Technical Note

Decision-Making Support System for Beef Production

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INTRODUCTION

Livestock raising is an important source for food safety, due to the different goods produced, such as meat, with significant levels of vitamins, proteins, and minerals (Torres and Delgado, 2018). The data reported by the National Statistics Office in Cuba evidence that beef production is under the historical levels, and the production volume is insufficient to meet the needs of the population. Efficient edaphic resources and production means management become relevant under these conditions to increase production.

In that sense, Decision-Making Support Systems (SATD, in Spanish) were created as an alternative to evaluate the managing strategies and optimum use of production materials in every scenario. Currently, SATD suites can provide assistance to cattle farmers. However, these systems have been developed in countries where bull fattening is done semi-extensively. According to Rodríguez (2015), cattle raising in Cuba needs the creation of computer tools that further develop early initiatives in this direction, integrating different environments, animals, and nutritional resources. Considering the above, a computer application was designed to back decision-making in beef production.

DEVELOPMENT

The computer application was designed in the Department of Applied Biostatistics, at the Animal Science Institute (ICA, in Spanish), to offer cattle farmers feeding strategies in bull fattening,

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based on feed balance, or the reports made in recent literature. The software was registered at the National Center for Author Rights (CENDA in Spanish), and it is used in the extension process in livestock raising.

A literary review was conducted in the Cuban Journal of Agricultural Science, and Journal of Pastures and Forages, from Indio Hatuey Institute, to collect research papers published in relation to fattening. The database was introduced using PostgresSQL, a highly demanded application that offers data safety. Besides, a RUP methodology was used. It is based on Unified Modeled Language (UML), which allows researchers to gather design information according to a program code. MyEclipse 8.6 software was used.

The computer application was based on three layers. The interface was managed by Java Server, Faces (JSF), and Richfaces Library. The second layer uses Spring to interact with three service modules in charge of data input and output functions, and system reports. The third layer manages database information based on SQL, to choose, remove, and insert data on user demand.

To access SATD, users (administrator and farmers), require a password to use the functions corresponding to their access level. This computer application offers an attractive appearance, and the operational quality is adequate. Upon starting SATD, the main interface is shown with three main functions: "*Factors*, *ICarne*, and *Manage*". The last one is only accessed by the administrator.

The function related to "*Factors*" deals with animal characteristics, pasture, and supplements, which are grouped in three tabs (Figure 1). Upon completion of the information required, the user can click on "*End*", where the screen shows the results of the search. This interface is divided in two parts. On the top, users have access to the experiments included in the database, which coincide with the search criteria inputs made by users; the lower part shows the title of the paper, the reference, and a link where immediate access is provided to research related to the topic.

Figure 1. "*Animal data*" tab in function system "*Factors*"

"*Factors*" provides livestock raising users assistance to know about managing and feeding systems that could be implemented on farms, based on previously published study reports. It also offers information on large-scale research in a given topic, thus establishing a starting point for further studies.

"*ICArne*" is another function of the software; it helps create a feeding balance to gather information on feed combinations that best meet the nutritional requirements. Accordingly, as users input data corresponding to animal characteristics, pasture, forages, and supplements, table "*Summary*" (Figure 2) calculates the overall contribution of nutrients supplied, and shows the difference in relation to animal requirements. Moreover, the software offers a choice to change the nutritional values of the existing feeds, and to add others to the database.

Resultados

Alimento	MS, kg	EM, MJ	EM, Mcal	PB, g	Ca, g	P, g	Prot met.alim, g	Prot.m. micr, g	Total P met, g	Prot solub, g
Pasto bueno	5,72831346	47,8091964	11,4266722	587,4315999	17,84467686	14,2125757	144,4096563	251,3867882	395,7964444	406,9195296
Mezcla de forrajes	0,359144	3,38098158	0,80807399	28,7315197	1,400661585	0,861945591	7,901167918	17,77762781	25,67879573	18,8550598
Total voluminosos	6,08745745	51,190178	12,2347462	616,1631196	19,24533844	15,07452129	152,3108242	269,164416	421,4752402	425,7745894
Pienso balanceado	2,01234284	23,5749989	5,63455995	281,7279977	13,68393132	10,06171421	50,30857103	124,7652561	175,0738272	201,2342841
Reciclaje de N				220,5927868						220,5927868
Total	8,09980029	74,7651769	17,8693061	1118,483904	32,92926976	25,13623549	202,6193952	393,9296721	596,5490673	847,6016603
Requerimientos		74,7651769	17,8693061	763,9938983	27,4694691	18,61143717	65,27160401	393,124735	458,396339	851,7702592
Balance		OK	OK	354,4900058	5,459800663	6,524798324	137,3477912	OK	138,1527283	-4,168598885,

Figure 2. Table "*Summary*" in the "*ICArne*" function

This function offers farmers information on efficient management of resources, and allows for nutritional planning strategies throughout the year. "*ICArne*" ensures proper production with efficient supply of pastures and feedstuffs. Its use prevents unnecessary expenses in bull fattening. SATD also tackles real-time errors, preventing faulty data from reaching the database.

Ponnusamy *et al.* (2016) and Alawneh, and Olchowy (2018), developed SATD mainly centered on milk production. However, Walmsley and Oddy (2018) suggested a similar computer system, though it considered other factors like mother production, heifer pregnancy rate, and herd-nutrition interactions, which were not included in this paper.

This study is focused on bovine feeding. Furthermore, it considers other variables that influence this process, in contrast to other decision -making support systems in cattle raising.

CONCLUSIONS

SATD is a computer tool that provides researchers and farmers with a solution to problems in animal nutrition during fattening; it also offers variants to ensure the efficiency of available resources.

REFERENCES

Alawneh, J., & Olchowy, W. (2018). Functionality and Interfaces of a Herd Health Decision Support System for Practicing Dairy Cattle Veterinarians in New Zealand. *Frontiers in Veterinary Science*, *5*(21). https://doi.org/ 10.3389/fvets.2018.00021

Torres, S. P. A., & Delgado, D. F. F. (2018). Estudio de los sistemas silvopastoriles como alternativa para el manejo sostenible de la ganadería. *Revista Ciencia y Agricultura*, *15*(2), 107-116. https://dialnet.unirioja.es/servlet/articulo?codigo=6682873

Rodríguez, L. (2015). *Modelación y simulación de la producción de biomasa de Pennisetum Purpureum Schum vc. king grass y su aplicación en la alimentación animal* (Doctoral dissertation, PhD Thesis, San José de las Lajas, Mayabeque, Cuba).

Ponnusamy, K., Sriram, N., Prabhukumar, S., Vadivel, E., Venkatachalam, R., & Mohan, B. (2016). Effectiveness of cattle and buffalo expert system in knowledge management among the farmers. *Indian Journal of Animal Sciences*, *86*(5), 604-608. https://www.researchgate.net/profile/Kuppusamy_Ponnusamy/publication/303755313_Effectiveness_of_cattle_and_buffalo_expert_system_in_knowledge_management_among_the_farmers/links/57ce41cc08ae83b37460eb80.pdf

Walmsley, B., & Oddy, V. (2018). *Modelling systems to describe maternal productivity, with the aim of improving beef production efficiency by eliciting practice change. Animal production science*, *58*(1), 193-205. https://www.publish.csiro.au/an/an14874

AUTHOR CONTRIBUTION

Conception and design of research: AMC, JRSM; data analysis and interpretation: AMC, JRSM, BCG; redaction of the manuscript: AMC, JRSM, BCG.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.