The Effect of Banning Glyphosate on Weed Management: The Case of Tea Production in Sri Lanka

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INTRODUCTION

Tea is the highest foreign exchange earning agricultural industry in Sri Lanka. It provides livelihood for many people, thus plays a major part in the economy. Weed management is important in commercial tea cultivation for a steady and high-quality crop that ultimately affects the profitability of the business. Glyphosate is a popular weedicide used for agricultural and non-agricultural purposes in the world. It is currently used by tea-growing countries such as China, India, Vietnam and Kenya in addition to Sri Lanka (Brookes, 2019). Glyphosate was first imported into Sri Lanka in 1977 as a pre-planting herbicide on annual and perennial crops (Marambe & Herath, 2019), while its use for general weed control in tea and paddy cultivations was recommended in the 1990's. By 2014, 36 percent of Glyphosate imported into the country was used by the tea industry (Marambe, 2019). The Government of Sri Lanka imposed an island-wide ban on Glyphosate in 2015 and lifted it three years later. This ban was implemented for purported public health and safety reasons, while opinions and advice about this justification are conflicting. The ban has reportedly had a substantial negative impact at the farm level and the industry, and therefore was lifted in late-2018. An annual loss of LKR. 10 – 20 billion was estimated on the tea industry because of banning the use of Glyphosate (Marambe & Herath, 2019). The likely effects of the Sri Lankan government policy on banning the use of Glyphosate in the tea farm sector are investigated in this study.

The research question being investigated is 'How has the ban on Glyphosate affected the tea farm sector in Sri Lanka?'. The research objectives are to study the changes in weed management approaches in different green leaf producing groups and to evaluate changes in gross margins of farm production in these groups following the ban. The research propositions formulated in this study are i) costs of weed control increase and ii) the gross margin decreases in case of a Glyphosate ban.

METHODOLOGY

Quantifying the cost of the ban and elaborating the impacts of the ban on the tea farm sector; tea smallholders and estate plantations require primary and secondary data at the farm level. Therefore, a mixed-method was used in this research that uses both quantitative and qualitative data. A mix of survey and case study approaches were applied, looking at both contemporary and past events with respect to the time periods before and after the ban. An embedded single-case research design (Yin, 2017) was used in this study. Key participants in the tea supply chain including tea smallholders, estate managers, laborers and tea factory managers were the embedded units of analysis in the case. Expert and key informants' opinions were used to gather information and select the embedded units specified above. Interviews with key participants enabled the collection of primary data including both quantitative and qualitative data. Out of the 14 districts where tea is cultivated, five districts with the highest production quantities and acreage were selected for the study based on statistics from the Sri Lanka Tea Board (2017) and the Department of Census & Statistics (2005) over the past ten years. The selected five districts were Galle and Rathnapura belonging to the low-country tea growing region, Badulla and Kandy representing the mid-country tea growing region, and Nuwara Eliya from the up-country tea growing region. From all these districts, 35 tea smallholders and five estate managers were selected for interview. Additionally, secondary data on prices from published sources such as annual reports from government institutes were used.

FINDINGS

Data collected from interviews suggested that the types of weed management options practiced by tea smallholder sector were manual weeding only, chemical weeding with supplementary manual weeding and chemical weeding only, depending on circumstances in tea cultivations. Conversely, only chemical weeding with manual weeding rounds carried out in the estate sector is usually managed by Regional Plantation Companies (RPCs).

Labour-intensive manual weed control was frequently practiced in the smallholder sector throughout and a considerable proportion of Glyphosate users before its ban switched to manual weed control during the ban. In the meantime, Glyphosate/chemicals only weed

control practice was greatly reduced and chemical weeding using illegal Glyphosate from informal markets and alternative weedicides such as Diuron, MCPA and Basta along with supplementary manual weeding increased during the ban. These illegal Glyphosate products and other alternative weedicides were reported less efficient than Glyphosate, hence growers had to increase manual weeding efforts in terms of labour allocation and frequency, in addition to increased doses of informal Glyphosate product application. This has led to increased costs of labour and chemicals eventually for landholdings. The comparison of costs of different weed management approaches across the two periods (Table 1) suggests that manual weeding only and chemical weeding with supplementary manual weeding rounds incurred the highest costs on weeding before and during the ban respectively.

Table 1: Costs of different weed management approaches in tea smallholder sector before and during the ban on Glyphosate (LKR /ha/year)

Before the ban (2014)			During the ban (2017)		
Manual weeding only	Chemical weeding with supplementary manual weeding	Chemical weeding only	Manual weeding only	Chemical weeding with supplementary manual weeding	Chemical weeding only
79,040	57,050	30,183	88,920	119,301	48,659

The estate sector carried out chemical and supplementary manual weeding continuously throughout the period with Glyphosate before its ban and illegal Glyphosate products or Glufosinate Ammonium during the ban. The estate sector also incurred extra costs on labour because of allocating more labour on manual weeding and chemical costs because of over-pricing in the informal market. The costs of weeding before and during the ban on Glyphosate were LKR 36,490/ha/year and LKR 82,710/ha/year respectively.

Findings from interviews highlighted the following as weed management decisions made by tea smallholders during the ban i) substitution of Glyphosate with labour only, ii) substitution of Glyphosate with informal Glyphosate products only and iii) substitution of Glyphosate with informal Glyphosate products and labour. As mentioned above, the estate sector continued the

substitution of Glyphosate with informal Glyphosate products during the ban.

Table 2 summarizes budget parameters of green leaf production with the ban in effect in representative tea smallholdings and the estate sector based on weed management decisions as stated. The effect of the ban on weeding costs, total variable costs (TVC) and gross margin (GM) are measured here by holding wage rates and green leaf prices constant across the two periods. Accordingly, the highest effect of the ban on green leaf production businesses was on those who practiced chemical weeding with illicit Glyphosate products and supplementary manual weeding during the ban.

Table 2: Summary of budget parameters of tea smallholding and estate sectors practicing different weed management approaches before and during the ban

Tea grower sector	Weed management approaches		% Change in weeding cost	% Change in TVC	% Change in GM
	Before the ban	During the ban			
Tea smallholder sector	Glyphosate weeding only	Manual weeding only	141.90	11.49	(20.72)
		Illicit Glyphosate products only	86.42	7.00	(15.56)
		Illicit Glyphosate products and manual weeding	196.94	15.95	(25.84)
	Glyphosate and manual weeding	Illicit Glyphosate products and manual weeding	77.88	11.12	(23.13)
Estate sector	Glyphosate and manual weeding	Illicit Glyphosate products and manual weeding	116.78	10.08	(70.77)

The ban on Glyphosate increased costs of production for almost all tea landholdings (due to an increase in the cost of weed management) and

gross margins decreased with the ban. Significant impacts of the ban on Glyphosate have been on landholdings that substituted Glyphosate with illegal Glyphosate and labour with the ban in place, and landholdings that continued with integrated chemical and manual weeding but substituted Glyphosate with illegal Glyphosate and extra manual weeding, incurring the highest cost changes. The least cost was incurred by landholdings that just substituted Glyphosate with alternative illicit weedicides in chemical-only weed management during the ban. The decision of such landholdings to use alternative chemicals only, labour only or a combination of alternative chemicals and labour for weed control depended on the elasticity of substitution between chemicals and labour, while factors including unavailability of adequate amounts and high cost of labour, not having access to illegal Glyphosate products or other alternative weedicides and over-pricing of them affected the decision.

CONCLUSIONS

Given increasingly challenging labour issues such as scarcity and wage hikes in the farm sector, and the absence of suitable alternatives for Glyphosate during the ban, growers' dependence on illegal Glyphosate products in informal markets have been increased. Therefore, the intended outcome of the ban on Glyphosate was not met. This has led to a substantially worse financial status for the green leaf production sector by narrowing down gross margins. A better approach that allows flexibility and reduced financial consequences at the grower level would be the introduction of input taxes rather than a ban with no contemplation on its effect on the industry.

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