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Full Length Research

Assessing the adoption of Maximum Residue Level (MRL): in the Tea Small Holding sector of Kandy district, Sri Lanka

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The subject of food safety has at present caused a great concern, the international organizations and developed countries have imposed very stringent food safety laws and regulations. In line with the above safety regulations, recent past Japan and European Union (EU) have stipulated the Maximum Residue Level (MRL) for various pesticides which are used in tea fields. Conversely, it may not only include the Japan and EU but in future all other tea importing countries and globally also impose such stringent safety laws and regulations for our tea. Therefore adoption to MRL by tea small holders (TSH) is imperative to open more of the world markets for Sri Lankan tea and gives a much needed competitive edge. This study was aimed to assess the current situation of tea small holding sector with respect to MRL and to find out the determinants of MRL adoption by the tea small holders. A questionnaire based survey was carried out to collect the data from a random sample of 145 tea small holders in Kandy district. Both descriptive statistical methods and Multiple Linear Regression were used to analyze the data. According to the descriptive analysis, all the tea small holders of the sample had adopted at least three recommended practices on MRL. Nevertheless significant amount of respondents had not implemented some important recommendations. Result revealed that the adoption of recommended practices on MRL of tea small holders was significantly determined by the farming experience, education level of tea small holder, awareness on MRL and use of hired labor for tea farming.

Key words: Food safety laws and regulations, Maximum Residue Level, Tea Small Holders, Adoption

INTRODUCTION

The subject of food safety has at present caused a great concern, international bodies such as the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) of the United nations and food importing countries from every part of the world are much concerned about the health of people and in turn, are formulated and imposed regularly very stringent regulations and legislations aiming a higher level of food safety (Caswell and Henson, 1997; Henson *et al*., 2000). Such laws are to control and prevention of any food commodities from contaminations with various chemicals, pesticides, foreign matters, microbial organisms, metals etc. particularly for food commodities exported from other countries.

There is no exception for tea industry worldwide. For this reason, a large scale production of such an export driven beverage product in the future by utilizing a vast amount of natural, physical and human resources may

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not be economically viable unless the sector itself takes appropriate steps to be compliance with those food safety standards (Buzby, 2003). In March 2003, a new EU pesticide regulation came into force. Prior to introduction of this regulation, individual EU member states had their own maximum residue levels (MRL) for different crop/pesticide combinations. In the new regulation, all MRLs will be harmonized at EU level. The basis for agreeing the harmonized EU level for MRLs will rest on the recommendation of the newly established European Food Safety Authority (EFSA). Where no harmonized EU MRLs are available, standard low level (0-01 mg/kg) will be applied as the MRL (Mohemad and Zoysa, 2006).

But Sri Lanka was fortunate to gain credit by way of a pronouncement from the Chair at the meeting of the International Standards Organization Sub Committee on tea (ISO/TC 34/SC 8) in 1997, to the effect that "Tea from Sri Lanka is the cleanest in the world as far as pesticide residues are concerned". This pronouncement was repeated at subsequent meetings of the ISO/TC 34/SC 8 held in Calcutta in 1999, Mombassa in 2001 and Hangzhou in 2003 and Hamburg in 2005 (Mohemad and Zoysa 2006).

This was as a result of use of less harmful pesticides together with adoption of TRI recommendations on correct use of pesticides. However, in line with the aforementioned safety regulation, from recent past, Japan and EU who are the major buyers of our up-country teas have stipulated the Maximum Residue Levels (MRL) for various pesticides some of which are used in tea fields. Meanwhile, teas exported to Japan in recent were subjected to analysis for pesticide residues. 2, 4-D residues were detected exceeding the MRL of 0.01 ppm while, Glyphosate residues were detected exceeding the MRL of 1.0 ppm stipulated by Japan. Moreover, very recently, 2, 4-D was again detected (0.03 ppm) exceeding the Japanese MRL of 0.01 in Sri Lankan tea exported to Japan (Premathilaka, 2007).

Here it is important to note that both countries will not confine their investigations only for 2, 4-D and Glyphosate but for other herbicides, fungicides, insecticides, nematicides etc. as necessary. Conversely, it may not only include Japan and EU but in future all other tea exporting countries and globally also impose such stringent safety laws and regulations for our tea. Moreover, in the case of such detection of residues the total analytical cost also to be borne by the relevant estate/country. The detection of residues in made tea has thus an adverse impact on our tea industry. Therefore, our rigorous efforts have to be made to avoid all possible ways of build-up of residues. In this context, it is important to understand the possible reasons for build-up of residues in made tea and the ways to get rid of such problems. Finally our aim should be to produce residue-free quality tea following all TRI recommendations on pesticide and to ensure that we, Sri Lankans still produce the "Cleanest tea in the world." This helps to open more of the world markets for Sri Lanka tea, and gives a much needed competitive edge (Premathilaka, 2007).

Having identified the necessity of adoption for MRL in Tea industry, this study was conducted to assess current situation of tea small holding sector with respect to MRL and to find out the determinants of MRL adoption by the tea small holders.

METHODOLOGY

Theoretical Framework

First, adoption level of recommended practices on MRL (ALORP on MRL) was derived to have values ranging from 0 to 100% depending on number of practices adopted by each small holder. Eight practices which should be followed to produce residue free quality tea were considered to calculate the adoption level of Tea Small Holders, namely; Application of recommended chemicals at correct rate and frequencies, Following up a minimum Pre-Harvest interval of 7 days ,Use of knapsack spray tank, Use of correct nozzles and spray guards, limit the number of application of a single pesticide for two per annum, Not applying any growth promoter for tea , Following up Integrated Pest Management (IPM) strategies such as manual and cultural methods together with chemical methods and Use of record book to maintain records on every operation undertaken in tea fields. Adoption level of recommended practices on MRL (ALORP on MRL) was derived to have values ranging from 0 to 100% depending on number of practices adopted by the each small holder.

$$\text{ALORP on MRL} = \frac{\text{Number of recommended practices followed by the TSH}}{\text{Total (eight) number of recommended practices on MRL}} \times 100$$

Empirical Model

Empirical model was developed to determine the factors that have an impact on tea small holders to act differently on the level of adoption of recommended practices on MRL as follows.

$$\text{ALORP on MRL} = \beta_0 + \beta_1 AGE + \beta_2 LAE + \beta_3 FEXP + \beta_4 EDL + \beta_5 GEN + \beta_6 FLB + \beta_7 HLB + \beta_8 AWN + \varepsilon i$$

Where, β_0 to β_7 = coefficient, ε_i= error terms

The variables defined for the empirical model are shown in Table 1.

Data Collection and Analysis

The study was carried out in Kandy district where tea was first grown in Sri Lanka. The data were collected using

Table 1. Description of Variables for empirical model.

Notation	Variables	Remarks
AGE	Age of the TSH	Years
LAE	Land extent	Acres
FEXP	Farming Experience	Years
EDL	Education level of the TSH	Scores
GEN	Gender of the TSH	If male = 1, Otherwise = 0
FLB	Family Labor	If family labor = 1 Otherwise = 0
HLB	Hired Labor	If hired labor = 1, Otherwise = 0
AWN	Awareness of the TSH on MRL	If yes = 1, Otherwise = 0

Table 2. Adoption of recommended practices on MRL.

Category	Adoption level	Frequency	Percentage
Low	≤40	4	9
Medium	41-70	30	67
High	≥71	11	24

structured questionnaire from random sample of 145 tea small holders. Field observations also were carried out to confirm the accuracy of collected data. Questionnaire was pre tested prior to the actual survey with small representative sample of 6 Tea small holders and modifications were done. Both descriptive statistical methods and Multiple Linear Regression were used to analyze the data.

RESULTS AND DISCUSSION

To get a preliminary idea about the current status of adoption of recommended practices on MRL, data can be presented according to their level of adoption as in Table 2. Sixty seven percent of the tea small holders had medium level of adoption. The high level of adoption was recorded by 24% of small holders with compared to the low level of adoption by 9% of small holders.

As can be seen in Figure 1, ninety five percent (95%) of tea small holders had applied recommended chemicals at correct rate and frequencies while 89% of small holders used knapsack spray tanks for spraying chemicals. Adopting for minimum pre harvest interval is a compulsory practice to ensure minimum residues in made tea and it was at a satisfactory level. More than half of the respondents had implemented IPM strategies such as manual & cultural methods to manage the pests of tea and the number of applications of single pesticides was limited to two per annum. Maintaining of records on every operation undertaken in tea fields particularly on the use of pesticides has been recommended by TRI as a trace-ability mechanism. Results depicted that only by 42% of respondents practiced this traceability mechanism. The use of yellow or green poly jet/flood jet nozzles and spray guards was observed only by 13% of tea small holders.

ALORP on MRL = 47.5 - 0.0609 AGE + 0.214 LAE + 0.540**FEXP + 6.06 **EDL + 1.55 GEN + 1.00 FLB - 9.09 **HLB + 8.02** AWN

** denotes significant at 5% level, R-Sq. = 79.4%
Probability > F = 0.000

The results of the regression analysis (Table 3) revealed that the adoption of recommended practices on MRL was significantly determined by the experience of tea small holder on tea farming, awareness on MRL, education level of tea small holder and use of hired labor at 5% probability level. According to the analysis, there was no significant relationship between adoption level of recommended practices on MRL and the variables of age, gender, land extent under tea cultivation and use of family labor. However the overall model is significant due to the probability value that is less than all the probability levels of 1%, 5%, 10%. This model explains up to 79.4% of variation of adoption level of recommended practices on MRL of tea small holders by the all independent variables.

Experience on tea farming

Farming experience of tea small holder was positively related with the adoption of recommended practices. It indicates when the farming experience was increasing; there was a tendency to adopt recommended practices. It may be due to the increasing awareness of causes, effect

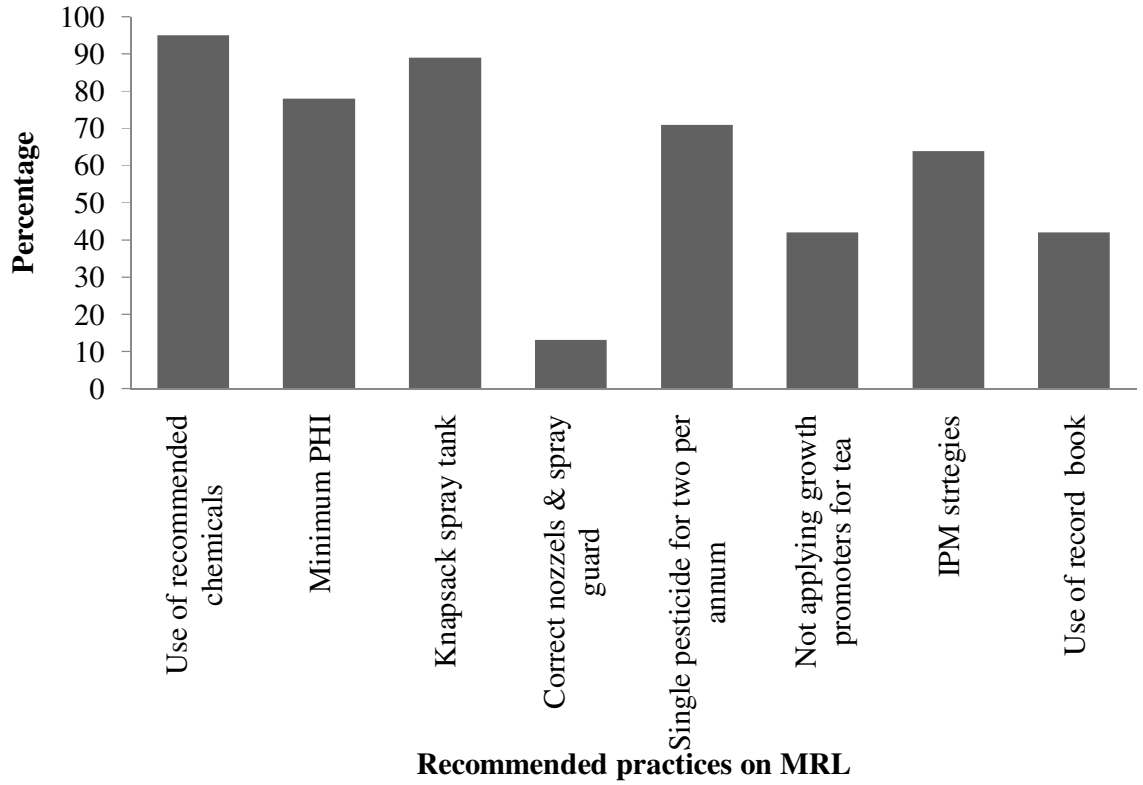

Figure 1. Percentage distribution of adoption of recommended practices on MRL.

Table 3. Results of the Multiple Linear Regression Analysis.

Variable	Coef.	SE Coef.	Sig Value
Constant	47.453	6.534	0.000
AGE	-0.06085	0.09993	0.546
LAE	0.2140	0.8885	0.811
FEXP	0.5400	0.2374	0.029**
EDL	6.060	2.022	0.005**
GEN	1.555	2.318	0.507
FLB	0.998	4.174	0.812
HLB	-9.093	2.681	0.002**
AWN	8.020	3.133	0.015**

and the management of pest and diseases with the experience of farmer. They attempted to implement IPM strategies while minimizing chemical methods.

Awareness on MRL

When tea small holders were aware on Maximum Residue Level (MRL) as the international food safety regulation, they concentrated more on recommended practices and avoided possible ways of buildup of residues.

Education level of tea small holder

There was a positive relationship between education level of tea small holder and adoption level of recommended practices on MRL. More educated farmers corresponded to a higher adoption index. Educated farmers understand innovations easily (Feaster, 1968). Better educated farmers are higher adopters of innovation (Gross, 1949). Since adoption is a process of decision making, formal education level contributes to adoption through the allocate ability of a person (Niranjan, 1992). Educated farmers had adopted for the

TRI recommendations on correct use of pesticides by knowing and understanding the tea as a food commodity and the consequences of incorrect use of pesticides.

Use of hired labor for tea farming

The result revealed that the labor type 2 (use of hired labor) was negatively related with the adoption of recommended practices on MRL. Quality of the family labor may be higher than hired labor. Therefore type of labor may have a relationship with adoption of cultural practices (Fieldson, 1981).

The respondents who employed family labor for tea cultivation had adopted for manual and cultural practices. Tea small holders who had large extent of land under tea cultivation and who engaged with other occupations used hired labor for cultivation practices .Those who employed hired labor had highly adopted for chemical methods to control the pests and diseases of tea. The negative relationship may be due to ignorance of hired labor on correct use of pesticides.

A positive relationship can be expected between cultivated extent and innovative behavior of an individual towards an innovation (Niranjan, 1992: Bogahawatta, 1982). But the above relationships might not be true in all instances. When the scale of the operation increases, labor incentive techniques may become uneconomical (Fliegel, 1956). This study revealed that land extent under tea cultivation has no significant impact on adoption of recommended practices on MRL.

Conclusions

The outcome of the study revealed that, all the tea small holders of the sample had adopted at least three recommended practices on MRL. Nevertheless significant amount of respondents had not implemented some important recommendations; use of correct nozzles and spray guards, limiting the number of application of a single pesticide for two per annum and not applying any growth promoter for tea. According to the positive list of Japanese and European Union, TRI of Sri Lanka was compelled to reduce the pesticide list to a considerable amount. However with more persuasion and justifications, TRI has recommended 27 pesticides for tea. According to the outcomes of this study, the majority of tea small holders applied recommended pesticides. It was revealed that the adoption of recommended practices on MRL by the tea small holders is significantly determined by the experience of tea small holder on tea farming, awareness on MRL, education level of tea small holder and use of hired labor for tea.

Therefore appropriate policies should be formulated to make aware the tea small holders on international food safety regulations of tea and to implement Good Agricultural Practices in tea fields as a mandatory requirement. This will help to ensure that we, Sri Lankans still produce the “Cleanest tea in the world” thereby to open more of the world markets for Sri Lankan tea and gives a much needed competitive edge.

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