IS BACKYARD RABBIT PRODUCTION A DEVELOPMENT OPTION FOR SMALL HOLDERS IN MEXICAN SOUTHEAST?

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ABSTRACT

This paper reviews the characteristics of rural backyard production in Mexican southeast as well as the opportunities to include rabbits as a productive animal in backyard productive system. Animal husbandry as a production system has an important role to improve the quality of life of those rural communities. Backyard livestock production is an important activity for rural communities around the world, representing a constant source of food, income, savings, as well as providing social status within the community. In Mexico at least 90 % of rural families develop this type productive activity, meanwhile in Mexican southeast is developed by 60 – 85 % of rural families. Mexican Southeast region is characterized by tropical conditions where wide varieties of plant species represent sustainable alternatives for animal production, especially herbivore species. Rabbit´s ability to consume fodder and convert it into high quality protein products represents a potential alternative for traditional productive systems in tropical areas maintaining a synergistic combination among animal – crop. In conclusion, in Mexican southeast there are conditions to include rabbits as a productive alternative for rural communities. The existence of a wide variety of plants and fibrous resources with potential for rabbit meat production would benefit southeastern rural population by improving nutrients intake. However, further research is needed to characterize rabbit utilization and keeping in order to developing efficient strategies for its successful incorporation to rural backyards of Mexican southeast.

Key words: Rabbit, opportunities, rural, backyard, Mexican southeast.

SMALL-SCALE ANIMAL HUSBANDRY AND BACKYARD PRODUCTION

In rural areas worldwide, the lack of economic resources and small land properties, among other factors make difficult to develop large-scale production systems for peasants and small farmers. Integrated production systems, such as backyard system, play an important role for rural families in terms of sustainability, protection of the environment and biodiversity conservation, improve living conditions by eliminating poverty. The use of resources available the tropics can help to meet the increasing demand of food for human consumption (Preston 1994). Utilization of solar energy and efficient nutrient fluxes among components reduce dependency of external inputs (commercial feeds, fertilizers, grains, pesticides) while reducing the capital investments (Rodríguez *et al.* 1993; Acosta 2004).

Animals can transform low nutritional value materials such as fibrous plants into high quality products; such capacity represents a tool to improve the sustainability in rural productive systems (Marsh and Hernández, 1996; Chantalakhana and Skunmun, 2002; Lukefahr 2007; Pok Samkol *et al.* 2007). The use of smaller species in animal production such as sheep, goats, pigs, rabbits etc. have been an important issue in recent years as they emerge as a viable alternative for those producers who lack or have limited capital for investment of animal production or reduced land availability. Nevertheless, the main reason for choosing small species husbandry goes beyond the classical arguments (low investment, facility to market products); their physiological characteristics, in particular with regard to feeding habits and the nature of their digestive tracts are important when selecting suitable species for small scale production (Devendra and Ibrahim, 2004). In the tropics it is necessary to study breeds and species able to use efficiently the available resources (fibrous) within the traditional backyard production or small scale production systems in order to improve nutritional and economic status for rural population (González *et al.* 2000; Devendra and Ibrahim, 2004; Nieves *et al.* 2005; Sarmiento *et al.* 2009).

THE MEXICAN BACKYARD SYSTEM

Backyard productive system is characteristic in Mexican villages; it is defined as, a system of cultivation and rising of several species that are developed in a specific and delimited space usually located in the same area of the family house. Backyards have been an essential part of peasant household agricultural systems in Latin America since pre-Columbian times (In Mexico 90 % of rural families develop backyard livestock production). This system is integrated by animal and vegetable species which are used to supply the different needs of the family and includes special constructions (generally handmade) used for animal and vegetable production. This system has several names such as "patio", "traspatio" and "huerto familiar". Backyards are ecologically sustainable systems that generate household savings on food, medicine, supplementary income, improve the nutritional quality of the families' diet through livestock production and minimize economic risks. (Rodríguez *et al.*1993; Acosta 2004; Kumar 2004).

Backyard livestock production is classified as a complementary activity to the household economy, income originating from trading animals or animal products (from 28 – 36 % of total household income). Backyard livestock production is mainly integrated by cattle, pigs, sheep and poultry; besides these species, it is possible to find others such as honey bees, cats and dogs. Sometimes there are other animals present such as White Tail Deer (*Odocoileus virginianus yucatanensis*), wild rabbits (*Sylvilagus floridanus*), parrots (*Amazona albifrons*) and stingless bees known as Xunancab (*Melipona beecheii*) which were part of the animals that Mayan civilization used to kept in pre-Hispanic times. These animals are raised especially to prepare special dishes for social and religious celebrations or as a kind of "savings account" of the productive family unit. These animals are fed mainly with plants considered plagues or cultivated specifically for this purposes. Occasionally and when the economic situation allows it the animals receive maize and commercial feeds. Additionally, a backyard provides 9 % of the calories, 10 % of protein, 47 % of fat and 10 % of riboflavin, niacin, and Vitamin A of household dietary requirement. Within this production system, animals can transform plants with low nutritional value as human food transforming this resource into high quality products such as meat. This capacity represents a tool to improve animal production sustainability, considering that in

backyard productive systems the highest cost are associated with the maintenance of the animal component (mainly feeds) (Marsh and Hernández, 1996; Chantalakhana and Skunmun, 2002; Lukefahr 2007; Pok Samkol *et al.,*. 2007).

RABBIT CONTRIBUTION TO BACKYARD PRODUCTION IN TROPICAL COUNTRIES

Rabbits are specie, which satisfies several of the desirable characteristics mentioned by Cheeke (1986) for being incorporated into smallholder production systems, has been recently promoted in some countries from Africa and Asia. Several studies mentioned that rabbit production has brought benefits for rural communities in less developed countries. A small rabbit production unit (10 females) could produce 86 fattened rabbits (2.5 kg each) and generate US$ 262 additional income to the farmer, considering US$ 1.22/Kg market price, increasing households income from 19.8 % up to 87.3 % as reported in several countries such as Indonesia, Cambodia, Laos and Vietnam. Alternatively, it can provide at least 2 -5 fattened rabbits on a weekly basis which would be available for family self-consumption and depending of family size, can also results in surplus meat available for sale (Lukefahr and Cheeke, 1991; Lukefahr, 2007; Nguyen Ky Son, 2008; Kariaki and Asare 2009; Olagunju and Sanusi 2010). Rabbits can be incorporated into the household not only from a small production system, but also from other sources such as hunting. For example, in rural communities from Chile rabbit meat is obtained by means of hunting (72.7 % of total rabbit meat consumption), an activity carried out by a diverse set or reasons: entertainment activity (44 %), because it is a healthy food (20 %) or both (24 %), to protect their crops (8 %) and traditional activity (4 %). In Chile, rabbit hunting has a recognized season according to the community, providing up to 11.3 % of the family annual income (Isla and Kantunaric, 2006). Despite in rural Mexico there is not recent information about the management - utilization of rabbits or rabbit meat consumption; there is a historical precedent related to the Pre-Hispanic times where Guerra and Naranjo (2003) and Emery (2008) declared that rabbit was part of the preferred hunting prizes of Mayan civilization as a source of food for human population.

RABBIT PRODUCTION IN MEXICAN SOUTHEAST

Rabbit production in Mexico is clearly a small scale activity; 94.6 % of rabbit producers perform this activity as a complement of the main income source, meanwhile only 5.4 % of rabbit producers have this activity as the main household income source (representing 10 % of national production). This activity has tied itself directly with adults and young, the latter being on their majority men (75.4%), while women represent only 24.6%. Since 2001, the Mexican federal government classified rabbit production as a productive activity which should be encouraged and promoted due to an increase in rabbit meat demand. For this reason some states such Puebla, Tlaxcala, Guanajuato and the State of Mexico destined financial support for training the producers and to promote the activity (Clavel 2004, Mendoza 2008) according to this Central Mexico rabbit production has had greater development, while other regions in the country have lower participation in this activity (Clavel *et al.* 2004), specially the southeast region. Meat production in Mexican southeast has been mainly focused on poultry and pork. During 2011, poultry and pork production in Yucatan were estimated to be 119 193 tons and 91 397 tons (50.4% and 38.6% of total meat production respectively), meanwhile cattle production participated with 24 879 tons (10.6%) and sheep with 876 tons (0.4%). In the case of rabbit production it does not is listed in the agriculture yearbook report as its participation in the regional market was very low (Toledo, 2011). However during the past decades, rabbit production was promoted specifically in Yucatan State as a strategy to help sisal producers to maintain a productive activity due to declining of the sisal industry (Canto et al. 1975; Toledo 2011). According to the agriculture census report (INEGI, 2007), rabbit population in Yucatan in 2007 was 2 745 heads, from which 37.99% (1043 heads) were found in formal production units (14 farms). The Northwest region had the highest population density for the aforementioned year, with 1382 total heads. Accordingly, the economic contribution of rabbit production during the same year (2007) was reduced as total sales accounted for 1275 heads in the state (Canto et al., 1975; INEGI, 2007). Regarding to sales in 2007 the most active regions were northwest, south and northeast (618, 236 and 200 heads sold respectively) (INEGI 2007). Despite that the potential of rabbits as productive specie (meat production) is confirmed in a recent survey by Cruz-Bacab

et al. (2012) (table 1) which shows the interests in two the rural communities to learn about rabbits and incorporate it as a component of the backyard production system as well as the availability of several potential feeding sources within the backyard system, this activity is not common in Mexican Southeast.

Table 1. Knowledge about rabbits in Ucu and Santa Elena, Yucatán, México.

	Ucú			Santa Elena			P-value
	Frequency	%	CI (95%)	Frequency	%	CI (95 %)	
Knowledge about rabbits	216	95.15 a	±2.43	90.8	92.6[a]	±4.93	0.3704
Previous experience in rabbit keeping	86	37.89 a	±5.48	55.1	56.2b	±9.35	0.0021
Previous consumption of rabbit meat	104	45.81[a]	±5.62	61.2	62.4b	±9.12	0.0060
Interest in rabbit keeping	135	59.47[a]	±5.54	75.5	77.0b	±7.93	0.0023

n = 227 for Ucu, n = 98 for Santa Elena; Letters in the same row = P<0.05. Frequency: afirmative answers to each question. CI: Confidence interval.

POTENTIAL FEEDING RESOURCES IN SOUTHEASTERN BACKYARDS FOR RABBITS

In general forages and high fiber resources has been associated with ruminant species, meanwhile little advance has been done with non – ruminant animals, because according to their digestive physiology high fiber levels in diet cannot be degraded affecting the performance. Physiological characteristics of rabbits allows including fibrous sources in its diet, due to the high fiber levels which are required for a correct function of rabbit´s digestive tract. This condition represent a favorable scenario to include rabbit production in diversified systems (based on animal–crop integration), representing a low-cost alternative for meat production in rural areas (Nieves, 2009). Mexican rural communities use a wide variety of plants with nutritional potential for animal feeding, including rabbit feeding. In the Yucatan peninsula peasants cultivate and maintain some trees and shrubs for a constant supply of forage for animals, usually managed with a cut and carry method (Acosta *et al.* 1998; Martínez *et al.* 2010). Several studies around Latin America and

around the world allow considering the inclusion and utilization of a wide variety of tropical forages at different inclusion levels obtaining satisfactory results in growing rabbit performance (Table 2). Eighty four plant species have been identified in southeastern backyards as potentially useful sources for livestock feeding, representing 64.1 % of forage species reported in Yucatan State and the 53.5 % of forage species reported for Yucatan peninsula (Acosta *et al.* 1998; Martínez *et al.* 2010). The existence of local resources for rabbit feeding could allow the implementation of backyard production with low dependence of external inputs such as grains and cereals. In other way the presence of some sectors of the population coming from central Mexico or even foreign countries with rabbit meat consumption tradition in Mexican southeast would stimulate the demand for rabbit products and promote the growth of rabbit meat market in this region.

Table 2 Studied forages in rabbit feeding in Latin America

Common name	Scientific name	Author
Guandul	*Cajanus cajan*	Quintero, 2003
Maní forrajero	*Arachis pintoi*	Nieves, 2009
Batata	*Ipomea batata*	Nieves, 2009
Yuca	*Manihot sculenta crantz*	Nieves, 2009
Matarratón	*Gliricidia sepium*	Quintero, 2003; Nieves, 2009
Naranjillo	*Trichanchera gigantea*	Nieves et al. 2009
Huaxim	*Leucaena leucocephala*	Nieves et al. 2009
Morera	*Morus alba*	Nieves et al. 2009
Ramon	*Brosimun alicastrum*	Rojas, 2008; Cruz – Bacab, 2009; Martínez et al. 2010
Cayena	*Hibiscus rosas*	Martínez et al. 2010
Arnica	*Tithonia diversifolia*	Nieves et al. 2011

CONCLUSION

In Mexican southeast there are conditions to include rabbits as a productive alternative for rural communities. The promotion of rabbit meat consumption would benefit southeastern rural population by improving nutrients intake and reducing livestock production cost. However,

further research is needed to characterize rabbit utilization and keeping in order to developing efficient strategies for its successful incorporation to rural backyards of Mexican southeast.

REFERENCES

Acosta B.L., Flores J.S., Gómez – Pompa A. 1998. Uso y manejo de plantas forrajeras para la cria de animales dentro del solar en una comunidad maya en Yucatán. Etnoflora Yucatanense. Fascículo N° 14. Universidad Autónoma de Yucatán. Facultad de Medicina Veterinaria y Zootecnia, Mérida, Yucatán, México.

Acosta C.M. 2004. Caracterización del sub-sistema de ganadería de traspatio en 33 comunidades del estado de Yucatán. Tesis de licenciatura. Universidad Autónoma de Yucatán. Facultad de Medicina Veterinaria y Zootecnia, Mérida, Yucatán, México.

Canto M.C., Chi P.C., Gónzalez F.J., Murillo J.A., Ojeda P.A., Pool M.G., Rivero M.J. 1975. Situación de la producción cunícola en la ciudad de Mérida, Yucatán. Tesis de licenciatura. Universidad de Yucatán. Escuela de Medicina Veterinaria y Zootecnia. Mérida, Yucatán, México.

Chantalakhana C. and Skunmun P. 2002. Sustainable smallholders animal systems in the Tropics. Kasetsart University Press. Bangkok, Thailand, 23 - 129

Cheeke P.R. 1986. Potentials of rabbit production in tropical and subtropical agricultural systems. Journal of Animal Science. 63, 1581 – 1586.

Clavel C., Hernández E., Herrera J., Hernández V. and Hernández D. 2004. Small cuniculture family farm on the south coasto of Guerrero State, Mexico. In proc.: 8th World Rabbit Congress, Puebla, México. 1465 – 1470.

Cruz – Bacab L. 2009. Comportamiento productivo de conejos alimentados con niveles crecientes de Ramón (*Brosimum alicastrum*) y concentración de energía neta del forraje de Ramón (*Brosimum alicastrum*). Tesis de Maestría en Producción Animal Tropical. Universidad Autónoma de Yucatán. Facultad de Medicina Veterinaria y Zootecnia. Mérida Yucatán, México.

Cruz – Bacab L., Sandoval – Castro C. and Pantoja – Nuñez G. 2012. Use of solar and social perception of domestic rabbit (Oryctolagus cuniculus) in two rural communities of the state of Yucatán, Mexico. In Proc.: 10th World Rabbit Congress, Sharm El –Sheik, Egypt. 847 – 850.

Devendra C. and Ibrahim M. 2004. Silvopastoral systems as a strategy for diversification and productivity enhancement from livestock in the tropics. 10th and 2nd International symposium of silvopastoral systems. Mérida, Yucatán, México.

Emery F. 2008. Assesing the impact of ancient maya animal use. Journal of nature conversation. 15, 184 – 185.

González C., Dí.az I. and Vecchionacce H. 2000. Cambios de paradigma en la investigación con cerdos para enfrentar los nuevos retos de la producción. In Proc.: X Congreso Venezolano de Zootecnia, Guanare, Venezuela.

Guerra M. and Naranjo E. 2003. Cacería de subsistencia en dos localidades de la selva lacandona, Chiapas, México. Manejo de Fauna silvestre en Amazonia y Latinoamérica. Selección de trabajos del V congreso internacional CITES. Bogotá, Colombia, 446.

Isla P.P. and Kantunaric N.M. 2006. El conejo europeo (Oryctolagus cuniculus): De plaga a subsidio de la naturaleza. Tesis de ingeniería. Universidad de Chile. Facultad de Ciencias Agronómicas. Escuela de Agronomía.

Kariaki P.K. and Asare K. 2009. An economic analysis of a smallholder meat rabbit production system. Am. – Eurasian J. Sustain. Agric. 3, 502 – 506.

Kumar B. and Nair P. 2004. The enigma of tropical home gardens. Agroforestry syst. 61, 135 – 152.

Lukefahr S. and Cheeke P. 1991. Rabbit project development strategies in subsistence farming systems. 1. Practical considerations. World Anim Rev, 68, 60 – 70.

Lukefahr S.D. 2007. Strategies for the development of small and medium scale rabbit farming in south-east Asia. Livestock Research for Rural Development. Volumen 19, article # 138.

Marsh R. and Hernandez I. 1996. El papel del huerto casero tradicional en la economía del hogar: casos de Honduras y Nicaragua. Agroforestería en las Américas. N° 9: 8 – 15 CATIE, Turrialba, Costa Rica.

Martinez Y. R., Santos R.R., Ramírez A.L. and Sarmiento F.L. 2010. Utilización de Ramón (*Brosimum alicastrum*) y Cayena (*Hibiscus rosa – sinensis L.*) en la alimentación de conejos. Zootecnia Tropical 28, 153 – 161.

Mendoza B.J. Díaz Z.S., Velazquez O.V., Alonso F.M.U. and Ortega B.E. 2008. Social and economic contribution of rabbit production in the state of Mexico. In proc.; 9th World Rabbit Congress. Verona, Italy, 10 – 13.

Nieves D., Rojas E., Terán O., Fuenmayor A. and Gónzalez C. 2005. Aceptabilidad de dietas con follaje de naranjillo, leucaena, morera, maní forrajero, batata y yuca en conejos de engorde. Revista UNELLEZ de ciencia y tecnología. Volumen 23.

Nieves D. 2009. Forrajes promisorios para la alimentación de conejos en Venezuela. Valor nutricional. En: Alimentación no convencional para monogástricos en el trópico. UNELLEZ, Mesa de Cavacas, Guanare, Portuguesa, Venezuela.

Nieves D., Terán O.,Vivas M., Arciniegas G., González C. y Ly J. (2009) Comportamiento productivo de conejos alimentados con dietas basadas en follajes tropicales. Revista Científica, FCV – LUZ Vol XIX, N°2, 174 – 180.

Nieves D., Terán O., Cruz L., Mena M., Gutierrez F. y Ly J. (2011) Digestibilidad de nutrientes en follaje de Árnica (*Thitonia diversifolia)* en conejos de engorde. Tropical and subtropical agroecosystems. 14, 309 – 314.

Nguyen ky Son 2008

Olanguju F.I. and Sanusi W.A. 2010. Economic recovery of backyard rabbitory for self-sufficiency in Oyo state, Nigeria. African Journal of Agricultural Research Vol 5, 16, 2232 – 2236.

Preston T. 1994. La revolución pecuaria; Recursos locales como alternativa a los cereales. Conferencia electrónica de la FAO sobre "Agroforestería para la producción animal en Latinoamérica". http://www.cipav.org.co/cipav/confr/index.htm.

Quintero V.V. 2003. Evaluación de leguminosas arbustivas en la alimentación de conejos. Livestock Research for Rural Development 5.

Rojas S.A. 2008. Eficiencia en la utilización del Ramón (*Brosimum alicastrum*) y determinación del contenido de proteína metabolizable en ovinos y conejos en crecimiento. Tesis de maestría en producción animal tropical. Universidad Autónoma de Yucatán. Campus de Ciencias Agropecuarias.

Samkol P., Borin K. and Sonovann S. 2007. Pig system in SE Asia – Cambodia case. In: PPT presentation regional workshop on pig system in Asia and the Pacific: How can the R&D enhance the benefit to the poor? 2006. Bangkok, Thailand.

Sarmiento F.L., Santos R.R. and Correa S.J. 2009. Alimentación no convencional para monogástricos. Experiencias en el trópico mexicano. En: Alimentación no convencional para monogástricos en el trópico. UNELLEZ, Mesa de Cavacas, Guanare, Portuguesa, Venezuela.

Toledo V. 2011. Perspectivas de la producción de carne en Yucatán. NACAMEH. 5, 69 – 83.