Impact of Rainfall Variation on Tea (*Camellia sinensis* L.) Yield in Uva Medium Region

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Introduction

Tea has been main stay of Sri Lanka's economy for more than a century and still continues to occupy an important place. Different clmatic parameters affect on tea yield in various degrees. But rainfall pattern (length of dry and wet seasons) and temperature are two key factors affect on the variability of tea production. Generally 2500-3000 mm of annual rainfall is optimum while 1200 mm minimum. Minimum monthly rainfall requirement is quoted as 50 mm (Watson and Zoysa, 2008). Tea yield that declined due to lack of rainfall is about 29-81kg month $^{-1}$ 100 mm^{-1} of rainfall deficit below the optimum rainfall (Wijeratne *et al*., 2007). Uva is one of the major tea planting area in Sri Lanka and famous for exotically aromatic flavor (Anonymous, 2000).This region is vulnerable to climate changes and it reported highest negative yield change in past year (Sarath and Abeysinghe, 2012). Therefore this study was amied at quantifying the impact of rainfall variation and determine the optimum rainfall level on tea yield.

Methodology

Eighteen estates are located in the Uva medium region and those estates belong to five agro ecological zones (AEZ). Sample was based on tea land extent of different agro ecological zones and accessibility. Two estates from IM1a, One estate from IM2b and Five estates from IU3c were selected. Data were collected for past ten year period (2003 - 2012) and monthly variations in following parameters like Production (yield) , yield productivity (Kg per month), Made yield tea (Kg per month), Yield (Made tea kg ha $^{-1}$ $^{-1}$month), Climate data and Rainfall (mm) were considered.

Rainfall data and production data were collected from estate records. Averaged yield values were derived for agro ecological regions where there were data for more than one estate. Quantification of rainfall variation on tea yield was done by using quadratic regression analysis and highly vulnerable area was identified by assiuming 10mm deviation from optimum rainfall level.Analysis was conducted separately for each agro ecological zone.

Results and Discussion

Quantification of rainfall in AEZ

Yield equations of each AEZ with rainfall

Yield (IM1a) = 44.84 + 0.6003 previous month rainfall - 0.00159 previous month rainfall**2
Yield (IM2b) = 62.97 + 0.2976 Previous month rainfall - 0.00058 Previous month rainfall**2
Yield (IU3c) = 2.58 + 1.066 Previous month rainfall - 0.002664 Previous month rainfall**2

There is a polynomial relationship between tea yield and rainfall of the previous month and bell shape cur**v**e could be obtained. Positive relationship was existed because plants tend to increase metabolic activities with moisture. Low yield at very high rainfall amount were attributed due to the lack of sun shine.

Determining optimum rainfall for AEZ in Uva medium region

Table 1. Optimum rainfall for AEZ in Uva medium region

Region	Optimum rainfall(mm $^{-1}$month)
IM1a	186.5±11.1
IM2b	252.2±17.8
IU3c	200.4±12.1

Optimum rainfall was ranged from186 – 252 mm $^{-1}$month. Soil physical properties, especially Water holding capacity of soil may influence on variation of optimum rainfall.

Identifying vulnerable AEZ

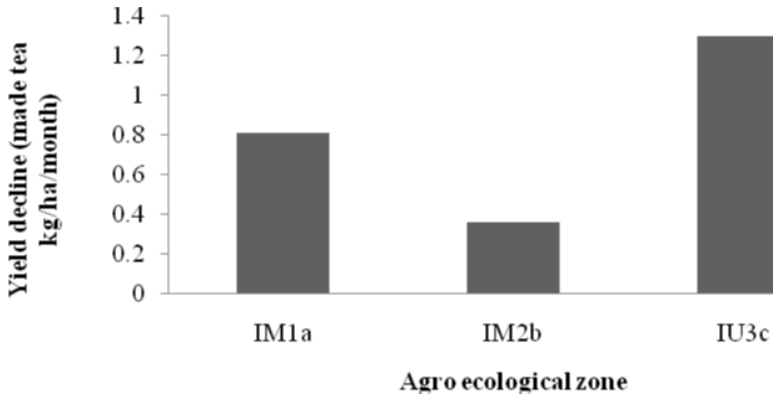

Figure 1. Change of yield (made tea kg ha^{-1} $^{-1}$month) with 10 mm $^{-1}$month deviation from optimum rainfall

Yield tends to be declined with drop/exceed of rainfall from optimum level. High yield declining can be seen by the IU3c AEZ while IM2b showing minimum. Therefore IU3c region will be highly vulnerable to rainfall change.

Conclusions

There is a polynomial relationship between tea yield and rainfall of the previous month. Optimum rainfall ranged from 186.5mm to 252.2 mm in Uva medium region. Reduction of rainfall by 10 mm per month from optimum value reduces 0.36 – 1.12 made tea kg ha^{-1} $^{-1}$month. The highest yield decline is shown by the IU3c AEZ while IM2b shows the minimum yield decline with the rainfall variation.

References

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