

Abstract of Doctoral Dissertation

Title:

**Application of Bio-Climatic Indicators for
Tea Cultivation in Uji Area
–Drawing from the Experience of Winegrape Terroirs–**

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In regards to the on-going climatic changes, the agriculture industry is among those which are directly affected by changing climatic behavior. Among the agriculture industries, tea and winegrape cultivation possess similar traits, especially on their sensitivity towards changes in the micro-climatic condition. There are many indications of similar elements between winegrape terroirs with the tea cultivation in Japan, especially Uji Area. Whereas in the cultivation process, the importance of natural environmental conditions and utilized agriculture practices are highly regarded as the important elements which affect the product characteristics. Changes in climatic conditions, especially air temperature will have a direct effect on the growth cycle of tea plant, which are especially crucial during leaf bud break to harvest period. In this research it was found that changes in the climatic condition have overwhelm other elements in the terroir concept and have been directly affecting both the natural environmental elements and agriculture practices. The focus of this research is application of bio-climatic indicators based from the terroir concept developed from the winegrape cultivation. The terroir concept in this study is elaborated in to two elements: natural environmental elements and agriculture practices elements (traditional agriculture knowledge), whereas important bio-climatic indicators were identified through series of micro-climatic data monitoring and recordings, complemented with social surveys and observations. For the tea growers to be able to utilize the bio-climatic indicators such as Heliothermal Index (HI), Cool Night Index (CI), Humidity Index (Hum-I) and Warm Day Index (WI), these indicators need to be reformulated and recalculated based on the

phenological process of tea cultivation. The calculated bio-climatic indicator values would provide more input and information to the tea growers, whereas HI is useful for selection of land as well as cultivars for tea cultivation. CI and Hum-I would be useful to predict optimal cultivation intervention timing such as time to fertilize, utilize leaf cover and frost protection system. WI could be utilized to formulate effective cultivation intervention types such as selection of leaf covering level and types of soil fertilizers. Through observation of the bio-climatic indicators moving averages values, decision on cultivation intervention timing and types could be made swiftly and effectively, thereby allowing them to better adapt with the changing climatic factor, as well as developing new intervention methods on tea cultivation process, to maintain and provide better value of tea productions. Bio-climatic indicators will be the basis for new tea cultivation knowledge which is explicit and transmittable among the tea growers, complementing the already existed implicit cultivation knowledge inherited from tea growers' family. From the combination of the two knowledge young and less experienced tea growers as successor would be able to quickly comprehend the mechanism of an important cultivation process, as well as understanding how the indicator values will affect the tea production quantity and quality. These would contribute to the socio-economic benefit of Uji Area, which ultimately ensuring the sustainability of Uji Area as a tea growing region. Application of terroir concept and bio-climatic indicators on tea cultivation industry in Uji Area would redefine the notion of Uji Tea, consequently the derived values from bio-climatic indicators calculations could be utilized to define the terroir boundaries of new Uji Tea definition.