FARMING FISH IN RECIRCULATING AQUACULTURE SYSTEMS: PERSPECTIVES AND CONSTRAINTS

JOHAN A.J. VERRETH AND EP H. EDING
Aquaculture and Fisheries Group, Wageningen University, POBox 338, 6700 AH Wageningen, The Netherlands; e-mail: johan.verreth@wur.nl

In the course of a few decades, aquaculture is growing into the main source of food fish. Together with this explosive growth, the limitations of farming become visible: competing claims for culture sites, negative environmental impacts, hazards due to diseases, use of chemicals and drugs, problems associated with welfare. A potential approach to mitigate these problems is to impose full control over the production process. Farming fish in closed recirculating aquaculture systems (RAS) is an example of this approach. Current production in RAS is still emergent (about 3% of total European production), but because of increasing concerns of environmental impacts of farming and concerns of bio-security, their popularity is strongly growing, especially for land-based farming operations.

The perspectives for “nearly zero discharge” farming via RAS are high indeed. Research at Wageningen University showed that Nitrogen and COD emission can be reduced to less than 5% of the inputs via feed. The water foot print of RAS based systems is 15 to 20 times less than for pond farming where pellet feeding is used. Using smart technology innovations, energy costs can be reduced to 2.2 kWh/kg and direct water consumption to 40 Liters/kg of warm-water fish produced.

However, farming fish in these systems experiences also some constraints. First, the initial capital investments are high, and this puts high demands on the cash flow in the farm. To be profitable, high returns per unit of investment is needed. High productivity per unit volume is needed when margins are small, or margins per kg of fish produced must be high. A second constraint is the high level of technical skills required from the farmer. The aforementioned drives lead to a continuous search for increasing productivity per unit water volume (e.g,, by increasing fish density) and to a continuous search for further closing the cycle. This entails the risk for accumulation of minerals, metals and metabolites which may impair growth, health and welfare of the animal.

GAJENJE RIBA U RECIRKULARNIM SISTEMIMA: PERSPEKTIVE I OGRANIČENJA

JOHAN A.J. VERRETH AND EP H. EDING
Aquaculture and Fisheries Group, Wageningen University, POBox 338, 6700 AH Wageningen, The Netherlands; e-mail: johan.verreth@wur.nl

U proteklih nekoliko godina, akvakultura postaje glavni izvor ribe kao hrane. Zajedno sa ovim eksplozivnim napretkom, ograničenja u gajenju riba postaju sve vidljivija: takmičenje za lokacijama gde bi se riba gajila, negativni uticaji na okolinu, opasnosti usled bolesti, korišćenje hemikalija i lekova, problemi vezani za dobrobit. Jedan od mogućih pristupa u rešavanju ovih problema je uspostavljanje potpuna kontrola nad procesom proizvodnje. Jedan od primera takvog pristupa jeste gajenje ribe u zatvorenim recirkulacionim vodenim sistemima - „recirculating aquaculture systems - (RAS)". Trenutna proizvodnja u recirkulatornim vodenim sistemima je jos uvek u povoju (oko 3% celokupne proizvodnje u Evropi), ali zbog povećane brige za uticaj na okolinu i brige za bezbednost životne sredine, njihova popularnost vrtoglavo raste, naročito kada su u pitanju sistemi gajenja vezani za kopnenu sredinu.

Mogućnosti za uzgoj „skoro bez emisije štetnih sastojaka" u recirkulatornim vodenim sistemima su veoma velike. Istraživanje na Univerzitetu u Wageningenu su pokazala da emisije azota i hemijska potrošnja kiseonija (COD) mogu da se smanje na manje od 5% unosa preko hraniva. Zagađenost vode u recirkulatornim vodenim sistemima je 15 do 20 puta manja nego kod gajenja u ribnjacima gde se koristi peletirana hrana. Korišćenjem inovacija „pametne" tehnologije, energetski troškovi se mogu smanjiti na 2.2 kWh/kg i direktna potrošnja vode na 40 litara/kg proizvedenih toplovodnih vrsta riba.

Ipak, gajenje ribe u ovim uslovima uključuje i neka ograničenja. Prvo, početna investicija kapitala je visoka, i upravo to postavlja visoke zahteve na protok novca na farmi. Da bi se pokazali kao isplativi, potreban je visok povraćaj novca po jedinici investicije. Potrebno je ili ostvariti visoku produktivnost po jedinici zapremine, ili visoku cenu po kilogramu proizvedene ribe. Druga prepreka jeste visoka tehnička obučenost, odnosno zavidan nivo veština koje farmer treba da poseduje. Prethodno pomenuto vodi ka stalnoj potražnji za povećanjem proizvodnje po jedinici zapremine vode (na primer povećanje gustine riba) ali i potrage za daljim zatvaranjem kruga – održivosti proizvodnje. Ovo podrazumeva rizik od akumulacije minerala, metala i metabolita koji mogu da ugroze rast, zdravstveno stanje i dobrobit riba.