Socio-economic analysis of the introduction of the buffalo species (*Bubalus bubalis*) in a cattle enterprise in Cuba

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Through a socio-economic research, the incidence of the introduction of the buffalo species was studied in the Cattle Enterprise "Macún", located in the Villa Clara province, Cuba. The rural participative diagnosis (RPD) was used, as well as the strategic analysis in three basic enterprise units: "Pancho Pérez", "Santa Rosa" (fattening buffaloes and cattle), and "Dorado" (dairy buffalo cows). Two participative workshops were conducted with diverse practices. Forty-six surveys were applied to workers, and seven interviews were made to enterprise and territorial officials. SAS (2007) was used to obtain contingency tables that were graphed in Statgraphic (2003). The SWOT analysis was conducted, including the strategic (cross-impact matrix) and the systemic analysis (interaction matrix). The factors were assessed in four quadrants (power, conflict, autonomy, and output). Some economic indicators were analyzed in the buffalo fattening activity. The shortness in resources was the limiting factor, with negative consequences in the animal management, the work productivity and the social character of the activity. Certain rejection to this species was evidenced and its productive and economic advantages were highlighted. The strategic analysis showed higher score in the strengths, and the offensive position was outstanding, which allows facing external threats maximizing the strengths and the opportunities. It is of future concern that the productive staff of workers is coming of age. The introduction of buffaloes in the enterprise has propitiated a stable and promising source of employment. However, it is urgent to spread the rearing of this species and overcome the organizational and technical difficulties to attain adequate socio-economic development. The applied methodology facilitates the decisions by the officials at the enterprise level out of the socio-economic factors involved in the productive process.

Key words: *buffaloes, strategic analysis, socio-economy.*

In the 80's, buffaloes (*Bubalus bubalis*) were introduced in Cuba due to the advantages of their exploitation under difficult habitat conditions and to guarantee beef and milk productions. Besides, compared with cattle, their introduction has represented to have labor force with low resource investment (Fraga 2008). Currently, according to Mitad (2011), there are more than 67 000 animals that are exploited in 70 cattle entities. Their evolution has been materialized in an average annual rise of 21 %. These data corroborated the adequacy of their incorporation to the Cuban cattle production (Brito 2009).

In the cattle activity context, the socio-economic studies acquire great relevance (Miranda *et al*. 2007 and Gudymas 2008), due to the economic and social contribution. Internationally, participative techniques and of strategic analysis are successfully applied (SWOT analysis, cross-impact matrix, systemic analysis) to evaluate the direct participation of the actors and the influence of several factors on the rural environment (Díaz 2004 and Cuesta 2005). Nevertheless, these techniques are new in Cuba, specifically in the field of buffalo production.

Due to the interest in the socio-economic studies, and when considering that the insertion of buffalo raising in Cuban cattle production constituted an important technological change, this work had as objective to make a socio-economic analysis in the Cattle Enterprise Macún, in Villa Clara, through the application of the cited techniques.

Materials and Methods

The Cattle Enterprise Macún was taken as object of study. It is located at the Villa Clara province. This enterprise was inaugurated in 1976 as cattle entity for beef cattle production. Since 1989, the first buffaloes were introduced and its social object was widened. Its beef and buffalo productions, as well as of milk and dairy products, are prestigious in the Cuban market.

Figure 1 shows the methodological scheme of the three work stages developed in the research: selection of the area under study, data collection and analysis. Three productive units were selected out of the six of the enterprise, known as basic enterprise units: Santa Rosa (buffaloes and cattle fattening), Dorado (buffalo rearing and dairy units), and Pancho Pérez (cattle and buffalo fattening). These basic enterprise units belong, respectively, to the two control centers of the enterprise (Sagua la Grande and Caguagua).

The selection criterion of the units considered the following elements: presence of both species (buffaloes and cattle), animals devoted to beef and milk production and representation of 50 % of the units in each control center.

The basic units represented 49 % of the labor force involved in cattle production, 66 % of the buffaloes, and 32 % of the cattle.

Two participative workshops were conducted

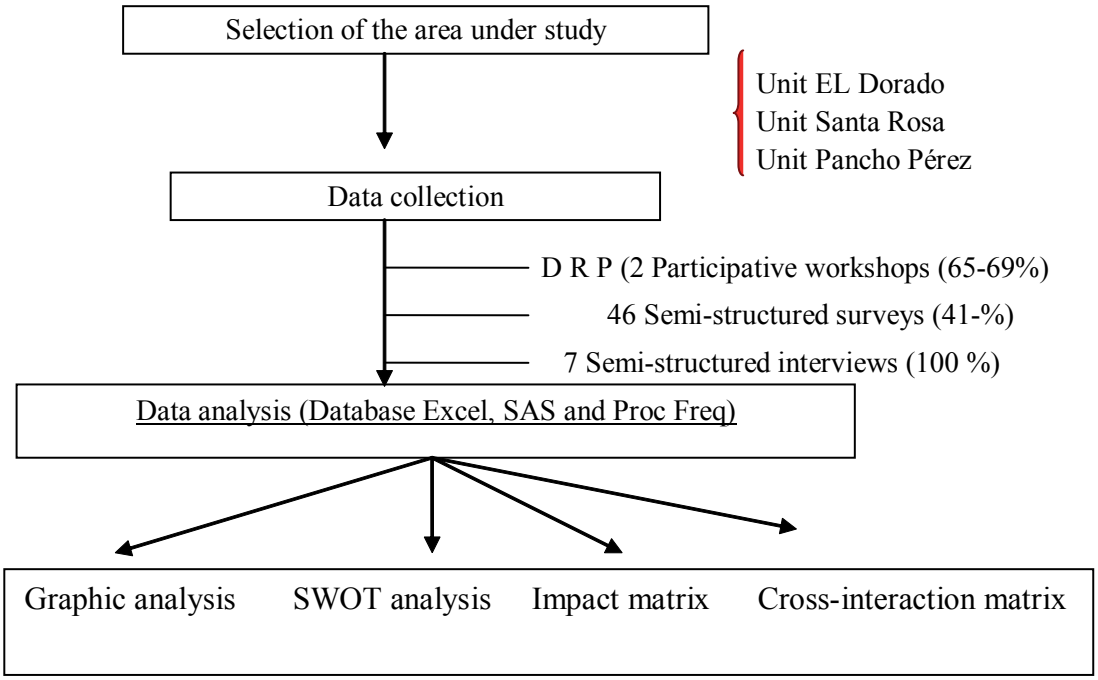

Figure 1. Work methodology

including 65-69 % of the staff. The technique of Rural Participative Diagnosis (Expósito 2003) was applied, using several tools (brainstorming, localization maps, and tree of problems). Also, surveys (eleven variables) and interviews (seven variables) were applied comprising 41-65 % of the staff of the three productive units and 100 % of the enterprise directors. The data were considered representative enough.

Data were collected about the main productive and economic parameters corresponding to this enterprise for the 2003-2007 period: functional program of the enterprise, sex and age composition (2008), annual incomes and expenditures through beef cattle and buffalo production, indicators of the annual economic plan (2003-2007).

Microsoft Office Excel (2007) was used to form the initial data file, which was exported to SAS 2007 (Versión 9.1.3) to apply Proc Freq to the variables, according to the categories or classes evaluated (gender, age, level of acceptance, among others) in the surveys and interviews. These preliminary results were summarized in contingency tables and they were graphed in Statgraphic (2003) to be interpreted. The SWOT analysis was performed (cross-impact matrix) according the procedure of Ronda (2002). For the systemic (interaction matrix) the criteria of Haep *et al*. (2006) were followed. With these results, the factors that affected the activity were evaluated in four quadrants (power, conflict, autonomy and output) according to their nature.

Out of the economic information from the enterprise, the principal indicators of the beef cattle and buffalo production were calculated during the 2005-2007 period: total production expenditures, total incomes, cost/animal, cost/$, and benefit/cost ratio.

Results and Discussion

In the participative workshops, the shortage of financial resources as central element affecting unfavorably the buffalo activity and hampering to guarantee adequate buffalo raising was identified through the problem tree. The different factors limiting significantly the investment process and that are needed to construct and maintain the productive infrastructure (fencing, grasslands, and carcasses) were established to apply a correct management of the species under study. Another limiting factor was the lack of knowledge on this species, particularly on the requirements of habitat, feeding, and benefits that can provide to the country's economy.

Although workers knew the potentiality and utility of the buffalo, 50 % of them showed certain type of rejection to this species. This affects socially those working with these animals and influences unfavorably on the welfare of the entity and the region. Regardless these limitations, it was recognized that the buffalo is a productive animal (on the order of 54 %). Out of those surveyed, 91 % considered that if the rearing conditions are improved, this species could have a great future in Cuban cattle rearing.

Socorro (2002) noted the transcendence of the introduction of buffaloes in Cuba and the important role that it can play in the development of cattle rearing and of the territories devoted to this vital activity vital for the Cuban economy, if the minimum requirements for their exploitation are guaranteed.

Little female presence was noted. Only 19 women

participated directly in the cattle activities, out of a total 156 working at the enterprise level. In this regard, 85 % of the workers stated that the women have the capacity to perform this activity, and that the technology in the current labors should provoke greater incorporation of them to the productive tasks. It was proved that 34 % of the workers from the cattle units were grouped in the age range from 46 to 55 years, only 9 % of them were from 16 to 25 years of age. This constitutes a socio-economic element of interest that can threaten the future cattle development.

The utilization of the SWOT analysis (table 1) permitted describing and classifying the diverse factors (28), internal and external, that affect buffalo rearing in this entity.

The analysis of the cross-impact matrix (table 2) demonstrated, according to the score (126), the predominance of the strengths-opportunities quadrant. This expressed the active attitude of the Enterprise Macún, by having the possibility of manipulating its internal factors or strengths, proven in the cross-impact analysis or identified in the SWOT analysis (consolidated enterprise, qualified directors, prestige of the productions, among others). The high score (104) in regard to the threats and difficulties deserves special attention (stagnation of the investment in the agricultural sector, staff aging, reject to this activity by some of the workers, among others), thus, opportunities should be used at maximum in this entity.

The economic analysis of the fattening as fundamental activity in the enterprise (table 3) proved better benefit/cost ratios and lower costs per animal and per weight produced in the buffalo rearing compared with cattle. This proves the possibilities of the buffalo species by having beef productions and added values with

Tabla 1. DAFO analysis. Macún Enterprise

Strengths		Weaknesses	
1	Direct young and capable directors	Limited technical and financial resources for the development of the activity and investments.	9
3	Personnel of the region and cattle raising backgrounds	Rejection to the buffalo rearing by some of the workers.	10
4	Good space distribution	Insufficient training on this activity.	11
5	Consolidated enterprise	Space limit for the growth of the buffalo herd.	12
6	Prestige of the productions	Aging of the staff directly related to this activity.	13
7	Qualified technical personnel	Contribution in foreign currency from buffaloes not surpassing 20 % of the incomes	14
8	Sense of belonging to the enterprise		
Threats		Opportunities	23
15	Deficient organization National Buffalo Program	High demand of buffalo productions at the internal market due to their intrinsic quality	24
16	Higher input of foreign currency through marketing of the cattle production	Proximity to centers of educational improvement	25
17	Stagnation of the investment in the agricultural sector	High technological development in the cattle world	26
18	Little spread of this activity at the enterprise and national scale	Possibility of commercialization at the internal market	27
19	Unfavorable climatic change	Presence of the productions in the national and international fairs	28
20	Deficient organization National Buffalo Program		
21	Higher input of foreign currency through marketing of the cattle production		
22	Stagnation of the investment in the agricultural sector		

Table 2. Summary of the impact matrix of the Cattle Enterprise Macun

	Opportunities	Threats
Strengths	126	104
Weaknesses	77	82

Table 3. Economic indicators of the beef production in the Cattle Enterprise Macun (national currency)

Concept	Buffaloes			Cattle		
	2005	2006	2007	2005	2006	2007
Total expenses	367726.60	554999.80	668151.20	8406235.50	7944410.40	16308270.00
Number of animals	2337.00	2055.00	2128.00	13042.00	11675.00	11403.00
Total incomes	737988.50	1337444.90	1476780.30	12754347.30	13117324.50	22063198.50
Cost/animal	128.40	257.60	300.10	644.50	684.30	1430.10
Benefit/cost	2.01	2.41	2.21	1.51	1.65	1.35
Cost/$	0.49	0.44	0.45	0.66	0.60	0.74

low investments, because the fattening is based only in pastures, without supplementation. However, bull fattening is performed in stables with supplementation. Other economic indicators, such as the incomes, the net added value, and the mean salary, were favorable in the enterprise (Cino 2009). The labor force had stable performance during the five years under evaluation.

Ramos (2006) noted the profitability of buffaloes from the standpoint of the productive cost, by demanding lower resource investment and by providing the farmer with economic profits. In regards to the productive element, Reguetti (2007) emphasized on its capacity of transforming the natural pastures into beef and milk. This turns it into an important economic resource, mainly in tropical and subtropical areas of different countries from this hemisphere.

The systemic analysis (classification of factors according to their nature) in the quadrants power, conflict, autonomy, and output showed the need of using at maximum the human resources of the enterprise and increasing the competitive level (figure 2). Thus, incomes by means of buffalo rearing, primarily in foreign currency, can be devoted to elaborate and perform projects to improve the rearing technology. Special attention should be paid to the general development of the national buffalo program to better use incomes from this activity and improve the habitat of the animals and men working with them.

In the output quadrant, occupied only by the factor 15 (aging of the direct productive staff), there was high risk represented by the aging of the staff devoted to the productive labors in the cattle units, whose range surpasses the 45 % compared with the current total. This factor may affect the future development of the buffalo

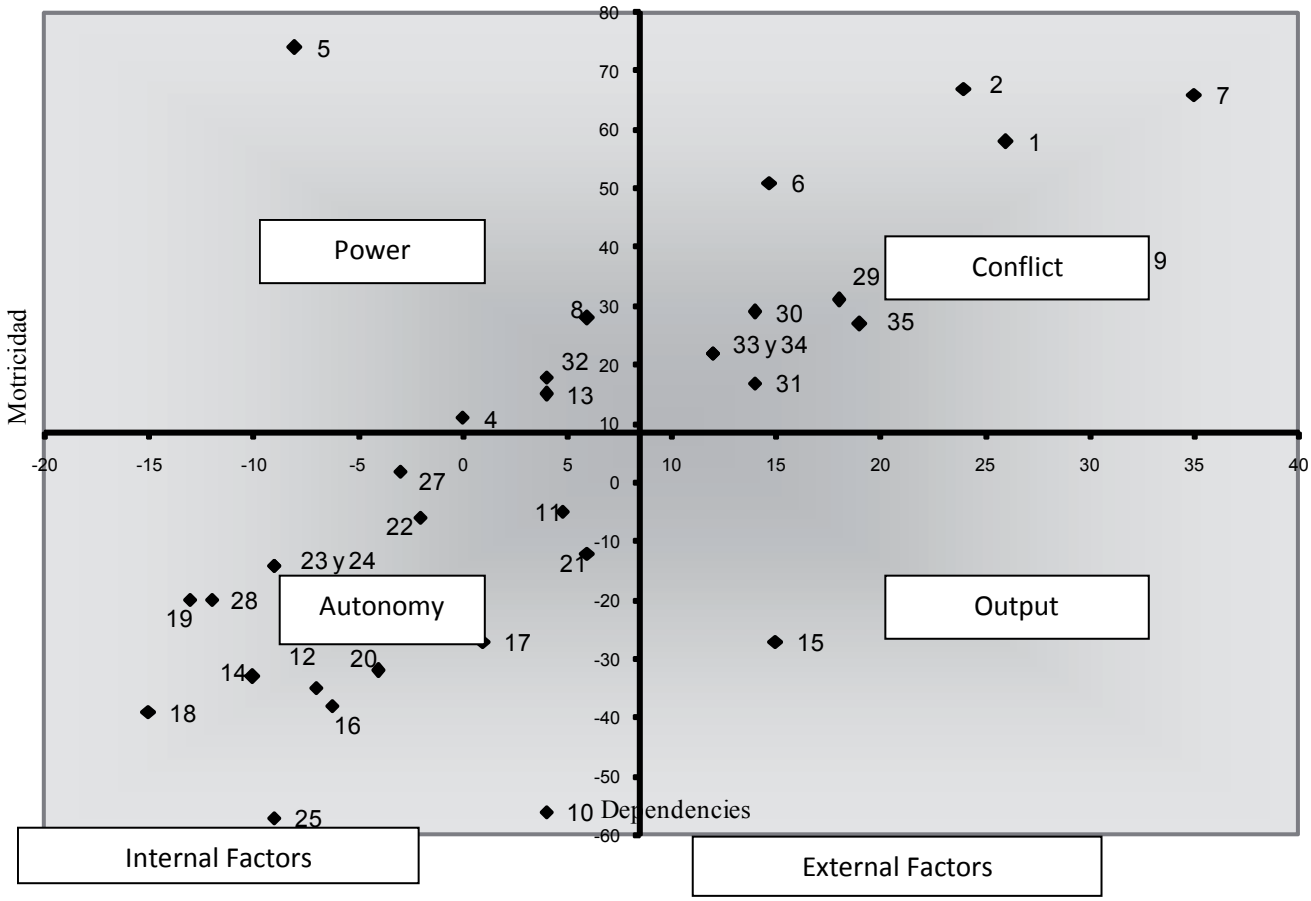

Figure 2. Classification of factors according to nature

production and of the entity.

Although the limiting factor related to the technical and financial resources for the development of the investments was located in the autonomy quadrant, its localization next to the central axis shows a dangerous proximity to the output quadrant. This should be considered in the strategy of action that the enterprise and the organizations responsible for cattle production in Cuba design.

The strengths should be addressed to minimize or remove the weaknesses that limit today cattle development, specifically as to the substitute of the cattle staff of workers. This factor affects negatively the Cuban agricultural sector (Jiménez 2004). Conditions should be created to improve the management and increase the inputs, besides emphasizing on the attention to the basic problems of the staff, for consolidating this promising activity.

The methodology permitted obtaining for the first time in Cuba an analysis of the socio-economic factor in the rearing of buffaloes and showed the advantages of these techniques to make adequate decisions at enterprise and territorial scale. It is necessary to perform similar studies that consider other socio-economic variables of interest in the buffalo productive process in different regions of the country. Also, a deeper study is needed to compare the buffalo and cattle species.

It was proved that the introduction of buffaloes in the enterprise propitiated a stable labor source for farmers and it is an alternative representing higher economic and social sustainability. This activity will increase its contribution with the development of a work culture and with the solution of the current difficulties in Cuba.

References

Brito, S. 2009. Balance de trabajo del programa de desarrollo bufalino. Programa de desarrollo bufalino, equino y de ganado menor. Ministerio de la Agricultura. La Habana, Cuba

Cino, D.M. 2009. Desarrollo rural social y económico: una experiencia con la introducción del búfalo en la Empresa Pecuaria MACAN de Villa Clara. Master Thesis. Facultad Latinoamericana de Ciencias Sociales (FLACSO). Universidad de La Habana, Cuba

Cuesta, A. 2005. Tecnología de gestión de recursos humanos. Ed. Academia. Segunda edición. La Habana, Cuba. pp. 21-25

Díaz, B. 2004. El enfoque participativo en las ciencias sociales. In: Concepción y metodología de la educación popular. Selección de lecturas. Ed. Caminos. Formación en Educación Popular Acompañada a Distancia (FEPAD). La Habana, Cuba

Expósito, M. 2003. Diagnóstico rural participativo: una guía práctica. Centro cultural Poveda. Proyecto de Comunicación y Didáctica. República Dominicana. Pp. 7-11

Fraga, L.M. 2008. Estúdio do desempenho produtivo e reprodutivo de buvalinos explorados no Brasil e Cuba. Relatorio. Facultade de Medicina Veterinaria e Zootecnia. UNESP. São Paulo. Brasil

Gudymas, E. 2008. Para enfrentar los cambios en la agricultura latinoamericana: el regreso del desarrollo rural. ALAI (América Latina en Movimiento). Available: <http://www.alainet.org/active/25728> [Consulted: 4/4/08]

Haep, R., González, G. & Jústiz, E. 2006. Gestión de proyectos: de la idea al proyecto. Tomo I. Ed. CARE-ACPA-AGROACCION ALEMANA. La Habana, Cuba. p. 39

Jiménez, M. A. 2004. Las cooperativas agrícolas cubanas: una estrategia para el desarrollo del país. Encuentro virtual internacional: una economía humana y solidaria. Universidad de Málaga. 13 pp.

Mitat, A. 2011. Resultados y perspectivas de la crianza del búfalo en Cuba. Conferencia. VI Simposio de Búfalos de Las Américas. VI Simposio de Europa y América. La Habana, Cuba

Miranda, T., Susset, A., Cruz, A., Machado, H. & Campos, M. 2007. Desarrollo rural sostenible. Perspectivas y enfoques de una nueva época. Pastos y Forrajes 30:191

Ramos, B. 2006. Cría de búfalos: menor costo, mayores ganancias. Suplemento Rural. Available: <http: //www.Abc.com.py/suplementos/rural/artículos.php?pid=186618> [Consulted: 5/5/07]

Reguetti, J. 2007. Water buffaloes in Venezuela. Proc. 8th World Buffalo Congress. Caserta. Italia. p.155

Ronda, G.A. 2002. El análisis estratégico: diagnóstico estratégico y del entorno. Available: <http://www.monografías.com/trabajos12/reco/dat.shtml> [Consulted: 4/2/02]

SAS. 2007. User's guide. Statistics SAS Institute Inc. Cary, NC. USA

Socorro, A. 2002. Indicadores de la sostenibilidad de la gestión agraria en el territorio de la provincia de Cienfuegos. PhD Thesis. Universidad Agraria de La Habana. San José de las Lajas. La Habana, Cuba

Statgraphics 2003. Statgraphics Plus for Windows 5.1. Statistical graphics Corp.

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