MICRO-ZONING CRITERIA FOR BIOFUELS AND FOOD CROPS PRODUCTION
THE EXAMPLES IN BRASIL AND MOZAMBIQUE
(MEXICO-ANGOLA)

ORIVALDO BRUNINI- PhD-AGROMETEOROLOGY

SCIENTIFIC RESEARCHER-SAA-APTA-IAC

SÃO PAULO STATE GOVERNMENT-BRAZIL

PRESIDENT – FUNDAÇÃO DE APOIO À PESQUISA AGRICOLA- FUNDAG
Considering some aspects of yesterday

- Biofuels
- Whom it may concern
- Why is it important
- How to cope with biofuels – food production
- Sustainable agriculture design
- Carbon sequestration
- Climate change and agriculture production
- Water security aspects
Biofuels - Food

- Biodiversity concerning
- Crop zoning
- Water security mathers
- Land/Soil use and preservation
- Soil fertility
- Social economic aspects
- Farmers integrated into the process
- Quality procedures
- Bring small farmers and workers to a good living
Brazilian examples
Made by São Paulo Government-
State Secretary of Agriculture

- Combining State Quality
- Private companies
- Others countries need
- Integration of different partners - NGO
- Bringing new horizon on the use of agriculture planning process to food and biofuels
- Crop zoning
- Biodiversity conservation
- Ethanol with responsabilty
- Studies on reducing GHG emissions
WE SHOULD CONSIDER THE FOLLOWINGS ASPECTS

- CROP REQUIREMENTS
- AVAILABLE WEATHER DATA
- SOILS CHARACTERIZATION
- WHAT THE CLIMATE CAN MAKE AVAILABLE FOR THE CROPS
- ENVIRONMENTAL AND BIODIVERSITY CONCERNS
- SOCIAL AND ECONOMIC IMPACTS
- HUMAN RESOURCES

THE IMPORTANCE OF CLIMATIC ANALYSIS ON AGRICULTURAL PRODUCTIVITY AND REDUCTION OF CLIMATIC RISKS
The high demand for renewable energy sources and concern for the preservation of the environment and food production to support the population have placed the countries around the world on alert due to the need for clean energy production, and service to a growing population, which negatively affects natural resources, water resources and the ability to produce food.
THIS PRESENTATION DEALS WITH MICRO-ZONING AND AGROECOLOGICAL ZONING FOR BIO FUELS AND FOOD CROPS – GIVING EXAMPLES IN

• BRASIL – SÃO PAULO STATE

• MEXICO

• MOZAMBIQUE

• ANGOLA
FIRST WE WILL PRESENT SOME OF THE RESULTS

SOME POSITIVE OR GOOD ASPECTS

SOME CONSTRAINTS WHICH MAY AFFECT NEGATIVELY THE EXPECTED OUTCOMES.
TO BETTER UNDERSTAND THE PROCESSES USED IN CLIMATE-PLANT ANALYSIS AND AGRICULTURAL ZONING, SOME BASIC DEFINITIONS ARE NEEDED:

1. **Agroclimatic Region** – An agroclimatic region is defined as a region with distinct characteristics of inter-related aspects among agronomic factors, type of exploration or system and the climate.

2. **Agroecological Region** – An agroecological region is defined as a region that has distinct characteristics of inter-related aspects among agronomic factors, farming systems and various characteristics of the environmental factors and not only climate.

3. **Agro-Ecological System** – An agro-ecological system is defined as an ecosystem manipulated by frequent anthropogenic modification of its biotic and abiotic environment. Four main types of modifications have been recognized, such as: energy input, reduction of biotic diversity to maximize the productivity of economic products, artificial selection and oriented external control.
SOIL-CLIMATIC SUITABILITY – BIOCLIMATES

THE SOIL-CLIMATIC SUITABILITY INCORPORATES THE CLIMATE ATTRIBUTES THAT DEFINE AGROCLIMATIC SUITABILITY WITH SOIL ATTRIBUTES, SUCH AS SOIL FERTILITY AND SOIL PHYSICS THAT SUMMARIZE THE AGRICULTURAL SUITABILITY OF THE SOIL,
WE WILL START NOW SHOWING SOME RESULTS
AND THE PROCEDURE UTILIZED
AND WHAT WERE THE MAIN PURPOSE
Angola

THESE FOLLOWING SLIDES REPRESENTS

SUGAR CANE

AND SORGHUM (MAPIRA)

MACROZONING
MEXICO

ANOTHER EXAMPLE IS GIVEN FOR SUGAR CANE IN MÉXICO

CONSIDERING TWO CLIMATE SCENARIO

• Actual
• Warning of 2ºC
Estados Unidos Mexicanos
Agroclimatic zoning (Mean temperature + 2 °C)
Preliminary result

Legend
Agroclimatic zoning
- Adequate
- Marginal with adaptation
- Marginal
- Marginal with restriction
- Restricted

Cartographic conventions
- City
- Mexican
- Other countries
MOZAMBIQUE

IN THIS CASE WE WENT A LITTLE MORE DEEPER IN THE STUDY

THE INITIAL SURVEY WAS MADE FOR

A) CASSAVA

B) POTATO
Jatropha

An initial proposal for Jatropha is also presented.

Although we can find this crop in some north-area, there are not an agroclimatic zoning.
BRAZIL - SÃO PAULO STATE

SUGAR CANE

IN THE CASE OF SÃO PAULO STATE A COMPLETE SURVEY OF ENVIRONMENTAL, ECONOMIC AND PHYSICAL FACTORS WERE ANALYSED
PARAMETERS USED

- CLIMATE REQUIREMENT OF THE CROP
- SOIL CHARACTERISTICS
- BIODIVERSITY
- CONNECTIVITY TO PRESERVE WILD LIFE
- WATER RECOMPOSITION TO THE AQUIFERS
- AIR CONTAMINATION- DUE TO INCREASE OF GASES IN THE AIR
- NATURAL AND RESERVE PARKS
- GREEN ETHANOL STAMP
- DROUGHT AND FROST RISKS
- SOIL FERTILITY
- SLOPE FOR MECHANIZATION
SÃO PAULO STATE - BRAZIL
AGRO ENVIRONMENTAL ZONING SUGAR CANE
BIODIVERSITY PROTECTION

Legend
- Low
- Median
- Restricted
- High

Convenções cartográficas
- Municipios
- Represas ou lagos
- Limite estadual

Coordenadas Geográficas
Datum: SAD-69

52° 48° 46°
50° 48° 46°
20° 22°
26°
SÃO PAULO STATE - BRAZIL
AGRO-ENVIRONMENTAL CROP ZONING SUGAR-CANE

Legend
- I Adequated
- II Adequated with limited environmental restrictions
- III Adequated with high environmental restrictions
- IV Inadequated

Convenções cartográficas
- Municípios
- Represas
- Limite estadual

Caracterização das áreas

I. Áreas adequadas, que correspondem aos territórios que apresentam aptidão ecológica favorável para o desenvolvimento de cultura da cana-de-açúcar e sem restrições ambientais específicas, permitindo a exploração econômica da cultura desde que os processos de manejo agrícola sejam corretamente empregados;

II. Áreas adequadas com ligeira limitação ambiental, que correspondem aos territórios com aptidão ecológica favorável para cultura da cana-de-açúcar, porém em algumas regiões observa-se a incidência de Áreas de Proteção Ambiental (APA); Reservas Naturais do Patrimônio Particular (RPPN) áreas de média prioridade para incremento da conectividade, conforme indicação de Projeto BIOTA FAPESP e as bacias hidrográficas, consideradas críticas, sendo necessário a adoção de medidas simples de controle ambiental e manejo agrícola;

III. Áreas adequadas com restrição ambiental, que correspondem aos territórios com aptidão ecológica favorável para cultura da cana-de-açúcar, porém apresentam também em algumas regiões a incidência de zonas de amortecimento das Unidades de Conservação de Proteção Integral (UCPI); áreas de alta prioridade para incremento da conectividade indicadas pelo Projeto BIOTA FAPESP e áreas de alta vulnerabilidade de aguas subterráneas do Estado de São Paulo, conforme publicação IGB/CTES/IBAEE - 1997, sendo necessárias medidas mais complexas de preservação ambiental e de proteção da flora e fauna;

IV. Áreas inadequadas, que corresponde às Unidades de Conservação de Proteção Integral - UCPI Estaduais e Federais, aos fragmentos classificados como de extrema importância biológica para conservação, indicados pelo projeto BIOTA/FAPESP para a criação de Unidades de Conservação de Proteção Integral UCPI; as Zonas de Vida Silvestre das Áreas de Proteção Ambiental - Apas, às áreas com restrições ecológicas para cultura da cana-de-açúcar, devido às geadas frequentes ou alto excesso hídrico, e também às áreas com declividade superior a 20%, que impede a mecanização total da cultura.
Characterization of the areas
1. No restriction climate soil environment;
2. No climate or soil restriction. Slightly restriction during crop ripening;
3. Slightly climate restriction. Biodiversity care must be enhanced;
4. No climate or soil restriction. Biodiversity care must be enhanced and aquifers recomposition;
5. No climate or soil restriction. But very important to restrict environmental damages;
6. Inadequate due to biodiversity preservation;
7. Inadequate due to soil and climate factors;
8. Slope above 20%.
NEGATIVE OR NEEDS TO BE IMPLEMENTED

✓ MOST CASE POLITICAL REASONS OVERCAME TECHNICAL INDICATION
✓ IT REQUIRES A GOOD WEATHER NETWORK SYSTEM (WNS) – BUT IT IS MISSING IN MANY CASES
✓ THE WNS IS EXPENSIVE (SOME DONORS) OVER EXAGERATE IN THE VALUES
✓ IT REQUIRES A BETTER TRANSFER OF KNOWLEDGE FROM SCIENTIFIC TO EXTENSION AND COMMON USER (THE LANGUAGE IS DIFFICULT)
✓ IT REQUIRES A GOOD TEAM OF EXPERTS (SOIL – CLIMATOLOGY – SOCIAL – ECONOMIC)
POSITIVE REMARKS

- THIS KIND OF STUDY ASSURES A COMPLETE UNDERSTANDING OF CROP SUITABILITY
- IT ALLOWS A BETTER CROPPING SYSTEM
- IT MAY ASSURE A BETTER ENVIRONMENTAL PRESERVATION
- IT GIVES SUPPORT TO STATE/GOVERNMENT POLICY ON FOOD SECURITY
- IT MAY PROVIDE A BETTER SOCIAL AND EMPLOYEMENT FOR POPULATION
- IT IS USED FOR SÃO PAULO STATE TO PROVIDE SUGAR MILLS FACILITIES
- IT MAY GIVE SUPPORT TO BETTER FOOD DISTRIBUTION DURING ADVERSITIES
FOOD

BIOFUEL

SUSTAINABLE AGRICULTURE

REDUCE POVERTY
INCREASE FOOD SECURITY
INCREASE THE DEMAND BETTER CROPING SYSTEMS
REDUCE GHG EMISSIONS
OBRIGADO- GRACIAS- THANK YOU- GRAZIE

WWW.CIIAGRO.SP.GOV.BR
WWW.CIIAGRO.ORG.BR
WWW.FUNDAG.BR