CIBA e-Publication Series No.13

e-Extension Module on

Tiger Shrimp Aquaculture (e-TSA)

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Introduction

Shrimp aquaculture had a paradigm transformation from its traditional livelihood activity to a commercial, technology driven and entrepreneurial enterprise since late 1980s. This was enabled by the technological, promotional and policy interventions of the government as well as the investments and labour put forth by the industry and entreprenuring farmers. A native species Tiger shrimp (*Penaeus monodon)* has been the major species being cultured with an average productivity of one ton per ha. The outbreak of White Spot Syndrome Virus (WSSV) disease in 1994-95 and continued crop failures led to discontinuance of shrimp farming to the level of 50%. Concentrated efforts of the research and development agencies has resulted in development of Better Management Practices (BMP) for shrimp farming to prevent the entry and spread of deadly pathogens in the culture systems. Similarly BMPs are getting improved constantly by the research institutions to solve the emerging production associated constraints. Moreover, the farmers need to be educated and trained on these BMPs to minimize the production risks and enhance the production. The fishery extension officers are the link pin between the researchers and farmers to transfer the technology to the field and bring feedback on the field situation. However, due to the limited organizational capacity with the fishery extension department and absence of a strong research-extension linkage mechanism, the above mentioned technology transfer and capacity building are in jeopardy. To address this critical gap the Central Institute of Brackishwater Aquaculture (CIBA) has developed a computer based e-Extension module to strengthen the technical capacity of fishery extension workers to help the farming community.

e-Extension Module on Tiger Shrimp Aquaculture (e-TSA)

The e-Extension Module on Tiger Shrimp Aquaculture abbreviated as 'e -TSA' was developed using MS Access as back-end database and MS Visual Basic 6.0 as front-end programming application. Better Management Practices (BMPs) of tiger shrimp (*Penaeus monodon*) farming is the subject matter covered in 'e-TSA'.The subject matter on shrimp farming practices is organized under ten modules viz., site selection, pond design and construction, pond preparation, seed selection and stocking, feed management, water quality management, health management, waste water management, harvest and post harvest management, and shrimp farm bio-security.All the modules of 'e-TSA' can be accessed from the home page interface (Fig-1). Each module is further divided in to one or more levels with further details under a particular subject as given in the Fig-2. At each level both textual and pictorial information is provided for the easy understanding. During the development of 'e-TSA', special care was taken to design the user interface to keep it as simple and self-explanatory.

- The user can navigate to home page from any page of the 'e-TSA'. For this purpose, 'HOME' button is provided in all the pages of 'e-TSA'.
- 'EXIT' button is provided in all the pages of 'e-TSA' so that the user could come out of the system at any point of time.
- All the pages in 'e-TSA' are provided with 'HELP' menu to assist the user on the operation of 'e-TSA' as and when required.

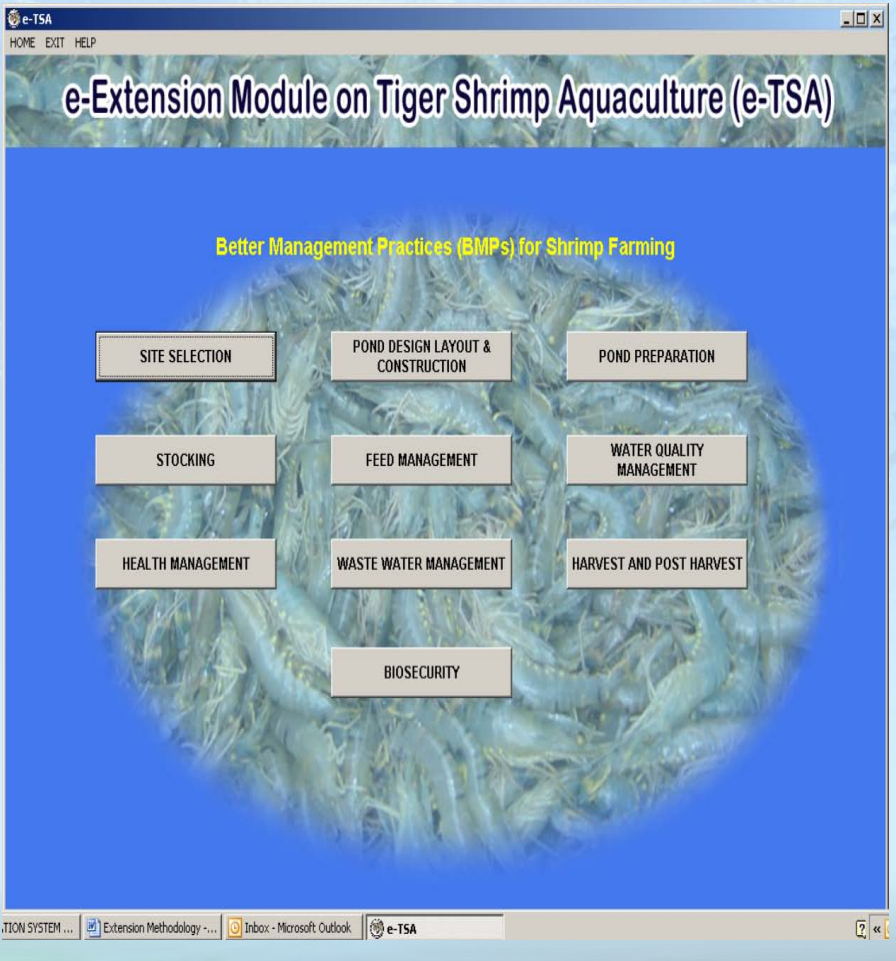

Fig - 1. Home page interface

Fig-2: Module description of 'e-TSA'

Name of the Module	Level -1	Level-2	Level-3
Site Selection	Site location		
	Soil quality		
	Water quality		
	Site elevation and infrastructure facilities		
Pond Design Layout and Construction	Peripheral dyke		
	Water intake and drainage system		
	Culture pond		
	Reservoir and ETP		
Pond Preparation	Cleaning of pond bottom		
	Reconditioning the pond bottom	Liming	Lime requirement calculator
	Enhancing natural food	Fertilization	Fertilizer calculator
	Chlorine requirement	Chlorine requirement calculator	
Stocking	Seed quality		
	Packing and transport		
	Acclimatization and release		
	Stocking density		
Feed Management	Feed quality and sampling of shrimp		
	Monitoring of feed intake and Feeding frequency		
	Feed size and feeding rate		
	Daily feed requirement and Feeding schedule	Daily feed requirement calculator	
Water Quality Management	Water exchange		
	Aeration		
	Liming and fertilization		
	Application of chemicals		
Health Management	1. Variables to Monitor 2. Shrimp Disease Diagnosis		
Waste water Management	Waste water treatment		
	Farm waste water standards		
Harvest and Post-Harvest	Harvest		
	Emergency harvest		
	Post-Harvest		
Bio-Security	Bio-security definition		
	Standard operating procedures (SOP)		
	Managing vectors	Vector	
		Bio-security risk	
		Possible remedies	Photograph for each remedy

Health Management Module

A detailed health management module which imitates the reasoning processes and knowledge of experts to solve the problems. is incorporated in e-TSA. A prediction rule is included for shrimp disease diagnosis. Each rule has two sections-a symptom pattern section and an action section, in the form of 'IF symptom pattern A, THEN the disease B', for example, IF shrimps often observed near the surface of the water, AND white spots or patches under the carapace THEN the shrimp suffered the White Spot Disease. A hierarchical logical and reasoning procedure is inbuilt for disease diagnosis (Fig. 3) wherein, the knowledge is organized in a decision tree, with nodes at different levels. The most general level is the shrimp behaviour, while at the lowest level node is the shrimp disease are represented. Based on extensive research and consultations with experts the shrimp behaviour, exoskeleton texture, appendages, musculature, gills and body colour are taken as features for disease identification (Fig-3). Adequate care is taken to present appropriate combinations of symptoms for identification of a particular disease. Nevertheless, the recommendation of 'e-TSA' for any particular disease is only a probabilistic and need to be confirmed with appropriate laboratory tests.

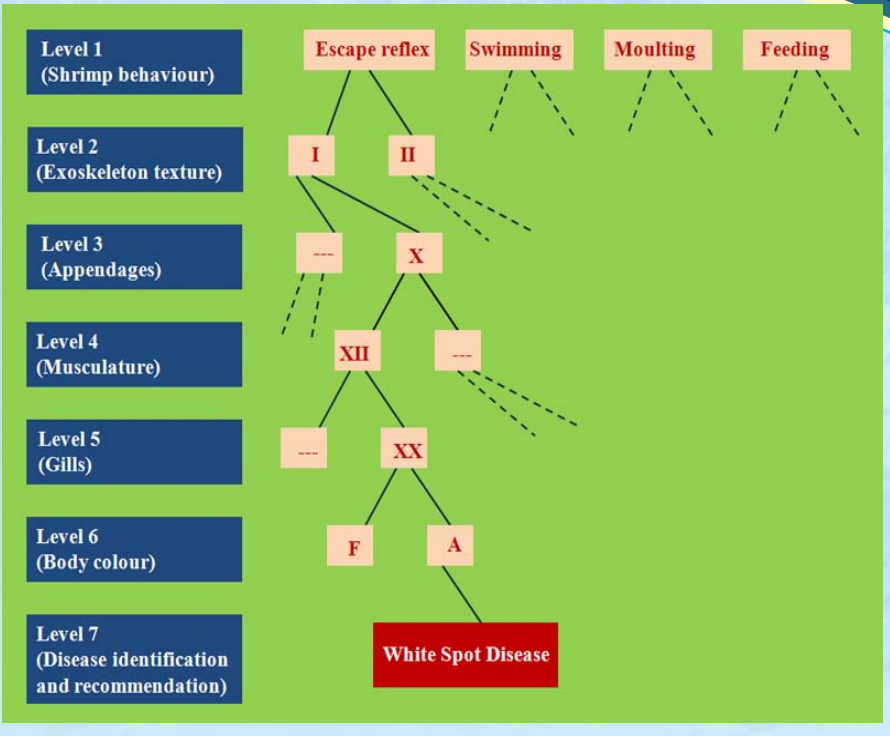

Fig. 3. Hierarchical classification tree for shrimp disease diagnosis

The shrimp health management module contains three components viz., health management strategy, variables to be monitored and shrimp diagnosis and management. The disease diagnosis module contains a list of 20 symptoms and by choosing appropriate symptom(s), the probable disease is identified. The disease identified can be verified with the photograph(s) given in the menu. Disease description (disease name, cause, and symptom) and disease management (treatment and prophylaxis) components are also included in the module as given in the flow diagram and figure 5,6,7 & 8.

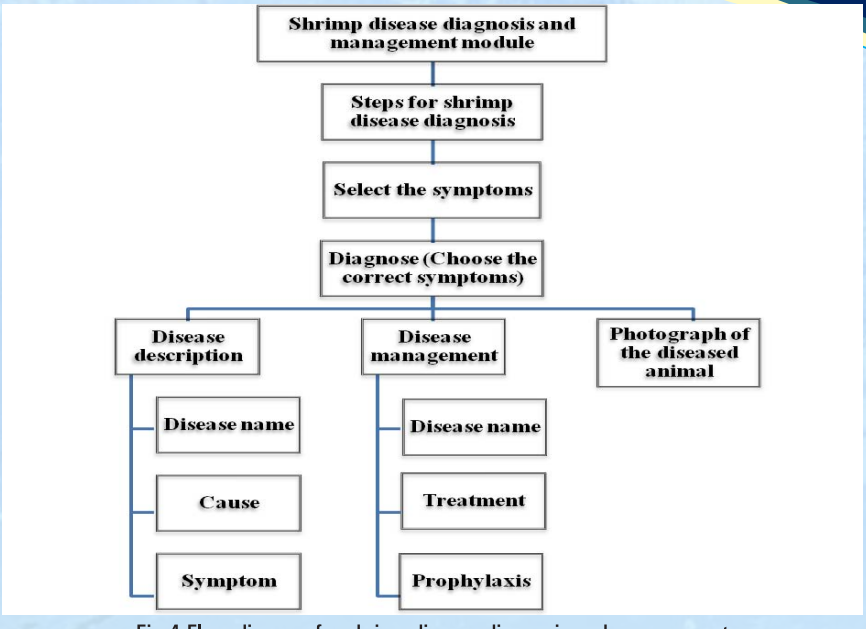

Fig.4 Flow diagram for shrimp disease diagnosis and management

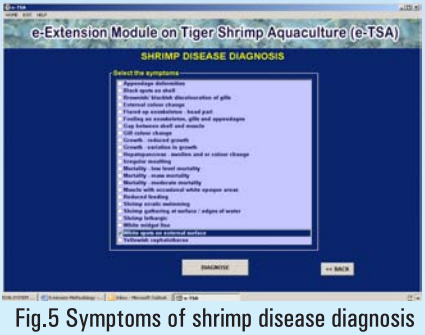

Fig.5 Symptoms of shrimp disease diagnosis

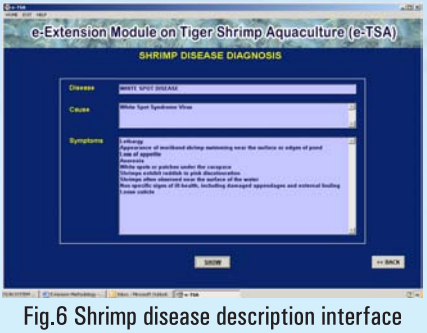

Fig.6 Shrimp disease description interface

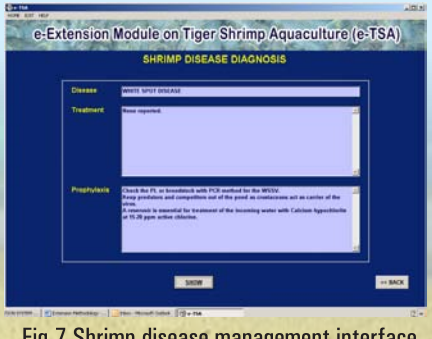

Fig.7 Shrimp disease management interface

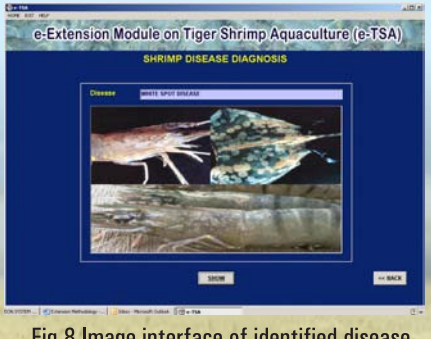

Fig.8 Image interface of identified disease

Validation of 'e-TSA'

The effectiveness of 'e-TSA' as a tool for knowledge dissemination was evaluated in terms of knowledge gain among the selected extension workers by means of a teacher made knowledge test. The test was administered to the respondents independently before exposure to 'e-TSA' and after exposure to assess the knowledge gain. The mean knowledge gain of the extension workers after exposure to 'e-TSA' is 48%. 'e-TSA' is perceived as highly informative, easy to use, less complex and compatible. It was validated as high for its technicality, feasibility and user friendly design.

Installation Process of e-TSA in User's PC

'e-TSA' is developed as a software package in the form of '.exe' setup file through 'Pack and Go Wizard' of VB 6 and stored in the Compact Disc (CD) for distribution and installation in other computers. For a user to use the extension module e-TSA in his computer, it needs to be installed in the computer. The minimum system requirements for e-TSA to be installed in the computer are:

Processor	: Pentium – III or above
Operating system	: Windows 2000 and above
Internal memory	: 128 MB RAM
Hard disk optical Drive	: CD-ROM Drive
Hard disk free space	: 30 MB
Ideal monitor display	: 1024 x 768 pixels

To install e-TSA in the computer, the following steps needs to be followed:

1. Insert the e-TSA installation CD into the CD-ROM drive of the computer. The CD would start automatically.

   In case, the CD does not start, go to "Start", click "Run" and type in d:\setup.exe (where d: is user's CD-ROM drive). Or else open up the CD-ROM drive from 'My Computer' icon in the Windows Desktop and click on 'setup.exe' file for installation of e-TSA.

2. The screen showing 'Install e-TSA' or 'EXIT' appears.
3. Click on 'Install e-TSA' to begin installation of e-TSA.
4. Follow the onscreen instructions of the setup Programme to finish the installation process.
5. After installation, e-TSA could be accessed from Start menu Programs tab.

Citation : Alagappan. M, Kumaran. M, Ravichandran. P, Alavandi. S.V, Muralidhar. M and K. Ambasankar. 2012. e-Extension Module on Tiger Shrimp Aquaculture (e-TSA). CIBA e-Publication Series No.13. Central Institute of Brackishwater Aquaculture, Chennai, P_{12}.