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Designing Yield Estimation Mechanism Using Blockchain Technology

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Abstract— **Price fluctuation of agricultural products is a complicated problem influenced by many factors that can be harmful for the players of the market. One of the most important factors is uncertainty in yield estimation of the products. It is a fact that accurate yield estimation is crucial for planning and evaluating the agricultural investment. Generally, the existing yield estimation systems are designed in centralized setting. However, effective tracking may not be possible due to problems in the data flow. Recently, data can be stored in a decentralized and distributed architecture using the blockchain technology that provides a censorship-resistant, tamper-proof, and strongly immutable database. In this study, we will propose a blockchain based solution to determine the yield of agricultural products. Our solution can be considered as a platform that enables the producers to share their farming plan with the other players, and makes them to review their investments for the oncoming season.**

Keywords — yield estimation; blockchain; agriculture

I. INTRODUCTION

Agricultural production can be examined under two headings as vegetable and animal production. The vegetable production consists mainly of field crops, grains, legumes, seeds and organic fruits and vegetables. Accurate estimation of vegetable production is important for both producers (farmers and investors) and consumers (human, governments and the food industry). The yield here can be defined as the amount of product produced during a production period.

Today, the predictability of the outputs of agricultural production has become increasingly important. Product prices are determined according to free market conditions. Therefore, overvaluation of the product price or selling below the actual value can be observed in many countries, including Turkey. As a result, problems such as hunger, food price inflation and the black market may arise. Production based on data and analysis in agriculture is increasing as a result of widespread use of precision agriculture-based technologies. TARBIL, which is built on public, academia and private sector cooperation, is able to provide reports thanks to real-time observation data [1]. Through the data collected over the years, it is able to estimate the yield using machine-learning methods [2].

Precision agricultural technologies are based on communication technologies such as, satellite communication, GPS, GIS, remote sensing and supports monitoring product forecast processes [3]. In recent years, the technology has also started to be developed on the blockchain, which can produce solutions for agricultural problems other than fintech and cryptocurrency. In addition, there are also academic studies, which emphasize the future impacts of the blockchain on the agriculture and food sectors. Food and Agriculture Organization (FAO), which belongs to United Nations (UN), has highlighted the current trends in agricultural applications that can be developed with blockchain [4].

Several applications based on blockchain are available to the public. Ripe.io, which presents the origin information about the products, aims to prevent food fraud [5]. AgriLedger aims to open new markets to farmers in the developing world by using blockchain [5]. It proposes to create trust and accountability among market players. It is desired to establish mutual trust in the market without the need of any trusted broker. As seen from two applications, Projects that will enable the producer to deliver its own product directly to the consumer or food industry companies without the need for any