E3 Journal of Environmental Research and Management Vol. 4(11). pp. 0352-0358, November, 2013
Available online http://www.e3journals.org
ISSN 2141-7466 © E3 Journals 2012

Full Length Research Paper

A case study of an integrated wildlife management strategy using a sustainable approach in a rural community of southern Mexico

Oscar Gustavo Retana Guiascón*, Demián Hinojosa-Garro y, Jesús Vargas Soriano

Laboratory of Wildlife Management. Center for Sustainable Development and Wildlife Studies (CEDESU). University of Campeche. Av. Agustín Melgar s/n Colonia Buenavista, CP. 24039, Campeche, México.

Accepted 12 November, 2013

This study was carried out in Cano Cruz´s UMA (Unit for Conservation and Sustainable use of Wildlife), Campeche, Mexico, which offers sport-hunting as its main activity. Data were gathered based on a participatory rural appraisal (e.g. semi-structured interviews, direct observations, participation in regional meetings and databases). During 2009 we assessed the sustainability index of UMA hunting and for the integrated/diversified UMA scenario. Data shows that beside sport-hunting there were 12 non-conventional practices in the region, including breeding facilities for fauna to be reintroduced into UMA´s and for local use (e.g. pets), biodiversity interpretative boards, bird watching activities, handicraft exhibitions, as well as a local natural history museum that could be included in UMA´s integrated management strategies. The sustainability index was significantly higher (63.55%) when UMA activities were developed under an integrated and diverse use of wildlife resources, compared to the actual management strategy, which scored only 22.78%. Thus, we propose that local villages in southern México should adopt and apply an integrated of UMA´s activities in order to encourage local, social and economic development, as well as wildlife conservation.

Key words: wildlife management, integrated management, peasant management, human-wildlife relationships, sustainable approach, natural resources, rural community.

INTRODUCTION

Nowadays worldwide protected natural areas are considered not only terns of biodiversity, but to also provide a wide range of goods and services for human communities in terms of cultural and economic activities, especially in the case of indigenous and rural communities (Millennium Ecosystem Assessment, 2005; Sarukhán et al., 2009).

In Mexico the need for a new integrated and diversified management strategy for wildlife use in natural areas, which is managed by rural communities in order to encourage sustainable practices and to promote local development opportunities, is clear. For this reason, as a result in 1997 the Ministry of Environmental and Natural Resources (SEMARNAP) launched a Conservation of Wildlife and Productive Diversification in Rural Sector program (SEMARNAP 1997) to promote biodiversity conservation as well as socioeconomic development. This program was founded on the bases of two main strategies: 1) Conservation and Recovery of Priority Species and 2) Development of Units for Conservation and Sustainable Use of Wildlife (UMAs). As a result, areas designated for UMAs activities have been increasing significantly, reaching the same extension that has been designated for protected areas in the country.

In addition, UMAS have also promoted the active participation of the rural communities, achieving gradually a new perception as the benefits are derived from sustainable wildlife management (INE, 2000; Retana, 2006). However, most UMAs do not have diversified/integrated activities, and have focused only on extractive activities like sport-hunting rather than non extractive ones such as ecotourism and environmental education. Thus, in the present study we evaluate and determine the potential of an integrated management

*Corresponding authors: E-mail: retana1967@yahoo.com.mx

strategy (non extractive activities) for flora and fauna under the scheme of community UMAs in Cano Cruz village to encourage non- conventional productive alternatives that could allow for both wild life conservation and local development.

RESEARCH METHODOLOGY

Description of study area

The study was carried out in Carlos Cano Cruz village that is located on the south-east of Campeche, Mexico (19º 22' 17.9" N and 89º 52' 56" W). Flora consists of evergreen seasonal forest represented by species such as zapote (*Manilkara zapota);* ramón (*Brosimun alicastrum*); pucté (*Bucida buceras*); pimienta (*Pimienta dioica*); tabaquillo (*Alseis yucatenensis*); ya'axnik (*Vitex gaumeri*), among others. The mean annual temperature is 26.8°C and rainfall of 1100 mm (Flores and Espejel, 1994). Cano Cruz inhabitants are not native to Campeche, they migrated in 1992 from the state of Tlaxcala, Veracruz and Tabasco. Nowadays, there are 250 inhabitants. Soy bean, sorghum and maize cultivation are the main economic activities, as well as some lamb and honey production (INEGI, 2005). Cano Cruz village owns 9,600 ha in which hunting and cinegetic activities for self consumption take place. The most hunted species are ocellated turkey (*Maleagris ocellata*), white- tailed deer *(Odocoileus virginianus*), red brocket deer *(Mazama americana)* and collared peccary *(Pecari tajacu)*.

Methods and Indices used in the research

Fieldwork was carried out from March 2009 to September 2010. Participative evaluation methods with semi-structured interviews (Chambers, 1994) were applied (n= 100) in order to evaluate the local knowledge concerning direct use of flora and fauna. At the same time an Integral Planning method was applied (Stokes et al., 1968; Goggins et al., 1971; Anderson and Hurley, 1987), to determine the potential of the community to develop an integrated management plan for their UMA.

This method consists of the analysis of : 1) the abundance of wild fauna based on local knowledge; 2) the actual use of wild fauna; 3) the actual use of wild species for local use; 4) future scenarios for wild life use, 5) the relationship between the actual and future scenarios for wildlife use and 6) diversified activities income administration.

In order to compare the actual mono-specific activities (sport-hunting) *versus* an integrated UMA management a Sustainability Index (SI) was applied on the basis of the study of Taylor et al. (1993); and the Evaluation of Natural Resources Management (Masera et al., 2000).

The SI allowed a comparison of the state of sustainability that keeps the UMA with a system of only hunting management with respect to the UMA with a system of alternative management or integral types, considering 15 indicators (Table 1), representing social, economic and environmental conditions of the community. Each indicator value was assigned between 0 and 5 points according to the degree of compliance with regard to the optimal management system. Average scores for each thematic area in the SI were calculated being 100% the optimum management score.

Also two community workshops were held to determine the alternatives of integrated management (non-conventional productive activities) to be implemented in the short term in the ejido Cano Cruz under scheme of community UMA.

RESULTS AND DISCUSSION

The use of flora and fauna

The Cano Cruz UMA is adjacent to the UMAs of Pich, Chencoh, Las Flores, San Juan Cantemó and Santa Genoveva which in total covers 200,000 ha of evergreen seasonal forest with 135 species of flora with use value (Retana et al., 2010). From those Cano Cruz inhabitants use 81 species (60 %) that are ranked in seven categories of use: 1) wood 2) medicinal, 3) fuel, 4) scattering, 5) food, 6) ornamental and 7) forage (Figure 1). These values were higher than those reported by Méndez and Montiel (2007) for the communities El Remate and La Isla in which they use 34 and 17 flora species, respectively. This difference may be due to the fact in that region of the State of Campeche, in which both these communities are located the flora is relatively less diverse because it has coastal vegetation, coupled with the fact that its inhabitants are mostly dedicated to fishing or other economic activities that minimize the interaction with vegetation, which influences a low recognition of the local use of wildlife resources.

In terms of fauna there were 26 species reported under four categories of use: 1) food, 2) medicinal, 3) utensil and 4) as pets (mascot) (Figure 2). Food category archived, 84.61 % of the total recorded species; 12 species were mammals (46.15 %), seven birds (26.92 %) and three reptiles (11.53 %). The white- tailed deer, red brocket deer, collared peccary, ocellated turkey, and rattlesnakes (*Crotalus tzabcan*), achieved the highest values of use.

These data agree with similar studies by Méndez and Montiel (2007) and León and Montiel (2008), in indigenous communities of northern Campeche which emphasize the importance of sustainable use of these species through the establishment of new rural UMAs. In addition to sharing this position, we suggest that UMAS foster the integrated model of wildlife management, in which community participation training is essential.

Table 1: Weighting of indicators for the assessment of sustainability of UMA-Cano Cruz. (Key: H-UMA= sport-hunting UMA; I-UMA= integrated management system).

Evaluation area	Criterion	Indicators	H-UMA (Reference System)	%	I-UMA (Alternative System)	%	Optimum management System	%
Environmental	Comprehensive utilization of species and habitat conservation.	A-1. Number of species thought and with potential comprehensive utilization	3	23	7	54	13	100
		A-2 Number of regulated extractive activities	1	25	2	50	4	100
	Holistic approach to the planning of use of natural resources	A-3. Number of natural elements incorporated into the UMA	1	33.3	3	100	3	100
	Environmental Education	A-4. Development of educational projects and research	1	20	2	40	5	100
		A-5. Disclosed information	1	25	2	50	4	100
Social	Employment generation	S-1. Number of local people benefited	33	53.2	51	77.4	62	100
		S-2. Temporality (months of the year in which it works)	1	8.3	6	50	12	100
	Training community	S-3. Trained personnel to carry out activities related to the UMA	1	2	48	77.4	62	100
	Holistic approach to the planning of use of natural resources	S-4. Number of socio-cultural elements incorporated into the UMA	1	25	3	75	4	100
		S-5. Valuation of local knowledge	1	20	4	80	5	100
	Local participation	S-6. Number of local people involved in the management and decision-making	33	53.2	45	72.6	62	100
		S-7. Gender equity: number of women and men participating	7	11.3	40	64.5	62	100
Economic	Diversification of productive activities	E-1. Number of productive alternatives	1	8.3	5	42	12	100
		E-2. Production of goods and services (number of goods and services offered by the UMA)	1	9.1	5	45.4	11	100
		E-3. People type the target goods and services	1	25	3	75	4	100

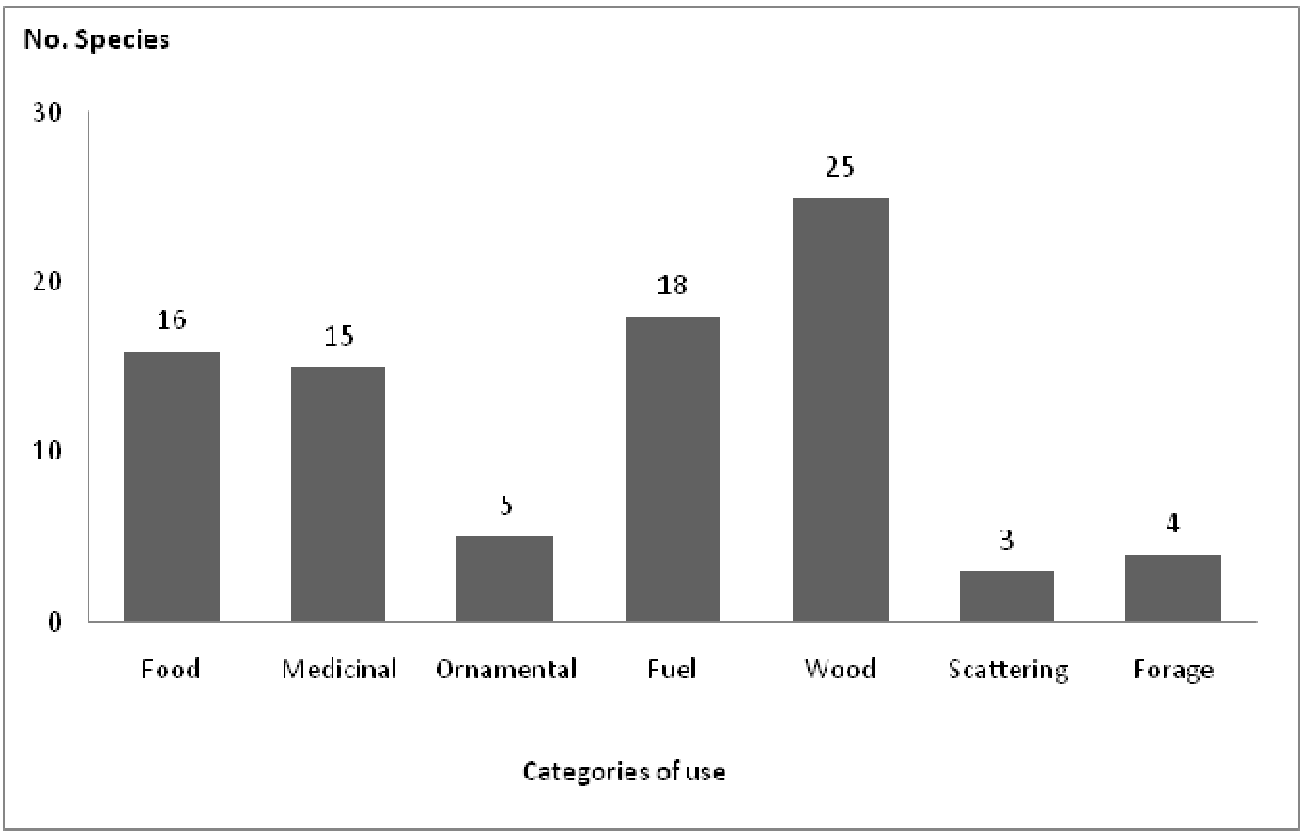

Figure 1: Number of species floristic with use value in the forest area of the Cano Cruz UMA.

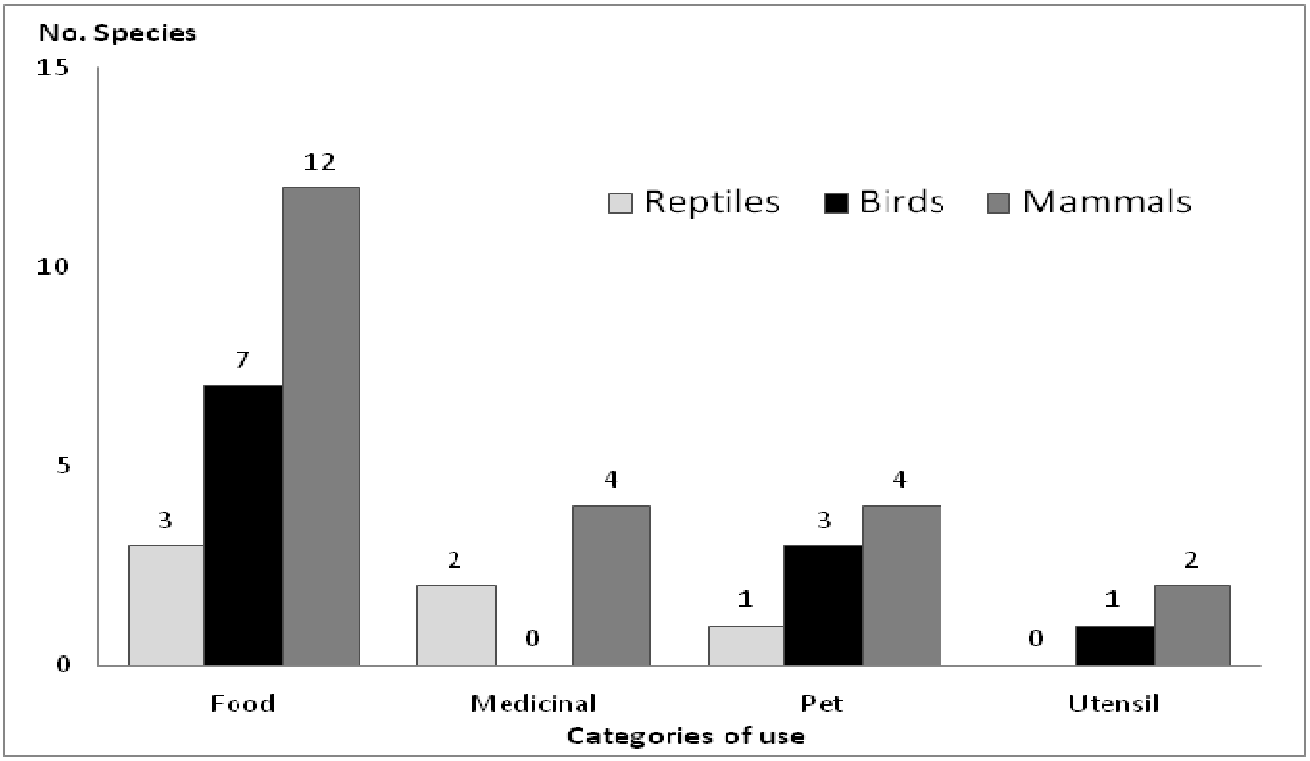

Figure 2: Number of species of fauna with use value in the forest area of the Cano Cruz UMA

UMAs Integrated management alternatives

Based on the integrated management analysis rural appraisal chose 12 alternatives activities that can be established in Cano Cruz UMA beside cinegetic and self-consuming hunting. From these, eight were related to the use of natural elements whereas the four remaining were related to cultural elements. We proposed the establishment of two circuits of integral management; the first one includes 11 alternatives, from which six activities involved natural elements such as: hiking, fauna breeding facilities, interpretative boards, bird watching, wildlife photography and cycling. From the cultural elements: accommodation in local chalet, visits to mayan vestiges ("Cuyos"), a local community restaurant, a natural history museum and art and crafts exhibitions.

The second circuit includes a series of permanent and ephemeral ponds (seven consecutive ponds) that are located next to an old road that connect several villages. These water bodies constitute sites with special interest for resident and migratory birds, allowing wildlife observation and landscape photography as well as wildlife tracking. Likewise, these paths are next to a zone of "cuyos" and some interpretive boards end up in a cave for observation of bats. In agreement with Gonzalez et al. (2003) and Méndez and Montiel (2007), the non conventional economic activities encourage wild life conservation and use as well as the development of the rural communities. Redford and Robinson (1997) and Villareal (2006) determined that wildlife observation and natural landscaping has become recently a more common practice in Latin America, providing significant financial incomes to the rural communities, which in fact is part of the conservation strategy. In addition, integrated management of wildlife has not only promoted diversification of the community economy, but also has encouraged habitat and species conservation.

These results support the idea of previous works by Bocco et al. (2000) which established successful sustainable uses of natural resources in San Juan Parangaricutiro village in the state of Michoacán, México. In particular, they emphasize activities such as reproduction in semi-captivity of the white- tailed deer to commercialize their meat at a local level and to repopulate areas for sport-hunting as well as for ecotourism activities. In addition there have been other projects in which the singing quail (*Dendrortyx macroura*) was bred, as well as sustainable forestry activities. Thus, we consider that integrated wild life management practices (also known as multiple-use strategy for local natural resources, Toledo et al. 2008), as well as some other natural and cultural resources, most be included in rural UMAs management which in turn will increase sustainability conditions.

Sustainability index of Cano Cruz UMA: Hunting management *vs* Integrated management

Results showed that under hunting management (H-UMA) Cano Cruz UMA scores were < 26 % in three main areas: environmental = 25.26; social = 24.71 and economic = 14.13 %, while sustainable index (SI) was 22.78 % (Table 1). This means that this UMA is generating socioeconomic benefits and income to the community. Nevertheless, they are temporary and less profitable compared to the integrated UMA (I-UMA) which registered scores of up to 63.55 % of SI which shows the potential of sustainable integrated management for this UMA (Figure 3).

These results agree with those reported by García et al. (2008), which evaluate six UMAs located in the state of Campeche and showed that they tend to increase economic sustainability through diversification of productive activities as well as environmentally when diversified management strategies and programs promote habitat and species conservation. Thus, in order to increase the state of sustainability of Cano Cruz UMA in a short term (five to eight years), community participation to identify locally the multiplicity of benefits that can be generated if sustainable diversified practices are applied must be emphasized instead of monospecific activities like sport hunting.

For instance, Bocco et al. (2000) reported that in the Nuevo San Juan community, the integrated management of resources has not only increased local sustainability, but has also created over 900 permanent jobs, the creation of a transportation company, local stores, agricultural and ecotourism programs, etc. It has also promoted gender equality by empowering women in agro-ecological solid waste management and environmental education. As a result this community was awarded in 1997 with the Green Certificate by the Forest Stewardship Council.

CONCLUSIONS

Through the proposal of comprehensive management of community territory of Cano Cruz, helps to enrich the local compression on the importance of sustainably using wildlife under the system of UMA. But in a fundamental way to socialize the significance of conserving their natural heritage.

While sport hunting in the UMA Cano Cruz has promoted protection of habitat and regulated the use of certain species, we recommend an integrated management of natural and cultural resources under the scheme of communal UMAS as it shows that this system of management tends to a greater state of sustainability.

Accordingly, we propose that integrated UMA is the model to be implemented at community level in Campeche State, this in accordance with its environmental and cultural characteristics, since this scheme of management and sustainable management of natural heritage offers a range of productive opportunities that promote and strengthen local capacity development and the long term conservation of wildlife.

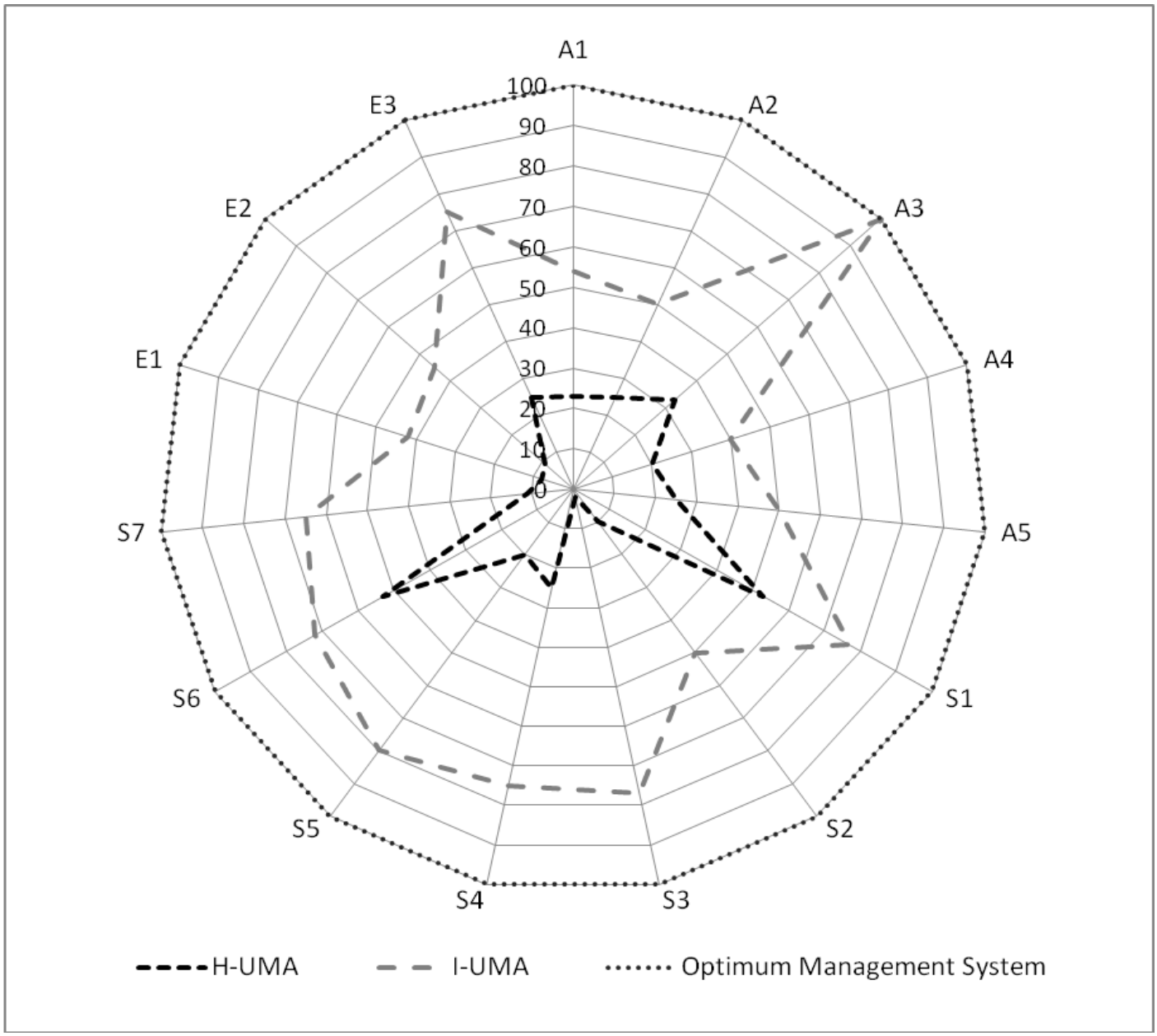

Figure 3. Sustainable analysis for Cano Cruz UMA: In its mode as sport-hunting UMA (H-UMA) *versus* integrated management system (I-UMA). Figure describes a significant increment of sustainability base on diversified management and holistic approach. Axes were standardized in percentage with the highest score value of 100%. Environmental indicators: A1 to A5; Social indicators: S1 to S7; Economic indicator: E1 to E3.

ACNOWLEDGEMENTS

We are thankful to CONACYT (FOMIX-CAMPECHE 2007) which sponsored the present project CAMP-2007-C01-72355. We also thank people from Cano Cruz community for their enthusiastic participation and all students from Laboratoy of Wildlife Management (CEDESU, UAC). In particular we thank Dr. Linda Russell and Dr. Chris Mason, for their valuable comments and suggestions on this manuscript.

REFERENCES

Anderson K, YF Hurley (1987). Planificación de Programas para la Gestión de la Vida Silvestre. Pp 479-495. In: Rodríguez T R (ed), Manual de Técnicas de Gestión de Vida Silvestre. The Wildlife Society, Inc. USA.

Bocco G, A Velásquez, YA Torres (2000). Ciencia, Comunidades Indígenas y Manejo de Recursos Naturales. un Caso de Investigación Participativa en México, Interciencia 25 (2): 64-70.

Chambers R (1994). The Origins and Practice of Participatory Rural Apprasial, World Development 22 (7): 953-969.

Flores S, El Espejel (1994). Tipos de vegetación de la Península de Yucatán. Etnoflora Yucatanense. Fascículo 3, Universidad Autónoma de Yucatán, México.

García MG, G Escalon, H Van der Wal (2008). Multicriteria evaluation of wildlife management units in Campeche, Mexico. Journal of Wildlife Management 72(5): 1194-1202.

Goggins P, K Christie, K Anderson, K Warner, C Lombard, O Fenderson, F Kircheis (1971). Planning for Maine Fish, Wildlife, and Marine Resources. Maine Dept. Inland Fish. and Wildl. Maine Dept. Sea and Shore Fish., Augusta, USA.

González MR, R Montes, YJ Santos (2003). Caracterización de las Unidades para la Conservación, Manejo y Aprovechamiento Sustentable de Fauna Silvestre en Yucatán, México. Tropical and Subtropical Agroecosystems 2: 13 – 21.

INE (2000). Estrategia Nacional para la Vida Silvestre. Logros y Retos para el Desarrollo Sustentable 1995-2000. Instituto Nacional de Ecología-Secretaría de Medio Ambiente, Recursos Naturales y Pesca. México, D. F.

INEGI (2005). II Conteo de población y vivienda 2005. Datos por localidad.

León P, YS Montiel (2008). Wild Meat Use and Traditional Hunting Practices in a Rural Mayan Community of the Yucatan Peninsula, Mexico. Human Ecology 36: 249–257.

Millennium Ecosystem Assessment (2005). Ecosystems And Human Well-Being: Biodiversity Synthesis. World Resources Institute, Washington, D. C.

Masera O, M Astier, YS López (2000). Sustentabilidad y Manejo de Recursos Naturales. Marco de evaluación MESMIS. Mundi- Prensa-Grupo Interdisciplinario de Tecnología Rural Apropiada, A. C. México, D. F.

Méndez CF, YS Montiel (2007). Diagnóstico preliminar de la Fauna y Flora Silvestre utilizada por la población Maya de dos comunidades costeras de Campeche, México. Universidad y Ciencia 23 (2):127-139.

Redford K, YJ Robinson (1997). Usos Comerciales y de Subsistencia de la Vida Silvestre en América Latina. Pp 23-42. In: Robinson, J y K, Redford (Comps.). Uso y Conservación de la Vida Silvestre Neotropical. Fondo de Cultura Económica. México.

Retana O (2006). Fauna Silvestre de México. Aspectos Históricos de su Gestión y Conservación. Fondo de Cultura Económica-Universidad Autónoma de Campeche. México.

Retana O, C Ballesteros, J Vargas, R Noriega, M Aguilar, G Niño, Y Vidaña, E Victoria, YR Góngora (2010). Uso de la Vida Silvestre y Alternativas de Manejo Integral en Comunidades Rurales del Norte de Campeche. Universidad Autónoma de Campeche. Centro de Estudios de Desarrollo Sustentable y Aprovechamiento de la Vida Silvestre (CEDESU). Informe final Fomix-2007. Proyecto CAMP-2007-C01-71355. Campeche, México.

Sarukhán J, P Koleff, J Carabias, J Soberón, R Dirzo, J Llorente, G Halffter, G González, I March, A Mohar, A Anta, YJ de la Maza (2009). Capital natural de México. Síntesis: conocimiento actual, evaluación y perspectivas de sustentabilidad. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, México.

SEMARNAP (1997). Programa de Conservación de la Vida Silvestre y Diversificación Productiva en el Sector Rural. Secretaria de Medio Ambiente, Recursos Naturales y Pesca .México.

Stokes JD, J Delisle, YJ McCormick (1968). Fish and Wildlife Resource Planning Guide. California Dept. Fish and Game.USA.

Taylor D, C Abidin, S Nasir, M Ghazali, E Chiew (1993). Creating a farmer sustainability index: A Malaysian case study. American Journal of Alternative Agriculture 8 (4): 175-184.

Toledo V, N Barrera, E García, YP Alarcón (2008). Uso Múltiple y Biodiversidad entre los Mayas Yucatecos. México. Interciencia 33(5): 345-362.

Villareal S (2006). Primer Seminario de Unidades de Manejo para la Conservación de la Vida Silvestre en el Sureste de México. Simbiosis, SA de CV. Quintana Roo, México.