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Integrated rice–fish farming gives farmers in Laos' Sanamxay region a new lease on life

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Background

Laos is a developing country that goes by the formal name of Lao People's Democratic Republic. Laos' economy is one of the fastest-growing in Southeast Asia, with a lower-middle income, a markedly rising urbanization and population density and falling rates of malnutrition (GHI 2019; World Bank 2022). Although agriculture is the main source of income, livelihood and nutritional security in Laos, rice has historically been the country's most significant staple food grain grown (CIA 2023), and there have been significant increases in rice crop area and productivity (World Bank 2022). Since 2000, there has been a growing demand to become self-sufficient in low-cost animal protein, with aquatic species as the most potential food source (Chaparro et al. 2014). The production of these foods has also demonstrated year-over-year exponential growth (FAO 2022), indicating the importance of aquatic foods within the country. However, Laos' aquatic food production is still relatively small, both in terms of local consumption and international trade volume (Vongvichith et al. 2018). To meet the demand, the Laotian government and a number of local, regional and international organizations have offered extension assistance. As a result, Laos generated 65 percent of its own aquatic foods in 2020 (FAO 2022).

Despite enormous potential, just 42,000 ha of the country's land are set aside for freshwater aquaculture, while 1.236 million ha are used for capture fisheries (Hortle 2009; LAOPDR 2016). Current efforts have focused on creating sustainable and doable strategies for growing aquaculture within farming communities. Growing rice fields increases the likelihood of rice field-based fisheries, which are a well-accepted indigenous method of obtaining aquatic food in Laos (Freed et al. 2020). However, rice–fish farming is still unpopular and has a low acceptance rate, even though it was introduced to Laos in 1937 and rice fields are one of the country's most important fishing sites (LAOPDR 2016; FAO 2022; Thongsamouth 2021). Farmers are unable to make use of the advantages of rice–fish farming systems, which may be due to the lack of necessary information and assistance (Saikia and Das 2008) along with inadequate infrastructure (Li et al. 2023). However, because of ideal temperatures, sufficient water supply, and affordable labor and land, Laos offers great potential for developing rice–fish farming systems. In recent decades, several promotion and extension projects have been carried out by governmental, intergovernmental and nongovernmental organizations, including the Food and Agriculture Organization (FAO), WorldFish and the Japan International Research Center for Agricultural Sciences in recognition of the significance of developing rice–fish production systems in Laos.

The southern province of Attapeu is the focus of this report. However, the overall image of rice–fish production systems in the region is unknown because of the paucity of statistical data and pertinent literature, which makes it difficult for rice–fish production systems to contribute more in the future to a wide range of sustainable development goals. Therefore, attention has been given to grasp the potential and impact of three prototype experimental rice–fish farming systems in Attapeu's Sanamxay District. It has led to the prediction of a possible agroecological transition route through integrated rice–fish farming in the region.

Study location

In October 2023, a study was carried out in multiple communities within Sanamxay District (14.7633° N, 106.3935° E) to assess the opportunities and constraints implementing an integrated rice–fish farming system (IRFFS) (Figure 1), where culture-based and capture IRFFS coexisted. Although capture fisheries based on rice paddies previously existed in this region, FAO and the Department of Livestock and Fisheries (DLF) of Loas' Ministry of Agriculture and Forestry have been the main promoters of IRFFS.

Figure 1. Study location.

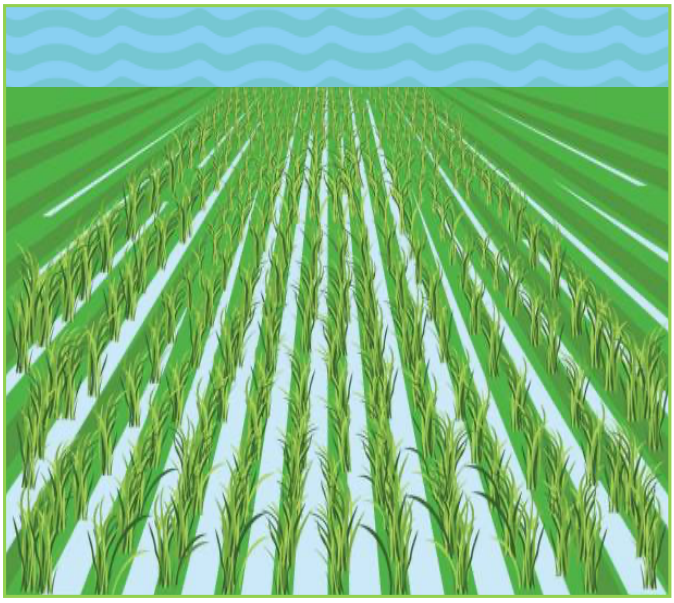
Practices

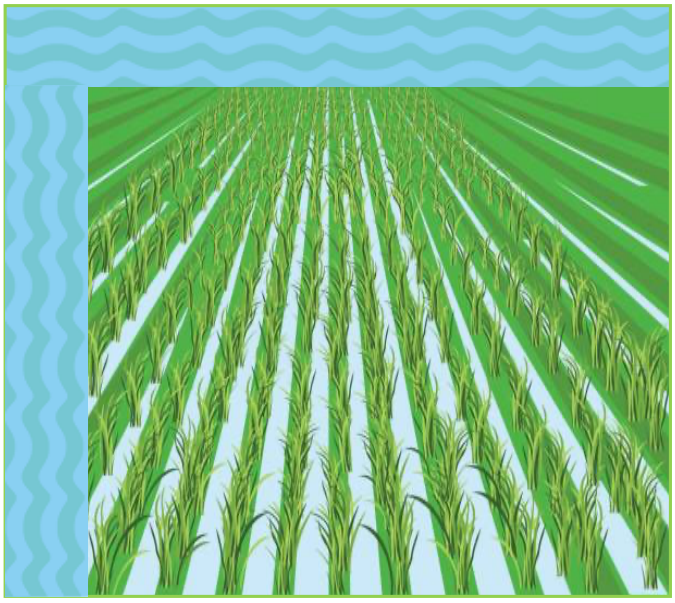
The surveyed region has two primary types of rice–fish farming operations: one for rearing fingerlings and the other for table fish production.

IRFFS for rearing fingerlings

This model is practiced in the villages of Oudamxuy and Donephay, where farmers usually stock fingerlings (5–7 cm) of silverbarb, tilapia and common carp within paddy fields. It involves only minor changes with the least amount of human labor. Farmers dig trenches as fish refuges along one or both of the adjacent sides of the paddy fields. These trenches are an additional 2 feet deep, maximum, and 4 feet wide, and are regarded as "I" or "L" shaped models along low-lying zones (Figure 2). When working with the native rice variety (*Oryza sativa*), the stocking density for fingerlings is typically maintained at three per square meter. The paddy fields are prepared with buffalo manure prior to transplanting. During the first 10 to 15 days after stocking, any synthetic chemical treatment is avoided. In the paddy fields, sufficient water availability is maintained for 4 or 5 months because of small irrigation systems, allowing fish to grow up to the advanced fingerling stage (20–25 cm size). Commercial fish feed is occasionally used as additional feeding throughout the cultivation process. June to mid-October is when the fish are cultivated. They are then moved to neighboring grow-out ponds to produce table fish, right before paddy harvesting, which actually begins at the end of October.

Figure 2. IRFFS land types.





IRFFS for producing table fish

In this type of IRFFS, advanced or regular fingerlings are stocked in small or medium-sized impounded waterbodies within paddy fields for the purpose of producing table fish (Plate 1). These waterbodies are approximately 4 feet deep and are connected to the paddy fields through various ditches. Similar to earlier techniques, fingerlings are reared in this system by keeping the water at a minimum of 3 feet. Prior to paddy harvesting, water was contained in impoundments, and ditches served as a passageway for the fish to the refuge; here, fish are cultivated for 8 to 10 months before reaching table size. Alternatively, advanced fingerlings are sometimes raised exclusively in impoundments to grow into table fish. As previously mentioned, there are similarities in land preparation and a greater frequency of using commercial feed to raise fish.

Plate 1. A type of IRFFS created for producing table fish.

Potential

There are large floodplain paddy fields in that particular zone, where programs supported by FAO and the DLF are having a favorable impact. The community has documented over 10 varieties of regularly occurring native fish species, with snakehead and catfish being their main nutritional options. Although they have since shifted their focus to pond-based aquaculture, a fishing group in the village of Tanwang identified these resources as a potential area for capture-based fisheries. They also hope to learn rice–fish cultivation techniques in order to encourage the production of silverbarb, common carp, tilapia and Indian major carps in their paddy fields. Another village, known as Donemouang, has similar stories about paddy cultivation, with limited options for their diet and means of subsistence. Their attention has now been drawn to IRFFS because of the abundance of floodplain paddy fields, but input support and technical advice are needed (Plate 2).

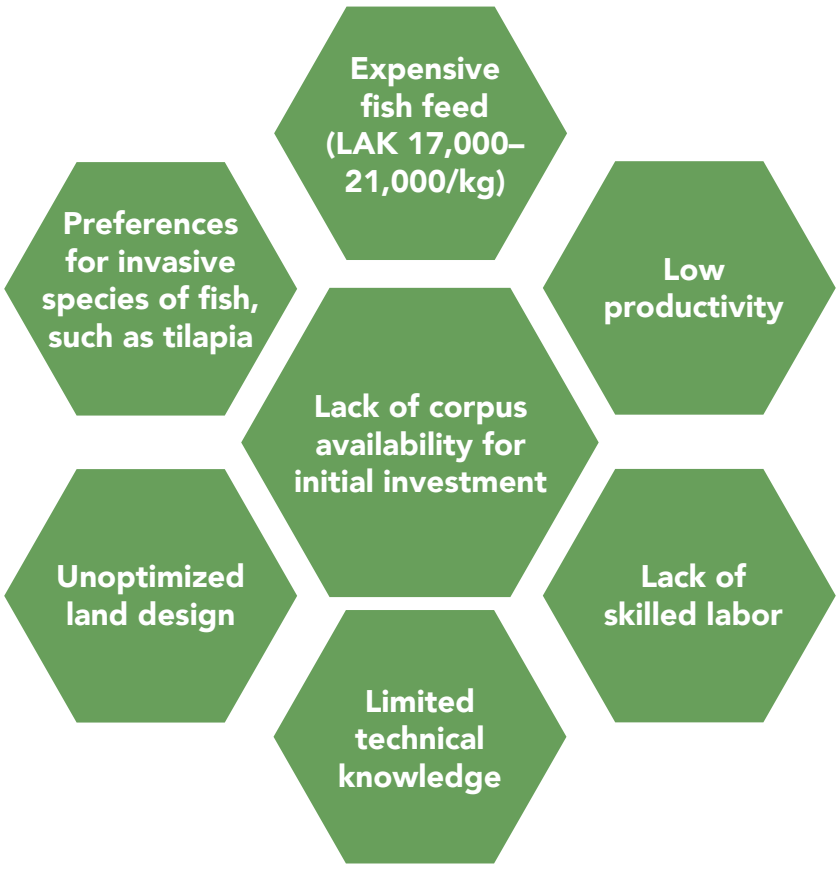
Plate 2. Potential zones to promote IRFFS.

Nutrition and livelihoods

The main crops in this area are steamed rice (*mallie*) and sticky rice (*tandoum*, *taseno*, *pongum*) with an annual productivity of 2 t/ha and 3 t/ha, respectively. Cassava, various vegetables, and livestock are their other agricultural resources. Households consume the majority of agricultural harvests, with any surplus sold at the local market. There is heavy reliance on one's own labor and readily available biodegradable resources, and costs are low for mechanical support and buying seeds. When it comes to IRFFS, fish are continuously and partially harvested from paddy fields for 1 or 2 months in order to be stored for domestic use. However, production trends for table fish are primarily concerned with grabbing the interest of the local market, even though the primary uses of capture fisheries are food security and household nutrition. The market price for rice fluctuates year-to-year, ranging from LAK 3500 to 6300/kg, although the price of fish is relatively stable throughout the year.

Major challenges and constraints

Figure 3. Issues that increase the risk to sustainability and hinder implementation of IRFFS in the surveyed region.



Concluding remarks

This study discovered that systems for producing rice and fish, such as IRFFS and rice field fisheries, continue to have prospects and challenges. Some of the most important characteristics that have the potential to support IRFFS in this area include the availability of enough family labor, the type of land available, the enriched aquatic biodiversity within paddy fields, local demand, and the willingness of the farming community. IRFFS have the potential to influence the HLPE's established agroecological principles (HLPE 2019) in the future by addressing food, nutritional security and livelihood options. This is essential to create transformative change for a sustainable food system. It would be helpful for Sanamxay to conduct more research on the specific ways that the agroecological concepts based on food systems and IRFFS could interact in the future.

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