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Pastureland Management, and Influence on the Economic Response of Breeding Herds

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ABSTRACT

The influence of the main pastureland components on the economic response of breeding herds at the *Rescate de Sanguily* Company was studied from January 2012 to December 2014. Six breeding farms from *Ricardo Flores* Farm were chosen in the municipality of Jimaguayú, province of Camagüey, Cuba. Variables of pastureland, and forage resources in general were used. To determine the main components that led to variability of breeding units, a Principal Component Analysis was performed; components with values above the unit were selected. Stocking rates variables over 0.60 were chosen too. The elements related with pastureland management in breeding units were defined (forage area with native and cultivated grass), which explain the more than 40 % variance in all the units under the study. Forage balance is negative in the units, as a result of poor agro technical management of grasslands; however, the expenses-income ratio is positive (between CUP $2 500 and $17 600), caused by the low feeding costs. Activities and resources linked to pasture and forage agro techniques must be prioritized, along with the completion of forage areas.

Key words: *breeding cattle, pastureland management, forage balance*

INTRODUCTION

Bovine raising includes a wide variety of production systems managed by different ethnic and social groups, living in different climatic conditions, kinds of soils and plant development. Huge variations of biological, technical economic and social parameters are found in these systems (Pérez, 2010).

Sixty per cent of the land used for cattle raising in Cuba is composed of usually low-quality native pastures, and poor biomass production in the dry season, barely enough to cover 15-20% of production used the rainy season. This situation adds to the lack of fertilizers and nutrient-energetic supplements for bovines, whose gains after weaning do not exceed 250 kg of live weight over 24 months of age (Guevara *et al.*, 2009).

Zebu (Bosindicus) cattle are raised in Cuba, due to satisfactory adaptation to exploitation conditions. It is also used for cross breeding with Bostaurus for beef and milk production, to generate new high production and adaptation quality genotypes (Planas and Álvarez *et al.*, 2002).

Pasturelands are the main herd nutritional pillar, but they are extremely deteriorated (Padilla, 2000), with the ensuing reduction of biomass and nutrient contribution leading to beef and dairy declines (Guevara *et al.*, 2009; Curbelo, 2003).

The aim of this paper is to study the influence of pasture management on the production response of breeding herds at the Rescate de Sanguily Breeding Company.

MATERIALS AND METHODS

Research was done on the Ricardo Flores farm, from Rescate de Sanguily Breeding Company, in the municipality of Jimaguayu, province of Camaguey. It is located on the 21° north latitude, and 77° west longitude, 21 meters above sea level. Its mission is to breed Zebu cattle for genetic purposes. The evaluation period started in January 2012 and finished in December 2014.

The area´s climate is humid tropical of inland plains, with seasonal humidification, high evaporation levels and high air temperature, with a remarkable seasonal rainy period (Holdrich, 1988).

Brown carbonated and non-carbonated soils are predominant, according to the classification of inceptisols and cambisols, from Soil Taxonomy (1999) and FAO (1990), respectively.

Characterization of the farms studied.

The study mainly included six farms with the following characteristics: average area of 13 ha, split into seven enclosures infested 13.5 % with mimosa bush (*Acacia farnesiana* L.) and sickle bush (*Dichrostachys cinerea* L.), and 15 % infestation of paspalum (*Paspalum virgatum*). The grazing area has about 110 trees, such as algarroba, (*Samanea saman* Jacq.), gliciridia (*Glyricidia sepium* Jacq), West Indian Elm (*Guazuma ulmifolia* Lam) and leucaena (*Leucaena leucocephala* Lam), white cordia (*Cordia* sp.), cedar (*Cedrela americana*), mahogany (*Zuethenia*), and others. The pasture distribution includes 30% of Camagueyan grass (*Bothriochoa pertusa*), 8 % of Texan grass (*Paspalum notatum*), 15.5 % of Guinean grass (*Panicum maximum*), 7.1 % of African Bermuda grass (*Cynodon nlemfuensis*), 0.7 % of legumes (*Centrosema*, *Desmodium*, *and Caloporgonium*), 0.6 % of weeds, and 0.3 % of cleared areas. Additionally, they have one and a half hectare of CT-115 (0.8 % of total area). The farm has three mini dams and only four troughs. The average number of animals is 213, for a total stocking rate of 1.3 LU/ha. Grazing is rotational. The raising system used is natural, and weaning takes place between seven and eight months of age.

Research procedures

The botanical composition of the areas was made using the steps method (Corbea and García Trujillo, 1982), once a season.

The previous information, together with availability and performance sampling for forage areas, respectively, was used to carry out forage balances (Guevara, 1999), considering the forage needs for the rainy season (155 days), and the dry season (210 days), at a ratio of 15 kg of DM/LU/day (1LU = 450 kg of LW), the mean annual coefficient was 50% for pasture, and 90% for forage. The farms were split into three groups, according to the amount of forage areas available (G1: no forage area; G2, between 1.6 and 4.0 forage ha; G3, 13.4 forage ha).

Determination of pasture management of critical components for farm variability

Analysis of the main components was made, choosing special components with values higher than the farm. Variables with stocking rates higher than 0.60 in every main component were chosen. SPSS 15 (2006) was used for statistics.

Information regarding income, expenses, and cash flows at bovine raising units from Ricardo Flores breeding farm was gathered and analyzed.

RESULTS AND DISCUSSION

Crucial elements of pasture management for raising unit vulnerability

The elements related to pastureland characteristics, in particular; as well as general grazing elements, were grouped in five components (Table 1, Fig. 1). The former comprises seven elements related to the productive potential of the area, which determines 39.75% of total variance. The same occurs to the latter component, whose only three variables determine 21.30 %, especially infestation with undesirable plants. The sum of the two components explains 51.21% of total variance observed, whereas the third component accounts for 13.59%, and has to do only with the element (sickle bush infestation). All the other components contribute with 16.11%, and are associated to undesirable species in pasture areas.

Considering the variable characteristics, the first component can be characterized by the productive capabilities of the pasture lands, and it comprises the forage area, the number of trees, the per cent of Texan grass, and the number of enclosures available, as critical elements to ensure herd feeding and proper pasture management. The negative value of the native pasture area variable load may be related to low productivity due to infestation by undesirable species and inefficient management in the farms studied.

The importance of these elements in cattle farm performance is widely explained by the research results and production practices. The use of trees and shrubs associated to cattle production, through forest-grazing techniques, has quite positive results. Forest-grazing systems are a modality of agro-forestry, in which forage plants, like graminaceae and crawling legumes; trees and shrubs for animal production, wood, fruit, shade, wildlife habitat, hydro-regulation and landscaping, are combined in the same space (Simon, 2000; Iglesias, 2003; Murgueitio et al., 2005).

Several trees grow naturally in the grazing areas or enclosures, such as algarroba (*Samanea saman* Jacq.), gliciridia (*Glyricidia sepium* Jacq), West Indian Elm (*Guazuma ulmifolia* Lam) leucaena (*Leucaena leucocephala* Lam), white cordia

(*Cordia* sp.), cedar (*Cedrela americana*), and mahogany (*Zuethenia*).

Gliricidia is commonly found in the area, mainly used for life fences. Other tree uses, however, are not exploited; for example, as foliage for animal feeding (Pedraza *et al.*, 2007). Trimming is made regardless of its potential for animal nutrition.

Forage areas in the grazing farms somehow guarantee pasture availability throughout the year, particularly *pennisetum*, with a broad ecological plasticity that allows it to adapt to several different edafoclimatic conditions, and produces high biomass volumes. Regarding CT-115, with abundant foliage and low height, the plant is dry resistant, has high lignin contents, high palatability and is better consumed by animals than other plants from the same species. It has been used for grazing, especially during the 100 days of the rainy season, in the form of biomass stocks during the dry season. Biomass stock technology to increase beef and milk, using CT-115 has been effective in Cuba and Mexico, and it is highly demanded by producers from locations with prolonged dry seasons (Jordán, 2003; Martínez and Herrera, 2007).

The distribution of forage areas per farm varies a great deal, so three different groups were set according to the particular areas. According to forage balances (Table 2), farms in group 3 have a significant increase in forage production ($P < 0.05$), though the area available is insufficient for the total number of animals, averaging 203 LU. Accordingly, an increase in the area is required, in order to make 0.8 t DM/LU every year. To achieve that, each farm must produce 12 t of forage, besides recovering other areas infested by sickle bush, which in some instances account for 20% of the grazing space. As a result, the farm´s stocking rate is remarkably limited, causing overgrazing on cleared areas. In that sense, Senra (2003) noted that overgrazing has a negative effect on pastures and animals, and causes deterioration and unsustainability of cattle systems.

Considering the benefit/cost balance, the entities in the study had a positive behavior (Table 3), because herd feeding is mainly based on pastures and forages, with minimum concentrate supplementation. In turn, related costs are low. The fact that feeding expenses in these farms represent 70-80% of variable expenses (Cino and Díaz, 2010) must be considered.

Under tropical conditions, pastures constitute the cheapest nutritional source, covering up to 80-90% of the breeding herds´ needs, especially when graminaceae-legume associations take place, along with other variants based on forest-grazing. In these cases, weight gains can be over 600 g/day, and the production results may be positive in the absence of energetic-protein concentrates (Iglesias, 2003).

Within the farm´s expenses, reproduction, purchase of medications and other materials for cattle raising, are essential; whereas the expenses for fencing and grass cutting, associated with pasture management, take a less important place, possibly related to deficient attention, which causes a poor nutritional basis in the farms.

Cuban economic studies on fattening operations, using different technologies that take few or not many resources (Cino and Díaz, 2010), indicate the importance of rational resource use, stressing that expenses in activities and materials to improve pasturelands, lead to positive economic results. Concerning the breeding systems, it is key to take into account that the main production is weaned and sold calves to other entities in charge of fattening or stud development. Therefore, the dividends from this activity are closely related to rationality during the operations (Jordán, 2003).

CONCLUSIONS

Among the elements related to pastureland management in breeding farms, emphasis must be put on forage cultivated pastures, and natural pastures areas, which represent more than 40% of variance in the farms studied.

Forage balance in the farms is negative, as a result of poor agro technical attention to the pasturelands.

The expense-income ratio is positive, derived from the low feeding costs.

REFERENCES

CINO, D. M. y DÍAZ, A. (2010). Leguminosas herbáceas para el pastoreo de bovinos en preceba: indicadores económicos y financieros. *Rev Cubana de Ciencias Agrícolas*, *44* (1), 9-12.

CORBEA, L. A. Y GARCÍA, R. (1982). *Método de muestreo en pastos y forrajes*. Matanzas, Cuba: EEPF *Indio Hatuey*.

CURBELO, L. R. (2003). *Alternativa forraje-ganadería para las sabanas infértiles del norte de Camagüey*. Tesis de doctorado en Ciencias Veterinarias, Facultad de Ciencias Agropecuarias, Universidad de Camagüey, Cuba.

FAO (1990). *Evaluation of Tropical Feed Resource for Ruminant Draft*. Working Paper in First FAO, Electronic on Tropical Feed and Feeding System.

GUEVARA, R. (1999). *Contribución al estudio del pastoreo racional con bajos insumos en vaquerías comerciales*. Tesis de doctorado en Ciencias Veterinarias, Facultad de Ciencias Agropecuarias, Universidad de Camagüey, Cuba.

GUEVARA, R. V.; GUEVARA, G. V.; SÁNCHEZ, MARÍA; CURBELO, L. R.; VÉLIZ, M. y PEDRAZA, R. (2009). El contexto socioeconómico global y regional: sus efectos sobre la producción ganadera (Artículo reseña, parte final). *Rev. Prod. Anim.*, *20* (1), 37-42.

HOLDRICH, C. (1988). *Climas del mundo*. Extraído el 22 de enero de 2014, desde http;//www.clima.md.cr/bims/ko3/p13/co46/00159/fo1382/g00868615027467.htm.

IGLESIAS, J. M. (2003). *Los sistemas silvopastoriles, una alternativa para la crianza de bovinos jóvenes en condiciones de bajos insumos*. Tesis de doctorado en Ciencias Veterinarias, Universidad Agraria de La Habana, Cuba.

JORDÁN, J. (2003). *Importancia de los rebaños de cría en la producción de carne bovina*. Curso MININT, Instituto de Ciencia Animal, La Habana, Cuba

MARTÍNEZ, R. O. y HERRERA, R. S. (2006). Empleo del CUBA CT-115 para solucionar el déficit de alimento durante la seca. En Herrera, R. S.; Febles, G. J. y Crespo, G.J. (eds). Pennisetum purpureum *para la ganadería tropical*. Cuba: EDICA.

MURGUEITIO, E.; MOSQUERA, R.; LOSADA, J. y REGUEIRO, A. (2005). *Silvopastoral Systems in the Neutropic, Silvopastoral and Sustainable Land Management*. International Congress on Silvopastoral and Sustainable Management, Lugo, Spain, CABI Publishing.

PADILLA, C. (2000). *Establecimiento de pastos y forrajes*. Conferencia XXV Aniversario del ICA.

PEDRAZA, R.; MARTÍNEZ, S.; ESTÉVEZ, J.; GUEVARA, G.; GUEVARA, R. y CURBELO, L. (2007). Valor nutritivo para rumiantes del follaje de árboles y arbustos tropicales *Rev. Prod. Anim.*, *19* (número especial), 5-12.

PLANAS, T. y ÁLVAREZ, J. (2002). El cebú cubano: un material genético valioso. *Revista ACPA* (4), 26-27.

PÉREZ, F. (2010). *Ganadería eficiente*. La Habana, Cuba: Editorial ACPA.

SENRA, A. (2003). *Manejo del pasto y la recuperación lechera*. Taller de lechería. Sociedad Cubana de Lechería (SOCUL), Asociación Cubana de Producción Animal (ACPA), 1-2 abril.

SIMÓN, L. (2000). *Tecnología de silvopastoreo. Aplicaciones prácticas en fincas lecheras*. La Habana, Cuba: EDICA.

DEPARTAMENTO DE AGRICULTURA DE LOS ESTADOS UNIDOS. (1999). *Soil Taxonomy* (2nd ed.). Extraído el 9 de marzo de 2007, desde (http://www.unex.es/edafo/IndST.html).

SPSS. (2006). *SPSS 15.1 for Windows*.

VERA, R. (2000). *Sistemas de producción a base de pastos. Una visión prospectiva de los mismos*. XI Reunión de ALPA, Uruguay.

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Table 1. Variable load per component

	Component				
Variables	1	2	3	4	5
Total trees	0.749				
Total area	0.747				
Forage	0.847				
Guinea	0.629				
Texan	0.848				
Native pastures	-0.848				
Enclosure	0.687				
Cultivated pasture		-0.792			
Weeds		0.698			
Mimosa bush		0.963			
Sickle bush			-0.736		
Grass field				-0.823	
Cleared population					-0.360

A5: Extracted components

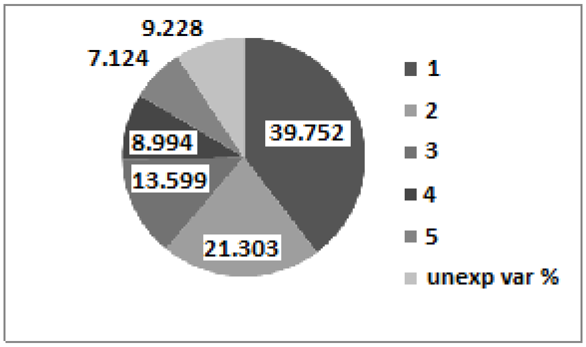

Fig. 1. Component variance per cent

Table 2. Average forage balance in the units studied

Variables/Groups[a]	G-1	G-2	G-3	ES	CV (%)	Sig.	R2
Annual pasture production (t DM)	431.80b	416.10b	589.76a	±1.3	16.0	*	0.58
Annual forage production (t DM)	0.0c	27.50b	134.00a	±1.0	12.0	*	0.52
Total production (t DM)	431.00c	443.60b	723.76a	±6.2	10.3	*	0.67
Herd´s needs (tDM/year)	1 111.42	1 111.42	1 111.42	-	-	-	-
Annual balance (t DM)	-680.42b	-667.82b	-387.66a	±7.05	10.6	*	0.62

a G1 has no forage area; G2 between 1.6 and 4.0 ha of forages; G3 13.4 ha of forages de forrajes

Table 3. Income-Expense-cash flow ratio in bovine breeding farms, and the Ricardo Flores Breeding Farm

Farm	Period	Average expen-ses	Average income	Income or loss
4	2012-2014	64943.3	79979.2	15035.9
5	2012-2014	50533.1	66964.3	16431.u2
9	2012-2014	46142.7	63749.5	17606.8
11	2012-2014	53353.5	70168.6	16815.1
22	2012-2042	60036.9	74615.6	14578.7
56	2012-2014	66284.9	68819.2	2534.3