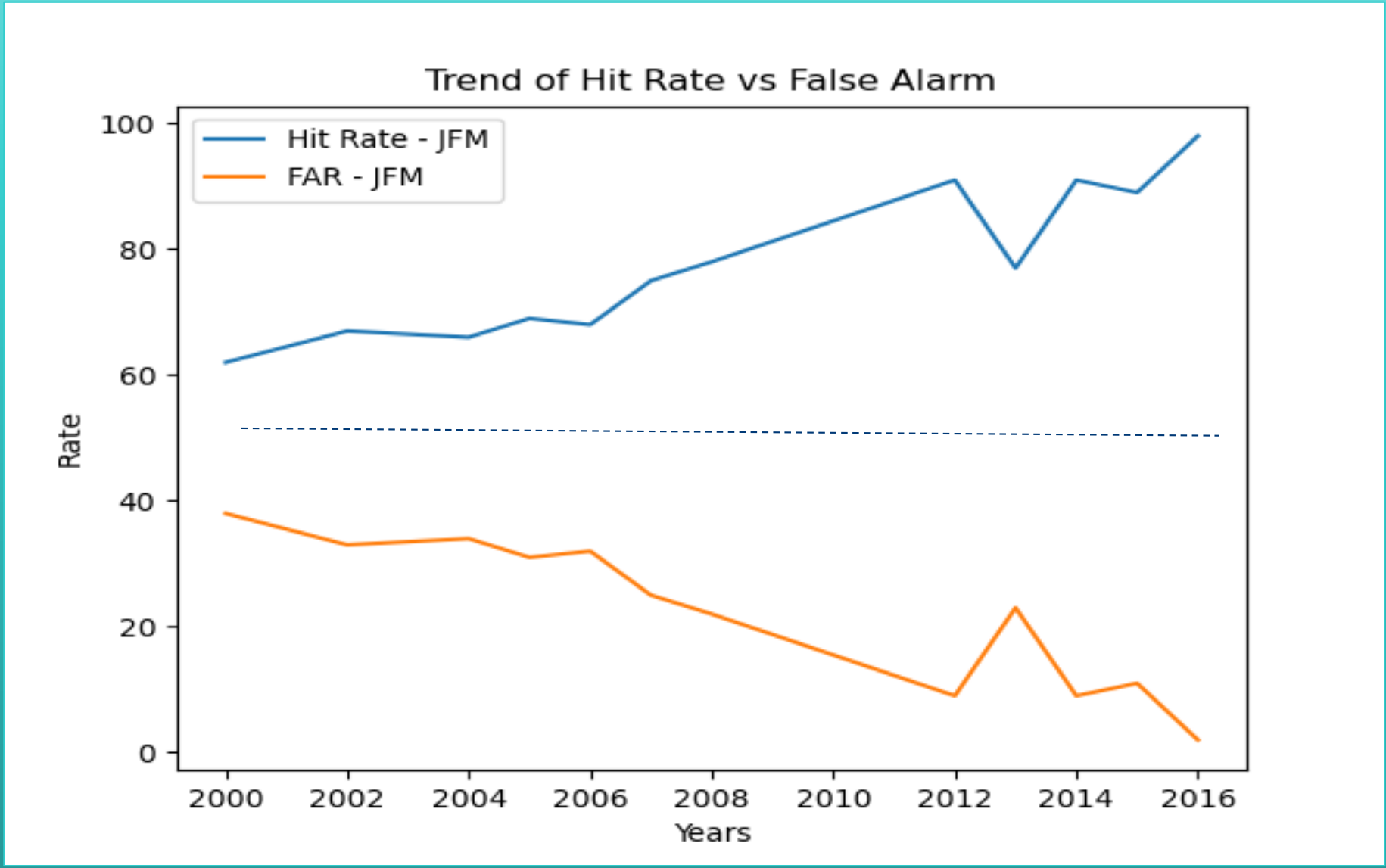
		Observed		
		Yes	No	
Forecast	Yes	a	b	a + b
	No	c	d	c + d
		a + c	b + d	n = a + b + c + d

Contingency Table

Above table looks at four possible outcomes:

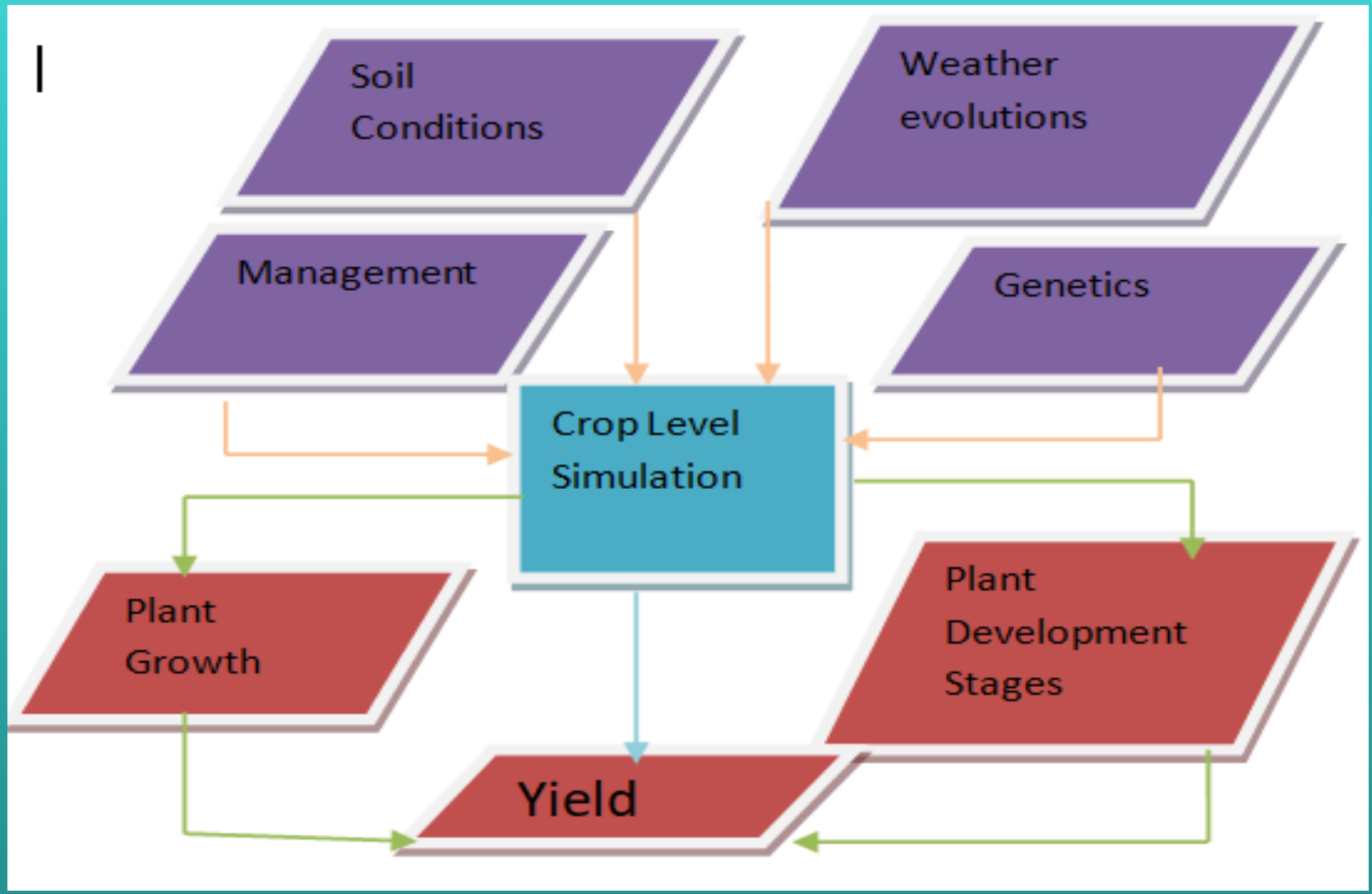
- An event is forecast and the event occurs (a)
- An event is forecast and the event does not occur (b)
- An event is not forecast and the event occurs (c)
- An event is not forecast and the event does not occur (d)

Hit Rate: ***H = a/(a + c)*** ***False Alarm Rate:*** ***FAR = b/(a + b)***



SADC HIT RATE VS FALSE ALARM 2000 – 2016 SEASON JFM

crop simulation model



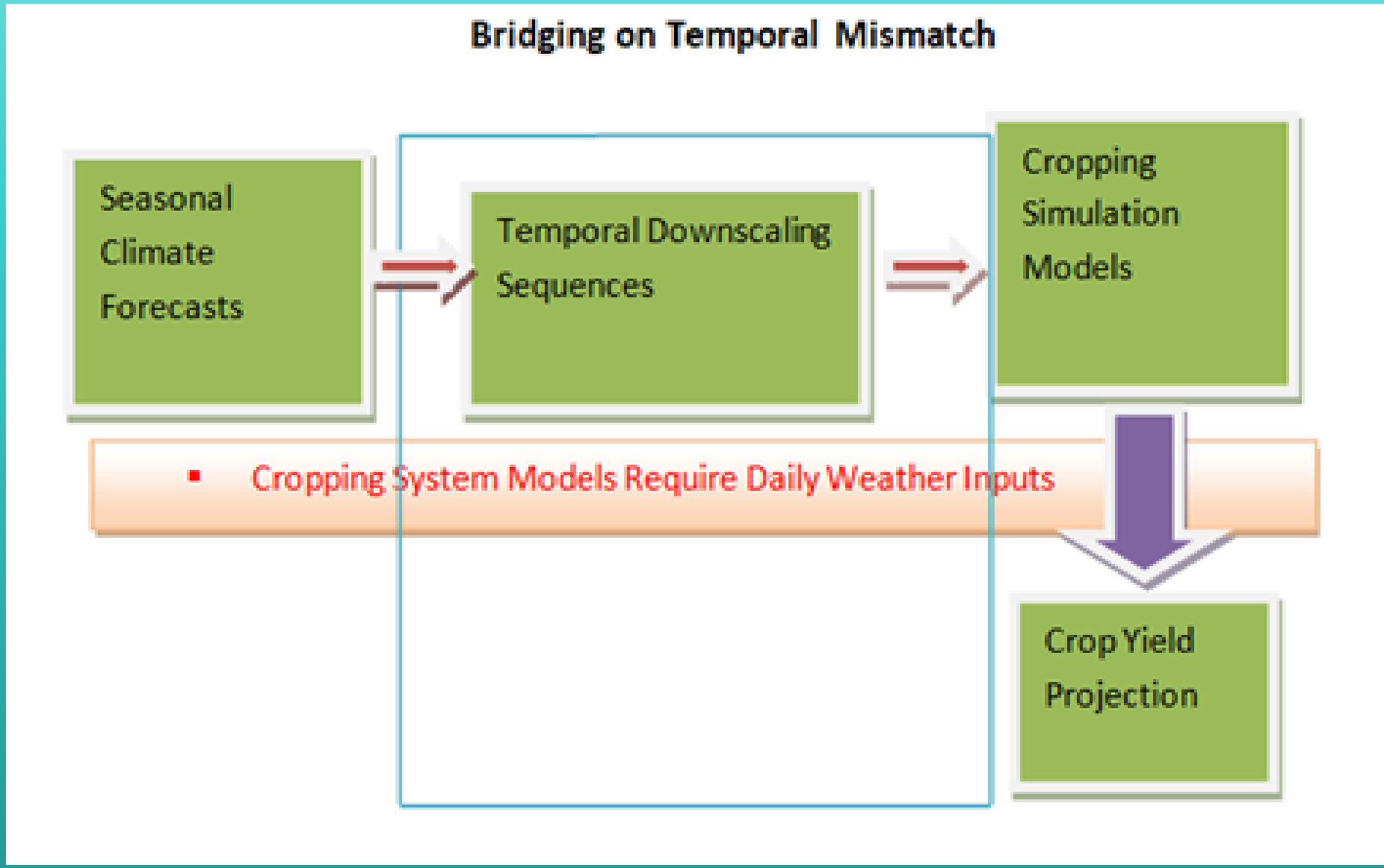
uncertainties

The simplification of reality as modelled has drawbacks. Therefore there will be some inherent uncertainties in any model. There will some uncertainties due to the fact that:

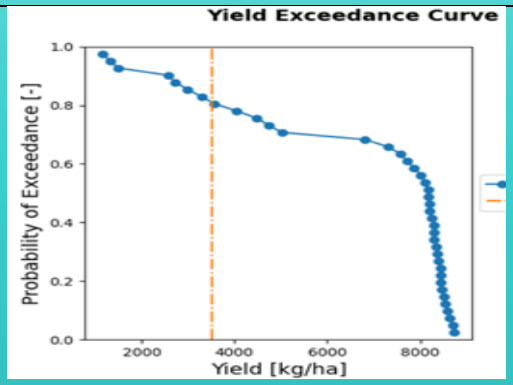
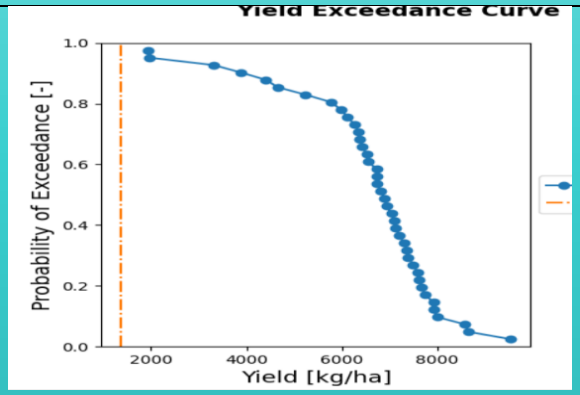
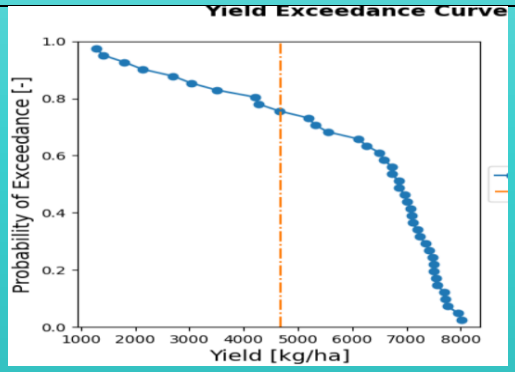
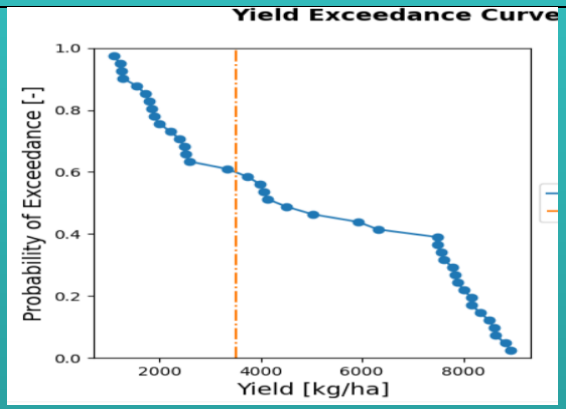
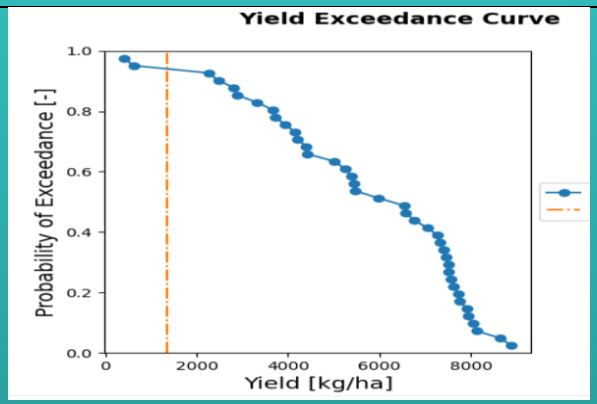
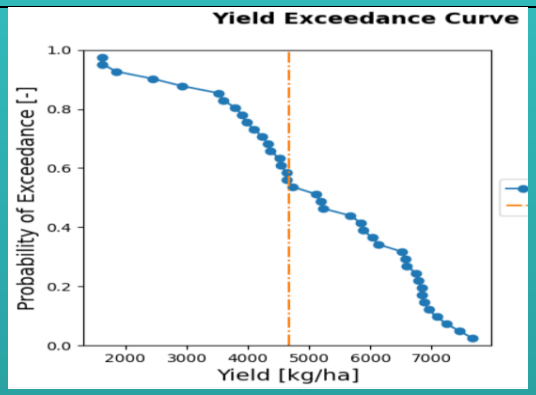
- Model is applied in a new situation (e.g., switching to a new variety);
- Processes are not all fully understood to be always ideally simulated;
- Best mechanistic model still contains some empiricism making parameter adjustments vital in a new situation; and
- Model performance is limited to the quality of input data of parameters to be modelled: e.g., (meteorological data used in the model need to be reliable and complete).

simulation

- A simulation is the manipulation of a model in such a way that it operates on time or space to compress it.
- One of the main goals of crop simulation models is to estimate agricultural production as a function of weather and soil conditions as well as crop management.
- These models calculate both rate and state variables over time, normally from planting until harvest maturity or final harvest.



SADC HIT RATE VS FALSE ALARM 2000 – 2016 SEASON JFM

		
a (i) Rice yield exceedance curve in above-normal rainfall	a (ii) Maize yield exceedance curve in above-normal rainfall	a(iii) Sorghum yield exceedance curve in above-normal rainfall
		
b (i) Rice yield exceedance curve in below-normal rainfall	b (ii) Maize yield exceedance curve in below-normal rainfall	b (iii) Sorghum yield exceedance curve in below- normal rainfall

Yield exceedance curves for Masvingo, Zimbabwe based on three-month lead forecasts, with planting date 15 December 2009 for for (a) above-normal and (b) below-normal rainfall for (i) rice, (ii) maize and (ii) sorghum

validation

Purpose of model is usually to aid in explaining, understanding or improving performance of a system. It is not a simple task to produce a comprehensible, operational representation of a part of reality.

Model has to grasp the essential elements and mechanisms of that real world system;

- Exceedance curves are realistic
- Calibrations need to be carried out with data
- Need for further field experiments

Modelling complex systems encountered in environmental management is more demanding

Field experimentation helps in the validation

Model users need to understand the structure of the chosen model, its assumptions, its limitations and its requirements before any application is initiated.

Users need to judiciously assess model capabilities and limitations as they adopt it for application and decision-making purposes.

digiSoft AgroMeteorology Science

Thank You; Merci; Obrigado; Zikomo; Siyabonga; Tatenda

11/24/2021

Digitron-CAMDT/DSSAT
CROP YIELD PREDICTION MODELLING

T: +263 242 793691-4
M: +263 772 220330 (WhatsApp)
M: +263 784 996 727 (WhatsApp)

E: bjgaranganga@digitron.co.zw
bjgaranganga@gmail.com
E: trymoren@digitron.co.zw