



# World Aquaculture Singapore 2022

## NEXT GENERATION AQUACULTURE

**INNOVATION AND SUSTAINABILITY WILL FEED THE WORLD**

**Nov. 29 - Dec. 2, 2022**

Singapore EXPO Convention & Exhibition Centre  
and MAX Atria

The Annual International Conference & Exposition of  
World Aquaculture Society

Asian Pacific Aquaculture 2022

- Annual Meeting of Asian Pacific Chapter, WAS

Hosted by Singapore Food Agency

Conference Sponsors

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3rd International Symposium on Perch and Bass



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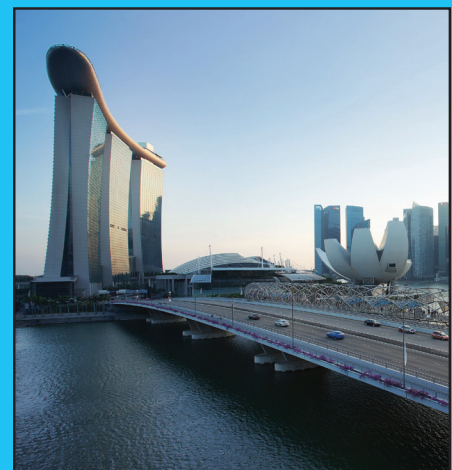
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# Welcome Message for World Aquaculture 2022

Warmest greetings to everyone

On behalf of the Singapore Food Agency (SFA) I like to welcome everyone to Singapore for World Aquaculture 2022. This conference was originally intended to be held in Singapore in 2020. But the Covid-19 pandemic resulted in the conference being postponed until 2022. Therefore, we are really pleased to be able to welcome you to Singapore.

Despite your busy schedule during WA 2022, I hope that you will get the chance to do some sightseeing and try our local cuisine. We have a diverse range of food in Singapore. However, as Singapore is a small country, most of our food has to be imported. Therefore, food security is an ongoing concern for us. To ensure a stable supply of safe food, the Singapore Food Agency has embarked on a 30 by 30 goal to locally produce 30% of our nutritional needs by the year 2030. While this appears to be an ambitious goal, we believe that it can be achieved.

One of the cornerstones of our 30 by 30 goal is aquaculture. We aim to increase the volume of aquaculture products produced in Singapore by 2030. To achieve this, we want to transform our traditional net cage way of farming into high tech and highly productive fish farms where we can make use of the latest technology and farming methods to increase output.

Therefore, it is with this background that we are happy to host World Aquaculture 2022 in Singapore. We want to take this opportunity to learn from you and to also share with you the opportunities for fish farming and research & development in aquaculture in Singapore. Despite our small size, Singapore has a lot to offer.

Finally, I like to thank the conference organizers, participants from the industry, the various government agencies and all who have contributed to the planning and organization of this Conference. Thank you for your efforts and hard work.

Let us all make World Aquaculture 2022 a resounding success.

Thank you very much.

A handwritten signature in black ink, appearing to read 'Hon Keong', written over a horizontal line.

Dr Leong Hon Keong  
Co-Chair of WA 2022

# WELCOME MESSAGE

Dear All,

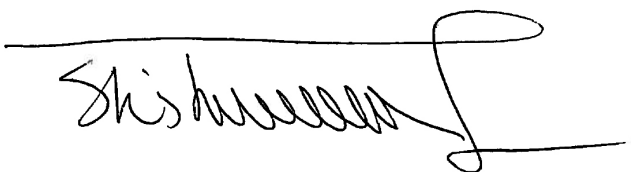
Welcome to the World Aquaculture 2022 Conference. It is an honour for us to host you in the beautiful Singapore. We are confident that during the following days, all of you will have plenty of opportunities to share knowledge and experiences, meet old friends, make new ones; and eventually start new businesses. Such moments in our academic and business careers are contributing to the exciting growth and the development of sustainable aquaculture globally. As you will see, the conference will offer some of the greatest opportunities to access key players of aquaculture in Asia and to network with experts travelling from all over the world to Singapore.

Being the world leading aquaculture association, it has been important for the World Aquaculture Society (WAS) to organize this global event in Singapore, a global hub for business and knowledge exchange. Our combined trade show and scientific conference reflect our commitment to consolidate the linkage between academia and industry as a basis for innovation.

We would like to thank the Government of Singapore and its agencies for all the supports received, especially the Singapore Tourist Board and the Singapore Food Agency. We extend our acknowledgements to the steering committee and program committee members for their hard work in preparing the event. Finally, we would like to thank all our sponsors and exhibitors for being part of the WAS family and making this event a success.

The Garden City is one of the most conducive business environments globally, providing us with incredible amenities, cultural diversity and outdoor activities. With so many varieties of food and culture, Singapore is a home to some of the best gastronomy in the world. This necessarily includes some of the locally produced aquaculture products. We are confident that this will be an unforgettable event for everyone!

Enjoy World Aquaculture 2022!



Dr. Farshad Shishehchian



Dr. Guillaume Drillet

Co-Chairs of the World Aquaculture 2022

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# ABSTRACTS

## **PADDY CUM FISH INTEGRATED FARMING TO SUSTAINABLE AQUATIC FOOD PRODUCTION: A CLIMATE-SMART APPROACH FOR LOW LYING AREAS IN ASSAM, INDIA**

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Assam is a state in northeastern India where paddy is a major crop and the staple food for almost all households. About 75% of the state population is directly or indirectly dependent on agriculture, while about 69% of the workforce in the state is engaged in agricultural activities. The traditional practice of raising fish in the paddy fields probably began with the beginning of paddy cultivation itself in the region because the waterlogged paddy fields create a natural habitat for fish. However, over the years, the practice has evolved with recognition of its multi-ecological benefits. In Assam, paddy-fish integration is mostly practiced in flooded river basins, unmanageable vast waterlogged areas, and perennial waterlogged wet paddy lands. Fishes enter the paddy fields during monsoon and grow along with paddy. Fishing activities start after the recession of water during November-December and the farmers use various fishing gears and indigenous traps either operated in the paddy-free spots of the field or are fixed at appropriate water entry and exit points in the fields. These lands often remain dry from December to April. Physically, the aquatic phase starts from May to November and possesses varying water depths depending on land topography, local rainfall patterns, water tables, soil quality etc. The paddy-fish integration in Assam can broadly be classified into three categories viz., perennial system, synchronous refuge pond system and enclosure system. In the perennial paddy fish farming system, a single crop of fish is raised along with two crops of paddy viz. *Ahu* (autumn paddy) and *Sali* (winter paddy) cover nearly both seasons. In a synchronous refuge pond system, the fish crop is raised synchronously with *Sali* paddy during the monsoon period. In the enclosure system, the fish crop is raised with deep water paddy (*Bao*) in deep water areas by enclosing the plot with pegged screens. Traditionally, the waterlogged paddy fields were one of the most common fishing grounds for small indigenous fish species (SIS) for the rural people of the region during the wet season (June to November). Hence, the paddy fields were the major source of SIS production and were contributing to household nutrition in rural areas. It is an extensive level of farming practice using low to moderate input technology. In the World Bank-funded APART project, WorldFish and Govt. of Assam are working together to improvise the traditional paddy-fish culture system through multi-locational demonstrations at farmers' fields with the objectives of introducing climate resilient paddy-fish integrated farming for improving the livelihood, income, and nutrition of smallholder farmers along with gender-equitable employment. The cost and return evaluation showed that the paddy-fish culture is much more profitable than the mono-crop paddy. The integrated paddy-fish systems have high reliability and stability and therefore better adapted to future changes. Paddy-fish systems are promising climate resilient models for climate changes and challenges that will reduce risks for smallholders and maintain productivity and sustainability.