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# ICAR NEWS

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## RESEARCH UPDATE



## PROMISING TECHNOLOGIES

# Biofloc-based shrimp farming technology

Specific-pathogen-free Pacific white shrimp *Litopenaeus vannamei* introduction in India has resulted in high economic returns to shrimp-farmers. Delivering high productivity with sustainability through eco-based approaches, this shrimp is evincing keen interest among all stakeholders. One such eco-based approach for this is biofloc- and -periphyton technology (BFT), which is based on the concept of retention of the waste and its conversion into biofloc as a natural food within the culture system.

Recently, an intensive aquafarming system has employed this technology using some kind of biomats and supplementation with carbon addition to manipulate C : N ratio. Biofloc is a conglomeration of heterotrophic bacteria, algae (dinoflagellates and diatoms), fungi, ciliates, flagellates, rotifers, nematodes, metazoans and detritus, which act synergistically to maintain quality of the water in aquaculture units, thus reducing water exchange need and production cost, and the feed also is reutilized.

Biofloc-based *L. vannamei* harvest

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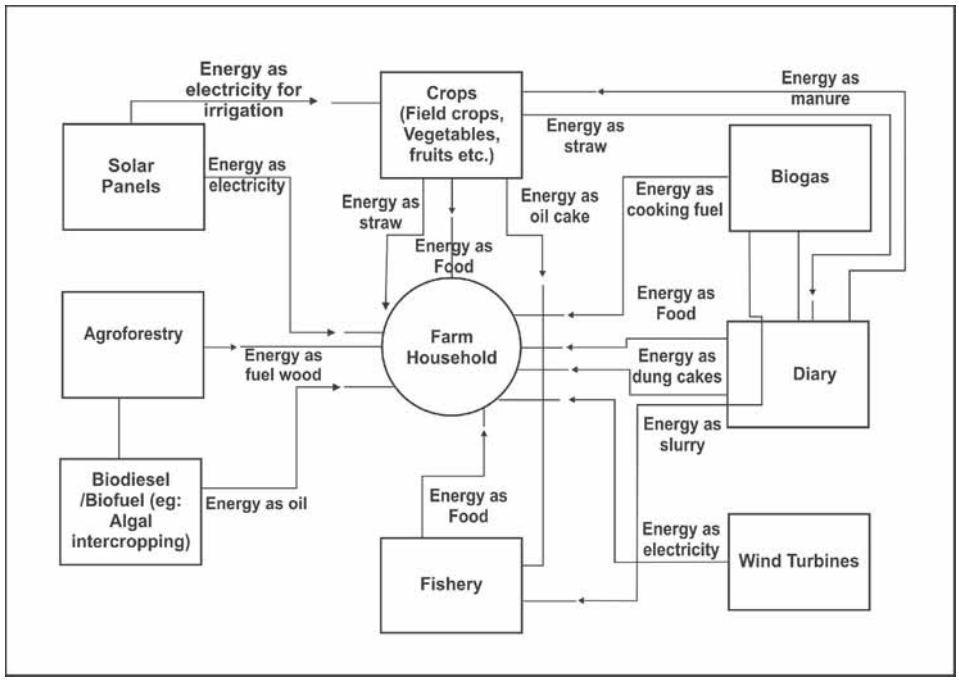
# Energy self-sufficient integrated farming systems for livelihood security

Farming systems have to meet multiple demands — supporting livelihood, conserving biodiversity, producing energy, offsetting emissions and adapting to climate change. An energy self-sufficient integrated farming system (E-IFS) that may satisfy/fulfill many of these conditions has been conceptualized in Indian context as well as for global relevance. As a traditional way of farming in India, an integrated farming system represents multiple crops (cereals, legumes, tree crops, vegetables, etc.) and enterprises (animal farming, bee keeping, fish farming, etc) in a single farm. The concept of E-IFS that could make farms energy self-sufficient (or even surplus), especially with modern forms of energy, was studied. Such farms can mitigate large amount of carbon emissions, and can offer resilience to probable climatic changes.




Energy flow among different components of the proposed E-IFS

In the E-IFS concept, the objective is to integrate all direct and indirect sources of energy, which have so far been never explored and thought of in the context of the IFS, though they have potential and utilize-resource recycling and resource conservation options to reduce energy embodied in inputs, such as fertilizers, pesticides and irrigation water.

The E-IFS concept was tested in a small farm (1.25 ha) in Anantpur village of Balasore district of Odisha in eastern India, involving crop-livestock-fishery-agroforestry during 2012-13.

Nine members of the farm-family (6 adult and 3 children) were dependent on the IFS for their livelihood. The IFS model generated an income of ₹ 136,161 from 1.223 ha with a cost involvement of ₹ 68,985. Energy output of the system was 251,854 MJ, with energy inputs of 149,427 MJ from farm activities. Energy requirement of the farm household was 165,170 MJ; out of which energy consumption for the needs of the household through burning of fuel-wood, cowdung-cake and rice- straw was 98,550, 9,592 and 31,937 MJ, respectively. The total energy requirement involving farming and household was 314,597 MJ, and there was net deficit of 62,743 MJ (5,259 Kwh). This energy requirement could be met by exploring renewable energy production from biogas, solar panel and windmill. With these energy sources, burning of fuel-wood, cowdung-cake and rice-straw, which needed 140,079 MJ, could also be avoided, thus making IFS energy self-sufficient (or even energy-surplus).

The integration of modern energy sources with conventional wisdom of the integrated farming as suggested by the concept is presented in the above Figure. The study is a novel attempt to bring energy security in rural India while addressing climate change and biodiversity concerns. It can potentially lead to ensuring sustainable livelihood options to small farmers in India. Whole idea is to produce modern form of energy at the farm itself by linking various interdependent enterprises to bridge energy deficit and to meet future energy demands, and also for offsetting emissions.

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