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Aquaculture in desert and arid lands

Development constraints and opportunities

FAO Technical Workshop
6–9 July 2010
Hermosillo, Mexico

Cover photo: Harvesting of Nile tilapia (*Oreochromis niloticus*) in a small-scale desert fish pond in Ouargla District, Algeria (courtesy of Valerio Crespi).

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Preparation of this document

This document contains the proceedings of the technical workshop entitled "Aquaculture in desert and arid lands: development constraints and opportunities" held from 6 to 9 July 2010, in Hermosillo, Mexico, and organized by the Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations (FAO) and the Centro de Investigacíon en Alimentación y Desarrollo (CIAD).

The workshop was a direct result of the growing interest by FAO Member countries with vast desert territories within their national boundaries and the desire to make better use of the limited water resources in these areas characterized by harsh climatic conditions. The production of additional animal proteins would contribute to the dietary needs of rural households, as well as generate additional employment opportunities and revenues. This document contains a summary of the workshop, including major opportunities and constraints in the development of desert aquaculture and a series of follow-up and recommended actions for the sector to grow. It also includes a brief global overview on the status and trend of aquaculture development in desert and arid lands and seven reviews from different countries and regions of the world. These reviews provide interesting information on past and recent experiences, as well as ongoing activities on desert aquaculture. The document is written for national authorities (e.g. governments, ministries and research institutions) that are interested in promoting and supporting the development of desert aquaculture, and it attempts to provide a comprehensive review on the main issues specific to this subsector.

This document was prepared under the supervision of Valerio Crespi and Alessandro Lovatelli, Aquaculture Officers, Aquaculture Service (FIRA), FAO Fisheries and Aquaculture Department.

Abstract

Aquaculture in desert and arid lands has been growing steadily over the last decade thanks to the modern technologies and alternative energy sources that have allowed water in these places of extremes to be exploited more effectively and more efficiently, using it for both crop irrigation and production of fish.

This publication presents the evolution of desert and arid lands aquaculture in the past few decades in seven countries and regions (Australia, Egypt, Israel, Mexico, Southern Africa, the United States of America and Central Asia) describing the achievements of a number of farming operations, which demonstrate the significant potential for farming commercial aquatic organisms using geothermal, fresh and brackish waters. The global overview on desert aquaculture development shows, through the use of maps and tables, those countries with vast extensions of arid territories that should be better investigated for potential aquaculture development.

Limiting factors were extensively discussed during the workshop, and several measures were identified and proposed. Desert conditions are characterized by high day temperatures, cold winter nights, high solar radiation, scarce precipitation and very low relative humidity. The experts reached consensus on the definition of aquaculture in the desert and arid lands, which was defined as follows: "Aquaculture activities practised in desert and arid lands characterized by low precipitation (<250 mm/year), high solar radiation, high rate of evaporation, using subsurface and surface water".

At the end of the workshop, a series of recommendations were elaborated by the experts to assist FAO Member countries wishing to generate a favourable national environment to promote sustainable aquaculture development.

Limited water supply remains the single largest constraint for aquaculture development in arid and semi-arid regions; however, where the resource is available, the development of integrated aqua-agriculture systems may certainly provide economic output opportunities from such resource-limited regions. Such farming systems may also enable the production of highly priced fish, vegetables and fruits all year round.

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Abbreviations and acronyms

AASA	Aquaculture Association for Southern Africa
ADU	Aquaculture Development Unit
AI	Aridity index
AISA	Aquaculture Institute of South Africa
AMA	Arizona Mariculture Associates
ASDB	Aral Sea Drainage Basin
AUD	Australian dollar
CA	Central Asia
CBS	Central Bureau of Statistics
CFGC	California Department of Fish and Game
CIAD	Centro de Investigación en Alimentación y Desarrollo
CIBNOR	Centro de Investigaciones Biológicas del Noroeste
CICESE	Centro de Investigación Científica y de Educación Superior de Ensenada
CONAPESCA	National Aquaculture and Fishing Commission
CPISARC	Cooke Plains Inland Saline Aquaculture Research Centre
CSAP	Camdeboo Satellite Aquaculture Project
DAFF	Department of Agriculture, Forestry and Fisheries
DoFWA	Department of Fisheries – Western Australia
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FCDC	Uzbek Research Centre of Fish Culture Development
FCR	Feed conversion ratio
FDA	Federal Drug Administration
FRDC	Fisheries Research and Development Corporation
FTS	Flow-through system
GAFRD	General Authority for Fish Resources Development
GDP	Gross domestic product
GMO	Genetically modified organism
GoB	Government of Botswana
HACCP	Hazard Analysis and Critical Control Point (system)
HE	Haemocytic enteritis
IAAS	Integrated agri-aquaculture systems
IFREMER	Institute français de recherche pour l'exploration de la mer
IISBA	International Initiative for Sustainable and Biosecure Aquafarming
INAPESCA	Instituto Nacional de Pesca
INFOSA	Marketing Information and Technical Advisory Services for the Fisheries Industry in Southern Africa
INWEH	Institute for Water, Environment & Health
ISAARG	Inland Saline Aquaculture Applied Research Group
ISARC	Inland Saline Aquaculture Research Centre
KIFI	Kamutjonga Inland Fisheries Institute
MAWR	Ministry of Agriculture and Water Resources
MDB	Murray-Darling Basin
MFCF	Muynak Fish Canning Factory
MFMR	Ministry of Fisheries and Marine Resources
MIL	Murray Irrigation Limited

MoAG	Ministry of Agriculture and Rural Development
NSW	New South Wales
OAI	Organic Aquaculture Institute
PL	Post-larva
PRONAR	National Programme for the Support of Rural Aquaculture
R&D	Research and development
RAS	Recirculation aquaculture system
SA	South Australia
SADC	Southern Africa Development Community
SAGARPA	Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación
SARDI	South Australia Research and Development Institute
SARS	Severe acute respiratory syndrome
SENASICA	Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria
SGR	Specific growth rate
SIFTS	Semi-intensive floating tank system
SIS	Salt Interception Schemes
SPADA	Special Programme for Aquaculture Development in Africa (FAO)
TAFE	Technical and Further Education, Tertiary Education Institute
TSV	Taura syndrome virus
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNU	United Nations University
USD	United States dollar
USDA	United States Department of Agriculture
USSR	Union of Soviet Socialist Republics
UzAS	Uzbekistan Academy of Sciences
UZS	Uzbekistani sum
WA	Western Australia
WISAC	Waikerie Inland Saline Aquaculture Centre
WMO	World Meteorological Organization
WSSV	White spot syndrome virus
YHV	Yellowhead virus