Aquaculture vis-à-vis Agriculture

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Abstract

The effect of aquaculture, especially shrimp farming, on agriculture has caused heated debate among aquaculturists, agriculturists, and non-governmental organizations. As data on the negative impact of shrimp farming on adjacent rice fields are not available, a study was undertaken in rice fields skirting three shrimp farms: a semi-intensive farm; an extensive farm; and a semi-intensive farm with a buffer zone. The buffer zone was found to be helpful in preventing salinization of the adjacent agricultural fields and the Electrical Conductivity (EC) values (less than 1) reported were found to be harmless to the rice crop. Thus, aquaculture and agriculture can coexist in coastal areas if there are buffer zones in between.

Introduction

Seeing the immense economic potential of shrimp culture, the Government of India recognized it as an 'extreme focus sector'. As a result, coastal India witnessed a feverish expansion of fish farming activity. Unregulated construction of farms and construction by conversion of rice fields caused many problems. In the Tamil Nadu State, the agriculture farmers of the Thanjavur delta organized themselves into a movement to resist the setting up of shrimp farms. There is constant friction between the protagonists and antagonists of aquaculture. The main complaint of the antagonists has been that shrimp farming has not only deprived the crop farmers of precious rice fields, but also that the seepage from the shrimp farms makes the adjacent agricultural lands unfit for cultivation. However, there is no information available on the consequences of shrimp farming for adjacent agriculture land. The present study was undertaken to collect data on the impact of shrimp farming on adjacent rice fields.

Materials and Methods

Shrimp farming in Tamil Nadu follows two methods, namely, extensive and semi-intensive. This study selected three agricultural fields, one skirting an extensive shrimp farm, another a semi-intensive shrimp farm, and a third near a semi-intensive shrimp farm with a buffer zone (a 10 m wide freshwater channel) in between. Two crops were raised annually in each of the three shrimp farms. In the adjacent agricultural fields, samples were collected fortnightly for a year by taking soil samples (500 g) in three places; 0, 60 and 300 m from the embankment. The samples were dried in the shade and analyzed for parameters: electrical conductivity (EC), hydrogen-ion concentration, organic carbon, organic matter, available nitrogen, total nitrogen, phosphorus, potassium and soil texture. In the present study only variations in EC are discussed as these indicate impairment in the rice fields.

Results

The EC values recorded in the three sites are given in Table 1. In the rice field situated near the semi-intensive shrimp farm, the values at three places (0, 30, 60 m from the embankment) were 5.84, 5.05, and 4.82 m.mhos/cm, respectively, during the pre-monsoon season. During the monsoon season the values recorded were 4.86, 1.07 and 0.60 m.mhos/cm, respectively, at the three places. During the post-monsoon months, the values increased to 7.52, 3.63 and 2.53 m. mhos/cm, respectively, at the three places. The highest EC values were recorded during the summer season, at 30.65, 22.82, and 17.87 m. mhos/cm. In all seasons, the values decreased with distance from embankment into the field. A two-way analysis of variance showed significant differences between different places (F = 6.3635; P < .05) and seasons (F = 99.814; P < .005).

In the rice field situated near the extensive farm, comparatively lower EC values were recorded than in the rice field situated near the semi-intensive farm. During the pre-monsoon season, the values recorded at three places (0, 30, 60 m from the embankment) were 4.96, 3.84, and 3.65 m.mhos/cm, respectively. Minimum EC values were recorded during the monsoon months (2.37, 0.84 and 0.71 m. mhos/cm). The values rose in the post-monsoon season (5.92, 3.88 and 3.66 m.mhos/cm) and reached the maximum during summer (10.70, 7.90 and 3.05 m.mhos/cm). The two-way analysis of variance showed significant differences between places (F=25.8; P<.005) and seasons (F=13.82; P<.005).

In the paddy field situated near the semi-intensive farm with a freshwater buffer zone in between, interesting results were obtained. The EC values recorded during the pre-monsoon months were 0.95, 0.85 and 0.74 m.mhos/cm, respectively, at the three places. During the monsoon season the EC value was found to be the same at all the three places (0.1 m.mhos/cm). During the post-monsoon period the values recorded were (0.57, 0.51 and 0.46 m.mhos/cm). In summer, the maximum values of 1.85, 1.75, and 1.30 m.mhos/cm were recorded at the three places. A two-way analysis of variance did not suggest significant differences between the places (F=0.3515; P>.05) and seasons (F=589; P<.001).

Discussion

The aquaculture sector in India, especially shrimp farming, is passing through a transitional phase and facing many problems, especially social. All forms of food production affect the environment in one way or another. Disturbance to the balance of nature caused by human activities is a recognized phenomenon. However, as long as the pressure on the environment remains within sustainable limits that permit continuing natural adjustment, no major conflicts are recognized (Pillay 1992). One reason for the clamour against shrimp farming in India is the salinization it causes in the neighboring areas, especially rice fields, rendering them unsuitable for agricultural purposes. This study indicated that the electrical conductivity in the rice fields skirting the semi-intensive farm was negatively critical for rice culture throughout the year, except during the monsoon period, at 60 m from the embankment (Table 1). The same was true in the paddy field skirting the extensive farm. However, in the third field the buffer zone ensured that the soil was unharmed all year, except during the summer when there was no freshwater flow in the buffer channel. This study clearly demonstrates the usefulness of a buffer zone between shrimp farms and agricultural fields. If there

Table 1. Mean electrical conductivity (m.mhos/cm.) values recorded at various distances from paddy fields skirting the shrimp farms.

Season	Paddy field near semi-intensive farm			Paddy field near extensive farm			Paddy field near intensive farm with buffer zone		
Distance from peripheral embankment (m)	0	30	60	0	30	60	0	30	60
Pre-monsoon EC (m.mhos/cm)	5.84 C	5.05 C	4.82 C	4.96 C	3.84 C	3.65 C	0.95 H	0.85 H	0.74 H
Monsoon EC (m.mhos/cm)	4.86 C	1.08 C	0.60 I	2.37 I	0.84 I	0.71 I	0.10 H	0.10 H	0.10 H
Post-monsoon EC (m.mhos/cm)	7.52 C	3.63 C	2.53 I	5.92 I	3.88 I	3.66 I	0.57 H	0.51 H	0.46 H
Summer EC (m.mhos/cm)	30.65 C	22.82 C	17.87 C	10.7 C	7.9 C	3.05 C	1.85 I	1.75 I	1.30 I

C:Critical; I:Injurious; H:Harmless.

is a freshwater buffer zone of 50 m width and 4 m depth, then the shrimp farm will not impair the adjacent agriculture field. In places where it is not possible to have a buffer zone with freshwater, a gap of more than 60 m between the shrimp farm and rice field is necessary, even for estuarine water-based farms, given that impairment was observed up to 60 m in the present study. In another area (Parangipettai), shrimp farming adjacent to rice cultivation has existed for some time. After the outbreak of white spot disease, only one crop of shrimp is raised in a year, coinciding with the monsoon season, and no impairment has been noticed here. This demonstrates that aquaculture and agriculture can successfully coexist in the coastal areas. The country stands to gain on various counts through shrimp farming and it will be a loss if we fail to promote it in a sustainable way.

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Reference

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