

Simulation Model and Scenario to Increase Corn Farmers' Profitability



Erma Suryani, Rully Agus Hendrawan, Lukman Junaedi
and Lily Puspa Dewi

Abstract Corn demand in Indonesia is quite high; this commodity is useful as food, as animal feed ingredients, and as industrial raw materials. The main problem in corn farming is not enough production to meet the demand as staple foods and industry. Therefore, it is necessary to increase the amount of corn production to meet demand as well as to increase farmers' income and profits. Based on this condition, in this research we propose to develop a simulation model and scenario to increase farmers' income through land productivity improvement. As a method use for model development, we utilize system dynamics framework based on consideration that system dynamics is a scientific framework for addressing complex and nonlinear feedback systems. System dynamics can use both qualitative and quantitative techniques such as computer simulations. It also facilitates the adoption of nonlinear mental models so that they can search and describe the feedback process of problem dynamics. In particular, system dynamics has proven useful in overcoming agricultural problems. Simulation results show that increasing farmers' income can be done through increasing land productivity. With the increase in land productivity, corn production will increase, hence the income of corn farmers will also increase. Increased productivity can be done by carrying out structural and non-structural approaches. Structural approach can be carried out through rehabilitation of watersheds and irrigation networks. Meanwhile, non-structural approach can be carried out through the application of new technologies, strict land conversion rules, dynamic planting calendars, dissemination of climate information, and the development of climate field schools.

Keywords Simulation · Model · System dynamics · Corn · Farmers' profitability

E. Suryani (✉) · R. A. Hendrawan
Department of Information Systems, Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia
e-mail: erma.suryani@gmail.com

L. Junaedi
Department of Information Systems, Universitas Narotama, Surabaya, Indonesia

L. P. Dewi
Informatics Department, Petra Christian University, Surabaya 60236, Indonesia

1 Introduction

For Indonesia, corn is the second food crop after rice. Even in some places, corn is the main staple food as a substitute for rice or as a mixture of rice. Corn demand in Indonesia is currently quite large reaching more than 10 million tons per year [6]. One of the developments of the agricultural sector besides rice is corn. This commodity is an important food ingredient because it is the second source of carbohydrates after rice. Besides that, corn is also used as animal feed ingredients and industrial raw materials [8].

From the market side, the marketing potential of corn continues to experience enhancement. This can be seen from increasingly the development of the livestock industry that will eventually increase the corn demand as a mixture of animal feed.

Currently, the problem of corn farmers is the amount of imported corn which has caused a fall in the price of local corn so that it can cause losses on farmers. The price of imported corn is often cheaper than local corn. The imported corn price is often cheaper than local corn. This is because the demand for animal feed entrepreneurs who lack local corn supply, so the government must import corn. Corn imports should not be done when farmers are harvesting and must also be stopped during post-harvest especially in July–September and January–March.

2 Literature Review

In this section, a literature review will be discussed about the structure of farm costs, prices, and farm income.

2.1 Farming Cost Structure

Farming is the science that studies how to cultivate and coordinate production factors in the form of land, natural resources, and capital to provide benefits as well as possible [14]. Farming cost structure is influenced by two factors: fix cost and variable cost. Farming costs can be calculated using the formula as given in Eq. (1) [9].

$$TC = VC + FC \quad (1)$$

where

TC = total cost; VC = variable cost; FC = fixed cost.