

## Fast Growing and Hybrid African Catfish

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### Summary

The African catfish is excellent for inland freshwater farming and has large potential to boost local and regional production and improve human nutrition and protein security across Africa. Catfish are native to all Sub-Saharan African countries and are widely consumed. Rearing catfish started fifty years ago in West and Central Africa. They grow fast and are omnivorous (including many low-cost agricultural byproducts), they are hardy against common pests and tolerate low water quality, they can be farmed at high stocking density with potential annual production of 6-16 ton per hectare, they mature and reproduce easily in captivity, and they can be sold live, fetching a higher price than tilapia. One favorable characteristic is their ability to gulp air when oxygen levels are low, making pond aeration less difficult and risky. Catfish breeds can grow up to 1.5 meter long and weigh up 30 to 60 kg although most are harvested when smaller from culture systems. Scarcity of quality fingerlings from improved catfish breeds by local hatcheries is a major hurdle to enhancing yields and returns of farmers and meeting demand from local markets. As a result, too many fish farmers collect fish eggs from the wild or purchase poor quality fingerlings. Lack of knowledge on pond and fish health management among farmers also leads to high mortality, limited growth and poor feed conversion and must be addressed through training and advisory services.

### Technical Description

The most popular catfish breeds for farming are the African sharptooth catfish (*Clarias gariepinus*), which has a dark gray or black coloration on the back, fading to a white belly; and the African catfish (*Heterobranchus bidorsalis*) with greyish brown on the back and sides, a pale brown on the belly and some individuals showing a marbled coloration at the rear of the body. Both species are fast-growing and well adapted to conditions in Sub-Saharan Africa. Crossbreeding female *C. gariepinus* with male *H. bidorsalis* produces a hybrid offspring (Hetero-*Clarias*) that has a superior growth rate, higher survival, and hardiness compared to the parents. It does not spend energy on reproduction because the hybrid is sterile and has a high feed conversion. The hybrids also have a white meat which is usually preferred by consumers. The two species do not mate with one another naturally. Hybridization requires that female catfish are given a hormone injection, which induces the release of eggs. They are anesthetized, and eggs are "stripped" by gently pushing the belly. Male catfish are killed to harvest their seminal fluids, also known as milt, which is subsequently mixed with these eggs. Fish farmers can perform the process

themselves after short-term training, particularly focused on ensuring that hormone dosages, egg, and sperm are prepared correctly, along with other hatchery practices.

## **Uses**

Catfish can be cultured in ponds, cages, and raceways. A larger percentage of catfish are produced in earthen ponds. Warm water is needed for good growth, with 27°C to 29°C being the optimum. Fish will also survive in temperatures as low as 16°C but feeding rate will reduce. All regions of Sub-Saharan Africa are suitable for commercial production of catfish, even in highland regions where temperatures drop during the night. A location with reliable access to clean water is needed to maintain the quality of ponds and to achieve desired growth rates and feed conversion.

## **Composition**

A hatchery typically includes indoor units and outdoor structures, efficient waste management for environmental health, understanding and compliance with biosecurity issues, water storage tanks, hatching/incubating troughs, and water filtration to remove all mineral solids and debris from the water. Other materials include buckets to transport larvae and fry, a water testing kit, rectangular or circular fry tanks, nursery ponds for fingerlings, and pumps for water and air. Hatchery operations require superior broodstock (fertile and healthy), syringes, hormones to induce female broodstock, and knowledgeable and skillful hatchery operators. Fish farming starts with sourcing quality fry or fingerlings from an improved breed that grows fast and converts feed to flesh more efficiently. Certified hatcheries offer a safe route to increase local supply of fast-growing and hybrid catfish.

## **Application**

Producing seed requires selection of fertile broodstock. Females should weigh 1 to 4 kg and be at least one year old. Female catfish are injected with ovaprim hormone or freshly extracted pituitary can be used to promote egg maturation. Seminal fluid (or milt) is collected from male brooders that weigh 2 to 3 kg which can fertilize eggs from 20 females. Milt incubation in saline water extends its lifespan and ensure that all eggs are fertilized. Collected eggs can be weighed to forecast the number of fry, each gram contains approximately 600 eggs. Fertilizing eggs is best done in a narrow container, water temperature should be higher than 25°C, and eggs hatch within only 20 and 36 hours. Larvae do not require feeding until three days after hatching because they are feeding on their yolk sacs. Aeration is necessary because fry is very active and require more oxygen. Feed them for 5-8 days with cultured zooplankton or finely powdered shrimp, fishmeal, or special feed. Water quality is very important to managing fish health and monthly antibiotic treatment of ponds can greatly reduce the risk of infection. The pH of water in ponds must be maintained between 6.5 and 9.0, if the pH drops below 6.5 and total alkalinity and hardness below 10 ppm, limestone can be applied to the ponds. A successful farm requires a dissolved oxygen concentrations of 5 ppm or higher. Treat wastewater from ponds before discharge to avoid pollution of local waterways.

<b>Agroecologies</b>	All Agroecologies.
<b>Regions</b>	Africa South of Sahara.
<b>Developed in Countries</b>	Nigeria, Democratic Republic of the Congo, Tanzania, Kenya, Uganda, Ivory Coast, Cameroon, Malawi, Zambia, Benin.
<b>Available in</b>	Zambia, Uganda, Tanzania, Nigeria, Malawi, Kenya, Ivory Coast, Democratic Republic of the Congo, Cameroon, Benin.
<b>Solution Forms</b>	Genetics.
<b>Solution Applications</b>	Fish Farming.
<b>Agricultural Commodities</b>	Fish.
<b>Beneficiaries</b>	Small-scale farmers, Commercial farmers.

## Commercialization

### Commercialization Category

Commercially available

### Startup Requirements

Hatcheries in many African countries sell pure and hybrid catfish fingerlings in conjunction with promotional campaigns among fish breeders and fish farmers. The following steps need to be considered before starting catfish hatcheries and farms: 1) Select or construct a pond in an open place free of flooding with direct sunlight, 2) Provide a reliable source of quality water, 3) Purchase matured and fecund improved breed of broodstock or fingerlings and 4) Supply well-balanced feed that is free of aflatoxin and contaminants.

### Production Cost

Catfish fingerlings may be produced and marketed for US \$0.025 cents per gram and sold for up to US \$0.05 cents per gram; with two-month-old juveniles sold for US \$0.09. In Kenya, five- to six-week-old fingerlings of common catfish are sold at US \$0.12 per individual. At a stocking rate of 600 fish per cubic meter of water, this cost is US \$72. Hybrid catfish fingerlings can cost 2-2.5 times more than the non-hybridized breeds.

Feed for a one-hectare pond stocked with 8,600 fast-growing catfish is about US \$2,500, while feed inputs for 10,000 hybrid catfish are approximately US \$3,500, making feed the greatest recurrent production input.

### **Customer Segmentation**

There is a diverse customer base for improved breeds of African catfish, including hatcheries and small and commercial producers.

### **Potential Profitability**

Access to fast-growing and hybrid catfish breeds from hatcheries is a major opportunity to increase production and profitability farmers. Hybridized catfish increases the production of farmers by 20% to 30% compared to pure non-hybridized catfish breeds.

### **Licencing Requirements**

Within larger, commercial-scale operations, hybrid production relies upon complex arrays of equipment and materials, many of which are protected by patents. In many cases, operations may be streamlined by local ingenuity and materials described elsewhere on this portal.

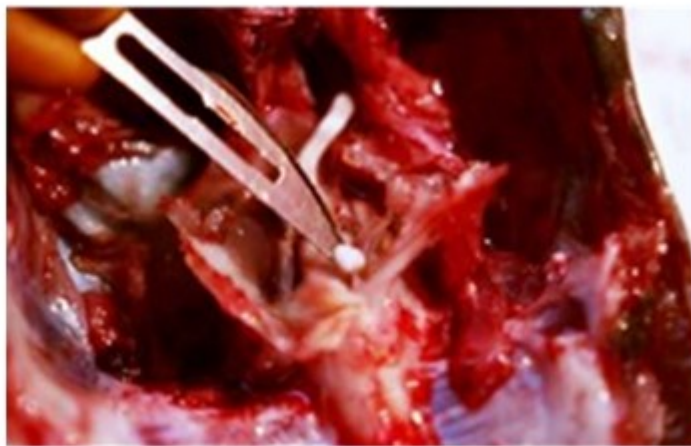
### **Innovation as a Public Good**

In its simplest form, catfish nurseries may be conducted as a cottage industry for the supply of local pond operators based upon the access to Regional Public Goods through WorldFish.

## Solution Images



*Sex differentials in African catfish;  
male (left), female (right)*



*Extraction of pituitary gland from selected fish*

# Institutions

