# FAO's Regional Rice Initiative: Sustainable Management of the Multiple Goods and Services derived from Rice Production Landscapes in Asia

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**Summary:** FAO estimates that farmers will have to produce twice as much food as they do today as to feed the expected 9.2 billion global population by 2050. Farmers need to intensify agricultural production in the face of declining availability of water and agricultural land, lower productivity, changing consumer patterns and loss of ecosystem goods and services due to unsustainable practices such as overuse of agro-chemicals. The challenge will be for farmers to intensify production in a sustainable way while meeting the increasing demand for food at present and in the future. These concerns have led governments to promote more efficient use of diminishing resources by farmers (i.e., *Save and Grow* concept) and better management and use of agro-ecological processes for sustainable intensification of agricultural production. In 2013, FAO's Regional Rice Initiative (RRI) was launched as a pilot project of FAO's new Strategic Objective 2 in three countries (i.e., Indonesia, Lao PDR and the Philippines) by (i) focusing on goods and services produced by and available from rice ecosystems and landscapes, and (ii) identifying and undertaking sustainable rice production practices to enhance resilience and increase efficiencies in rice production to improve food security. Pilot activities - including farmer training in innovative Farmer Field Schools on Save and Grow for Sustainable Intensification of Rice Production (SIRP) - have demonstrated a possible net income increase of 72 percent (Philippines) and 211-551 percent (Vietnam) from higher yields and benefits derived from smart use of ecosystem services and enhanced agro-biodiversity through multiple cropping as well as introducing fish and ducks in rice production, and utilizing existing aquatic biodiversity. Sustainable rice production intensification requires smallholder farmers in Asia to understand and responsibly manage agro-ecosystems and landscapes. Ecosystem-literacy training for smallholder farmers is essential for smallholder farmers to acquire the required agro-ecological knowledge and skills for sustainable production intensification. Improved management practices and enhanced agro-biodiversity (e.g., existing and introduced aquatic organisms like fish and waterfowl species) brings significant increase in yields, benefits and net income that could provide incentives for the younger generation to take on a renewed interest in rice production. Development of national and local Government policies and investments in support of farmer education generated by evidence from RRI pilot activities will be crucial for facilitation of scaling up of Save and Grow for SIRP farmer training.

**Keywords:** FAO, Regional Rice Initiative, Farmer Field School, Save and Grow, Sustainable Intensification of Rice Production

## 1. Introduction

The Food and Agriculture Organization (FAO) estimates that the global population will reach about 9.2 billion by the year 2050. Nearly all the increase in population will be in developing countries where about 795 million people remain undernourished. Urbanization which is at 49 percent today is expected to continue and reach about 70 percent by 2050. As cities and income levels grow, consumption patterns also change and there will be a need to increase food production (in addition to food used for biofuels) by about 70-100 percent as to feed the world's population [9]. Eighty percent of production increases in the developing countries could only come from increased yields and cropping intensity given the reducing land area from changing land-use patterns. On top of this, farmers will have to contend with other yield reducing challenges such drought, floods, pest and disease induced by climate change. On the other hand, the yield growth of major cereal crops has been declining steadily from 3.2 percent in 1960 to 1.5 percent in 2000 [2]. Rice yield growth has declined from 3.3 percent per year during 1976-85 to 0.7 percent during 1998-2007 [10].

Asia produces and consumes 90% of the world's rice. It is also home to about nearly two-thirds (64.3%) of the world's food insecure population. Majority of them eat rice as a staple food and are dependent on rice production for their livelihoods [9]. These producers are mostly resource poor, smallholder farmers, many with less than 1 ha of landholdings. These farmers hold a key role in protecting and enhancing vital ecosystem services provided by natural biological processes, e.g., biological control, pollination and nutrient cycles if they are to intensify crop production sustainably [3]. Unfortunately, the push for intensification of agricultural production has driven farmers to increase the use of chemical inputs such as fertilizers and pesticides in efforts to increase their yields. The intensive use of pesticides harms vital ecosystem services particularly aquatic fauna like fish and waterfowl [1] and continuing patterns of pesticide use are damaging biodiversity in production areas [12]. Furthermore, pesticide use raises food safety concerns and jeopardizes export potential of agriculture produce, causes frequent poisoning and chronic health

problems and exposes the most vulnerable - women and children - directly or indirectly to toxic substances. These concerns have led governments to promote more efficient use of diminishing resources (i.e., *Save and Grow* concept) and better management and use of agro-ecological processes for sustainable intensification of agricultural production [4]. Ecosystem-literacy training for smallholder farmers is essential for smallholder farmers to acquire the required agro-ecological knowledge and skills for sustainable production intensification [11]. Other global phenomenon such as climate change, the "greying" and "feminization" of agriculture, vanishing rice cultures and heritages, the lessons from the 2008 rice price crisis, and enhancing the contribution of rice production to poverty reduction and food and nutrition security of the millions of farmers have also led governments to examine and re-design policies and strategies to support sustainable rice production intensification.

## 2. The Regional Rice Initiative

### 2.1 The Regional Rice Initiative - A Response to the Emergent Call from Member Countries

It was against this background that the government representatives, at the 31st Session of the FAO Regional Conference for Asia and the Pacific (APRC) held in Hanoi in March 2012, requested FAO to i) strengthen the capacities of the Member Countries on rice production and ii) develop a regional rice strategy to harmonize diverse rice-related issues. The strategy document is to provide evidence-based strategic guidelines to member nations to help them (i) develop and adjust their rice sector strategies in the light of broader regional and global trends and national priorities and (ii) choose among key strategic options while considering the implied trade-offs (or consequences) with the end view of assisting countries achieve sustainable food security [6]. In December 2012, the 145th Session of the FAO Council endorsed the formulation and implementation of a regional initiative to strengthen rice-based production systems in Asia as part of its new Strategic Objective 2: "Make agriculture, forestry and fisheries more productive and sustainable". Since 2013 the Regional Rice Initiative has supported three pilot countries– Indonesia, Lao PDR and the Philippines – by (i) focusing on goods and services produced by and available from rice ecosystems and landscapes, and (ii) identifying and undertaking sustainable rice production practices to enhance resilience and increase efficiencies in rice production to improve food security.

Indonesia and the Philippines were chosen as the pilot countries because they are major rice importing countries but are strongly committed to improving food security by reducing their dependency on rice imports and increasing food production. Lao PDR was selected as it suffered from the second highest prevalence of undernourished in the region in terms of the proportion of undernourished in total population at that time [8]. Sustainable increase of rice production in Lao PDR was considered critical for reducing hunger and malnutrition and improving livelihoods of impoverished farmers, especially smallholders.

### 2.2 Concepts and Approaches of the Regional Rice Initiative

The Regional Rice Initiative foresees long-term impact on (i) improved food and nutrition security through effective provision and utilization of ecosystem services and goods derived from rice-based farming systems and landscapes; and (ii) poverty reduction through increased productivity and income generating opportunities, and improved access to market in the rice sector. These can be achieved through:

- adopting innovative and sustainable rice farming practices, i.e. Save and Grow Sustainable Intensification of Rice Production, which allows rice farmers and producers to increase productivity and improve rice quality in a sustainable way despite less agricultural and labor input;
- generating more knowledge and evidence on the sustainability and resource use efficiency in order to substantiate the effectiveness of the Regional Rice Initiative approach; and
- formulating and implementing national rice policies or strategies drawing on the vision and strategic options laid out by the Regional Rice Strategy for Sustainable Food Security in Asia and the Pacific, while contributing to regional and global policy processes such as the Convention on Biological Diversity.

The Regional Rice Initiative offers farmers an array of options that are more productive, sustainable and efficient in resource use. These include: rice-fish, rice-livestock and rice vegetables production systems, Integrated Pest Management (IPM), Trees Outside Forest (TOF), policy and legal frameworks to support effective ecosystem control of insect pests, preservation of rice heritage and culture supported by Globally Important Agricultural Heritage Systems (GIAHS), improved canal operation techniques called "MASSCOTE", and Climate-Smart Agriculture. All these approaches are integrated in the overarching Save and Grow paradigm that espouses agroecological approaches that move agricultural development out of a focus on singular focal areas - e.g., improved seed, pest control, water management – to solutions that integrate all components of the farming system [7].

Save and Grow Farmer Field Schools (FFS) are the main vehicle to increase the knowledge and skills of farmer groups and communities on good agricultural practices (to achieve the objective of increasing rice productivity); cost

reducing technologies (to achieve the objective of increasing cost efficiencies and reducing production costs); and integrated rice-fish/livestock and multi-cropping systems, including trees (to achieve the objective of increasing farm incomes).

FFS employs discovery-based group learning processes. Usually, a group of 25-30 farmers meet one morning weekly for an entire crop growing season and engage in experiential learning activities to gain an ecological perspective of managing ecosystems and skills in informed decision making based on location-specific conditions. The learning process is facilitated by extension workers or trained farmers. Nonformal education methods are employed and the field is used as the primary resource for discovery-based learning. FFS develops groups of farmers to work together to address agriculture and broader community concerns [5]. In this way, communities can identify multiple goods and services in the rice ecosystem and landscapes and employ most suitable Save and Grow practices to enhance and utilize these for sustainable management. The FFS is recognized as one of the best educational and capacity building tools for training farmers on complex skills such as natural resource management [13].

## 3. Case Studies:
## Save and Grow Farmer Field Schools (FFS) to Promote Sustainable Management of the Multiple Goods and Services Derived from Rice Production Landscapes in Asia

### 3.1 Save and Grow Farmer Field Schools (FFS) in the Philippines

In the Philippines, participants in Save and Grow FFS established field studies to compare Save and Grow practices and conventional farmers' practices. Farmers reported an average rice yield of 6.7mt/ha in Save and Grow plots compared with 5.27mt/ha in Farmers' Practice plots or a difference of 1.43mt/ha, an average yield increase of 27.2 percent.

In Save and Grow FFS plots, the average reduction in cost of production was 17 percent or actual money value saved of US$132[1] per ha. Savings resulted into increases in net income of about US$803. The average production cost using Farmers Practices was US$769 while in Save and Grow plots it was only US$638 (Figure 1). The reduction in the cost of production was attributed to the application of improved management practices (e.g., use of younger seedlings, wider spacing, organic fertilizer and alternate wet and dry water management). In addition, informed management decision making based on agro-ecosystem analysis, the use of ecosystem services such as natural pest control to avoid unnecessary use of chemical pesticides and the use of biological control agents also contributed to effective and sustainable pest management.

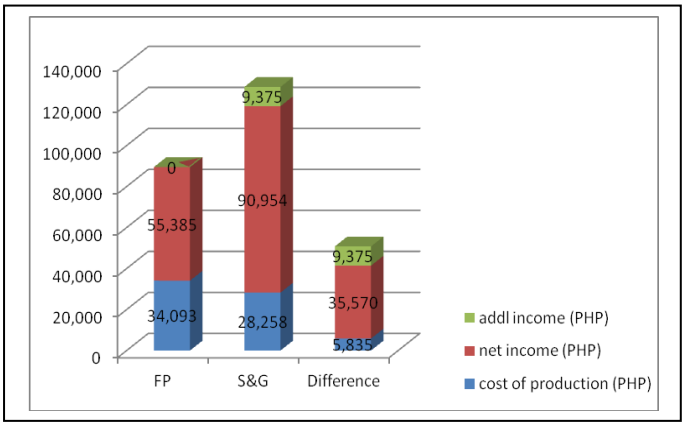


**Fig. 1: Comparison of Cost of Production, Net Income and Additional Income Using Save and Grow and Farmers' Practices**

The 72 percent increase in net income generated by the application of Save and Grow practices was attributed to higher yields, benefit derived from smart use of enhanced agro-biodiversity through multiple cropping as well as introducing ducks in rice production, and utilizing existing aquatic biodiversity. Savings from reduced cost of production resulting from improved management practices (e.g. reduced number of seedlings per hill) also contributed to the increased net income.

Planting vegetables on the bunds maximizes utilization of the production area and at the same time provides habitat for *natural enemies* enhancing natural biological control. Where ducks were introduced in the rice fields these provided additional services by eating the insect pests found at the stem and base of rice plants.

Enhancing aquatic biodiversity in rice based cropping systems provided an average additional income of US$208.56) per hectare. For example, duck egg production alone became a source of additional income and nutrition.

[1] May 2015 currency exchange rate US$1: PhP44.32

Information on existing aquatic biodiversity was not available until local agricultural schools - as part of the project - carried out assessments to determine existing species of inland fish (e.g., cat fish and mud fish) and mollusks (e.g. *kuhol* and another local snail species known as *ponngok*). These aquatic inland species had been lost as a result of high chemical use in rice production and their return is a result of reduced chemical use by farmers trained in IPM-FFS under the Philippine National IPM Programme that started in 1994.

### 3.2 Save and Grow Farmer Field Schools (FFS) in Vietnam

In response to the interest of other countries and as a way to expand the utilization of experiences gained from the first phase of the Regional Rice Initiative, pilot Save and Grow activities were implemented in Vietnam in 2014. A group of 105 FFS alumni (55 women) applied rice intensification practices learned from FFS to an area of 34 hectares. Farmers applied efficient management, growing healthy, well-yielding crops with fewer and more sustainable production inputs. Farmers explored making optimal use of multiple goods and services of paddy-based farming systems - including conservation and management of aquatic biodiversity (including both captured and cultured fish species) - in combination with improved agronomic practices such as wider plant spacing/reduced seeding rates, improved water management, and reduced chemical pesticides through the application of ecologically sound IPM. This included the use of biological control agents such as *Metarhizium anisopliae* as an alternative to chemicals for the management of the brown planthopper and natural biological control provided by ecosystem services.

The average gross income from integrated rice-fish-aquatic production was US$7,751 compared to US$1,892 obtained from producing only rice. Utilization of integrated rice-fish-aquatic biodiversity production practices resulted in average gross income ranging from 211-551 percent compared with producing rice only (Figure 2). Farmers' experience and the aquatic biodiversity species and numbers - especially fish - accounted for the big difference in benefits. Informed management decision making based on agro-ecosystem analysis, the use of ecosystem services such as natural pest control to avoid unnecessary use of chemical pesticides and the use of biological control agents also contributed to effective and sustainable pest management. The fish provided additional services by eating insect pests found at the stem and base of rice plants and those that fall into the water.

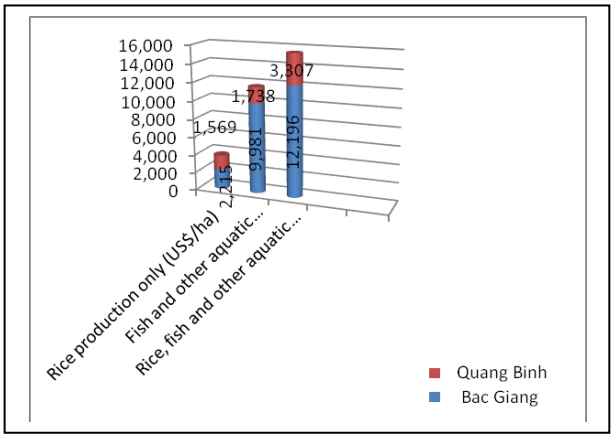


**Fig. 2: Gross incomes from rice only and integrated rice-aquatic biodiversity production systems (US$/ha)**

## 4. Key Lessons Learned

Key lessons learned from the implementation of the Regional Rice Initiative for sustainable management of the multiple good and services derived from rice production landscapes in Asia include the following.

- Sustainable rice production intensification requires smallholder farmers to understand and responsibly manage rice agro-ecosystems and landscapes.
- Smallholder farmers trained in season-long Farmer Field Schools master the concepts and skills required for sustainable management of natural resources and apply these in crop management.
- Improved management practices and enhanced agro-biodiversity (e.g., existing and introduced aquatic biodiversity like fish and waterfowl) brings significant increase in yields, benefits and net income that could provide incentives for the younger generation to take on a renewed interest in rice production.
- Sustainable production - with due consideration to the multiple good and services provided by rice production systems and landscapes - is knowledge intensive. Supportive Government policies and investments in farmer education can be generated by evidence from pilot RRI activities as evidence from both Philippines and Vietnam suggests.

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