ABSTRACT

WINDI AL ZAHRA. Simulation Model of Sustainable Forage Supply for Dairy Farming in Lembang Sub District West Java. Under the supervision of ASEP SAEFUDDIN and LUKI ABDULLAH

Forage supply is the core issue in dairy farming productivity in Indonesia. The restricted forage supply is mainly due to the limited farming land owned by the farmers. This research was carried out to formulate the simulation model of forage supply sustainability for dairy farming in Lembang Sub district, West Java. Method of this research was collecting data from (1) desk study, (2) survey,(3) interview with the stakeholder, (4) FGD (Focus Group Discussion). The model was built by using the system approach; need assessment, problem formulation, system identification (causal loop and input-output diagram) and model formulation. The model simulation software program used in this study was Powersim Studio 2005. There were four submodels built; population submodel, dairy cattle population submodel, economic submodel, and forage availability submodel. Based on the dynamic simulation, it was obtained the amount of population as 207.025 ppl in the end of year simulation (20 years), 15.392 AU for dairy cattle population, 48.722.025 litter for milk production, Rp. 157.372.140.750,00 for the revenue from milk yield, 40.484,52 ton for forage production and 165.492,73 ton for forage requirement. Policy analysis was exceeding from the model built. Sensitivity’s test was the real form of intervention from model structures. It showed how sensitive the model as the changes of output and it showed what the effect resulted. Model validation was done by statistical method; MAPE (Mean Percentage Error). The spatial analysis was done to determine the ecological suitability for forage management.

Keywords: model simulation, dairy cattle, forage sustainability
ABSTRAK

WINDI AL ZAHRA. Model Simulasi Penyediaan Hijauan Makanan Ternak (HMT) yang Berkelanjutan bagi Usaha Ternak Sapi Perah di Lembang, Jawa Barat. Dibimbing oleh ASEP SAEFUDDIN dan LUKI ABDULLAH

Ketersediaan bahan pakan merupakan isu penting dalam usaha peternakan sapi perah. Sapi perah mempunyai ketergantungan yang tinggi terhadap ketersediaan Hijauan Makanan Ternak (HMT), hal ini terkait dengan produksi susu yang akan dihasilkan nantinya. Permasalahan menjadi semakin kompleks ketika keterbatasan lahan dalam penyediaan HMT. Penelitian ini dilakukan untuk memformulasikan model penyediaan HMT secara berkelanjutan bagi usaha ternak sapi perah di Lembang, Jawa Barat. Metode yang digunakan dalam penelitian ini diantaranya adalah (1) desk study, (2) survey, (3) wawancara dengan stakeholder, (4) FGD (Focus Group Discussion). Model yang dibangun dengan menggunakan pendekatan sistem (system approach) yang dimulai dengan melakukan analisis kebutuhan, formulasi masalah, identifikasi sistem (causal loop dan diagram input-output) dan formulasi model. Simulasi model dengan menggunakan analisis sistem dengan menggunakan Powersim Studio 2005. Empat submodel dibangun dalam penelitian ini yaitu (1) submodel populasi, (2) submodel populasi sapi perah, (3) submodel ekonomi, (4) dan submodel ketersediaan HMT. Berdasarkan hasil analisis sistem dinamis didapatkan jumlah populasi sebesar 207.025 jiwa di akhir tahun simulasi (20 tahun), populasi ternak perah sebesar 15.392 AU produksi susu mencapai 48.722.025 liter, pendapatan dari hasil produksi susu Rp. 157.372.140.750, produksi HMT sebesar 40.484,52 ton dan kebutuhan HMT bagi sapi perah sebesar 165.492,73 ton. Skenario analisis sistem dinamis dilakukan dengan melakukan intervensi untuk mengetahui sensitivitas dari variable dalam model. Validasi model dilakukan dengan menggunakan analisis statistic; MAPE (Mean Percentage Error). Analisis spasial dilakukan untuk menentukan kesesuian ekologis bagi manajemen HMT.

Kata Kunci: model simulasi, sapi perah, ketersediaan HMT.
SUMMARY

WINDI AL ZAHRA. Simulation Model of Sustainable Forage Supply for Dairy Farming in Lembang Sub District West Java. Under the supervision of ASEP SAEFUDDIN and LUKI ABDULLAH

Dairy cattle have a highly dependence on forage for its daily diet that will influence the milk production. It is assumed that an adequate amount of forage will lead automatically to the higher milk production. Thus, it is very important in securing forage supply in order for sustainability of dairy farming. Forage sustainability should be observed by ecology, economy and social aspects. A model is needed on how the system works in providing forage in Lembang. It built by using a dynamic model that showed the time function due the input changes for every variable observed. The broad objective of this research was building a simulation model of forage sustainability for dairy farming in Lembang. The specific aims of this research were (1) to identify forage and dairy farming condition in Lembang and seek for related factors of forage availability considering the ecology, economy and social aspect (2) to simulate the model that be built to estimate the availability of forage (3) to formulate the policy of decision making from the model simulation built to support management systems of dairy farms. This research was done in Lembang Sub-district, west java province. The research spent for 4 months, since November 2011- February 2012. The method used to collect information follows: 1) Desk study from the previous information and research, 2) survey to collect the quantitative and qualitative data, 3) interview, 4) Focus Group Discussion (FGD) with the stakeholder. The respondents (the dairy farmers) were divided into four groups, they are the owned land for forage farmers (FOL), the renting land forage farmers (FRA), the sharing land area farmers with Perhutani (FSL) and the non land-forage farmers (FNL). The model was built by using the system approach; need assessment, problem formulation, system identification and model formulation. The model simulation was used Powersim Studio 2005. Validation was done by quantitative behavior pattern comparison. The model of forage sustainability for dairy farm was validated by using MAPE test (mean absolute percentage error). MAPE refers to diminished number between the actual and the simulate data. The policy analysis was considering the carrying capacity in Lembang. The method for counting carrying capacity is using ICPRC (Increasing Capacity Population of Ruminant Cattle). The spatial analysis of ecology suitability for forage in Lembang was done by considering suitability of forage management to determine the pathway of policy analysis. The ecological suitability was made from the criteria of land suitability that have been appointed.

There was four submodels built; population submodel, dairy cattle population submodel, economic submodel, and forage availability submodel. It was found the stakeholders on this research; Dairy farmers, KPSBU, Animal Livestock Services and Perhutani. Based on the dynamic simulation, it obtained the amount of population was only 143.669 ppl in 2006 and changed
dramatically into 207,025 ppl in 2025. The dairy cattle population was 12,433 AU in 2006 to 15,392 AU in the end of simulation year. The milk production was 37,870.575 litter in 2006 and it is predicting will be 48,722.025 litter in 2025. The revenue was Rp. 122,321,957,250 in the early simulation and it is going to increase rapidly for Rp. 157,372,140.750 in the end of simulation year. Forage production was 45,097.11 ton and it will be calculated increasing smoothly for 40,484.52 ton in 2025. Forage requirement was predicted 132,698.75 ton and it will change for 165,492.73 ton in 2025. Policy analysis accessed from the model built. Sensitivity’s test was the real form of intervention from model structures. It will show how sensitive the model is as the changes of output and it will also show how the effect resulted. There were three scenario used; Scenario 1 was focused on the increment of population (3%) and dairy cattle population (5%). Scenario 2 was focused on the increment of population (5%) and dairy cattle population (7%), the extension of plantation area for forage and while milk price was constant. Scenario 3 was focused on the increment of population (10%), and dairy cattle population (10%), the improving of management and the increment of milk price. The ecological suitability was the primary requirements for forage management in Lembang. The ecological suitability was done by classified some criteria in order to get optimum forage production. The ecological suitability carried out for the land evaluation. The result of overlapping has been resulted the potential ecology suitability for forage management. Land suitability was physically divided into 4 classes; highly suitable (S1) for 1,150,71 Ha, moderate suitable (S2) for 4,390.07 Ha, marginally suitable (S3) for 881,06 Ha, not suitable (N) for 1,115,17 Ha and it was found constrain (C) for 211,22 Ha that became the restriction point for forage management. The GIS analysis deals with the actual suitability for forage management. It was done by combined The Governor Direction Map into a single layer. Land suitability was physically divided into 4 classes; highly suitable (S1) for 1,055.31 Ha, moderate suitable (S2) for 4,377.98 Ha, marginally suitable (S3) for 1,108,97 Ha, not suitable (N) for 1,105,11 Ha and it was found constrain (C) for 2,100,26 Ha.

**Keywords:** model simulation, dairy cattle, forage sustainability