Rice-fish culture systems

By AP Surtida

Rice-fish culture has a long history in Indonesia, beginning in 9th century in West Java. Today, it is practiced in 17 out of 27 provinces in Indonesia. Rice-fish culture has spread to about 94,309 ha with 69% in Java, 15% in Sumatra, 6% in Sulawesi, and 10% at Nusa and Tenggara islands (Supriatna 1998).

Its distinct advantages are: (1) it allows farmers to maximize farm resources and therefore diversify harvest that leads to additional income; and, (2) it provides fish protein for land-locked areas otherwise deprived of fish from marine sources.

The rice field offers a special environment for raising fish if farmers use fertilizer properly. The ricefield has a high level of fertility owning to the rates of mineral elements, which result in higher production of rice. It is also rich in flora (algae, phytoplankton) and fauna (insect larvae, worm, zooplankton) which can serve as fish food.

Conversely, fish are beneficial to rice plants because they help provide a better growing environment of rice by controlling weeds and species of insect pests.

There are two types of rice-fish culture in Indonesia: (1) simultaneous rice-fish culture at the same field at the same time and (2) crop rotation wherein rice and fish are alternately raised as crops in the same rice field. Generally, the rice-fish technology was developed by farmers themselves.

The widely practical rice-fish culture in irrigated areas of West Java are: minapadi, penyelang and fish palawija. In the coastal areas of East Java, there is a special system called sawak tambak (dela Cruz 2000).

Most of the fish produced from ricefields are used mainly for restocking in growout systems such as: floating net, bamboo cages, running water (concrete tanks) and irrigation canal systems.

Rice varieties such as the IR64 (wet season) and ciliwung (dry season) which are proven to yield high with fish are planted.

Planting distance of rice plants is 20 x 20 cm, 22 x 22 cm or 25 x 25 cm. West Java farmers use the following fertilizers (in kg per ha): urea, 200; triple superphostate, 100; potassium chloride, 100; and ammonium sulfate, 50.

At the tillering stage of rice, water is kept low and is gradually raised to 10-15 cm throughout the rice growth.

Common carp (Cyprinus carpio, 15-25 g) are stocked at 2,500-3,000 per ha 7-10 days after rice planting. A center or a cross trench occupies about 2% of the total rice field area. Harvesting is done by draining the field slowly after a culture period of 40-60 days. By this time, the fish attain 50-100 g, the size desired for stocking cages and running water culture systems.

In the minapadi system, rice and fish are simultaneously raised in the same area. A trench refuge (0.5m wide and 0.3-0.4 m deep) is used. There is a variation called payaman method. The difference is that the rice-fish field is connected to a pond refuge instead of a trench.

The penyelang system is the culture of fish in between the first and second rice crops. Fish culture is shorter than the palawija system. A portion of the rice field with rice
stubbles is immediately stocked with common carp, while the remaining portion is prepared for the dry season’s crop.

Stocking size ranges from 5-8 or 8-12 cm or 15-25 g, depending on availability. Stocking rate is 2,000-4,000 fish per ha. Water depth is 10-20 cm. Fish are harvested after 30-40 days. The short period may not produce the desired size for grow-out in cages and running water systems, especially if stocked small. However, grow-out operators also buy small fish seeds if supply is scarce. The unsold fish are re-stocked in the following dry season crop.

The palawija ikan system is immediately done after the harvest of the dry season rice crop.

Dikes are raised to contain water depth of 30-40 cm. The stocking rate and size vary. In West Java, common carp of size 3-5 or 5-8 cm are stocked at 5,000 per ha without feeding. In North Sumatra, consumption size is produced in the palawija system. Stocked sizes are 30-50g or 50-100 g at the rate of 1,000-1,500 (no feeding); and 1,500-3,000 (with supplemental feeding). Supplemental feeds are rice bran, chopped cassava, corn kernel soaked in water, poultry feed, kitchen refuse and others. Harvesting the fish is done by draining the field.

The above systems are combined into sequential cropping patterns in a year such as:

- **Minapadi** (rice-fish), penyelang (fish only), minapadi (rice-fish), then palawija (fish only)
- **Rice**, penyelang, then rice palawija
- **Rice**, rice, then palawija
- **Rice-fish-duck**, fish-duck, rice-fish-duck, then fish-duck

In the last pattern, ducks are allowed to roam the rice field 25-30 days after transplanting rice. Ducks can control golden snail (*Pomacea* sp.) infestation in rice. The stocking density is 25 ducks per ha. The ducks have a small refuge pond where they are kept when necessary. Ducks can make the system most profitable. The year-round supply of eggs provides monthly income to the farmer. Without ducks, the first pattern (*minapadi-penyelang-minapadi-palawija*) is the most profitable.

### Fish stocking and production data

<table>
<thead>
<tr>
<th>System</th>
<th>Stocking size</th>
<th>Rate per ha</th>
<th>production (kg per ha)</th>
<th>Culture period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minapadi</td>
<td>15-25 g</td>
<td>2,500-3,000</td>
<td>100-200</td>
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</tr>
<tr>
<td>Penyelang</td>
<td>15-25 g</td>
<td>2,500-3,000</td>
<td>70-100</td>
<td>30-40</td>
</tr>
<tr>
<td>Palawija</td>
<td>5-8 cm</td>
<td>5,000</td>
<td>200-300</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>30-50 cm</td>
<td>1,000-3,000</td>
<td>300-800</td>
<td>60-70</td>
</tr>
<tr>
<td></td>
<td>50-100 cm</td>
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</tbody>
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### REFERENCES