Results

The animals are clearly diurnal, being especially active in two periods: from 6:30 to 10:30 a.m. and from 2:30 to 4:30 p.m. The individuals generally interact with all their congeners, independently of their sex and age. Interactive acts were mainly amicable (88%). When becoming older, males engaged in more sexual interactions, preferentially with old females. Older sows were more aggressive than younger ones. Dominance relations were evidenced in all groups, based on the frequencies of agonistic and submissive behavior, but no linear hierarchy was detected. The reproductive analysis results show that parturitions were distributed throughout the year. The mean age at first parturition was 639, although, the earliest first parturition occurred at 381 days of age. The mean duration of gestation was 138 days. Based on the presence of mating the first post-partum oestrus was observed at 8 days. The average litter size was 2 newborns per parturition (sex ratio of 52.6% females and 47.4% males), with newborn deaths occurring in the first two days of life. The seminal features observed were the following: volume 0.81 ± 0.86 mL, concentration $137.44 \pm 153 \times 106$ sptz/mL, pH 7.92 ± 0.73, motility 52.66 ± 28.79%, vigor 2.2 ± 0.8, viability 55.84 ± 28.55% and total abnormalities 31.52 ± 13.81%. There were no significant changes in production and semen quality along the months of the year. The results from serology for different infectious diseases showed that collared peccaries had antibodies against *Brucella* spp. (4.9%) and to *Leptospira* spp. (9.8%). None of the sampled captive collared peccaries showed antibodies against pseudorabies, porcine influenza virus, foot-and-mouth disease, porcine circovirus type 2, porcine parvovirus, porcine respiratory and reproductive syndrome, salmonellosis, swine erysipelas or tuberculosis. The results for endoparasites showed 71% *Toxascaris sp.*, 46% and less than 10% of *Entamoeba coli*. The *Entamoeba histolytica, Balantidium coli, Endolimax nana, Oxiurus sp. e Strongyloides sp.* occurred at multiple infections and *Balantidium coli*; *Ascaris suun e Strongyloides sp.* were found with less incidence. In relation to nutritional characteristics, one alternative ration substituting an amount of corn by babassu meal (*Orbignya phalerata*) was tested. The best results of weight gain and consumption were with the diet with 40% of babassu meal, and because it costs less than corn, it results in one significant economy for production system costs. The carcass parameters studied were the dressing percentage, commercial cuts, corporal composition, carcass measurements, organs and glands. The dressing percentage was very good, with 52.64 a 58.84%. The meat was soft, succulent and thin resulting with the analysis of the shear force, cooking losses, pH and water holding capacity and the meat also had a high proportion of unsaturated fatty acids (more healthy).

Conclusions

In conclusion, the results confirm that collared peccary is a viable species for intensive production system in the neotropics, once this species presents satisfactory reproductive parameters. Also, the behavioral characteristics of captive collared peccaries seem favorable to its successful commercial breeding. These are important factors for good breeding system management practices of this species, since the commerce of peccary products is very important in Latin America and the Caribbean.

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Mixed crop livestock systems in the developing world: present and future

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Introduction

The world is under significant pressure. The human population is projected to increase by 30% over the next quarter of a century to reach 8.3 billion by 2030 (UNPP, 2008). During this period, in developing countries, there is likely to be a rapid increase in demand for livestock products, driven by increasing urbanisation and rising incomes (Delgado et al., 1999). At the same time, the impacts of a range of driving forces such as water availability, climate change, and technological innovations on smallholder crop and livestock production may be substantial. The result of these drivers is that the farming systems responsible for global food security will inevitably change. The challenge is to ensure that the resource-poor, mixed crop-livestock, smallholder sector, which currently provides the majority of milk and meat in the tropics, is able to take advantage of the opportunity to meet the increased demand for these products. To do so the sector will need to

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intensify, but at the same time it is vital that this does not compromise household food security, sustainable natural resource management or rural livelihoods.

Mixed systems: trends and potential future impacts

Mixed crop-livestock systems, where crops and livestock are integrated in the same farm, have been the backbone of sustainable pro-poor agricultural growth in the developing World. Their significance cannot be ignored in the global development agenda. Two thirds of the global population live in or in the proximity of these systems. They produce 50% of the world's cereals and more importantly, produce most of the staples consumed by poor people: 41% of maize, 86% of rice, 66% of sorghum and 74% of millet production. They also produce the bulk of livestock products in the developing world – 75% of the milk and 60% of the meat—and employ many millions of people in long value chains. Rates of growth in production and consumption of agricultural products are significantly higher in these systems than in others, with livestock production and consumption rates doubling those of crops (Herrero *et al*., 2009).

Recent work (Herrero *et al*., 2009, 2010) suggests that, first, mixed intensive systems in the developing world are under significant pressures, caused by the rising demands of the human population, income shifts, and high rates of urbanisation. Some are reaching a point where production is being constrained by resources, as land per capita decreases. Significant trade-offs in the use of resources (land, water, nutrients) exist in mixed systems, especially as the demands for biomass for food, feed and energy increase. In the intensive mixed systems, crop residues and food-feed crops are vital livestock feed resources. The prices of food-feed crops are likely to increase at faster rates than the prices of livestock products, and stover production will vary widely from region to region to 2030. Large increases in stover production are projected for Africa as a result of (mostly) productivity increases in maize, sorghum, and millet. On the other hand, stover production may stagnate in some areas, notably in the mixed systems of South Asia, which have the largest numbers of ruminants in any system globally. In such systems, as ruminant numbers continue to increase, this may place a considerable squeeze on the availability of stover per animal. In such situations, stover will need to be substituted by other feeds in the diet, to avoid significant feed deficits, although the production of alternative feeds for ruminants in the more intensive mixed systems may be constrained by land and water availability. Second, important productivity gains could be made in the more extensive mixed rainfed areas. In these systems, with less pressure on the land, yield gaps of crops and livestock are still large. Pro-poor policies and public investments in infrastructure will be required to create a system of incentives, reduce transactions costs, and improve risk management in these systems. Integration of production in these systems to supply agro-ecosystems services (feeds, food, etc) to the more intensive systems will need to be investigated and promoted, where possible. Third, the livestock revolution, at least from a ruminant perspective, could potentially exclude the poor in terms of the benefits of consumption of meat. If green fodders become scarce due to land and water shortages and more grains are fed to ruminants to match production, this may increase the prices of animal products further, thus bypassing the ability of the poor to consume more milk and meat. This would present significant challenges in mixed systems, particularly in Asia. Fourth, while the costs of mitigating and adapting to climate change may not represent an enormous constraint to the growth of the global livestock sector as a whole, different livestock systems exhibit markedly a different capacity to adapt to climate change, or to take on board the policy and regulatory changes that may be required in the future. The vulnerability of households dependent on livestock, particularly in the drier areas, will increase substantially. A key research area is the development and implementation of comprehensive frameworks that can be used for impact assessment and trade-off analyses, in identifying and targeting production, adaptation and mitigation options in the mixed systems that are appropriate for specific contexts, and that can contribute to environmental sustainability as well as to poverty alleviation and economic development. Such work is also needed to inform the sustained public policy action that will be necessary to ensure that livestock system development can play its role as a tool for growth and poverty reduction, even as global and domestic trends and economic processes create substantial opportunities for sector growth.

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