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Scheduling model in strawberry harvesting by considering product decay during storage

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Abstract

Demand of strawberry from the supermarket required high-quality products with continuous supply. Asgita, an association of strawberry producers, is facing several problems regarding product's supply that will influence their profits. One of the problems was un-integrated supply chain between farmer and Asgita. A scheduling model for strawberry harvesting need to be developed to gain maximal profit. This model should provide an integrated system together with processing and storage. This model was developed using mix-integer linear programming updating by rolling horizon method. The result showed, harvesting with 90% maturity was more profitable, as long as the amount of supply and demand almost equal

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Keywords: Harvest Scheduling; Mix Integer Linear Programming; Decay Function

1. Introduction

Nowadays, fruit selling through supermarkets in Indonesia is increasing. Asgita is the association of a strawberry farmers who controls supply to the supermarket in Ciwidey Village. Most supermarkets require have set a product quality standard, as for strawberry it is with 90% maturity, good grading, sorting and packaging process. In the other hand, a traditional market requires only 75% maturity. In strawberry farming, to reach 90% maturity, it needs five-day cycle; and three-days cycle to reach 75% maturity. The excess of strawberry harvesting will be stored in a

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warehouse where the quality will decrease gradually as a function of time. The scheduling model will assist Asgita in deciding production and distribution schedule in order to gain maximal profit. In developing this model, we also consider post-harvest behavior, post-harvest decay, labors, and delivery cost.

This scheduling model has been developed in tea [1] and grape harvesting [2], however it hasn't been integrated with post harvest processing. In other cases, the scheduling model with post harvest processing integration has been developed in raw sugar [3] and strawberry [4] but without including product decay during storage. Reference [5] has developed a model which considers product decay but it did not accommodate harvest day before planning periods. The scheduling model that developed in this study was integrating post harvest by considering product decay during storage and also accommodating harvest day before planning periods as well as supported by strawberry function decay during storage [6]

2. Real System

Fig 1 describes Asgita harvest system that shows the relationship between five actors involved. There are producer, association, supermarket, traditional market and home industry for strawberry jam. Producer gives information to the association about field capacity and the latest harvest day before planning periods while supermarkets give information about quantity demand each day. After that the association makes a harvest schedule, post harvest processes schedule, storage and delivers a schedule. From the sorting process, strawberries that meet supermarket requirement will be sent directly to the supermarkets while others will be delivered to home industries.