Progress Review Seminar

Research Committee on Agriculture and Food Science

Date : **27th August 2010**
Time : **9.00 a.m**
Venue : **Auditorium**

09.00 a.m.	*Registration*
09.30 a.m.	Welcome Address **Director NSF**
09.35 a.m.	Introductory Remarks **Dr Sumith Abeysiriwardena** Chairman, Research Committee on Agriculture & Food Sciences
09.40 a.m.	Presentation – **RG/2007/AG/04** *Comparison of migration behaviour of organic components (contaminants) from plastic bottles to food* **Dr Asiri Perera** Dept. of Chemistry, Univ. of Sri Jayewardenepura
09.55 a.m.	*Discussion*
10.00 a.m.	Presentation – **RG/2008/AG/04** *Impact of temperature and water stress on dry zone vegetable cultivation in Sri Lanka* **Prof. C. S. De Silva** Dept of Agri. & Plantation Engineering, Open University of Sri Lanka
10.15 a.m.	*Discussion*
10.20 a.m.	Presentation – **RG/2008/AG/02** *Identification of suitable species and genotypes for cut foliage and flower cultivation on rubber lands* **Dr S.M.M. Iqbal,** Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatta.
10.35 a.m.	*Discussion*
10.40 a.m.	

10.55 a.m.	Presentation – **RG/2007/AG/02** *Assessment of ground water vulnerability in a highly productive coastal aquifer system in Kalpitiya peninsula due to natural and anthropogenic factors : a hydro geochemical geophysical and biological approach* **Dr H.A.Dharmagunawardena** Dept. of Geology, University of Peradeniya
11.10 a.m.	*Discussion*
11.15 a.m.	Presentation – **RG/2008/AG/05** *Economic incentives for firms to adopt an enhanced food safety & quality metasystem : The case of adoption of HACCP in Agri-food processing sectors in Sri Lanka* **Prof. J.M. Udith K. Jayasinghe** Dept. of Agribusiness Mgt., Faculty of Agriculture & Plantation Management, University of Wayamba
11.30 a.m.	*Discussion*
11.35 a.m.	*END*

Comparison of Migration of BHT from plastic bottles to food. (RG/2007/AG/ 04)

Polyethylene terephthalate (PET) is one of the materials that are widely used for packaging of beverages and edible oils. Plastic additives are necessary to attain the required properties for plastic packaging. Among the additives, mention should be made of antioxidant such as Butylated hydroxyl toluene (BHT), which is necessary to protect a polymer against oxidation, both during processing and in service life. Additives can interact with food through migration process. Consequently knowledge of migration of these additives is important in order to assess the potential health hazard to consumers presented by exposure to these substances. In this study, the migration of BHT from PET bottles to liquid food which is stored more than 6 months under market conditions was investigated. Purified CH_2Cl_2 was chosen as extracting solvent. The samples were analyzed at both room temperature and at 40°C to determine temperature effect on migration and analyzed by gas chromatography with FID (Flame Ionization Detector). Foods of different pHs such as water, fruit juice, and vinegar, which stored in PET bottles were also used to investigate the effect of pH (with range of pH 2.4 – 6.7) on migration of BHT. The storage temperature had a detectable effect on the migration of BHT. The peak for BHT, for the water bottles stored at 40^0C was higher than (1.32ppm) that at room temperature (1.289 ppm). The foods of different pHs, stored in PET bottles also showed different migrating behavior for BHT. Fruit juice and water samples showed almost similar values for BHT level. Highest BHT level was obtained for vinegar samples (1.42ppm). It was concluded that the storage temperature had a detectable effect on the migration of BHT. And the food stored in PET bottles which have different pH values also have affect on migration of BHT.

Identification of suitable species and genotypes for cut foliage and flower cultivation on rubber lands

S.M.M. Iqbal[1] , W.A.D.D.S.Wettasinghe[2],V.H.L. Rodrigo[1] and A. Nalaperuma[2]
[1]Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatta, Sri Lanka
[2]Rubber Research Institute of Sri Lanka, Sub station, Kuruwita, Sri Lanka
NSF/RG/2009/AG/02

ABSTRACT

With over 120,000 ha, rubber cultivation in Sri Lanka provides the livelihood of large number of people. Life span of a rubber tree is ca. 30 years, however it comprises 6 years of immature period which provides no income to the rubber grower. In mature fields, harvesting is confined to the morning hours of the day resulting in underemployment of estate workers. Intercropping with economically important crops offers a practical solution to these issues whilst increasing overall land productivity and improving income of estate workers. Cut foliage and flower industry in Sri Lanka is booming up in terms of both local and international markets. Therefore, the present study is aimed to identify suitable crop species of cut foliage and flowers for different growth stages (i.e. mature and immature phases) of rubber plantations.

Experiments were set up in both immature and mature rubber fields in May 2009 in the Kuruwita substation of the Rubber Research Institute of Sri Lanka. With immature rubber, three foliage species namely Polyscia, Croton and Cane palm were planted whilst Cane palm, Dracaena and Chinese grass were under mature rubber. Establishment of Anthurium plants were delayed due to an outbreak of pathogenic infection (Bacterial wilt). However, arrangements were made to conduct some assessments on limited number of Anthurium plants established before. Reestablishment of Anthurium under mature rubber was in progress together with the sprinkler irrigation system. Rabbit attack on cane palm was controlled by covering the plant base with commonly available mosquito nets. Bi-annual assessments on growth and leaf count (total and harvestable leaves) in foliage plants were made. Cane palm, Dracaena and Chinese grass reached to the harvestable stage (for cut foliage) within 12 months. A time cause increase in number of leaves in foliage plants (from 6 months to 12 months after planting) was observed. The performance of Chinese grass planted alone with rubber was significantly ($P<0.001$) superior to its mixed system in 6 months after planting. However, in 12 months after planting Chinese grass planted with mixed system was significantly ($P<0.01$) superior to its sole system.

Key words: Rubber, Foliage plants, Floriculture, Intercropping

An assessment of groundwater vulnerability in a highly productive coastal aquifer system in the Kalpitiya peninsula due to natural and anthropogenic factors: A hydro geochemical, geophysical and biological approach

H.A. Dharmagunawardhane , A.Pitawala, and J.P.Jayasinghe
Department of Geology, Faculty of Science University of Peradeniya, Peradeniya

Abstract

This study focuses on spatial and temporal nutrient pollution of groundwater in the unconfined sandy aquifers of Kalpitiya peninsula where agricultural activities are intense. The study covers two consecutive dry and rainy seasons during the period from 2008 to 2010. Nitrate is the dominant nutrient pollutant in groundwater. The values of nitrate-N up to 212.4mg/L in the dry seasons and up to 148.5mg/L in rainy seasons were noted.

Phosphate in groundwater ranged up to 5.7mg/L in the dry seasons and to 10.35 mg/L rainy seasons. About 50% of the studied water samples had Nitrate concentrations above WHO guideline values both in dry or rainy periods These high concentrations are found in vegetable growing areas whereas nitrate pollution in long term crop areas and human settlements were not significantly high. Although there is a slight decrease in Nitrate concentrations at random in rainy seasons, an increasing trend of average concentrations became evident over the study period as a whole. This probably indicates building up of nitrate in groundwater in the vegetable growing areas as a result of leaching from application of excessive chemical fertilizer.

High nitrate zones also show fairly steady lateral distribution indicating slow lateral mobility of nitrate rich groundwater probably due to low hydraulic gradient of the area. This condition may be useful and taken into consideration in future groundwater resources development activities in the area.

The low phosphate concentrations observed in groundwater did not show significant lateral or temporal patterns. Low phosphate concentrations in both groundwater and surface soils either indicates their less use in the area or that the available phosphate is leached and removed from the aquifer water and (sandy) soil solutions and probably adsorbed into clayey horizons at deeper levels.

The observed low concentrations of major cations (specially K, Ca and Na) indicate less impact on cation concentrations in groundwater by the fertilizer application or sea water intrusions/up coning.

It was also observed that high nitrate bearing groundwater can be used fairly effectively as a supplementary source of nitrogen for certain crops and that could indirectly have a positive effect on reduction of excessive nitrate in groundwater.

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RG/2008/AG/05

ECONOMIC INCENTIVES FOR FIRMS TO ADOPT AN ENHANCED FOOD SAFETY & QUALITY METASYSTEM: CASE OF ADOPTION OF HACCP IN AGRI-FOOD PROCESSING SECTORS IN SRI LANKA

Principal Investigator: Prof. Udith K. Jayasinghe-Mudalige
Co-Investigators: Mr. Mohideen Ikram and Ms. Menuka Udugama

Stage I

Existing literature was reviewed to identify elements at firm level that influence food safety responsive behavior in order to develop a suitable model. The incentives identified in the study by Jayasinghe-Mudalige and Henson (2006) was chosen to serve as the base of the theoretical formulation. The nine incentives selected were: (1) financial implications/cost (CST); (2) efficiency in human resources (HRE); (3) efficiency in technical procedures (TCE); (4) sales and revenue (SLR); (5) reputation (REP); (6) commercial pressure (CPR); (7) existing government regulation (EGR); (8) anticipated government regulation (AGR); and (9) liability laws (LBL).

During the literature review sufficient consideration was given to the identification and development of a statistical technique/methodology to overcome the issues of "unobservability" (i.e. the involvement relationships between and among theoretical concepts that are not directly observable) and "subjectivity" (i.e. firm decisions with respective to each incentive may be subjective to the decision maker). Two approaches utilizing Confirmatory Analysis were selected to overcome this problem. A Structural Equation Modeling (SEM) Approach to test the motivational model/theory developed, and the construction of an index, 'Incentive Related Index' (IRI), to quantify the relative impact of each incentive towards adoption of HACCP. For the purpose of SEM, the statistical package "Analysis of Moment Structures" (AMOS) [version 16] was selected.

The appropriate model was developed, by specifying each of the nine incentives as constructs in the measurement model, and in addition, in the structural model, the nine incentives were specified as exogenous constructs and the level of adoption of HACCP as the single-item measured endogenous construct. This was followed by the development of a structured questionnaire to be used for the survey, based on the review of existing literature and improved after consultation with experts in food safety and quality. In addition to general questions related to firm details and characteristics, the questionnaire included a set of attitudinal statements, to represent the nine incentives. The statements were a modification to the existing five-point likert scale, by including a "yes" (Agree) and "no" (Disagree) field; resulting in a 1 to 5 range of 'agree a bit' to 'strongly agree' and 'disagree a bit' to 'strongly disagree'. This enabled the possibility of obtaining numerical scores that range from -5 to +5 based on the conceptual meaning of the statement and the underlying phenomenon corresponding to which the respondents

scored each statement. Certain statement were inverted purposely, so that respondents cannot guess the potential incentive, and in turn, provide answers invariable and hastily, thus preventing 'agreement bias'.

A series of face-to-face interviews with the managers of the tea and dairy processing firms (representing "crop" and "livestock" based industries respectively) was conducted, supported by a structured questionnaire. An initial target of 40 firms from each sector was unattainable, and a final number of 32 tea processing companies and 34 dairy processing companies were achieved after removing ones with considerable amount of missing data. Data collection was carried out in the six provinces in Sri Lanka, including the Western, North Western, Central, North Central, Sabaragamuwa and Southern Provinces, between April and August 2008. The responses to the set of attitudinal statements in the questionnaire were defined as indicators to reflect the observable characteristics of the nine incentives and the models developed were tested using SEM in AMOS using Maximum Likelihood Estimation (MLE).

The descriptive analysis of the data revealed that, only 9.4 percent of tea processing firms had no plans to implement HACCP compared to 64.7 percent of dairy processing firms in the sample. Almost all of the small-scale dairy firms had no plans to implement HACCP, while 22.2 percent of small-scale tea firms on the other hand already had implemented HACCP. Even among the large-sized firms, differences although fairly lesser were obvious, with 38.8 percent of large-scale dairy firms with no plans, compared with none in the large-scale tea firms. These results are symptomatic that tea plants than dairy plants and large firms than small firms have greater propensity to adopt HACCP.

The outcome from AMOS was interpreted in terms of measurement model validity, (considering both model fit and Construct Validity), structural model validity and standardized regression weights (standardized path coefficients) of the hypothesized structural paths. For this purpose, the recommendations of Hair *et al.*, (1998), were considered. Mean index values were derived and utilized for interpreting the IRI. Overall, the output from the SEM and IRI suggest that reputation as the most important propeller behind food safety responsive behavior of firms, followed by sales and revenue more important for tea plants and liability laws having high impact on dairy firms. Other coercive elements responsible were commercial pressure and anticipated government regulation.

Stage II

The panel of tea and dairy processing firms were contacted again in 2009, for the purpose of evaluating whether "any changes occurred to the incentive-base of the firm", and in turn, whether there "any changes occurred with respect to the state of adoption of HACCP in the firm". Such an approach was adopted to examine the impact of those individual incentives on dairy processing firms' decisions on a more "dynamic" perspective, i.e. any changes take place to the incentive-base of a firm between two time periods. It is assumed that the strengths and weaknesses of an incentive may be changed over time not only due to changes occur in firm and market-specific characteristics associated with a firm, but also due to changes occur in the environment in which the said business is operating.

Data was collected from the dairy processing firms, by means of the same structured questionnaire, between February and March 2010. All 34 dairy product processing firms were contacted for the second phase of the study. Only 26 dairy processing firms participated for the second stage showing a 76.5 per cent response rate. Out the panel of firms, one was out of the business.

The 32 tea processing firms have been contacted and data collection has been scheduled for September - October 2010. The delay in collecting data from the tea sector was due to the refusal of respondents to participate citing increased workload in recent months as a result of higher harvest.

Preliminary analysis was carried out with the data from the dairy processing firms. This has revealed that HACCP adoption had increased to 26.9% from 17.6% and HACCP non-adoption has decreased to 73.1% in stage-two from 82.4%. In large dairy processing firms, HACCP adoption has increased by 10.4%. Small dairy processing firms in the stage-two have neither implemented HACCP nor in the process of implementing HACCP, however in stage-one 6.3% of dairy small firms were in the process of implementing HACCP. Descriptive analysis is beginning to show signs that reputation and liability laws are still the most important drivers behind HACCP adoption. However it is impossible to objectively assess the role and impact of incentives without proper inferential and quantifying techniques.

Work is also progressing in developing a panel data analysis approach nested within the structural equation modeling framework. This innovative and pioneering statistical methodology is a tedious yet crucial task in this study, since the research team has to go from scratch given the lack of sufficient literature in such an approach.

Dairy small large / don't why?