AGROCLIMATIC ZONING FOR CROP PLANNING

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OBJECTIVES

THE OBJECTIVES CAN BE DIVIDED INTO 2 CATEGORIES
MAIN FOCUS

- CROP SUITABILITY
- FARMERS INCOME
- RISK MANAGEMENT
- IRRIGATION REQUIREMENTS
- PRESERVE WATER RESOURCES
- CROP PLANTING AND HARVESTING
- PEST MANAGEMENT

- LONG TERM FOOD SECURITY
- INDICATION OF NEW SPECIES TO BE CULTIVATED
- HOW TO ADD SOCIAL AND ENVIRONMENT ASPECTS
- HOW TO COPE WITH CLIMATE CHANGE SCENARIOS
TOPICS TO BE DISCUSSED

- BACKGROUND AND IMPORTANCE
- METHODOLOGY USED FOR CROP ZONING AND CROP PLANNING
- THE NEEDS ENVOLVED FOR SUCH ANALYSES
- HOW TO PROCEED IN SUCH AREA

SUPPORT OR OUTCOMES EXPECTED

- CROP PLANNING
- CROP FIELD TRIALS
- CROP INSURANCE
- SOCIAL ECONOMY

THE IMPACT OF CLIMATE CHANGE ON AGROCLIMATIC ZONING
The climate is generally the first element taken into account as it is considered a stability factor, although seasonal variations and the climate variability are also to be considered.
An important procedure is the establishment of public policies for agricultural development based on climatic characteristics.

In that sense, agricultural zoning followed by Agro-ecological Zoning, based on the climatic and soil potential of a region and its climatic associated risks are highly relevant.

It is also important to mention that the agro-ecological zoning might provide complementary informations about the climatic risk such as: high or low temperatures, drought or excess rainfall, thus indicating the climatic risk and the feasibility of crop success.
PROCEDURE

- This paper aims to provide scientific information about agroclimatic zoning and crop planning based on FAO and by the Agronomic Institute (IAC).

- A complementary analysis of coping the process of climatic risks and crop development is introduced, considering also a dynamical procedure to follow-up weather variables and a monitoring system to ensure a better food security policy and crop yield estimates, considering the climate change.

- Some results are presented for a few countries...
Despite being relatively work intensive, this methodology of crop zoning is efficient for qualitative climate comparison between the several regions of the globe to study agricultural zoning.

Also, a better degree of refinement is reached when this methodology and the climate indexes are compared with weather indexes of crop response in order to obtain the bioclimatic indexes for the referred crop.
BASIC METHODOLOGY IN AGROCLIMATIC ZONING

Data collection and preparation of basic climatic charts representative of the region (average air temperature; annual and coldest month, potential evapotranspiration, among others);

Calculation of Water Balance for the determination of the following parameters: actual evapotranspiration; water deficit and surplus based on water balance parameters according to crop-soil relations;

Survey of climate demands of the crop - values estimated based on climate-crop qualification

Evaluation of major climatic constraints- frost-drought

Use of daily values for risk assessment
Besides the overall achievement of crop suitability in function of climate constraints and crop requirements, the crop planning should also enhance the major factors involved in crop development and production as described above, or for instance risks of frost, dry spell, and water surplus or meteorological and agronomical drought.

Furthermore, a consistent and dynamical procedure must be carried on to provide farmers and extension service communities with on-line weather data to better understand crop behavior and the success or fail in the expected crop yield.
After all the processes a region may be classified for the growth of a plant, in one of three following categories:

**ADEQUATE** - when macroclimate conditions are normally favorable to commercial base use;

**RESTRICTED** - when climate conditions present restrictions which frequently undermine certain phases of the crop. There might be some limitation, not too severe, in terms of temperature and/or water supply;

**INADEQUATE** - when climatic characteristics are not adequate for commercial use. In this case, there are serious limitations in terms of temperature and water supply.
The results presented will be considered to the following aspects:

- Agroclimatic adaptation
- Soil and climate combination
- Soil-climate and water restrictions
- Agro-environmental qualification
- Field trials
- Climate scenarios
- Crop breeding to cope with global warming
SUGAR CANE INDUSTRY IN SÃO PAULO

- Requirements to run the mills (water availability)
- Frost occurrence
- Drought probability
- Flowering probability
- Field transport
- Avoid burning process
- Alternate crop in restricted areas
- Environmental yield prediction
- To introduce new varieties
- Effect of increase in area and demand in water for population
A NEW DEMAND CONSIDERING SUGAR CANE INDUSTRY AND ENVIRONMENT CONSERVATION

- To preserve wild life
- Maintain reasonable aspects of rivers and water reservoirs
- To better indicate connection areas for wild life and natural vegetation to recovery
- To indicate soil conservation methodology
- Program named ~
  Green Ethanol~
- If the aspects are considered they get the green stamp for exportation
CROP INSURANCE POLICY SÃO PAULO

► TO SUBSIDIZE SMALL FARMERS UP TO 60 THOUSANDS US$ OF INCOME

► HOW TO PROCEED

► MAINLY SMALL FARMERS

► AGROCLIMATIC ZONING

► THE PREMIUM THE FARMERS WOULD PAY - 50% IS PAID BY STATE GOVERNMENT (FEAP)

► HORTICULTURAL CROPS

► OUT SEASON CORN - HAS A DIFFERENTIAL RELATED TO AVERAGE CROP YIELD FOR THE REGION

► AND THE TECHNOLOGY USED

► THIS HAS BEEN SINCE 1994 - FEDERAL GOVERNMENT INITIATED IN 2005

► SO FARMERS CAN HAVE 2 SUBSIDIES
ANGOLA

- Demand to indicated grain and bioenergy crops
- To make specific analysis to which crop should be better
- How to cope crop cultivation and labor
- To reduce social differences

- It was introduced the concept of < Model farming system>
- How to combine different crops cultivation systems
- Related to educate people and get more income to the population
- Demand - Fazenda Aldeia Nova and Odebrecht
SOUTH AMERICA—MEXICO

- Demand to indicate grain and bioenergy crops
- How to produce bioenergy crops to avoid competition for food and bioenergy
- How to get a better localization of mills and industry considering road and infrastructure
MOÇAMBIQUE

►► DEMAND TO INDICATE BEST MICROCLIMATIC AREAS FOR FIELD TRIALS
►► TO DEFINE ENVIRONMENTAL ASPECTS OF 4 CROPS TO BE STUDIED
►► CASSAVA-POTATO-CASHEW-COTTON
►► TO STABILISH A CROP CALENDAR AND PEST MANAGEMENT (CASHEW-POTATO)
►► TO DEFINE THE REQUIREMENTS FOR BREEDING PROGRAMS
►► TO INDICATE A SUITABLE AGROMETEOROLOGY WARNING SYSTEM
Deficiência hídrica anual
Armazenamento máximo 50 mm

Deficiência hídrica anual
Armazenamento máximo 75 mm

Convênções cartográficas
- Localidades
- Limites
REPÚBLICA DE MOÇAMBIQUE
Cultura do Algodão
Zonas Bioclimáticas

LEGENDA:
- Zona Agroclimática - Adequada
- Fertilité do solo
  - Alta
  - Baixa
- Zona Agroclimática - Adequada com leves restrições
- Zona Agroclimática - Adequada com restrições moderadas
- Zona Agroclimática - Adequada com restrições severas
- Zona Agroclimática - Inadequada
- Zona Agroclimática - Inadequada

Convenções cartográficas:
- Localidades
- Corpos d'água

Malawi
ZIMBABWE
ÁFRICA DO SUL
SWAZILAND
TANZANIA
LUSAKA
MALAWI
ZIMBABWE
ÁFRICA DO SUL
SWAZILAND

Mapa: Novembro de 2009
Projeto ENARGES/PHONEAS
S/N

REPÚBLICA DE MOÇAMBIQUE
Cultura da Batata
Zonas Bioclimáticas

LEGENDA:
- Zona Agroclimática - Adequada
- Fertilité do solo
  - Alta
  - Baixa
- Zona Agroclimática - Adequada com restrições moderadas
- Zona Agroclimática - Adequada com restrições severas
- Zona Agroclimática - Inadequada

Convenções cartográficas:
- Localidades
- Corpo d'água

Malawi
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ÁFRICA DO SUL
SWAZILAND
TANZANIA
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MALAWI
ZIMBABWE
ÁFRICA DO SUL
SWAZILAND

Mapa: Novembro de 2009
Projeto ENARGES/PHONEAS
S/N
Scenarious of Climate Change

THE RISE IN AIR TEMPERATURE

Very little about rain
MEXICO

- PROJECT (IAC-FUNDAG AND SUGAR CANE GROWERS-VERA CRUZ STATE)
- TRY TO DEFINE THE ACTUAL CLIMATE
- WHAT ARE THE CONDITIONS NOW AND CROP DEVELOPMENT
- TO VERIFY DURING CROP GROWING CYCLE THE MAJOR CONSTRAINTS
- CONSIDER CROP PHENOLOGY
- DRY PERIOD
- TO ORIENTATE THE BREEDING PROGRAMS
RECOMMENDATIONS

- Increase drought tolerant cultivars
- Use a better system to preserve water
- Use a better irrigation for crop security safety
SÃO PAULO STATE

- WARMING SCENARIOS AND REFORESTATION NEEDS
- TO PRESERVE WATER SUPPLY
- TO INDICATE THE DEGREE OF WEAKNESS AND WHICH LAND UTILIZATION SYSTEM WOULD BE
Current status (A) and climatic scenarios, (B) +2°C, (C) +2°C & -20% and (D) -2°C reclassified.
RECOMMENDATIONS

► AGROCLIMATIC ZONNING IS VERY IMPORTANT TO CROP PLANNING AND FOOD SECURITY POLICY

► TO BETTER UNDERSTAND AND BETTER INTERPRETATION AZ SHOULD ALSO CONSIDER SOIL CHARACTERISTICS (NATURAL FERTILITY; WATER RETENTION, SOIL MANAGEMENT, SLOPE
AGROCLIMATIC ZONING SHOULD BE USED TO ORIENTATE CROP BREEDING PROGRAMS RELATED TO REDUCE CROP VULNERABILITY TO WEATHER ADVERSITIES

THE USE OF CLIMATE CHANGE SCENARIOS SHOULD BE INCORPORATED INTO BUT ESPECIFIC ANALYSES SHOULD BE MADE CONCERNING THE CROP CHARACTERISTICS
AGROCLIMATIC ZONING SHOULD BE MORE A HOLISTIC PROCESS AND NOT TO BE CONSIDERED AS THE FINAL ACHIEVEMENT.

WHEN USING CLIMATE VARIABLES TO PERFORM AZ – WE SHOULD VERIFY THE RANGE OF THEM AS WELL AS THE COMPLEX INTERACTION BETWEEN CROP AND WEATHER.
CLIMATE RISK ANALYSIS IS A STEP FORWARD TO AND WE SHOULD BE VERY CAREFUL WHEN MAKING USE OF THE OUTCOME RESULTS

CROP SECURITY POLICY SHOULD BE BASED ON

A BETTER CROP INSURANCE SYSTEM MUST USE IN A CLIMATE RISKS ANALYSIS COMBINED WITH