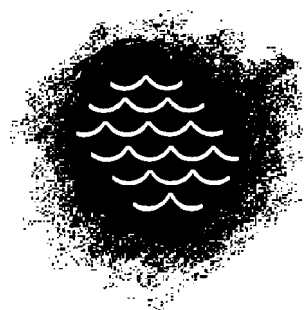


SUSTAINABILITY DEVELOPMENT ANALYSIS OF SEMI-INTENSIVE SHRIMP FARMS IN SONORA, MÉXICO



O. H. A. González,^{1*} L. F. Beltrán¹, C. Cáceres-Martínez,² H. Ramírez,²
S. Hernández-Vazquez,¹ E. Troyo-Dieguez¹ and A. Ortega-Rubio¹

¹ Centro de Investigaciones Biológicas del Noroeste, La Paz, México

² Universidad Autónoma de Baja California Sur, La Paz, México

During the year 2000, 12 modified and five new sustainable development indicators (SDIs) were applied and a sustainable index (SI) was developed for 21 out of the 33 semi-intensive shrimp farms in Sonora, Mexico, to measure their sustainable development. Farms 5, 7 and 19 showed the highest values in social indicators, farms 5, 7 and 19 in the economic indicators and farms 2, 3 and 4 in natural indicators. In contrast farms 9, 16 and 17 obtained the lowest values in social indicators, farms 3 and 11 in the economic indicators, and farms 9, 11 and 16 in natural indicators. In the SI, farm 9 obtained the lowest value, farm 20 the highest, and most farms values between 6 and 7. In Sonora most of the semi-intensive shrimp farms avoided adverse impacts on the environment by constructing on salty or arid lands with no mangroves. Most of the projects are

communal and benefits go directly to the population, giving Sonora, in comparison with other regions, a more sustainable development. Copyright © 2003 John Wiley & Sons, Ltd and ERP Environment.

Received 3 May 2001

Revised 26 March 2002

Accepted 4 April 2002

INTRODUCTION

In the past few years, aquaculture production has reached 30 863.067 tons (1998) and 2.5% of this production comes from the marine shrimp culture, which represents 770.997 tons (Dirección General de Acuicultura, 1999). Mexico produces 11% of this partial production (Barg *et al.*, 2000). Data shows that aquaculture contributes greatly to global food production (Kendall and Pimentel, 1994). It has also played an important role in the economic development of poor countries (Randall and Williams, 2000).

On the other hand, evidence of environmental impacts by aquacultural activities is well documented (Braaten, 1991; Gowen and Rosenthal, 1993; Phillips *et al.*, 1993; Teichert-

* Correspondence to: H. A. Gonzalez Ocampo, Centro de Investigaciones Biológicas del Noroeste, S. C. Apdo Postal 128, La Paz, BCS, México, CP 23000. E-mail: hgocampo@cibnor.mx