Jurnal Teknologi

Full paper

System Dynamics Model to Support Rice Production and Distribution for Food Security

Erma Suryani[a*], Rully Agus Hendrawan[a], Totok Mulyono[a], Lily Puspa Dewi[a,b]

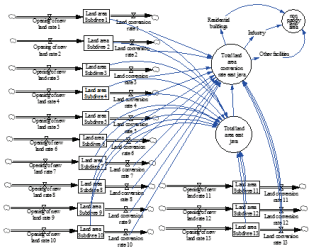
[a]*Information Systems Department–Faculty of Information Technology (FTIF), Institut Teknologi Sepuluh Nopember (ITS)–Kampus ITS Keputih, Sukolilo, Surabaya 60111*
[b]*Informatics Department–Faculty of Industrial Technology, Petra Christian University, Surabaya, Indonesia*

*Corresponding author: erma.suryani@gmail.com

Article history

Received :1 January 2014
Received in revised form :
15 February 2014
Accepted :18 March 2014

Graphical abstract



Abstract

Food security is a national issue as the impact of food insecurity in several regions in Indonesia. The number of Indonesia's large population requires a full attention by the government to meet people's welfare, especially relating to food. A comprehensive study is therefore required to solve this problem. In this research, we utilized System Dynamics based on consideration that this framework offers the ability to incorporate expert knowledge in the model and the ability to model highly non-linear behavior. This pilot study seek developed a System Dynamics model to improve food security by considering regional condition changes to evaluate several policies for strategic decision making; and help government in improving food security through several policy scenarios development such as land intensification, land expansion, and distribution from other region (subdivre) which has surplus stock and import. This study could be considered as a pilot study to improve food security through some scenarios such as land intensification, land expansion, distribution from other regional district, and import.

Keywords: System dynamics; modeling; food security; simulation

1.0 INTRODUCTION

Food security is an issue that has become a national concern as the result of the scarcity of crops traditionally consumed as staple food in several regions in Indonesia, as an impact of post-crisis macroeconomic issues. Indonesia's large population and its vastness pose challenges in ensuring the welfare of the people in all areas, especially regarding food.

System dynamics model for Food Security has been developed in development countries which used a systemic perspective as means of understanding the complexity of a phenomenon as well as the (interrelation) linkage and interdependency of its factors. The approach will empower the planners of local regions to foresee future threats, to alleviate partly the scarcity of food, and to handle the mismanagement of food resources [1].

A modelling approach based on System Dynamics can be used to represent relationships between the main agricultural and food system drivers and their consequences for food security, environment, and livelihoods; to represent the quantified outcomes through some regional scenarios, and to indicate how policy and technical interventions can be implemented to the system [2].

Therefore, in this research we propose a System Dynamics (SD) approach based on consideration that this framework offers the ability to model highly nonlinear behavior and to incorporate expert knowledge into the model. Using System Dynamics Framework, we can enhance our understanding of food security issues, especially in the context of local and regional availability of food, severity level of food insecurity in each location, and related changes that occur. Identification and understanding of these issues are crucial, especially for the government and related decision makers, as this would enable them to develop more effective strategic decision making in ensuring food security.

This paper is organized as follows. Section 1 demonstrates introduction. Section 2 provides literature review and previous related work. Section 3 describes the base model development, Section 4 provides model validation, and Section 5 shows the scenario development for the next future. Finally in Section 6, the conclusion is presented.