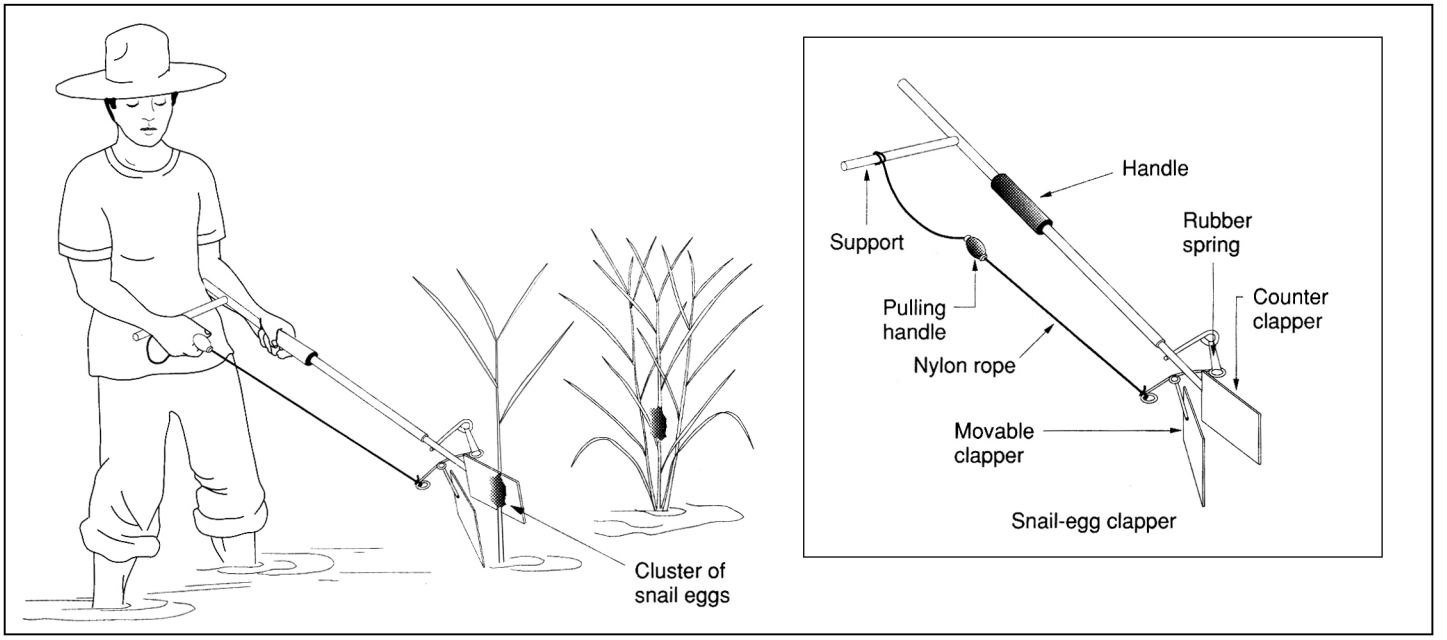

Use of a snail-egg clapper.

Other control measures include installing screens on water inlets, releasing snail-feeding ducks in field, and manually collecting and crushing snails and egg masses. Using a snail collector or *salaan* speeds collection of snails and eggs.

Snails lay eggs in clusters on objects above the water surface, including the vegetation of standing crops. Each cluster may contain 25-500 of the delicate eggs. Picking up snail eggs regularly is an effective control measure, but is tiring because it requires stooping.

The snail egg clapper was developed at IRRI to allow egg clusters on rice plants and vegetation to be mashed without stooping. The simple device weighs about 800 g (see figure). When the rope is pulled, the clappers move apart; when it is released suddenly, the clappers snap back together. The strength of clapper impact can be adjusted by tightening the rubber spring.

To operate the device, open the clappers by pulling the rope and align them on the rice plant or vegetation until the egg mass is between them. Then release the rope. The clapper will destroy the egg mass.

We compared the effectiveness of the clapper, collector, and hand picking. Area covered and work rate (egg masses removed/min) were recorded.

Area covered by the clapper varied from 1.6 to 9 m^2/min, 35-70% higher than that of the egg collector and 5-10% higher than hand picking.

The work rate of the clapper (mean 20.3/min) was about 1.8 times higher than with the egg collector (mean 11.2/min). With the egg collector, more than 32% of the egg masses dropped off the plant or bounced off the tool. The clapper missed fewer than 4% of the egg masses. We also found that while using salaan egg collector, the tillers would bend under the collector and sometimes needed support as the eggs were scraped off.

Effects of clapper impact on rice plant growth was measured at two growth stages, 3 wk after seeding and at panicle initiation, in collaboration with physiologists. The rice plants used were not infested with snail eggs.

The clapper was set at two levels of impact: high (47.5 g) and low (25.6g). There was no significant difference in plant height, weight of plant, root and shoot weight and their ratio, number of panicles, and grain weight between plants on which clappers were used and untreated plants.

The snail egg clapper is simple and inexpensive (costs less than US$ 2 to construct), and can be made with locally available materials. Blueprints are available free from IRRI Agricultural Engineering Division. □

Farming systems

Hybrid rice ratoon exploited in Sichuon China

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About 0.7 million ha of rice is grown at 29-31°N latitude, below 400 m elevation, in southeast Sichuan Province, China. Annual temperature is 17.5-18.5°C and annual rainfall about 1,000 mm. Most rice areas are rainfed lowland fields planted to a single crop of medium- to long-duration hybrid rice. The growing season is not long enough to grow two crops of rice.

Field duration of the rice crop is only 120 d from mid-Apr to mid-Aug. During the rest of the year, the fields are fallow under submergence, or more than 60 d elapse from the harvest of rice to the sowing of wheat in a rice - wheat cropping pattern.

Since 1986, about 80% of the farmers who ratoon rice follow the system rice -

ratoon rice - submerged fallow. The remaining farmers grow rice - ratoon rice - wheat.

In 1989, ratoon rice was on 0.45 million ha. Average yield of the main crop was about 7 t/ha, average yield of the ratoon crop was 1.6 t/ha (Table 1). Maximum ratoon yield was 4 t/ha. The ratoon crop has a short growth duration (about 60 d) and costs less than a second transplanted crop because it eliminates three major crop establishment operations: raising seedlings in the seedbed, field plowing, and transplanting.

Hybrid rices are planted in 85% of the total rice area in Sichuan. Some hybrids not only are high grain yielding but also have high ratooning ability. Hybrid rice ratoon crops yield 17% higher than conventional rice ratoon crops (Table 2). At present, the leading hybrid rice combinations Shanyou 63 and D-you 63 are most suitable for ratooning.

To make rice ratooning productive and economical, a package of main and ratoon crop management practices is recommended. The main crop nursery is sown in early Mar. Seedlings are raised under a plastic film or in a greenhouse, then transplanted at 33- × 13.3-cm spacing to reduce sheath blight. Rice is grown on ridges and fish in the ditches. Applying urea at 45-68 kg N/ha 2 wk before harvesting the main crop delays main crop senescence to produce more ratoon tillers and panicles. In fields with P deficiency, applying P fertilizer to the main crop significantly increases ratoon yield.

The main crop is harvested when nearly mature and when ratoon shoots have just begun to grow (3-5 cm). Optimum cutting height is 30-40 cm aboveground.

Inadequate fertilizer and low temperature injury at ratoon rice heading are the major factors associated with low ratoon crop yields. Breeders are selecting hybrid rices for intermediate to early maturity, high yield in the main crop, and strong ratooning ability. □

Table 1. Area and yield of ratoon rice in Sichuan Province, China, 1986-90.

Year	Area (10^4 ha)	Yield (t/ha)
1986	4.6	1.1
1987	19.3	1.5
1988	28.3	1.3
1989	45.0	1.6
1990	34.5	1.3

Table 2. Grain yield of main and ratoon crops of some rice varieties in Jiangjin, Sichuan, China, 1986.[a]

Type	Variety	Grain yield (t/ha)		
		Main crop	Ratoon crop	Total
Hybrid	Shanyou 63	8.6 a	2.0 a	10.6 a
Hybrid	D-you 63	8.5 a	2.0 a	10.5 a
Hybrid	V-you 63	8.5 a	1.7 a	10.2 ab
Hybrid	Gangai 63	7.6 b	2.1 a	9.7 bc
Hybrid	Zaishengyou 40-1	7.8 b	1.6 a	9.4 c
Conventional		6.9 c	2.1 a	9.0 d
Conventional	Daonan 18	6.6 c	1.7 a	8.3 e

[a] Av of 3 replications. In a column, means followed by the same letter are not significantly different at the 5% level.

Farm machinery

Ideal seed drill for direct sowing rice in semidry fields

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Rice crops that are broadcast seeded by hand in semidry fields have poor stands and low productivity. We compared two seeding techniques during 1990 wet season (WS). The trial was laid out in a randomized block design with 14 replications.

Soil was clay loam (fine Udic Chromusterts) with pH 6.8, 0.78% organic C; 300, 35, and 127 kg available NPK/ha. Rice cultivar CR1009 was seeded in dry soil in Aug, at 80 kg/ha. Fertilizer (150-60-60 kg NPK/ha) was applied at different stages of crop growth. The crop was flooded 30 d after seed germination.

The crop sown in lines with a three-tined, cupfeed type, bullock-drawn seed drill had the best yield attributes, resulting in a significantly higher yield (12.4% more than with conventional broadcasting) (see table). Gross income, net return, and benefit:cost ratio were also higher. □

Effect of rice seeding technique on yield and net income at Aduthurai, Tamil Nadu, India, 1990 WS.

Seeding method	Plant height (cm)	Tillers (no.)	Panicles/hill	Grain yield (t/ha)	Net return ($/ha)	Benefit:cost ratio
Line drill-sown	95.7	9.9	8.3	5.8	425	1.27
Broadcast	94.2	8.6	6.1	5.2	333	1.10
LSD (0.05)	ns	1.1	0.7	0.2		

Efficiency of a compartment-type rice separator

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Separating rough rice from brown rice is an important operation of modern rice mills: it avoids damage to polisher parts from the abrasive action of rice husks. Unhusked rice that goes through a polisher may also affect overall mill capacity.

A compartment separator (Schule-type) is more commonly used in modern rice mills than tray and screen type separators. We evaluated the effect of stroke length and slope of deck on separation, capacity, and energy consumption of a compartment-type paddy separator manufactured in India.

The separator has two outlets; three compartments with a single deck; and adjustments for feed control, slope, and