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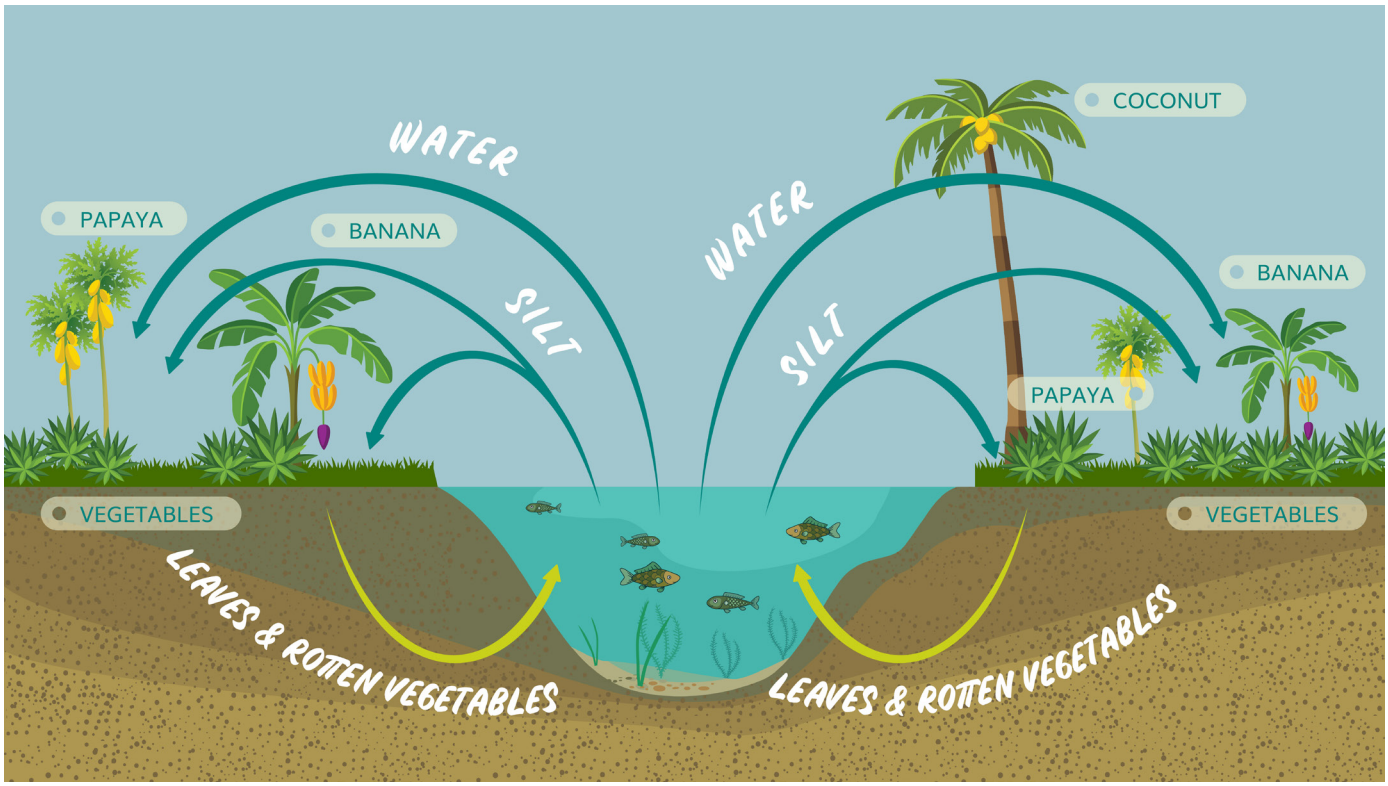
Climate-Smart Land Use Insight Brief No. 1 **DIGEST**

Integrated Agriculture-Aquaculture Systems for Climate Change Adaptation, Mitigation and Livelihoods

Diversifying food systems and integrated agriculture production systems can be important climate change adaptation measures. Integrated agriculture-aquaculture (IAA) systems, first developed in China over 2,000 years ago, have long been used in parts of Southeast Asia as a way to improve households' diets, increase incomes and enrich the soil, even with limited resources, by recycling nutrients.

IAA is a circular approach that reduces waste and increases productivity by using livestock waste and other farm and household by-products as fertilisers and as fish/animal feed. Water from fish ponds can also be used for irrigation, and rice and fish can be produced together in trenches (see Figure 1). IAA systems require fewer external inputs, such as fertiliser, pesticides and animal feed.

Figure 1. Illustration of an integrated agriculture-aquaculture system



In an integrated system, materials flow between the crop system and the fish pond. For example, nutrient-rich pond mud can be used as a fertiliser for growing crops, pond water can be used for irrigation, and farm residues can be used as fish feed (adapted from Tripathi and Sharma 2001).

IAA can be an effective climate change adaptation and poverty alleviation measure. It can diversify livelihoods, use scarce water more efficiently, provide more protein for household diets, and offer another productive use for the land in coastal areas experiencing saltwater intrusion. It does not typically require substantial investments, so it can be a low-cost way to increase farm productivity even when resources, infrastructure and institutional support are limited.

IAA systems can also help reduce greenhouse gas emissions, but the mitigation potential still needs to be quantified. Key benefits include avoiding methane and nitrous oxide from decomposing animal waste – which is instead used for fish feed – and reducing the need for fertiliser and for animal feed, avoiding the emissions associated with their production.

Insights for policy-makers, donors and project implementers

There are many options for implementing IAA, including aquaculture-based fisheries on open water, combined rice and fish production in excavations or trenches, and the use of ponds. Common types of freshwater, semi-intensive IAA systems include rice-fish farming; integrated fish and livestock farming; and integrated fish, pond and livestock, or VAC (a Vietnamese acronym for vuon, ao, chuong, which means garden, pond, livestock pen).

IAA has become less common in recent decades, due to growing intensification of both agriculture and aquaculture. To promote wider adoption, countries need to develop supporting programmes and policies, and integrate IAA into broader adaptation planning and strategies, as well as watershed and coastal zone management.

The ASEAN Technical Working Group on Agriculture and Rural Development could play a key role in promoting and enabling broader IAA implementation across the region, including knowledge-sharing across countries. ASEAN resources and frameworks for cooperation can also help Member States expand the use of IAA systems and adopt best practices.

When properly managed, IAA systems minimise any health risks from the use of waste, but sediments and sludge can still have other negative environmental effects, such as methane emissions and the accumulation of nitrogen in the ponds. Farmers may need support to learn how the different parts of the system interact with one another, so they can make appropriate farm-level decisions, avoid any negative outcomes, and realise IAA's full potential to improve productivity and sustainability.

It is crucial to remember that the farmers who stand to gain the most from adopting IAA – the ones whose livelihoods are now most vulnerable to climate change – are also the ones likeliest to have difficulties accessing resources and information to implement IAA. Attention to equity and inclusion, including gender equity as well as the needs of very poor households, is thus crucial. This includes tailoring approaches to the local context and to farmers' own priorities and existing practices.

It is also important to provide extensive capacity-building, not just on technical matters, but on the broader principles behind integrated systems and their effective management. Extension programmes have a key role to play. For effective implementation, IAA needs to be included in a suite of integrative approaches to agriculture, built around the principles of agro-ecology. IAA systems also require better land use planning to avoid fragmentation, as IAA requires the integrated systems to be close together.

For a more comprehensive overview of IAA and its climate change adaptation and mitigation potential, as well as considerations for equity and inclusion, ***please consult the full version*** *of this Insight Brief. This Insight Brief is part of a series prepared by the Stockholm Environment Institute on behalf of the Climate-Smart Land Use (CSLU) in ASEAN project.* ***All briefs are available at https://asean-crn.org/overview/publications/study-and-policy/.*** *This digest is written by Marion Davis based on Anschell, N., and Salamanca, A. (2021) Integrated Agriculture-Aquaculture Systems for Climate Change Adaptation, Mitigation and New Livelihood Opportunities. ASEAN Climate-Smart Land Use Insight Brief 1. Jakarta: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).*

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