

## PADDY CUM PRAWN FARMING (POKKALI FIELDS) OF KERALA

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**Abstract:** The Pokkali field are unique ecosystem of central Kerala with rich biodiversity and capacity to generate organic salt resistant paddy cum shrimp/fish. Salt tolerant strain of paddy cultivated in coastal areas for six months from May to October followed by Filtered shrimp or Prawn or fishes culture during November to April under traditional farming system of about 12,986.6 ha in Kerala. Rice cultivation alone not profitable under the organic farming, but the overall Pokkali farming system is made highly profitable by including prawn cultivation in the succeeding season. Around six species of shrimps, three species of prawns, three species of crabs and over 23 species of fishes have been recorded from the Pokkali field of Kerala. Paddy yield from traditional practices ranges from 1.0 to 1.5 tonnes per ha and that of high yielding varieties ranges from 3.2 to 3.5 tonnes per ha.

**Key Words:** Biodiversity, Organic farming, Pokkali farming.

### Introduction:

The traditional value and knowledge behind coastal aquaculture was an amazing and interesting factor to know about many brackish water aquaculture practices along with agriculture allied activities like Pokkali fields in Kerala (Saikia *et al.*, 2015). The Pokkali field is a unique ecosystem of central Kerala with rich biodiversity and capacity to generate organic salt resistant paddy and shrimp/fish alternatively (Vallarpadam & Joy, 2013). The term Pokkali is often referred as the salt tolerant strain of paddy crop cultivated in coastal areas of Kerala for about six months from May to October followed by Filtered shrimp/ Prawn culture or mixed group culture along with fishes during November to April. This system is specially called as “trap and hold” system of culture based on the tidal fluctuations (Pillai *et al.*, 2003). But recent days, Pokkali practices facing dramatic shifts from age old paddy cum shrimp rotational crop cultures due to intensification of shrimp culture. As time passes, the traditional system is being modified and intensified with continuous stocking and partial harvesting for sustainable yield and income without affecting the socio-economic status of the owner/lessee.

In Kerala, traditional and extensive shrimp culture is in practice and the total area under traditional farming system is 12,986.6 ha, of which 84% is under Pokkali fields. These fields are uniquely concentrated in the central part of Kerala with Ernakulam and Vypeen Island. The farming

areas are available in the districts of Kollam, Kottayam, Alappuzha, Thrissur, Malappurame, Kannur and Kasargod (Pillai *et al.*, 2003). There are about 4000 hectares of paddy fields under Pokkali cultivation in Ernakulam district, while in Alappuzha and Thrissur the extent of paddy cultivation is in about 3000 ha and 2000 ha respectively. The Pokkali fields of Kerala have been declining from 25,000 ha to 9000 ha. The Pokkali fields which are marshy situated close to the sea and the mouth of the rivers. Therefore, they are prone to flooding and salinity. The successful growth, propagation, survival, reproduction and harvest of shrimps are heavily dependent upon the quality of the field soil and water, degradation of which often limits the production in aquaculture systems (Ashamol *et al.*, 2014).

**Materials & Method:** Literature pertaining to pokkali field farming and cultivation practices were sequentially collected from various sources and logically arranged to have an outlook and view of the farming activities practiced in various districts of Kerala, India.

## Discussion:

### Pokkali Rice Cultivation:

Rice has enormous potential for tolerating towards most of the abiotic stresses and it was the only economic crop recorded that can grow well in waterlogged environments while tolerating salinity up to a certain extent. The crop can be grown in coastal belts that are always prone to inundation by sea water during high tides, resulting in salinization. Under these conditions, only salt and submergence tolerant crops are economically viable farming options. The major rice cultivating areas in Kerala include the lowland flooded areas like Kuttanad, Pokkali, Koal and Kaipad. 37% of rice production in the state is contributed by the low land ecosystems (Chandramohan and Mohanan, 2011).

Traditional cultivars namely *Kuthiru*, *Orkayama*, *Mundon*, *Kandorkutty*, *Orpandy*, *Odiyan* and *Orissa*, tolerant to low and medium salinity have been cultivated in various kaipad fields in Kerala. The average rice yield of these local cultivars is about 2000 kg/ha, making rice cultivation in this region unprofitable (Vanaja *et al.*, 2013).

The another traditional practice of *Kole* lands which form one of the rice granaries of Kerala are part of the unique Vembanad-Kole wetland ecosystem, the largest brackish, humid tropical wetland ecosystem in the Southwest coast of India comprising of 1,51,250 ha fed by 10 rivers and are exposed to diurnal tidal cycles. Within the Vembanad-Kole wetland ecosystem, the *Kole* lands cover an area of about 13,632 ha spread over Thrissur and Malappuram districts. The name *Kole* refers to the peculiar type of cultivation practice carried out on these lands and in the regional language Malayalam *kole* indicates bumper yield or high returns in case floods did not damage the crop.

*Kole* lands extend from the northern bank of Chalakudy River in the south to the southern bank of Bharatapuzha River in the north. The *Kole* lands remains submerged under flood water for about six months in a year and this seasonal alternation gives it both terrestrial and water related properties which determine the ecosystem structure and process which in turn gives rise to various provisioning services. Rice is the most important crop cultivated in the *Kole* land. *Virippu* is usually cultivated in higher rice fields around the *Kole* land where the duration of flood lasts only for few days. *Mundakan* is cultivated in medium elevation fields around the *Kole* lands where the flood water reside by August.

### Types of Pokkali Fields:

The name Pokkali is specifically denoted the oldest and best variety of salt resistant rice variety cultivated in Kerala that has a tradition of 3000 years in rice cultivation and accepted as organic farming. In paddy cultivation, the Pokkali strain has been remaining as a favourite and significant among many farmers which are attaining the global recognition as well as exclusive cultivation and distribution rights to its farmers in Kerala. The coastal aquaculture being practiced seasonal Pokkali

fields and perennial fields. The area specifications for seasonal and perennial fields are about 0.5 to 10 ha and 2 to 75 ha respectively. After the harvest of the Pokkali paddy in the month of October, these fields are used for the culture of shrimps which is locally called as “Chemmeen Kettu” or “Chemmeen Vattu” or “Adappu” for duration of five months either by single ownership or joint ownership specifically called as “Karshaka Samajams” (Pillai *et al.*, 2003). Perennial fields or "Varsha Kettu" are deeper fields and hence unsuitable for paddy cultivation. The Soils of Pokkali fields are deep, dark or pale bluish black in colour, impervious nature and clayey in texture that forms cracks on drying and turn sticky on wetting. The salinity of Pokkali fields decrease rapidly up to the month of August and maintained till the end of December to January (Vanaja, 2013). This area is under confluence with the freshwater and saline water. The salinity varies from 0 to 31 ppt or more.

The paddy seedling grows in natural way without addition of any inorganic fertilizers except organic manure and lime that supports nutrient cycling and eradication of unwanted weedy plants and fishes respectively. The adaptations of paddy crops recorded were really an interesting one that is, the rice plants grow up to 2 meter in order to survive in the water logged field and bend over to collapse with only the panicles standing upright. While harvesting, only the panicles are cut and the rest of the stalks are left to decay in the water, which in time become feed for the fishes/shrimps/prawns stocked over the field (Gayatri & Raveendra, 2009). The use of fertile bottom mud of this field as manure for the coconut plantation is also a common in North Malabar.

### **Analysis: Preparation of Rice Cultivation Field:**

During the start of rice cultivation, the owners of the respected field would employ the skilled labours for the mound preparation. The technical specification of the mound recorded was 45 cm diameter and 60 cm in height.

### **Water Filling and Seed selection:**

The soil condition could be tested along with salinity profile to analyze the crop management. Then water would be filled to the appropriate depth required for the rice cultivation. Seeds selected made based on the water and soil quality condition.

### **Sowing and Application of Organic Manure:**

After selection of saline tolerant seeds, cultivars would soak the seeds in water for about 24 hours as time period. Then, soaked seeds would kept undisturbed for about 2 to 3 days either in gunny bags or tied in bags of coconut fronts or covered with banana leaves un till the seeds germinate and the radical comes out. Then, the labours sow the germinated seeds on the raked mounds and cover with mud Mounds at essential places where salinity is high. After the time interval of 45 days, the mounds with grown up seedlings will be dismantled without damage to the roots of seedlings by man labourers, and the seedlings in clefts are dispersed around the flattened mounds and arranged uniformly by Woman labourers in the month of July. In order to maintain the potential nutrient cycling of the major and minor nutrients application of organic manure is essential.

### **Weed Management:**

No perfect weed management systems were recorded so far. But, the unwanted or excess weeds growth would terminated by the skilled labourers for the effective management of the crop.

### **Harvesting of Rice:**

By the end of September to mid of October, the crop would be ready for harvesting. During harvest, panicles along with small portion of the Culm are harvested leaving larger part of the stubbles in the field. Yield of traditional cultivars ranges from 1.0 to 1.5 tonnes per ha and that of high yielding varieties ranges from 3.2 to 3.5 tonnes per ha (Vanaja, 2013).

## Preparation of Pokkali Field

The preparation of Pokkali field is the progressive process, includes removal of sluices after paddy harvest, application of lime for eradication of the unwanted weeds, sluice modification, seed stocking by natural tidal fluctuation, post stocking measures, draining of water to harvesting of the standing crop will be carried out by the group of people.

### Technical Specification of Pokkali Field:

Bund should be strong enough to withstand the tidal fluctuations and other operation during supplementary feeding, application of chemicals, miscellaneous activities and harvesting. Bund top width is 1.0 m and height is maintained at the level of 1.5 m. The standard sluice length - 3.5 m, width - 1.25 m and height - 2.25 m. Shutter planks are used to regulate the water flow into the field and made up of the wood. Optimally, 8 to 12 Shutter planks are used and the number is related to the height of the sluice. The standard specification of a shutter plank is 1.25 m length and 0.15 m width. Nylon net sluice screen have the mesh size of about 2.5 mm that guards the escape of shrimps or fishes from the Pokkali field during discharge of water. For harvesting, draining of water should be completed within 2 hours period of time to achieve the clarity of the harvested stocks (Pillai *et al.*, 2003).

### Stocking Method:

In this unique system, there is no selective stocking or supplementary feeding followed. Only the organic vegetable wastes from the Pokkali paddy cultivation is allowed as the natural feed material for shrimp/fish culture. At low tide, fish are caught in the sluice net. Trapped fish and crustaceans are harvested when they reach a marketable size. Nowadays, the Pokkali fields are not such a profitable venture, due to the increasing cost of human labour. Nevertheless, the flesh taste and quality of this specific production system are quite valuable and popular. The system was being promoted and maintained by some governmental, non-governmental organizations and private initiatives. And now, these systems have been modified to include selective stocking of desired shrimp species.

### Species Composition:

The different types of shrimp species observed while harvesting were listed as follows as *Metapenaeus dobsoni*, *M. Monoceros*, *Fenneropenaeus indicus*, *Penaeus monodon*, *P. semisulcatus* and *M. affinis*. The fresh water prawns includes *Macrobrachium idella*, *M. rude* and *M. equidens*. The portunid crabs namely *Scylla serrata*, *S. tranquebarica* and *Portunus pelagicus* are often caught from the filtration fields. The common fishes available in traditional system are *Ambassis* spp., *Anchoviella* spp., *Arius* spp., *Barbus* spp., *Chanos chanos*, *Cyprionoides* spp., *Eetroplus suratensis*, *Eetroplus maculatus*, *Elops* spp., *Hemiramphus* spp., *Liza parsia*, *Mugil cephalus*, *Megalops* spp., *Oreochromis mossambicus*, *Ophichthys* spp., *Ophiocephalus* spp., *Platycephalus* spp., *Scatophagus argus*, *Siliago* spp., *Terapon* spp., *Thrissoceles* spp. and *Tachysurus* spp.

### Shrimp Filtration:

For the economic valuation of the culture, the species selection would be the deciding factor of success. The major shrimp varieties were filtered during the entry process by sluice gates and filtering net curtails the entry of unwanted species into the culture system and also prevents the escape of cultured species out of the system. The size and number of sluice gates required for a farm depends on the extent of the operational field and direction of the water flow. A bottom plank was set firmly on the ground under the water. The side planks provided with foot-rests are then fitted. These foot rests were meant for drawing the coir rope operating the shutter planks. The top frame was fixed over the side planks and the gate was made as a single unit. Strong poles were erected very close to both sides of the sluice gate and this inter-connected structure is firmly tied to the sluice gate to forms a stabilized unit.

Fishing or harvesting of the stock was carried out during seven to eight days on either side of the full moon and new moon periods by fixing a filter net to the sluice during ebb tides. This shrimp filtration technique has been receiving Geographical Indication Registration and considered the primary crop in these fields though some farmers maintain the fields primarily for fish cultivation.

### Conclusion:

In the present era of organic agriculture gaining societal, political and scientific recognition for its contribution to sustainable agriculture, enhancing rice production from a naturally organic production system like Pokkali rice tract, which is an abiotic stress prone area, is imperative to achieve ever green revolution in rice. Rice cultivation alone not profitable under the organic farming, but the overall Pokkali farming system is made highly profitable by including prawn cultivation in the succeeding season.

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