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Strategy to Face Climatic Change-Related Problems in Cuban Cattle Raising Systems

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ABSTRACT

A strategy to overcome climatic change negative effects and improve efficiency and sustainability in Cuban livestock ecosystems is suggested. The strategy technologies and activities are translated into economic benefits for a better and more efficient utilization of internal or local resources. Besides, social advantages are promoted by an increase in first-need agricultural goods production and, hence, imports of these goods and labor force emigration to cities can be decreased. Producers must be trained in a rural farming culture to be competent in applying and adjusting technologies to their own conditions.

Key Words: *strategy to overcome climatic changes in livestock ecosystem, sustainability*

INTRODUCTION

Background

World effects of climate change led to more acute droughts, desertification, extreme meteorological phenomena, thawing, sea level rising and temperature increases. Consequently, the factors related to these changes must be analyzed as a whole and harmonic part, because the survival of our generation will depend on joint efforts from all to prevent or reduce environmental pollution.

Milera (2010) and Mirabal-Plasencia (2010), reported that the 2000-2010 period was characterized by major worldwide developments and transformations which remarkably affected livestock production in Cuba. The processes were characterized by the lack of access to rational ideas and new technological products, the planet´s attempts to set up new accumulation and institutionalization trends, as the essence of the technological revolution. It was also characterized by the creation on powerful social movements, with different values, interests and commitments from those who generated them (Milera, 2011).

As a result, a strong movement to cut down energy (from fossil fuels) costs has been developed, also to have a hold on deforestation, two compelling measures to halt or reduce greenhouse gases, and increase CO_2 absorption, respectively. It includes waste disposal and treatment to prevent its contaminating effects and achieve environmental balance, especially in the most industrialized countries, the main contributors to pollution (Fig. 1).

Furthermore, climatic change threatens production and productivity stability. In many areas of the world where agriculture productivity is poor and the means to face adverse conditions are limited, climatic change is expected to decrease productivity to even lower levels and cause production to be more erratic (Fisher *et al*., 2002; Cline 2007 and IPCC, 2007).

Long-term changes in temperature and rainfall are expected to change production seasons, and pest and disease schemes. Viable crops are also expected to shift, affecting production, prices, income and life (FAO, 2010).

Therefore, in Cuba, as a strategy to face the effects of climatic change, a higher priority should be given to mitigating and preventing agricultural ecosystem degradation, especially those involved in ruminant stock systems. The natural resources, mainly soil, water and biodiversity have been greatly deteriorated, which has not been quite understood and assimilated. Degradation is determined by the application of improper technologies for our socioeconomic and climatic conditions, but especially due to inadequate application according to particular conditions of the area, because there is no “rural culture” (Senra, 2011), to achieve a goal for which there is no other alternative, though producers can be trained and guided properly.

The high costs posed by natural resource losses, along with inefficiencies in the productive

processes caused by its ever-growing low potentials. All this derives from the degradation of the ecosystem, which determines our will to confront the climatic change effects on livestock systems and must be based on greater efficiency and sustainability in the use of ecosystems, protection and gradual recovery of degraded areas (Fig. 2).

It is an imperative to design new strategies according to the situation in each province, aimed at achieving food safety and mitigate the effects of climatic change in agriculture. Another imperative is to have agricultural models that use renewable energy, on the bases of low-methane producing phytogenetic resources, which can produce milk and meat qualified for humans (Milera, 2011).

The most common general integrated aspects should be considered, in order to prevent, mitigate or eliminate the effects of climate change. Also, the development and application of more suitable technologies to deal with climate change in terms of livestock handling should be included in the objectives of this paper.

MATERIALS AND METHODS

The methodology was based on the results from the application of inappropriate technologies to our climatic and socio economic conditions, as well as failure to adjusting to more concrete exploitation conditions; thus determining degradation of livestock systems, mainly caused by insufficient plant coverage on the soil. As a result, natural fertility of the soil is lost, along with environmental balance and unsustainability of the exploitation system. Again, rural culture had a significant weight. It was necessary for the producer to meet his goals (Iglesias *et al.*, 2006; Renda, 2006; Palma, 2005; Senra, 2005; Senra, 2007; Senra, 2009; Senra *et al*., 2010; Senra, 2011 and Vargas, 2008).

RESULTS AND DISCUSSION

1. Common general aspects in the strategy

1.1. Actions to be implemented to deal with climatic change will always have to be linked to economic aspects, provided biological sustainability is secured in the short, mid and long term for a final positive impact.

1.2. Stage planning of the measures to be implemented, considering the main factors in an integrated manner. Programs related to climatic change that include systematic control of sustainability indicators (Senra, 2005) and corresponding adjustments in time.

1.3. Survey or diagnostic from the available data was insufficient, so surveys, team or selected specialist meetings, including representatives from farms, surveyed areas and regions, etc., to determine the deterioration degree of ecosystems and the main causes, in order to set up an integrated plan.

1.4. Planning stages: a) priorities will be set depending of the farms, areas or regions, with low and mid degradation. Benefits will be received in the short-term at lower costs, leading to positive productive effects. The objective is to prevent high ecological losses associated to highly degraded areas; b) areas with high degradation, producing no liquid or tangible benefits in the short-term, but need the application of urgent measures for gradual recovery.

1.5. In areas where degradation is lower, a key factor to apply all measures is having a rural culture, that is, knowledge and abilities to fulfil the tasks of applying and adjusting technologies and innovation to concrete material conditions to use more biologically and economically efficient and sustainable systems.

1.6. Diminishing or preventing uncounted losses by natural resources degradation (hidden capital) for long periods, generally incremented by acute deterioration of the ecosystem and losses related to gradual decline of animal production potential, reported by Betancourt *et al*. (2007).

1.7. Cut on the use of machinery, chemical fertilizers and fossil fuels in conventional agriculture, due to their effects on cost increase and environmental pollution (limit high-y-consuming, foreign-dependent technology) according to Flores and Sarandón (2002-2003).

1.8. Upgrading and training is a key factor to face climatic changes, regardless of the importance posed by natural resources, provided the level reached by human resources does not secure economically efficient and biologically sustainable use of exploitation systems.

2. Technological activities to deal with climatic change in livestock raising under our conditions.

2.1. Top priority is given to efficient and sustainable livestock handling and exploitation technologies, based on pasture lands in low and mid degraded areas, in order to mitigate and recover

pasture land ecosystems and prevent major losses associated to severely degraded areas.

2.2. Reduce the re-sowing volume of well-accepted pasture species, degraded by poor handling. It will reduce, mitigate, prevent and recover from the climate change effects on livestock raising (Senra, 2007).

2.3. Application of replacement of recovery technologies, where the main goal is recovery, not getting high profits in the short term. The ecological costs of the productive process, hidden capital, should be included in the technology profit analysis, according to Harte (1995) and Flores and Sarandón (2002-2003).

2.4. Suitable plant coverage and soil sustainability are closely related to carbon rupture, and water retention and distribution (Soto *et al.,* 2010), and the preservation of drainage basins to solve or mitigate water deficit for urgent needs, in some livestock exploitation systems (Aspiolea, 2006), and its contribution in water re-circulation through wind energy pumping.

Better water location and retention (ponds, ditches, Wells, retention chains, etc.) efficiency in the use of these irrigation systems are essential to increase production and tackle the growing instability of rainfall schemes (FAO, 2010).

2.5. Application of technologies that include the introduction of multipurpose trees and shrubs, mainly legumes for the protection and recovery of the pasture land ecosystem, is a necessary complement mechanical works applied in the control of undesirable trees and shrubs; and also increase the positive effects of large and small depressions to mitigate and prevent eroding damages by flowing water and increase natural fertility (Soto *et al*., 2008).

2.6. Participative diagnostic to secure success of commercial technology application, where not only technology is chosen, but also systematic control of the main sustainability and efficiency indicators from early stages of evolution, which guarantee final positive productive impacts (Senra *et al.,* 2010). It will allow detecting problems in time and applying correction measures to adjust technology to concrete conditions, a producer´s essential duty and responsibility. Later, long-term tests will be carried out where social and psychological factors will be analyzed (González. 2004).

2.7. The application of technology should guarantee economic sustainability as essential condition to prevent degrading and recover environmental balance; as well as considering the establishment of an agro-ecological farm as a technological alternative in our region, as reported by Vargas (2008), or seasonal production levels of milk where hundreds of parturitions are induced in the months of pasture abundance (April-August), Guevara *et al.* (2007) and Soto *et al.* (2010) to potentiate the use of natural cycles, environmental balance and rational use of resources.

2.8. Developing small-scale rural industry to increase the primary value of agricultural products, deal with harvest peaks and surpluses induced by climatic change effects. That would include products for animals, meaning animal preservation or feed preparation from local sources, thus reducing the risks of environmental pollution. Another promising alternative is the use of species with a long physiological cycle, which produce the necessary biomass during shortages.

2.9. Sustainability and technology efficiency, especially process efficiency, are within the obligations and responsibilities of the producer (Senra, 2011). That would include the delivery of courses based on the solution of everyday problems, to deliver the required experience, knowledge and abilities to deal with climatic changes. In this way, producers will acquire the necessary culture to be able to increase productivity and efficiency of bovine exploitation levels from local resources.

In general terms, sustainable production (especially in developing countries) may guarantee feed safety and contribute to mitigate the effects of climatic change, by reducing deforestation and the invasion of agriculture in natural systems (Bellassen, 2010).

Economic assessment

The technologies and activities mentioned in this strategy to deal with phenomena associated to climatic change, bring about wide-range economic benefits for livestock ecosystems, due to more efficient use of important local resources. The extensive areas dedicated to livestock production pose a great risk of natural resource depletion if the necessary measures are not implemented.

Betancourt *et al.* (2007), evaluated the biological and economic impacts on pasture degradation in double-purpose systems in Peten, Guatemala. The study was based on diminishing animal production potential, and the results achieved were

that milk/cow yields decreased 7-34 % when pasture land degradation was increased from slight to more severe, and the equivalent meat production levels were 13-43 %. As a result of pasture land degradation, the area studied was annually losing about US $ 82-50 per hectare.

Soto *et al*. (2008) in *Leucaena leucocephala* coverage crop introduction impact studies to set up a protein bank in the province of Camagüey, found that the forage contribution of side crops, sensitive savings in feed purchases were achieved for the animals affected during leucaena development. This technology is an economically sustainable alternative offering additional benefits to the environment and society.

This means that within the measures to deal with the effects from climatic change, the main factor to consider is the application of suitable technologies, adjusted to climatic and socio economic conditions of the island or region, which demands from the producer to acquire the necessary

rural working culture, through knowledge and skills, to make technologies efficient and sustainable, providing natural resources recovery (hidden capital).

There are also social advantages due to an increase of first-need ítems, with the ensuing decrease in imports and urban migration.

An efficient productive process (high yields and optimum quality), and low costs, will depend on the way all elements are used in the productive process (Soto *et al*., 2008).

Furthermore, Milera (2011) reported that significant changes are needed in policies and institutions; as well as major technological innovations and improvements in people´s capacities to manage local ecosystems and adapt to modifications in such ecosystems.

CONCLUSIONS

The general aspects of the strategy and the activities, technologies and strategic actions for livestock raising must be applied as a whole to face the effects of climate change and increase efficiency and sustainability of our agricultural exploitation systems, from a more efficient use of the local resources potential.

In order to assure positive final productive impact, producers must incorporate a “rural culture of work”, for an efficient and sustainable management, and as a way to adjust technologies to concrete situations, through systematic and systemic controls of main indicators of bovine grazing exploitation systems.

Producer training in rural working culture is confirmed as an imperative. It would guarantee ecosystem sustainability and efficiency in pasture lands with plant coverage (ceiling) that would significantly decrease damage caused by climatic changes, especially with extreme hydro meteorological events, not considered previously in their real dimension.

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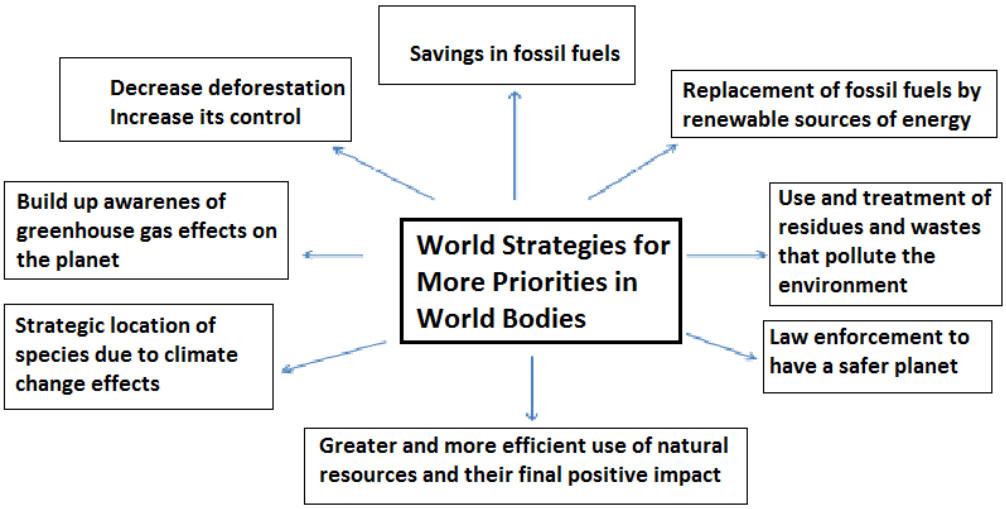

Figure 1. World strategy for more priorities

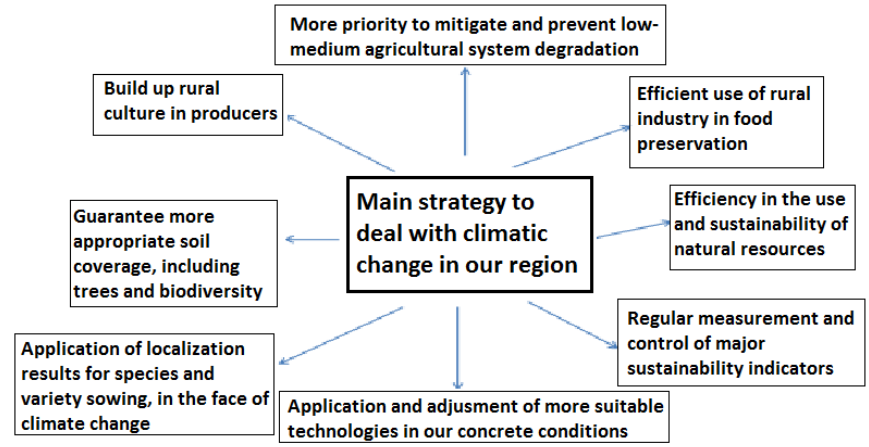

Figure 2. Main strategy to deal with climate change in our region