# การปรับการเลี้ยงปลาในนาข้าวโดยเกษตรกร : วิธีการและเหตุผล [1]

# The How's and Why's of Rice-Fish Culture Development by Northeast Thai Farmers


## Abstract

Northeast Thai rice farmers have traditionally used their rice fields as a source of fish. As wild fish stocks have become eroded and the rural population has grown, an increasing number of farmers are becoming aware of the need to supplement this customary protein source.

Not surprisingly, then, rice-fish culture has developed and spread of its own accord among these farmers, with research and extension efforts by a number of agencies accelerating this research and extension efforts by a number of agencies accelerating this expansion.

Each farmer has a unique combination of needs, resources, and limitations. This is reflected in the variety of rice-fish systems adopted by them.

A universally-applicable, "optimal" rice-fish model, then, cannot be defined; the "best" system is situation-specific. Development agents involved in rice-fish culture extension must be flexible in their approach, and emphasize choices and guidelines that farmers can use in deciding what system best suits their circumstances.



## บทคัดย่อ

เกษตรกรในภาคตะวันออกเฉียงเหนือใช้ที่นาเป็นแหล่งหาปลาธรรมชาติมานานแล้ว ในปัจจุบันประชากรเพิ่มขึ้น ปริมาณปลาธรรมชาติเหล่านั้นจึงลดลงอย่างรวดเร็ว การเลี้ยงปลาในนาข้าวจึงได้รับการพัฒนาขึ้นโดยเกษตรกรเองและจากงานวิจัยและส่งเสริมโดยหน่วยงานต่าง ๆ

เกษตรกรแต่ละรายจะมีความต้องการ ทรัพยากร และข้อจำกัดที่แตกต่างกันไป ดังนั้น จึงสะท้อนออกมาให้เห็นความแตกต่างของระบบการเลี้ยงปลาในนาข้าวของเกษตรกรเหล่านี้ ดังนั้น การที่จะกำหนดระบบการเลี้ยงปลาในนาข้าวที่จะนำไปใช้ได้ในทุกสถานการณ์จึงเป็นไปไม่ได้ ระบบที่ดีที่สุดจึงใช้ได้เฉพาะในแต่ละสถานการณ์เท่านั้น

หน่วยงานพัฒนาที่เกี่ยวข้องกับการส่งเสริมการเลี้ยงปลาในนาข้าวจึงควรมีความยืดหยุ่นในวิธีการ และให้โอกาสเกษตรกรเป็นผู้ตัดสินใจว่าระบบใดจะเหมาะสมที่สุดสำหรับเกษตรกรแต่ละราย


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## 1. Introduction

Rice-Fish culture has become very popular among Northeast Thai farmers over the past ten years, in the wake of a wisespread disease which has devastated stocks of wild fish in many areas.

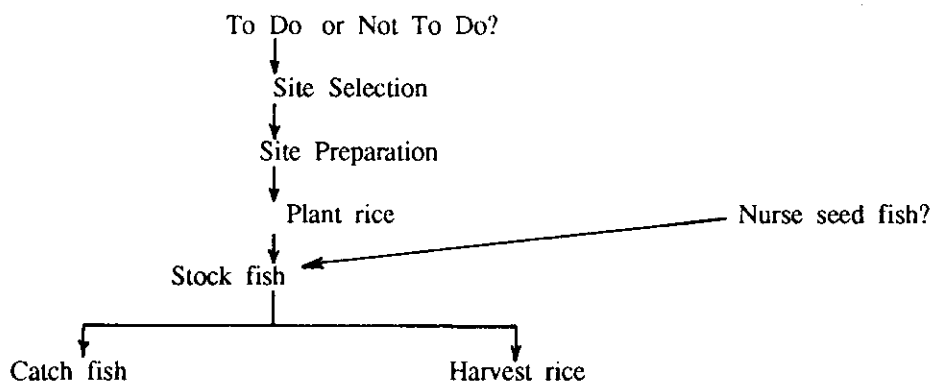
Rice farmers in the Northeast operate under a variety of environmental, social, and economic conditions. A technology appropriate to one farmer's circumstances will not necessarily fit those of his neighbor; in application, every technology can and should vary from farmer to farmer.

Rice-fish culture comes in a great variety of forms, adapted, for the most part, to the conditions of each operator.

Development workers must keep this in mind when extending rice-fish culture. No optimal model exists, and the extension agent must use the farmer's situation to provide guidelines as to how the system should be adapted and managed.

Many farmers can culture fish in rice fields, but no particular model has wide applicability. this paper will explore farmers' adaptations of rice-fish culture in more detail, following the steps given in Figure 1.

Figure 1 : Northeast Thai Rice-Fish Culture : The Steps




## 2. Materials and Methods

Most of the information used in this paper comes from reports of Department of Fisheries personnel who surveyed rice-fish culture practices in target villages, following trainings held in-village during the 1989 dry season, under the auspices of the Northeast Fishery Project.

The survey form followed the steps in managing rice-fish culture in some detail. Farmers were asked the decisions they took at each step, and why they decided to manage as they did.

Eliciting from farmers the reasons for their decisions is considerably more challenging than recording what particular decisions were taken. Consequently, our data on the reasons for farmers' decisions are relatively scanty. They remain worth considering.

This report considers data from about half the villages surveyed. A future NFP report will consider the data presented here and in those other survey reports.

Results are reported primarily as simple frequencies. In the absence of good economic data but when otherwise possible, the validity of farmers' decisions has been tested by pairing farmers' decisions with their subsequent production estimates, on a farmer by farmer basis, and examining the resulting scattergrams. In this writer's experience, production per crop is a more valid estimate of benefit per family than production per rai.

These surveys were conducted in the provinces of Korat, Chaiyaphum, Khon Kaen, Kalasin, Buriram, and Mahasarakham. These provinces include the driest areas of the Northeast.

## 3. Results and Discussion

### 3.1 To Do or Not To Do?

This project interviewed 1002 farmers as part of the post-training follow-up. One of the questions asked was why they decided to culture, or not to culture, fish in rice fields. In the context of this paper, the constraints are of interest :

The commonest constraint indicated was a lack of water. While the relative importance of this as a constraint may be less in better-watered parts of the Northeast, it will still apply. "Lack of water," means different things in different areas. In irrigated and otherwise well-favored areas, a number of farmers indicated that the lack of reliable water prevented them from culturing fish in rice fields. Farmers in drier areas never emphasized low reliability of water as a constraint preventing rice-fish culture, since it is a problem shared by all. Fish cannot be grown in the absence of water. Farmers in areas of highly uncertain rainfall may not be able to culture fish everv year; by preparing their fields, however, they can take the opportunity to culture fish when it presents itself.

Money and labour often placed constraints. Field preparation places particularly high demands on one or both of these resources. Selecting a field with a convenient microtopography of with a small area can often address these problems.

Many farmers felt that their fields were too remote to allow fish culture. Remoteness makes intensive culture difficult, but examples of successful, extensive culture in fields on to several kilometers from farmers' homes are not rare.

Poor water-holding capacity kept a few farmers from culturing fish; risks of serious flooding prevented others.

Landless farmers who rent their fields for rice cultivation commonly modify these fields with difficulty. Agreements with landowners are, however, sometimes possible.

Financially well-off farmers often find that rice-fish culture is not worth the investment; other activities can easily compete with it in terms of net benefit.

In some areas, seed fish supply is not convenient. Farmers in such villages must take considerable time to search for fish to stock; sometimes they lack the time.

## 3.2 Site Selection

Our data on farmers' site selection criteria are not very systematic, but from their responses to other questions, a number of factors can bc inferred :

(1) Local water regimes are probably the most important criterion. Neither too little nor too much water are desirable. In drier areas with limited catchment, then, some farmers place their fields at the lowest possible site, confident that the risk from flooding is minimal. Under other circumstances, farmers selected high-lying sites where the water-holding capacity of the soil was particularly good.

(2) Proximity to home affects siting. The definition of proximity, however, varies from village to village.

(3) The presence of an existing pond makes site selection easier. Such a pond can serve as a refuge for fish at times of low water, thereby reducing greatly the labour normally required in field preparation.

The local micro-topography is often put to use in order to save labour. Basinshaped fields with the lowest point at or near the centre of the field are popular. The investments needed for contructing a refuge and high dikes are reduced, and water is collected easily from elsewhere. The presence of termite nests or hummocks can similarly reduce the labour needed in raising high dikes. Fields sited in sloping areaes often need only modest dikesaround their upper portions.

(4) The ease with which the site can be integrated into other on-farm activities is sometimes a consideration. A less-than-ideal site for fish culture can be chosen if it complements other activities at the site well.

(5) Other considerations will apply for differen farmers, and an exhaustive list will probably not be possible.

## 3.3 Field Preparation

### 3.3.1 Field Size

Famers culture fish in fields covering a great range of sizes. The factors affecting the areas devoted to rice-fish culture vary: Among experienced farmers, rice-fish culture often occupies the entire area appropriate area available. Beginning farmers often like to test the practice in a limited area. Time and money commonly limit area and area expansion, as well.

Scrutiny of Figure 3.3.1 shows no optimal field size, in terms of subsequent fish production. Examples of success occur throughout the entire range of areas.

On a per rai basis, reported production from fields fed monthly or less frequently fell mostly near or below 10 Kg./rai. In only two cases was 40 Kg./rai exceeded. Feeding or fertilizing more frequently can lead to higher production, but provides no guarantee of success. An imporant proportion of farmers have invested land area, as opposed to time and money for feed, in order to generate production. Under such a strategy, production per rai is low, but production per family is high.

### 3.3.2 Dikes and Refuges

Dikes are commonly raised around rice-fish areas in order to collect water, conserve water, and prevent flooding. In the course of raising these dikes, a hole of some sort is usually dug. This hole can take the form either of a trench or pond, and serves as a convenient refuge for fish when water in the rice field becomes too low.

Our survey showed that no particular refuge configuration was "best," in terms of production. Both success and failure are possible with a variety of configurations.

Farmers whose operations included a large number of plots often reported very high production. Fish could swim over a very wide area, and could be stocked in different plots from year to year, depending on suitability.

Some farmers raise their dikes by scraping the surface of their field, rather than by digging. Although no refuge results, fish yields remain satisfactory. Some farmers find that such fields retain water better than those with a dug refuge, probably because an organic seal forms more rapidly on horizontal than on vertical surfaces

## 3.4 Rice, Fish, and Management

A great number of rice varieties were planted by farmers. This writer has yet to encounter a variety which cannot be grown with fish, although variety-specific suitabilities will differ from situation to situation.

Water availability was the commonest limit to timing of seeding, transplanting, and stocking. A number of farmers indicated that they stocked only after their rice was well-established, a phenomenon dependent on timing of transplanting and on availabiliy of water afterwards.

Farmers are commonly encouraged to stock large seed in their fields because the larger the fish, the less susceptible in is to predation. For most farmers, however, finding large seed is difficult; nursing small seed up to a larger size for release to the field, then, is an alternative many farmers use.

Our results indicate that farmers who nursed seed fish achieved, on average higher production than those who reported no stocking strategy. Success and failure, however, can occur under both conditions. Other factors, notably water shortages, can limit production despite good nursing. It must also be emphasized that a bad nursery, one with water quality, water quantity, or predation problems, is worse than no nursery at all, since seed fish in a nursery have no place to which to escape. In the more uncontrollable environment of a rice field, escape, at least, is possible.

A great variety of fish species were stocked. Thai silver barb (Puntius gonionotus was the most, popular, followed in order, by common carp (Cyprinus carpio) and Tilapia (Oreochromis nilotica). No species is appropriate in all situations, but some combination of species will fit most.

Stocking rates, too, were highly variable, with no apparent optimum in terms of fish production (Figure 3.4) Two clusters of points in this figure deserve particular attention :

Four farmers who stocked at extremely low rates achieved very satisfactory productions. Three of these stocked mainly brood fish, Tilapia in one case, and a combination of snakehead, climbing perch, and walking catfish in the other two. This writer has seen similar results from stocking a few snakeskin gourami (Trichogaster pectoralis) brood. Stocking broodfish in rice fields fol seed production and grow-out deserves further study and quite possible, extension.

A number of fields stocked at very high densities achieved very low production. In these cases, serious drought greatly limited the water available, and fish spent almost all their time in the refuge. Particularly in areas where water supply is unpredictable, investments in rice-fish culture should be made with caution.

Following stocking, most farmers checked water levels and the condition of their dikes. Frequency of feeding tended to be correlated with stocking density. A number of farmers stocking at high densities, however, fed very infrequently. A lack of experience played a role here. In other cases, water was so severely limited that intensified feeding would probably have accomplished little and could have led to pollution problems. In a couple of other cases, the farmers stocked a large number of small seed in anticipation of high mortalities and consequently, a low effective stocking density.

## 4. Concluding Comments

There is no single "best" way to culture fish in rice fields. All management aspects of the technology must be adapted to the situation of each farmer-operator. The extension worker should use the situations of individual farmers to guide specific recommendations he makes to farmers.

This survey has indicated two promising technologies which deserve serious consideration and where appropiate, extension :

(1) Stocking broodfish in rice fields. A number of species qualify here : Tilapia, snakehead, walking catfish, climbing perch, snakeskin gourami have all worked well under rainfed conditions, and common carp have generated similar successful yields under irrigated dry season conditions.

(2) The use of extensive rice field areas to raise production. Production per rai will be low, but gross yields tend to be very satisfactory, at negligible time and money investments by the farmer.

Figure 3.3.1 Scattergram : Fish Production versus Area Under Fish Culture.

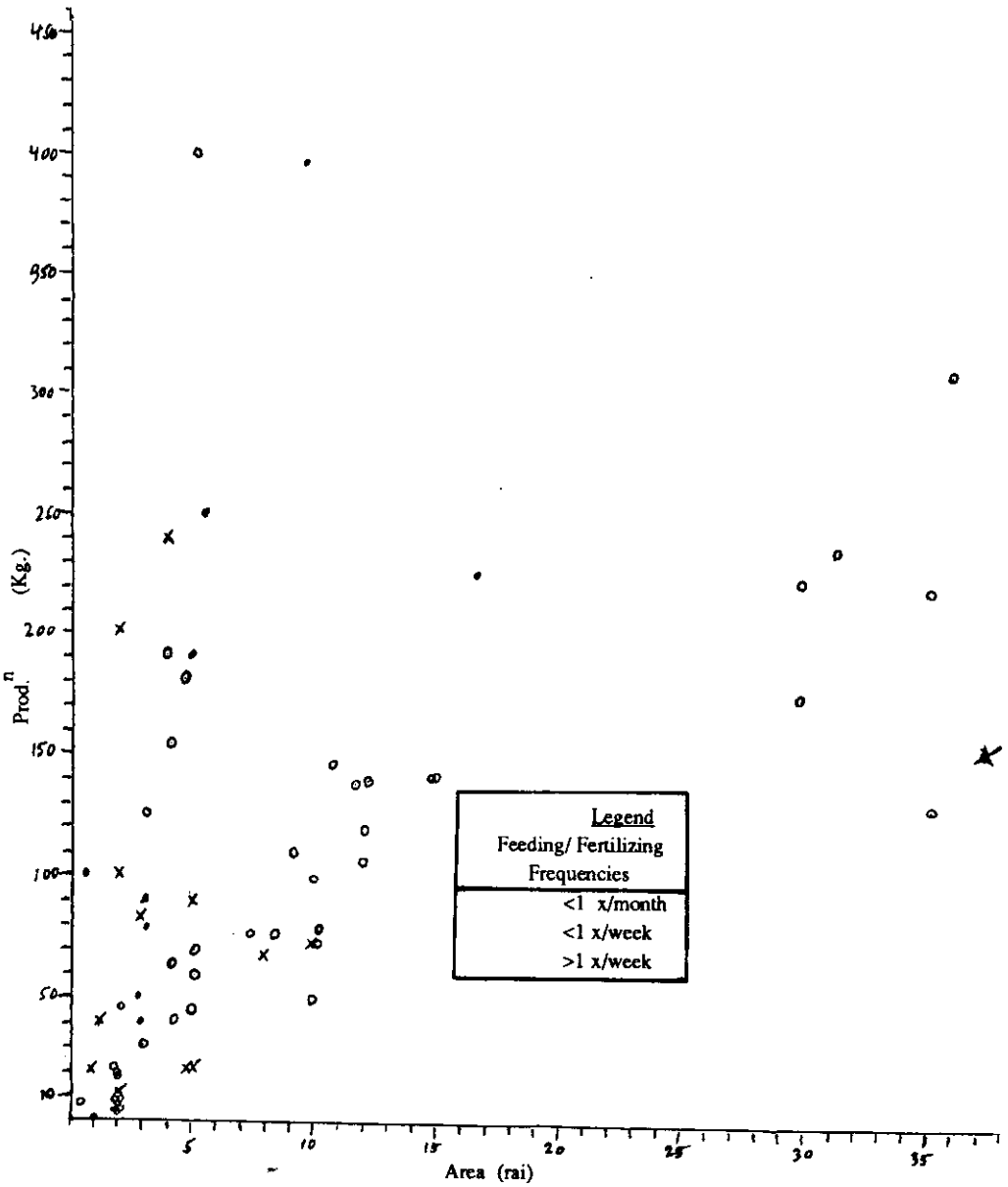


Figure 3.4 Scattergram : Reported Fish Production versus Stocking Rates