Course Outline

Annual International Training Course

1. Course Title:

Resilient Freshwater Aquaculture: Sustainable Management, Climate Adaptation, and Green Economy for Food Security

2. Duration:

2 weeks (10 training days), Tentatively on 14 - 27 September 2026

3. Background:

Aquaculture plays a significant role in food security, rural livelihoods, and economic development across the Global South. Catfish and tilapia are among the most important freshwater fish species cultivated in Asia and Africa. However, challenges such as poor genetic quality, disease outbreaks, low productivity, and fragmented value chains hinder the potential of this sector.

This training course, hosted by Kasetsart University in collaboration with Betagro Group, aims to build capacity in sustainable freshwater aquaculture with a focus on advanced fish breeding technologies, particularly genomic selection. Participants will explore innovative approaches such as **data-driven fish breeding**, **smart feeding systems**, and **precision aquaculture** to enhance productivity and genetic gain.

Integrated modules on **urban aquaculture**, **wastewater management**, and **recirculating aquaculture systems (RAS)** will highlight scalable solutions for space- and resource-efficient production, especially in urban and peri-urban settings. In addition, the course will introduce basic tools for **aquaculture value chain analysis**, promote **food safety**, and explore **alternatives to fresh water-sourced food** as part of climate-resilient and bioeconomy-oriented aquaculture strategies.

A special emphasis will be placed on **freshwater fish genetics** and **fish therapeutics** for managing emerging aquatic animal diseases. This interdisciplinary training supports Thailand's commitment to the Sustainable Development Goals (SDGs), particularly **SDG 2 (Zero Hunger)**, **SDG 9 (Industry, Innovation, and Infrastructure)**, and **SDG 17 (Partnerships for the Goals)** by equipping participants with practical skills and strategic thinking for aquaculture development in their respective countries.

Organization/Institution

Kasetsart University, in collaboration with Betagro Group and KSGtEC (Kasetsart University-Salus Biomed-Gibthai Collaborative Excellence Center for Agricultural and Environmental Genomics)

4. Objectives:

1) Participants have increased technical capacity to independently design and implement genetic improvement programs for catfish and tilapia, using genomic and data-driven methodologies, leading to measurable productivity and sustainability improvements.

2) Participants successfully apply precision aquaculture technologies (smart feeding systems, wastewater management, and recirculating aquaculture systems) adapted to their local contexts, resulting in enhanced operational efficiency, reduced environmental impacts, and improved economic outcomes.

3) Participants effectively integrate aquaculture innovation into national strategies and regional value chains, demonstrated by actionable plans or policy recommendations addressing food safety, market expansion, climate resilience, and bio-circular-green (BCG) economic objectives, while strengthening collaborative networks between their countries and Thailand.

5. Course Contents:

The course is designed to provide an interdisciplinary learning experience that integrates genetic improvement, precision aquaculture, and value chain development in catfish and tilapia aquaculture. The key contents include:

- Genetic principles and the design of aquaculture breeding programs
- Applications of genomic selection and data-driven fish breeding
- Smart feeding technologies and precision aquaculture systems
- Urban aquaculture, wastewater management, and recirculating aquaculture systems (RAS)
- Aquaculture value chain analysis from hatchery to market
- Food safety, traceability, and biosecurity in freshwater aquaculture
- Freshwater fish genetics, fish therapeutics, and emerging disease control
- Practical field visits to hatchery and RAS pilot sites, in collaboration with Betagro Group, and KSGtEC (Kasetsart University-Salus Biomed-Gibthai Collaborative Excellence Center for Agricultural and Environmental Genomics)
- Group workshops to develop country-specific breeding and value chain strategies
- Presentations, peer learning, and expert feedback sessions

6. Participants' Criteria:

Applicants must fulfill the following requirements:

- Be nominated by their respective governments;
- **Education:** A Bachelor's degree or higher in aquaculture, fisheries science, animal science, veterinary medicine, biology, or related fields;
- **Language:** proficiency in English (speaking, reading and writing)
- **Work Experience (preferred):** At least 2 years of experience in aquaculture development, breeding programs, fish health, or value chain management;

7. Attendance and Evaluation

Participants who complete the training will receive a certificate based on:

- **Real-time class attendance**: Participants must attend no less than 80% of all sessions.
- **Interactive class participation**: Active involvement in lectures, discussions, and group activities is encouraged and monitored.
- **Presentation and report**: Each participant or group is expected to present their country-specific breeding and value chain strategies and submit a brief summary report.
- **Evaluation**: A final assessment will be conducted through course evaluation forms and facilitator feedback.
- **Post-Training Access**: All participants who successfully complete the program will be granted **free access to the online course platform for an additional 3 months** after the training. This access allows participants to review lecture recordings, course materials, and additional learning resources at their own pace.

8. Venue:

1) Kasetsart University (Bangkok campus)
2) KSGtEC (Kasetsart University-Salus Biomed-Gibthai Collaborative Excellence Center for Agricultural and Environmental Genomics)
3) Betagro Aquaculture Facilities

9. Expected Results:

Upon completion of the course, participants are expected to:

1. **Gain hands-on expertise** in designing and implementing aquaculture breeding programs using genomic and data-driven approaches, with an expected **80% of participants demonstrating improved technical capacity through pre- and post-course assessments**.

2. **Understand and critically evaluate** precision aquaculture tools—such as smart feeding systems, wastewater management, and recirculating aquaculture systems (RAS)—and identify appropriate adaptations to their local or national contexts.
3. **Apply basic value chain analysis** and develop strategies to improve food safety, market access, and climate resilience. At least **70% of participants will submit action plans or policy recommendations** tailored to their country.
4. **Contribute to sustainable aquaculture development** through knowledge-sharing, policy input, or pilot program implementation within six months after course completion, monitored through a follow-up survey.
5. **Strengthen professional networks and regional cooperation**, in line with TICA's development cooperation framework. The course will facilitate **at least 5 new international collaborations** involving Thai institutions and participating countries in areas such as freshwater aquaculture innovation, fish health management, and bioeconomy.
6. **Enhance visibility of Thailand's expertise and services** in aquaculture R&D and capacity building. Through a post-course follow-up, participants will gain continued access to technical resources, expert consultations, and after-training support services from Thai institutions, fostering a "**service mind**" approach aligned with Thailand's role as a regional knowledge hub.
7. **Support TICA's mission** in promoting South–South cooperation by showcasing Thailand's best practices in aquaculture, genomics, and sustainability. Statistical indicators such as participant satisfaction (target ≥ 90%), knowledge gain (≥ 60% improvement), and follow-up engagement rate (≥ 50%) will be used to evaluate the program's success and regional impact.

10. Organization/ Institution:

- **Implementing Agency;** Animal Genomics and Bioresource Research Unit, Kasetsart University, Thailand *(In collaboration with Betagro Group, and KSGtEC)*
- **Contact Person:** Worapong Singchat, email: worapong.singc@ku.ac.th, Tel. +66896023162

11. Expenditure/Funding:

Thailand International Cooperation Agency (TICA)
Government Complex, Building B (South Zone), 8th Floor,
Chaengwattana Rd. Laksi District, Bangkok 10210 THAILAND
Website: https://tica-thaigov.mfa.go.th/en/index
Email: aitc@mfa.go.th

Additional support is jointly provided by:

1) Faculty of Science, Kasetsart University
   Contributing in-kind support through facilities, laboratory access, and academic personnel, with an estimated value of 20,000 THB.

2) Betagro Group
   Providing in-kind contributions including access to breeding centers, field demonstration units, and technical staff, valued at approximately 50,000 THB.

3) Kasetsart Genetic Technology and Excellence Center (KSGtEC)
   Supporting the training with in-kind contributions in the form of genomic laboratory resources, high-performance computing access, and coordination staff, with an estimated value of 50,000 THB.

Schedule for the Training Programme:

Date	Time (Thailand time)	Content	Speaker
Day 1	09:00–12:00	Lecture: Global Trends and Challenges in Freshwater Aquaculture	Assoc. Prof. Dr. Narongrit Muangmai Dr. Sahapob Dokkaew
	13:00–16:00	Lecture: Genetic Principles in Aquaculture Breeding Programs	Prof. Dr. Kornsorn Srikulnath Dr. Worapong Singchat Dr. Thitipong Panthum KSGtEC
Day 2	09:00–12:00	Lecture: Genomic Selection Tools for Catfish and Tilapia	Prof. Dr. Kornsorn Srikulnath Dr. Worapong Singchat Dr. Thitipong Panthum
	13:00–16:00	Lab Visit: Introduction to DNA-based Broodstock Screening	Prof. Dr. Kornsorn Srikulnath Dr. Worapong Singchat Dr. Thitipong Panthum KSGtEC
Day 3	09:00–12:00	Lecture: Data-Driven Breeding and Selection Index	Prof. Dr. Kornsorn Srikulnath Dr. Worapong Singchat Dr. Thitipong Panthum KSGtEC
	13:00–16:00	Lab Visit: Genomic Data and Analysis Software (e.g., SNP marker use)	Prof. Dr. Kornsorn Srikulnath Dr. Worapong Singchat Dr. Thitipong Panthum KSGtEC
Day 4	09:00–12:00	Lecture: Smart Feeding and Precision Aquaculture Technologies	Assist. Prof. Dr. Jantana Praiboon Dr. Sahapob Dokkaew
	13:00–16:00	Case Study Workshop: Designing Breeding Programs	Mr. Jiraboon Prasanpan
Day 5	09:00–12:00	Lecture: Urban Aquaculture and Recirculating Aquaculture Systems (RAS)	Assoc. Prof. Chomdao Sinthuvanich
	13:00–16:00	Group Discussion: Wastewater Management and Climate Resilience	Mr. Jiraboon Prasanpan

Day 6	09:00–12:00	Lecture: Aquaculture Value Chain Analysis	Mr. Jiraboon Prasanpan
	13:00–16:00	Lecture: Food Safety, Biosecurity, and Traceability	Assoc. Prof. Dr. Chomdao Sinthuvanich Assoc. Prof. Dr. Saharuetai Jeamsripong
Day 7	09:00–12:00	Lecture: Alternatives to Sea-sourced Food and Freshwater Fish Genetics	Assist. Prof. Dr. Jantana Praiboon Dr. Sahapob Dokkaew
	13:00–16:00	Lecture: Fish Therapeutics and Disease Control	Assoc. Prof. Dr. Chomdao Sinthuvanich Assoc. Prof. Dr. Saharuetai Jeamsripong
Day 8	09:00–12:00	Field Visit: Betagro Hatchery and Breeding Facilities	Mr. Jiraboon Prasanpan
	13:00–16:00	Field Visit: Urban Aquaculture & RAS Pilot Sites	Dr. Sahapob Dokkaew Mr. Jiraboon Prasanpan
Day 9	09:00–12:00	Group Work: Country-specific Breeding and Value Chain Strategies	Dr. Sahapob Dokkaew Mr. Jiraboon Prasanpan
	13:00–16:00	Mentoring & Peer Review of Group Proposals	Prof. Dr. Kornsorn Srikulnath Dr. Worapong Singchat Dr. Thitipong Panthum
Day 10	09:00–12:00	Presentation of Group Projects	Prof. Dr. Kornsorn Srikulnath Dr. Worapong Singchat Dr. Thitipong Panthum
	13:00–14:30	Feedback Session and Course Evaluation	Prof. Dr. Kornsorn Srikulnath Dr. Worapong Singchat Dr. Thitipong Panthum
	14:30–16:00	Closing Ceremony and Certificate Distribution	