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AN ASSESSMENT OF THE SCIENTIFIC POTENTIAL AT THE UNIVERSITY OF THE WEST INDIES IN SUPPORT OF A COMPREHENSIVE REGIONAL RISK REDUCTION STRATEGY WITH RESPECT TO INVASIVE SPECIES

Ranjit H. Singh, *Department of Agricultural Economics and Extension, Faculty of Science and Agriculture, University of the West Indies, St. Augustine, Trinidad, West Indies. Phone: 868-662-2003 Ext. 2094 FAX: 868-663-8355; Email: rsingh@fans.uwi.tt*

ABSTRACT: While globalization of markets and freer trade may have benefits associated with the expansion of trade, globalization is also associated with the increased risk to agriculture and the natural environment from the incidence of invasive / exotic pests. The impact of invasive species could be severe and long term in nature thereby setting back the development process of countries so affected. Given the importance of agriculture and environmental resources to the development of countries in the region comprising the Caribbean Basin, a strategy for addressing the associated risk and threat is urgently required and timely.

Designing an effective strategy for risk reduction and management with respect to invasive species requires an efficient intelligence/early warning system so as to ensure the timely adoption of precautionary measures to prevent entry or measures to contain the spread and damage caused by invasives where the third border has been breached. The response, however, must be informed by scientific knowledge. In this regard the S&T/R&D support is an essential component of any comprehensive strategy to address the threat of invasives. This paper examines the S&T/R&D capacity resident at one of the Region's major institutions, the University of the West Indies. The methodology for this assessment includes a review of recent research at the UWI as well an examination of the competencies in relevant areas of science that are resident at the various Campuses of the institution.

KEY WORDS: UWI, globalization, Mona, Cave Hill, St. Augustine, contestable fund for R&D, disciplinary area, specialty area, number of researchers, number of publications

RÉSUMÉ : Pendant que la globalisation de marchés et fait plus librement du commerce peut avoir des avantages associés à l'expansion de commerce, la globalisation est aussi associée au risque augmenté à l'agriculture et à l'environnement naturel de l'incidence d'envahissants / les insectes nuisibles exotiques. L'impact d'espèces envahissantes pourrait être sévère et à long terme dans la nature retardant ainsi le processus de développement de pays si affectés. Étant donné l'importance d'agriculture et de ressources de l'environnement au développement de pays dans la région comprenant la Cuvette Antillaise, une stratégie pour adresser le risque associé et la menace est d'urgence exigé et à propos.

La conception d'une stratégie efficace pour la réduction de risque et l'administration en ce qui concerne les espèces envahissantes exige un système d'intelligence/signe avant-coureur efficace afin de garantir l'adoption à propos de mesures préventives pour prévenir l'entrée ou les mesures pour contenir la propagation et le dommage provoqué par invasives où la troisième frontière a été faite une brèche. La réponse, pourtant, doit être informée par la connaissance scientifique. À ce propos le S /R le soutien est une composante essentielle de n'importe quelle stratégie complète d'adresser la menace d'invasives. Ce papier examine le S /R le résident de capacité à une des institutions importantes de la Région, l'Université des Antilles. La méthodologie pour cette évaluation inclut une révision de recherche récente à l'UWI aussi un

examen des compétences dans les régions pertinentes de science qui sont le résident aux Campus différents de l'institution.

MOTS CLÉ : UWI, la globalisation, Mona, la Colline de Grotte, la Rue. Augustine, le fonds contestable pour R & D, la région disciplinaire, la région de spécialité, le nombre de chercheurs, le nombre de publications

1. INTRODUCTION

Invasive species, according to the Ecological Society of America, refers to those non-indigenous species which have evolved elsewhere and have been purposely or accidentally relocated into an environment where they persist, proliferate and cause harm to the environment as well as to the inhabitants of that environment. Invasive species include both plant and animal organisms.

Invasives can adversely affect the environment into which they are transferred in several ways, ultimately destroying or changing the genetic make up of the environment. Invasives, according to research have eaten indigenous organisms, interbred, or in some cases have introduced pathogens or parasites which have severely compromised the environmental integrity of these ecosystems.

Research in this area, however, has provided some useful tools to deal with the problem of invasives. Specifically, the approach to invasives can either be proactive or reactive in nature. Prevention of intrusion by invasives can take the form of decontamination, especially in the case of transportation equipment in international trade.

The international community has also taken heed to the threats of invasives and has sought to enact new conventions and protocols of trade which reduce the risk of invasives. At the other end of the spectrum, the problem of invasive species can be dealt with, through eradication, where early detection and rapid response is the key to dealing with the invaders. In this situation, continuous monitoring and evaluation of the system is imperative to prevent any further invasions. Invasives can also be contained and controlled.

Invasives can be controlled using chemical, mechanical and or biological methods. At this stage it is important to note that with any method used to deal with invasives, restoration of the native environment is important. This is an important step to minimize the risk of reinvasion.

The issue of invasive species is currently a 'hot topic' in the international arena, especially in the agricultural sector due to several reasons, including the increasing pace of trade and globalization coupled with the expansion of agricultural operations. In the Caribbean Region where there have been tremendous efforts to revive and revitalize the agricultural sector researchers have made significant progress. The main tertiary educational institute in the Region, the University of the West Indies (UWI), has been working with other institutions to address various problems in the sector including that of invasives.

In an attempt to assess the capacity of UWI to conduct research in disciplinary areas relevant to invasives, Research Reports from each of the three main Campuses were reviewed, with some degree of emphasis, placed on the research work and publications from the respective Medical Sciences, Engineering, Natural Sciences as well as Agricultural Faculties. Some of the specific publications reviewed included The Mona Campus Report, The Cave Hill Report and the St Augustine Report. The Annual Departmental Reports were also reviewed to determine the capacity for invasive research.

This paper provides a summary of research conducted in various disciplinary areas related to research on invasives. The paper also attempts to measure capacity for research in this area based on the number of scientists actively working in associated disciplinary areas.

2. EVIDENCE OF RELEVANT RESEARCH OUTPUT

As indicated above, an attempt was made to determine the capacity for research on invasives at UWI using the publication records of scientists at all three campuses. Table 1 below provides a summary of the number of publications in the key support areas in recent years. The data suggests a concentration of work at UWI on disease control (18 papers). On the other, hand the effort in the area of pest control was significantly below (8 papers) that for disease control. Similarly, work on Genetics and Biotechnology was less prominent.

A total of 84 scientists were associated with the publication output reported with the concentration/clustering of scientists appearing in the area of disease research, followed by genetics and biotechnology.

In addition to the publication record, an alternative indicator of capacity for research at UWI in invasives was the number of scientists working in associated disciplines. On all three campuses of the UWI a total of 52 scientists were active in disciplines of relevance to invasive research (Table 2). As it stands, at UWI there are currently 22 active scientists in the area of biotechnology and genetics research, 14 scientists working in pest and disease control, 13 in biology and entomology research and 2 in biochemistry research.

Table 1: Summary of Research Publications and the Number of Researchers in the Disciplines Relevant to Invasives

Disciplinary Area	Number of Publications	Number of Researchers
Bio Technology	6	20
Genetics	7	20
Pest Control	8	15
Disease Control	18	29
Management Policy	1	4

Table 2: Indication of Research Capacity for Invasive Species: Number of Scientist

Area of Specialty	Number of Specialists
Biotechnology and Genetics	22
Pest and Disease Control	14
Biology and Entomology	13
Biochemistry	2

3. BIOTECHNOLOGY AND GENETICS RESEARCH

Biotechnological and genetics research is a key area of focus because understanding the genetic make up of the invasive specie as well as the organism or environment which it invades, enables researchers to identify those characteristics which make either the organism or environment vulnerable. In this regard the University of the West Indies has made some significant strides. The list below summarizes some of the current research being conducted in this field;

- ✓ Biotechnology of Selected Crops with a view to Improving Productivity, Yams, dasheen and Coco Yams, Anthuriums.

- ✓ "Biological and Molecular Characterization of Papaya Ringspot Virus

- ✓ Exploiting Pepper Genetics Resources Towards Developing a Pepper Industry in the Caribbean

- ✓ Utilization of Cacao Genetic Resources Towards Developing Resistance to Blackpod and Witches' Broom Diseases

- ✓ Construction of a Genome Map for Cacao

- ✓ "The Evolution of New Virus Genes

- ✓ Microbial Genetics

The range of individual scientists on the respective campuses conducting research in biotechnology is given in the Table 3 below. It is clearly evident that the university has a significant research capacity in terms of the number of specialists conducting publication oriented research on topics relevant to invasives.

4. PEST AND DISEASE RESEARCH

Pest and disease control is another key support area in the study of invasives. In this regard the UWI has also made significant strides. The list below gives a snapshot of the current research being conducted, with the relevant scientists involved in this area of research, being cited in the Table 4.

- ✓ Begomovirus and Whitefly in Tomatoes
- ✓ "Management of Cabbage Pest With Companion Crops and Botanical Formulations
- ✓ Biocontrol Potential of the Nematode; Management of citrus root Weevil
- ✓ The impact of Botanical Formulations on citrus root weevil
- ✓ Pesticidal Potential of various Tropical Plants
- ✓ Strategies of control of Commelina spp. in Banana Plantations
- ✓ Non Traditional methods for Nematode Control in Bananas
- ✓ IPM: Integrated Pest management

Table 3: Scientists: Concluding Research in the Area of Biotechnology & Genetics

Mona Campus	**St Augustine Campus**
Helen N. Asemota M. Chin Paula Tennant Mohammed H. Ahmed. Roye, Marcia E., Wayne A. McLaughlin, D. P. Maxwell Dwight E. J. Robinson Wendell Snow George Grant.	D. A. Iwaro S. Surujdeo-Maharaj D. Butler P. Umaharan Marissa Moses Lambert Motilal, O. Sounigo, J. M. Thevenin, C. Lanaud A. M. Risterucci I. Pieretti, J. L. Noyer.

Table 4: Scientists: Activity Conducting Research on Pest & Disease Control

Mona Campus	**St Augustine Campus**
Kathy M. Dalip Dwight E. Robinson Ajai Mansingh. Jacinth Myers Dave G. Hutton	P. Umaharan A. Khan S. Seepersad J. Walker C. Caruth A. Hosein V. Gajadharsingh Wendy Ann P. Isaac Richard A. I. Brathwaite Ayub Khan

5. BIOLOGY AND ENTOMOLOGY RESEARCH

Biology and entomology generally involves the study of living organisms in their natural habitat. The University, as an institution, has a strong Biology and by extension, Natural Sciences Faculty. A list of some of the topics being researched currently is given below and the researchers who are active in these areas are included in Table 5:

- ✓ Cell wall biochemistry
- ✓ Food ripening
- ✓ Uses of Caribbean Plants
- ✓ Crop ecology and sustainable agriculture
- ✓ Behavioral ecology
- ✓ Marine ecology
- ✓ Fisheries Biology

- ✓ Environmental and microbiology
- ✓ Plant pathology
- ✓ Soil microbiology
- ✓ Mangrove ecology
- ✓ Microbial ecology
- ✓ Ecological entomology

Table 5: Scientists: Activity Conducting Research in Biology & Entomology

Mona Campus	**Cave Hill Campus**
	C. M. Sean Carrington
Karl Aiken	Angela Fields
Dr. Dwight E. Robinson	Louis Chinnery
Mona K. Webber	Julia Horrocks
Eric Garraway	Wayne Hunte
	G. E. Mathison
	Leonard O'Garro
	Sarah Sutrina
	Lyndon Waterman

6. BIOCHEMISTRY

The concentration of the current research being conducted in biochemistry at the University of the West Indies is summarized by the list below.

- ✓ Biochemical and molecular Studies on Tuberization on selected crops:
  - ➢ Sweet Potatoes
  - ➢ Yam bean
  - ➢ cassava
  - ➢ pigeon peas
- ✓ Post Harvest Technology

7. CONCLUSION

This paper sought to examine the R&D effort at the UWI and the cadre of scientists at the institution as a basis for assessing the capacity for research on invasive. The data reviewed was limited to recent years and included data from the three main campuses of the University – the Mona Campus in Jamaica, the St Augustine Campus in Trinidad and the Cave Hill Campus in Barbados.

The general indication is that UWI has a large pool of scientists working in a range of disciplines relevant to R&D with respect to invasives. The data however suggests significantly more effort is manifested at Mona and St Augustine than at Cave Hill. While this capacity exists at UWI, any serious attempt to address the risk of invasive to the Caribbean Region would necessarily need to mobilize and engage this capacity. Towards this end a range of strategies may be appropriate, including the establishment of a contestable fund for R&D on invasives.