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Review

Developing a set of indicators to measure sustainability of tea cultivating farms in Rize Province, Turkey

Shamsheer ul Haq*, Ismet Boz

Department of Agricultural Economics, Ondokuz Mayıs University, 55139 Samsun, Turkey

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ABSTRACT

Sustainability of farms is frequently assessed by developing specific indicators. However, a common choice of indicators is rarely emphasized and it is almost impossible to adopt such indicators due to the different biophysical and geographical conditions of different countries and regions. Similarly, suggesting a common choice of indicators for tea farming appears quite challenging. This study was designed to develop a set of indicators for tea farming by considering the site-specific features. The methodological steps followed in this study were as follows: i) defining a number of possible factors based on the regional characteristics and life patterns of the people, (ii) defining the selection criteria and the validation procedures of the indicators, and (iii) selecting the directly usable indicators from previous farm-level sustainability studies. Self-validation, scientific validation, and social validation were performed. Expert's opinion and stakeholders' participation were found to play a vital role in the validation and selection of the indicators. The data availability and scoring methods were also discussed. As a result, we developed a user-friendly methodology for selecting indicators and scoring methods for the qualitative indicators. The set of indicators identified in this study is totally site-specific. This study proposes a method for a convenient selection of indicators in a region with geographical and climatic diversity.

1. Introduction

Tea (Camellia sinensis) is the second most widely consumed beverage in the world, which apart from being relished, is also very effective in curing various human diseases (Khan and Mukhtar, 2013). Tea is a perennial crop cultivated throughout the world. Turkey also holds an important position in tea cultivation. It ranks fifth in tea production, after China, India, Kenya, and Sri Lanka, respectively (Worldatlas, 2016).

Although Turkey enjoys a good status in tea production and export, tea enterprises nonetheless encounter numerous issues related to production. These include aging problem, delays in the renewal of tea plants, downsizing of land assets, fluctuations in tea-processing sectors, illegal tea entry, the high cost of cultivation and processing, and inadequate organic production (Özcan and Yazıcıoğlu, 2013). The major issues encountered by small tea growers are the fragmentation of land, lower tea prices compared to the cost of production, delayed payments and the lack of solidarity organizations (Sakli, 2011).

The main region for tea cultivation in Turkey is Rize Province. The climate of Rize Province, which is a part of the Black Sea region, is very suitable for tea cultivation. Out of the total cultivated area in Rize Province, more than 90% is reserved to tea cultivation, which contributes 78% to the total tea production of the country (RTB, 2014). Aylangan (2011) revealed that more than 200 thousand families are involved in tea cultivation, as the owners of the tea-cultivation lands, sharecroppers, or employees of the tea processing factories. This implies that tea farming plays an important role in the economic and social lives of these people and is also vital to the economy of the country. Hence, there is a necessity to assess the sustainability of tea farms.

Sustainability of tea farms in Turkey is very important because of several reasons which are briefly described below: First of all, tea farms have been divided and fragmented due to inheritance law which requires farms to be equally divided among the heirs. The fragmented and downsized tea farms have become inadequate to provide viable income for farmers, even for those who have remarkable desire to work in tea farming and enjoy living in rurality. A second major issue is that in order to increase productivity and earn income from the limited land, tea farmers have been using chemical fertilizers in increasing amounts which have threatened the environment. The most dominated fertilizers until 1974 were manure and mulching with leaves under the forests (Yüksek, 2001). While the amount of manure and mulching used in tea farming decreasing between 1974 and 1991, the amount of chemical fertilizer increased from year to year. In this period, 60–70% of the

* Corresponding author.
E-mail addresses: shamsheer213@hotmail.com (S. ul Haq), ismet.boz@omu.edu.tr (I. Boz).

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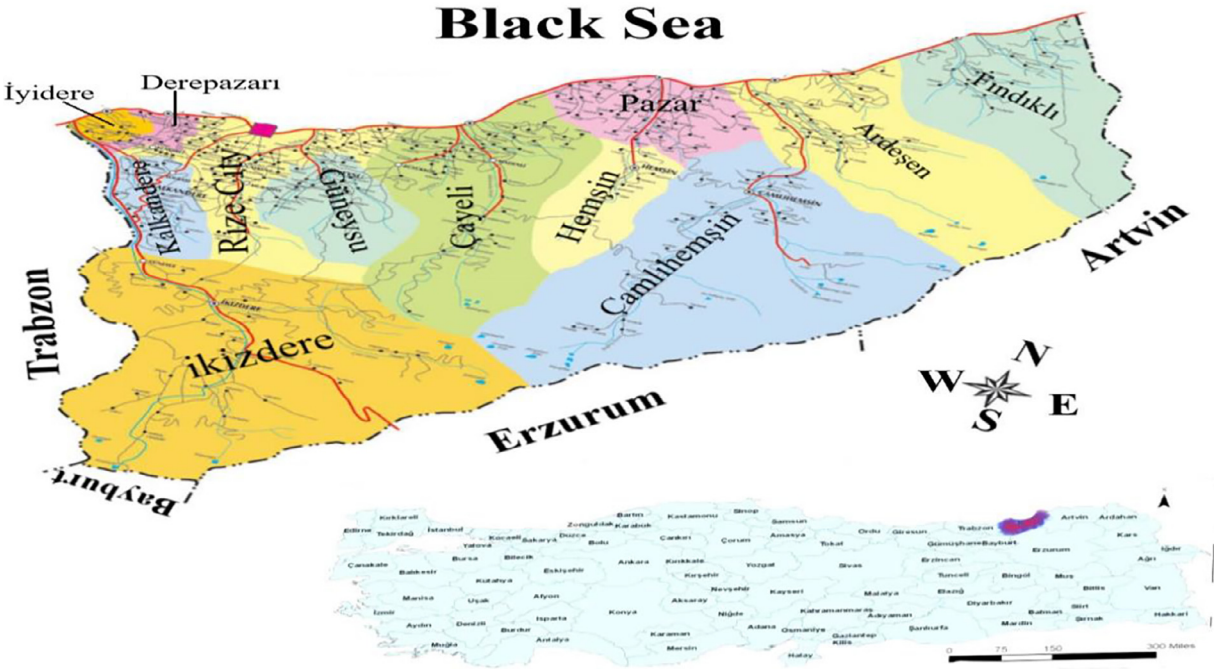

Fig. 1. Map of Rize Province (Source: World Map Site).

fertilizers applied in tea cultivation are in the form of ammonium sulfate and they are promoted to the farmers through Tea Farmers Co-operative (Çay Ekicileri Kooperatifi- in Turkish Language) Between 1991 and 2010, fertilizer nitrogen-phosphorus-potassium 25-5-10 mixture (NPK 25-5-10) became the most used fertilizer in tea farming (Yüksek et al, 2013). Since then chemical fertilizers have been substituted for manure and mulching. Although in high altitudes there has been a slow tendency towards organic tea production it has remained at minimal level considering the entire conventional tea cultivation areas where chemical fertilizers, particularly nitrogen is intensively being used. A third significant reason for sustainable tea farming is rural migration, particularly among the young population. Farmer population in the locality is getting older with less interest in following and adoption of agricultural innovations which ultimately will result in economically unviable, and socially unacceptable farming community. Finally, Turkey was a self-sufficient country in tea production, however, due to the above issues tea import is increasing from year to year. Due to insufficient research and technological developments, quality improvements in Turkish tea has remained at minimal level which resulted in many Turkish tea consumers particularly living in the South Eastern and Southern part of Turkey becoming addict to imported tea product.

The three main pillars of the sustainability assessment process include the economic, social, and environmental aspects. When tea farming is economically sound, environment-friendly, and socially acceptable, then only it could be sustainable. The assessment of sustainability requires great attention at each level during the measurement, blended with the knowledge of experts and assistance from the literature. The basic method for the assessment of sustainability is identifying the “indicators”. As defined, “an observed variable can be termed as an indicator when its role in the measurement or evaluation of a phenomenon has been recognized” (Tanguay et al., 2010).

There are numerous methods for the selection and analysis of indicators. The variable climatic and biophysical conditions across different countries, even across different regions within a country, limit the applicability of indicators to be used in a study. It implies that an indicator selected and successfully applied in sustainable agricultural assessment in one region or country may not be applicable in some other region or country (Tellarini and Caporali, 2000; Hatai and Sen, 2008; Sharma and Shardendu, 2011). Therefore, this study was designed to develop a suitable set of indicators that can specifically address the three dimensions of sustainability of tea farming. This study will also fill the research gap in relation to the indicators for the cultivation of tea, which is a major crop in many countries. The specific objectives defined for this study are as follows:

1) To develop an approach for indicators’ selection based on site-specific features of tea farming community operating in Rize Province.
2) To develop criteria for selecting an adequate set of environmental, economic, and social indicators for tea farms.
3) To review the literature for developing a list of indicators.
4) To check the validation of indicators and elucidate the data collection and scoring methods.
5) To provide a rationale of why these selected indicators should be proposed to assess the farm-level sustainability of tea cultivation farms in Rize Province of Turkey.

2. Material and method

2.1. Material

The primary material used for this study was information provided by an extensive review of the related literature, governmental reports, and stakeholders involved in different stages of tea cultivation in Rize Province of Turkey. Before explaining the methodology of the study, it is worthwhile to give a general description of geographic characteristics of Rize Province, the history of tea cultivation, and farming community in the province. Fig. 1 presents the map of Rize Province. Rize Province is located on the eastern black sea coast of north-east Turkey between longitude 40.9581° in North and, 40.9227° in East. It has a surface area of 3920 Km^2 with a rough and mountainous land surrounded by Trabzon (in the West), Erzurum and Bayburt (in the South) and Artvin (in the East). The Black Sea is located in the Northern part of the province.

2.1.1. History, climate, and land requisites of the tea plant

Tea is not a native plant of Rize Province. It is very sensitive to climate and requires moderate hot and humid weather. High lands