

CROP PROTECTION STRATEGIES TO ADAPT TO CLIMATE CHANGE

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INTRODUCTION

- The only constant is change and therefore adaptation should be as constant as change
- A great volume of research has been undertaken within the past fifteen years which have enhanced the knowledge base for the science and about the possible effects of climate change.

- It is anticipated that there will be greater influxes in pest outbreaks such as insects, weeds and pathogens.
- These outbreaks will affect the amount of food produced globally.

Food Production Yields

- Sixty-five percent of the world's population reside in developing countries, and a drastic rise in temperatures will have serious implications on yields.
- Temperature affects the metabolic processes of plants such as photosynthesis and respiration.

- When temperatures continue to rise above the optimal range for the plant crops, usually there is a negative decrease in their growth.
- This negative drop will ultimately affect the production yields of the crop.
- In 2004, a heat wave affected the poultry industry in Trinidad and Tobago and was responsible for killing over fifty thousand (50,000) chickens. (The Caribbean Climate Change Center. 2008).

- Rice is one of the most susceptible crops to climate change. This is because with the temperature increase, the rice spikelet become slender and the grains will fall.
- This problem will become prevalent in the rice farms that are rain fed.
- Rice producers in Africa would be the most at risk if the rising global temperatures started to decrease rice production. (Padma. 2008)

Weeds

- Increased temperature will increase the chances of invasive weeds at high latitudes country like United States of America.
- This is because the environment becomes more suitable for invasion from weeds in warmer climates.
- Wild relatives are considered to be the untapped genetic pool for crop species and this biodiversity is crucial for adaptive methods

- However due to stress caused by cultivated lands and now, the possible impacts of climate change, these wild relatives are on the brink of extinction.
- Scientists claim that in the next fifty (50) years, twelve percent (12 %) of the one hundred and eight (108) wild potato species would become extinct, as well as sixty-one percent (61 %) of the fifty-one (51) wild peanut varieties. (Bennet. 2007)

Insects

- Elevated temperatures can affect the invertebrates', mainly insects', dispersal and reproduction.
- Some studies have shown that their reproductive rates are affected by temperature. This is also due in part to the fact that insects can now complete more life cycles in a year.
- This outcome will be felt greatly by those insects with a short lifespan, of which examples include aphids and the Diamond back moth. (Collier 2007)

- Natural enemies and insects may react differently with temperature changes and pests may now pass through vulnerable stages more quickly than before which would reduce the effectiveness of biological control agents
- If an insect resides in the soil for any part thereof, it will most likely be able to buffer the effects of temperature changes because soil ambient temperatures are cooler than that of air. (Petzoldt.2006)

Pathogens

- Higher temperatures render host plants much more susceptible to diseases, such as wheat and oat which are vulnerable to rust disease.
- Quarantine areas will become harder to create and manage as the increased temperatures cause outbreaks which this may occur frequently on imported commodity. (Petzoldt.2006)

- Certain pathogens, like the powdery mildew which can survive and germinate at high temperatures, can thrive in hot, dry climates.
- Therefore, it can be assumed that there will be increased pathogen activities for certain types of these organisms. This will, however, affect the quality of post-harvest commodities and thusly, increase post-harvest losses due to pathogens.
(Rosenzweig 2001)

Postharvest

- Globally, postharvest loss is estimated to be nine percent (9%) to sixteen percent (16%) so technologies should then be implemented to avoid these losses and increase available food. (Sargent.2007)

RECOMMENDATIONS

- **Agricultural Meteorology (Soil and Water Conservation)**
- Agricultural meteorology is the science by which climate data, in tangent with other factors, is used to help predict the best time to avoid common agricultural problems. Traditionally, it was used since colonial farmers as rainfall was a limiting factor. Currently, it is used to predict the incidences of drought and flood

- In Australia, for example, four of their major export crops had increased yield due to utilization of the information obtained from agro metrological services.
- The data required to map are meteorological, agronomical, soil and Geographic Information Systems data (GIS). However, long-term monitoring is being used to determine the incidences of drought and flood. (Farrell.2010)

- Being able to predict the occurrence of drought or floods reduces the vulnerability of the agricultural system to dynamic weather patterns.
- This, however, is not only limited to agricultural systems but social ones as well, where these predictions can be used to conserve water at the onset of droughts.

Pest Management

- **Integrated Pest Management**
- The management of agricultural pests is a billion dollar industry and as such, large quantities of pesticides are sprayed each year.
- This broad technique is now considered to be ineffective and in order to modernize agriculture; Integrated Pest Management (IPM) was developed. The major objective was the cut down in the use of pesticides in the 1960's.

- The principles behind IPM are the use of methods of pest control by monitoring, economics feasibility and environmental sustainability.
- This means that all stages of food production should be monitored but it does not mean the total eradication of all pests.
- The methods of pest control include chemical, biological, cultural, and regulatory means.

- In the world market, organically grown produce currently have the edge in the market. In the United States alone, organic produce was worth \$10.38 billion in 2003 and was predicted to reach \$14.5 billion. (Plotto and Narcsico.2006)
- Growing organic food items also must comply with organic produce standards in order to be labelled as such

- Generally, the food production trend is moving away from the crops grown with heavy pesticides and given the added pressure from climate instability, research must flow in both organic and climate research.

Bio fuel

- Bio fuels are the extraction of liquid fuel from vegetable sources that can replace petroleum products, and are hence a renewable form of energy.
- The production of bio fuels can open up new opportunities for farmers and rural communities as a source of income

- In Brazil, there is a booming bio fuel industry operates through the collaborative efforts between the Non-Governmental Organizations (NGO's) and private stakeholders. (United States Department of Energy. 2001.)
- Raw material and manufacturing capabilities are two essential elements that countries like Trinidad and Tobago can utilize for employment opportunities and increased revenue.

Conclusion

- Adapting to the environment is the only way we can truly stem the effects of climate change. In order to do so, advanced warning systems should be placed to help prepare for disaster events.
- Agro-meteorology is a method of an early warning system where precipitation can be monitored for the possibility of incumbent drought and floods

- Pesticides are no longer the future of agricultural and thus IPM strategies should be promoted in the region.
- However, greater research is required and the interaction with all food handlers by training and alerting them to their responsibilities.

- THANK YOU

