



Rice-eel integrated organic farming combined with earthworm culture

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Finless eel is a benthic aquatic animal and can live in different kinds of freshwaters with strong adaptability to adverse environment. It likes to drill into water-bottom mud, and often hides in caves calmly in the daytime and comes out for food at night. Finless eel is an omnivorous fish, and mainly preys on insects and their larvae, earthworms, froglets, meat of snails and mussels, small fish and shrimps, as well as algae and vegetable fragments. It is a kind of favorite food in high nutritional value in China and worldwide. With the increase of international and domestic demands, however, the wild source of it is sharply reduced. According to the investigations, the quantities of wild finless eels in China were reduced from 90 kg each hectare in 1960s to less than 1.5 kg each hectare in recent years. It is even on the verge of extinction in some areas of China. Artificial breeding of finless eels is the only way to solve the contradictory problem of the short supply and protection of wild source. Finless eels can be artificially cultured in paddy fields, as the fields are their natural habitats and can provide them with adequate natural bait, shaded waters and inhabitable mud. On the other hand, the eels in the fields can improve rice growth through loosening soil, reducing pests and increasing soil fertility, when they constantly burrow and run in the fields, eat insects and release excrements. According to our two-year field experiments, raising finless eels in the paddy fields effectively controlled the occurrences of rice leaf rollers, stem borers and planthoppers, significantly reduced the incidences of rice blight and blast, and increased the contents of ammonium nitrogen and phosphorus in the soils. As a result, no chemical fertilizers and pesticides were needed during the entire rice growing season any more. In the rice-eel integrated system, however, finless eels grew slowly. For the yield increase of eels, therefore, it was necessary to feed the eels with earthworms that were artificially cultured on the field ridges nearby. Earthworms mainly live on cow dung and straw, and finally transform them into wormcast, which is porous aggregates with many nutritional elements, humus and probiotics. The application of wormcast to fields improved physical-chemical properties of soils, increased crop resistance to pests and diseases and inhibited soil-borne diseases, thus highly raising the yield of agricultural products. This contributes to the development of recycling agriculture. The rice-eel organic farming system, combined with culturing earthworms on the field ridges, shows both ecological and economical benefits, and is very promising in the suburbs of Shanghai and other areas in China in the future. This work was supported by the Key Agricultural Technology Program of Shanghai Science and Technology Commission (16391901500).