Rice-Fish Culture in China

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Fish culture in paddy field was an ancient farming practice found in several rice-growing areas, such as Sichuan and Guizhou Provinces, in South and Southwest China. It can be dated back to nearly twenty centuries ago. In traditional rice-fish culture practice, rice cultivation was the main activity of farmers, while some fish seeds were stocked in paddy fields and looked after extensively, merely for the purpose of having additional animal protein food for household consumption by farmers. From the 1950's to late 1970's, this once common practice faded out considerably as a result of introduction of planned economy run under rural communes and later the increase in use of chemical fertilizers and pesticides. When economic reform was started in 1978 and farmers began again to decide again what they could do the best with their land for their families, some farmers chose to resume fish culture in their paddy fields just as their ancestors had done.

Development in the past two decades

In 1983, a national field seminar on rice-fish culture was conducted for the first time. As a result, the socio-economic and ecological benefit of rice-fish culture started to draw the increasing attention of farmers and various public sectors. A series of follow-up actions recommended during the seminar lead to the gradual spread of rice-fish culture from its traditional homes to areas where it was not practiced in the past. Eventually, rice-fish culture emerged as an important rural farming system by the early 1990's. Its role in alleviating rural poverty and improving the rural economy, especially in remote provinces and regions, was widely recognized.

Sumps provide a refuge for fish and a reservoir during the dry season

In the 1990's, rice-fish farming enjoyed a rapid expansion in the number of new entries and total area of rice-fish production area in the country. The farming system has extended from pluvial and warm provinces in South, Southeast, Central and East China to the Northeast and Northwest China, including several economically less developed regions, such as Xinjiang Urgur Autonomous Region, Inner Mongolia and Gansu Province. During the course, it evolved from traditional family-scale extensive operations towards medium-to-large scale or even commercial scale operations in selected provinces. The rapid expansion of rice-fish farming was the immediate result of the growing interest and enthusiasm among farmers in the rice-growing areas, coupled with the continuous collective supporting efforts from the public sector such as provision of relevant extension and advisory services to farmers, application of policy incentives and better accessibility to loans for renovation of conventional paddy field to suit fish culture and four nation-wide rice-fish culture field seminars.

By 1999, the area of rice-fish farming in China reached 1,464,094 ha, an increase by 71.6% from 853,000 ha in 1994. The rice-fish farming area further expanded to 1,528,027 ha 2001. Food fish production from paddy field increased from 206,900 tons in 1994 by 214% to 649,996 tons in 1999. The food fish production from rice field increased to 849,055 tons in 2001. The increase in food fish production from paddy was not at the cost of rice yield reduction. Instead, rice yield from the rice-fish farming attained an average increase of 225 kg per ha over the period 1994-1999.

Farming systems

The technological advances borrowed from pond aquaculture and the changes in market demand have lead to the changes in the rice-fish farming practices including the species used and the scale of operation. To maximize

the use of natural productivity in the paddy field space for the optimal economic returns, various rice-fish culture models with variations of integration with crop and animal species were developed through field trials by farmers in different parts of the country according to the local conditions and available resources.

Several newly developed rice-fish culture models with desirable economic return became popular among farmers, and the examples include the culture of high-value fish species with rice in Chongqing suburb, giant freshwater prawn culture with rice in Jiangsu Province, native freshwater shrimp culture with rice in Shanghai suburb and Chinese mitten-handed crab in Liaoning Province. With intensified management and increased input, including artificial feeding, rice farmers could gain an average annual net profit of USD 1,813 per ha from the animals they raise in their paddy with these new models.

Paddy field renovation

At present, most paddy fields used for rice-fish culture have been renovated to varying degrees in favor of fish growth. The renovation usually includes the excavation of ditches and sumps as shelter for fish and building of higher and wider dikes. About 10-20% of the total area is converted for these purposes. Paddy fields with such renovations on average could produce at least 7,500 kg of rice and 750 kg of fish per ha without artificial feeding. The fish yield can be significantly increased as farmers develop better skills in handling their fish and increase their inputs, such as fish seeds and feed, into the system.

Fish species used in rice-fish culture

In the past two decades, the fish species employed in rice-fish culture as a whole have changed from simple species combination, such as Chinese carps and common carp, into a multi-species combination. Both monoculture and polyculture are adopted. Nowadays, a great diversity of aquatic animal species is found in the rice-fish culture systems, adapting to the wide range of farming systems and market environment in different parts of the country. Apart from the traditional finfish species, crustaceans, amphibians, mollusk and reptiles became common in rice-fish culture. The general trend is shifting from low value carp dominated species towards species that could fetch higher market price. Currently, the popular species for rice-fish culture in China are Chinese carps, tilapia, swamp eel (Monopterus albus), eel (Anguilla japonica), giant freshwater prawn (Macrobrachium rosenbergii), native freshwater shrimp (M. nipponensis), Chinese mitten-handed crab (Eriocheir sinensis), Letiobus cyprinelus, American frog (Rana nigromaculata), Crucian carp (Carassisu auratus,), snakehead (Oxyeleotris marmorata), loach, catfish (Misgurnus anguillicaudatus, Clarias leatheri, Silurus meridionalis), soft-shell turtle (Trionyx sinensis) and edible snail.

Development of large-scale rice-fish culture

Although China is a vast country, it has the world's largest population and its land resources for crop farming and aquaculture development are limited for further expansion by area. Rice-fish culture is an effective way of land utilization for food fish production with nominal competition with other agriculture activities for land and water resources. Taking 1999 as example, the fish production from paddy field in that year was 650,000 tons. It was equivalent to the fish production from 86,667 ha of fish ponds with the yield of 7,500 kg/ha. It is estimated that about 6.7 million ha of paddy field in China has the potential for conversion into rice-fish culture. If half of these paddy fields are used for rice-fish culture, it is equivalent to the fish production from 200,000 ha of fish ponds based on the present-day fish yield level.

Rice-fish culture is a relatively easy, low-cost and low-risk entry point for rural farming communities to improve their livelihood and household income without jeopardizing the sustainability of rice production. Compared with pond-based aquaculture, rice-fish culture is less restricted by initial capital investment and labor requirement. Rice-fish culture is now used widely as an alternative livelihood improvement and poverty alleviation.

In the 1990's, China has undertaken a series of mass campaign of rice-fish culture extension. Several standardized paddy field renovation models were recommended and widely adopted. It turned out that farmers with their paddies renovated became less vulnerable to flood and drought. For instance, in rice-fish-duckweed-lotus-water cane-chufa-vegetables integration, the recommended renovation includes an increase in dike height to 80-100 cm, the excavation of a 120-150cm deep sump and 50-70cm deep ditches. The sump, sometimes

brick and cement walled for durability, accounts for 7-10% of the paddy field area while the ditch occupies 3-5% of the total area. Each hectare of paddy filed with such renovation could store up to 7,500m3 of water during rainy season. The sump could be used as reservoir for watering vegetables in dry season.

Effective extension service at various levels, financial support and incentive policy by government have played important roles in the wide spread of rice-fish culture in China in the past two decades. At present, the government has formed a national fisheries extension network and extension activities are carried out at four different levels under the National Fisheries Extension Centre, namely provincial, prefecture, county and township levels. In some places, extensions officers also help to secure fish seed supply and marketing information for farmers. Rice-fish culture has been incorporated into the overall rural development plan and agriculture development plan by many local governments. In less developed and remote regions, financial support in the initial stage is a key factor to help the resource-poor farmers in paddy field renovation and first run operations. Financial support from the government is usually delivered in the forms of construction materials and seeds, etc. Tax exemption is applied to rice-fish culture in places where it is promoted poverty reduction purpose. Such incentive policy should be continued.

It is apparent that small-scale rice-fish culture can bring improved economic benefits to individual farmer families. With more than 60% of China's population occupied in agriculture, there is a need for further extension on rice-fish culture among rural communities on a mass scale, where it is possible, in order that its development can benefit the economy and well being of the whole society. Only when rice-fish culture is practiced on a mass scale will its socio-economic and environmental benefit be realized. Therefore, the need in the immediate future for aquaculture development should include rice-fish culture as one of the top agenda items.

What's New in Aquaculture

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fish; smoked and marinated fishery products; canning; silage; packing; quality assurance, HACCP and sensory evaluation.

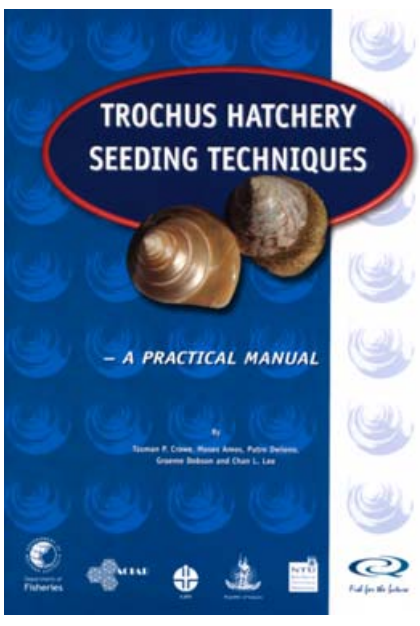
Available from: Directorate of Information and Publications of Agriculture (DIPA), Krishi Anusandhan Bhavan, Pusa, New Delhi-110012, Phone: 91-11-25731350, Fax : 91-11-25731282, http://www.icar.org.in/icar6.htm

Conclusion: Recommended. This book provides a useful insight into manufacturing processes and their impact on product life, quality and nutritional value.

Trochus hatchery seeding techniques – a practical manual

T.P. Crowe, M. Amos, P. Dwiono, G. Dobson and C. Lee.32pp.

This manual is written for the general public, fisheries extension officers and artisinal fishermen. It aims ot provide a basoc overview of the biology of trachus and its production in aquaculture facilities. It also summarises the findings nd protocols of the ACIAR Truchus Reseeding Research Project in practical terms. The manual contains sections on i) the biology and life cycle of trochus, ii) hatchery production of trochus and iii) reseeding of trochus. The manual addresses practical issues such as how to spawn and raise the shellfish, selection of suitable sites, size of trochus at release, how to improve survival and packing and handling. It includes a reference section for readers who wish to explore topics in more depth.



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Conclusion: A useful introductory manual and a good starting point for people wishing to become involved in trochus culture.

Aquaculture Compendium - case study component

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developed from published materials from our Compendium partners (AIT, IoA, NACA and WAS), and collaborators (MRC, STREAM), with discussions on-going with other potential collaborators (Deacon University, FAO, SEAFDEC, WorldFish Center). Although it is CABI's intention to cover case studies in other selected countries more fully in subsequent editions of the Aquaculture Compendium, it would benefit the first release of the Compendium if it were to have wider case study coverage. I intend to "cherry pick" systems and issues of particular relevance and interest from around the world so do contact me if you wish to contribute.

Formats and examples of case studies are in preparation. Each case study is to be brief, about 10 pages, with summarized text and bullet points. There will be a standardised table of contents for growout production systems although for other topics it will be flexible because of diverse content. Case studies will be richly illustrated with photographs, tables and graphs.

For more information contact Martin Parr at m.parr@cabi.org. Specifically for case studies, contact Peter Edwards pedwards@inet.co.th. Contributors will receive a small honorarium to express appreciation for their input to the Compendium.