



Backyard Recirculation Aquaculture System

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Introduction

Recirculation Aquaculture System (RAS) is a technology where in water is recycled and reused after filtration and removal of suspended matter and metabolites. The method is used for high-density culture of various species of fish utilizing minimum land area and water. It is an intensive approach (higher densities and more rigorous management) than other aquaculture production systems. Instead of the traditional method of growing fish outdoors in open ponds and raceways, in this system fish are typically reared in indoor tanks in a “controlled” environment. Recirculating systems filter and clean the water for recycling it back through fish culture tanks. The technology is based on the use of mechanical and biological filters, and the method can in principle be used for any species grown in aquaculture. New water is added to the tanks only to make up for splash out, evaporation and for that used to flush out waste materials. The reconditioned water circulates through the system and no more than 10% of the total water volume of the system is replaced daily. In order to compete economically and to efficiently use the substantial capital investment in the recirculation system, the fish farmer needs to grow as much fish as possible in the inbuilt capacity. However, in order to encourage small-scale fish farmers and entrepreneurs and also to facilitate fish production in urban and peri-urban areas where land and water are scarce, it is proposed to promote Backyard Recirculation Aquaculture Systems.

Our country ranks good in freshwater fish production as even traditional methods of fish farming are able to produce anywhere between 2–10 tonne per hectare per year. But a



Recirculation Aquaculture System may produce up to 500 tonne fish per year in same area. Recirculation Aquaculture is a relatively new practice. Establishment of these units will therefore improve the knowledge base of fish farmers about emerging and future technologies in aquaculture.

Operation of these units is more demanding in terms of technology, techniques, biology of cultured fish and stringent water quality parameters. There is deficit of proper knowledge, expertise in technical management of Recirculation Aquaculture Systems (RAS) and entrepreneurial attitude for commercial scale units. The high investment costs may have kept RAS Technology away from our country until now. But there is an amazing potential for it in India and with growing interest RAS Units (big and small) are coming up in Uttar Pradesh, Bihar, Andhra Pradesh and elsewhere. In the next 5 years, these are going to be seen in many places in India for sure and RAS would be the next big thing to happen in Inland Fisheries Sector in the country.

Site Selection

Selection of a good site is extremely important, although Recirculation Systems are desirable where only limited water is available for removal of fish wastes out of the production system. Passing water through a treatment unit removes ammonia and other waste products achieving the same effect as a flow-through configuration. Land measuring approximately 100 m² is required for the construction of a Backyard RAS Unit.

Water Quality: Water quality is important and optimum range of certain parameters required for successful fish culture in a Recirculation Aquaculture System is given below:

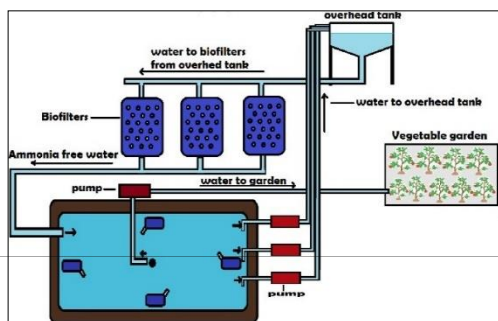
Sl. No.	Water Parameter	Optimum Range
1	Temperature	26 - 30 °C
2	Dissolved Oxygen	4 - 6 ppm
3	pH	7 - 8
4	Alkalinity	120 - 150 ppm
5	Ammonia	<0.05 ppm
6	Nitrite	<0.5 ppm
7	Nitrate	<5 ppm

Ras Components

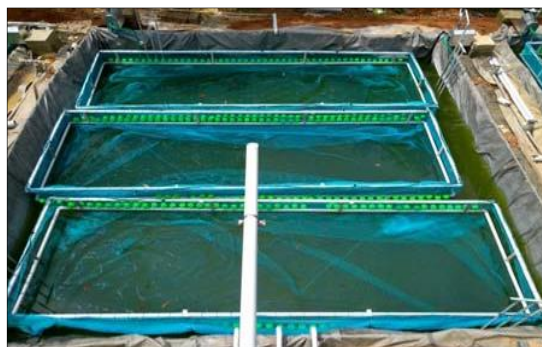
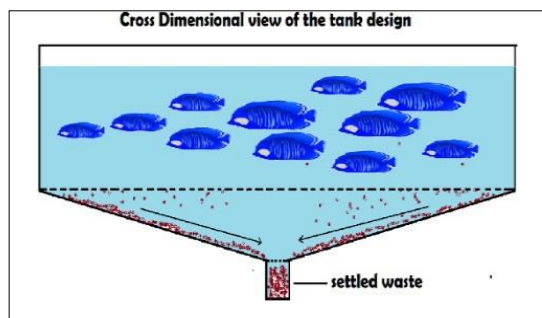
Pond/Tank: Area required for construction of the Backyard RAS Pond/tank is 44.89 m². Fish Tank is constructed with RCC/ brick masonry and lined with HDPE sheet; the dimensions are 6.7 x 6.7 x 2 m, having a water volume of 90 m³ (90,000 liter); bottom is conical with a slope of 18°; effective water depth is 2.0 m and maximum depth is 3.3m.

Sl.No.	Particulars	Unit
1	Total Land Area required	Maximum of 100 m ²
2	Tank Area	44.89 m ²
3	Tank Dimension	6.7 x 6.7 x 2 m
4	Tank Volume	90 m ³ (90,000 liter)
5	Effective Depth	2.0 m
6	Bottom Shape	Conical with a slope of 18° and a central slurry accumulating pit
7	Maximum Depth	3.3 m (Centre of the tank)
8	Pump	0.5 HP, Centrifugal Pump
9	Venturi Aeration System	0.5 HP, 4 Systems in a tank
10	Bio-filters	Trickling, Nitrifying Bioreactor

Floating Cages: Three cages of 30 m³ each are floated in the 90 m³ pond/tank, in series. Cages may be free floating or fixed.



RAS Fish Tank Setup






Floating Cages Setup in RAS Fish Tank

Model Backyard RAS Unit

Selective Fish Species:

Monosex Tilapia (*Oreochromis niloticus*), Pearl spot (*Etroplus suratensis*) and Pangasius (*Pangasius hypophthalmus*) are suitable for Backyard RAS.

		
GIFT Tilapia (<i>Oreochromis niloticus</i>)	Pearl spot (<i>Etroplus suratensis</i>)	Pangasius (<i>Pangasiandon hypophthalmus</i>)

Stocking and Yield

Although stocking densities should be determined by species requirements and operational considerations, the influence of stocking densities on growth and production has been determined empirically. The indicative stocking and harvest details are as follows:

Reference

- Jacob Bregnballe, 2015. A Guide to Recirculation Aquaculture: An introduction to the new environmentally friendly and highly productive closed fish farming systems. Published by FAO and EUROFISH International Organisation, 2015, pages 1-100.
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