

## Commercial Frog Farming

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### Introduction

Raising and selling frogs on a commercial basis has **not** proven to be successful economically in Virginia or elsewhere in the United States to our knowledge. Although farming for frog legs sounds promising, operating a profitable frog farm seems to be more of a myth than a reality. Those few individuals who claim to be successful frog farmers generally are distributors engaged in the selling of adult frogs, tadpoles, or frog eggs, frequently harvested from the wild.

Many “frog farms” turn out to be natural marshy areas, swamps or shallow ponds with abundant food and habitat suitable to the needs of wild frogs. At some frog farms, culture methods simply consist of increasing the shoreline area, erecting a fence to exclude predators and retain the frogs, and stocking wild frog eggs or tadpoles. The frogs usually are left to raise themselves.

Intensive indoor frog culture techniques have been developed for the production of laboratory frogs used in medical and biological research. At present, however, it is doubtful that these indoor culture techniques can be applied economically to the culture of large frogs for human consumption.



### Edible Frogs

A number of species of frogs, including the green frog (*Rana clamitans*), the leopard frog (*Rana pipiens*), and the pickerel frog (*Rana palustris*), are harvested from the wild and sold as a luxury food - frog legs - in expensive restaurants. However, the bullfrog (*Rana catesbeiana*) has the greatest potential for culture.

The common bullfrog, often referred to as the “Giant Frog” or “Jumbo Frog,” is the largest native North American species, often reaching 8 inches in body length. Because of its large size, the bullfrog is the most preferred and commonly attempted species for farming.

### Breeding and the Life Cycle

Bullfrogs lay their eggs in shallow standing water during the Spring (April and May) in temperate climates. The large, floating, jelly-like egg mass produced by a single female may cover an area about 3-5 feet square and include from 10,000 – 25,000 individual eggs. The eggs hatch in 1 – 3 weeks, depending on the water temperature, into larval frogs that commonly are called tadpoles. Bullfrog tadpoles chiefly are vegetarians, spending most of their time grazing on microscopic plants and bottom algae.

### Slow Growth

Frogs and other amphibians are coldblooded animals that grow slowly, not a particularly desirable trait for farming. The rate of growth of the bullfrog tadpole varies with the climate, length of the growing season, and available food supply. Even in temperate climates, it may take a year or more to transform the tadpole into a young bullfrog. Another year or more is required to produce a mature, marketable-size bullfrog. Therefore,

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in the mid-latitude states like Virginia, development from egg to a mature bullfrog of harvestable size may take over 3 years, even under ideal conditions.

## Artificial Feeding

Feeding is the critical process in culturing frogs successfully. Poorly fed frogs are susceptible to disease and frequently resort to cannibalism (eating younger bullfrogs and tadpoles), thereby reducing the harvestable population. Frogs and tadpoles reared outdoors will obtain some natural foods, but for intensive commercial culture of frogs in high densities, supplemental food must be supplied.

Bullfrog tadpoles are mainly vegetarians and will consume most soft plant matter and some animal feed. Acceptable tadpole foods include such items as boiled potatoes, meat scraps, or chicken viscera. Recycling butchered frog scraps is a convenient way to reduce food costs, but may transmit disease.

Once the tadpole has metamorphosed into the adult frog (i.e., the legs are fully developed and the tail is absorbed), feeding becomes especially difficult. Adult frogs feed exclusively on **moving animals**, primarily small insects. They generally refuse to eat dead or at least non-moving food. Japanese researchers reportedly have been able to induce frogs to eat dead silkworm pupae by using small motorized trays that mechanically roll the silkworms back and forth to simulate live animal motions.

Live animals, such as minnows, crayfish, and insects, also are placed in these trays to condition the frogs to feeding from these mobile platforms. Although this technique may work, most American frog farmers rely on stocking or attracting live food animals. Smaller species of frogs, tadpoles, crayfish, and minnows can be stocked as food items for bullfrogs although the expense of live feed is high.

The use of strong flood lights to illuminate the shoreline at night will attract flying insects and provide additional food for frogs. However, this technique is not sufficient to supply enough food to sustain the high frog densities needed for a commercial operation. At present, live food, adequate in quantity and quality, remains the greatest problem for would-be frog producers.

## Pond Design

A mature bullfrog may require as much as 21 feet of shoreline as its exclusive feeding territory. Territorial behavior firmly limits the number of frogs that can

coexist in a small area. Available shoreline area (the ratio of land to water edge) is a critical factor. The total size of the pond is not as important as shoreline, because frogs use shallow shorelands to rest and feed. Large expanses of deep, open water are seldom used by frogs.

Regularly shaped round or square ponds have less shoreline in proportion to area than small irregular-shaped ponds. Therefore, increasing the length and irregularity of the shoreline by constructing long narrow ponds with numerous islands, shallow bays, or coves will increase the carrying capacity of frogs in a given area. Some growers increase the amount of shoreline, by constructing ponds as a series of narrow ditches.

Ponds should be deep enough to protect the adult frogs and tadpoles from extremely hot or cold temperatures. Accordingly, the depth of the pond must vary with the climate. In the southern U.S., water from 1-2 feet deep is adequate, but in the North, much deeper water (6-12 feet) may be required to assure the overwinter survival of frogs hibernating in the bottom muds. Most of the pond should be shallow (2 -12 inches deep), because frogs normally rest and feed in shallow waters.

Predatory fish, snakes, snapping turtles, cats, foxes, and water birds that feed on adult frogs and tadpoles should be fenced out. Enclose the pond with a mesh fence about 3 feet high. A vertical fence, topped with wings, one inclined outward and the other inward, will exclude predators and keep frogs in. Birds are especially difficult to exclude, but, in small ponds, a wire net stretched above the shallow shoreline area may offer some protection. Some loss due to predatory animals should be expected.

## Water Quality and Quantity

An abundant supply of high quality water must be readily available to the frogs throughout the growing season. For good growth, water temperature should remain relatively constant at 20° to 26° C. The pH of the water should be slightly acidic. Dissolved oxygen always should be present because tadpoles, as fish, breathe by gills and are dependent on the available oxygen. Pesticides and other dangerous chemicals often are toxic to frogs, and even non-lethal concentrations could restrict the sale of frog legs for human consumption. Pesticides can be distributed widely by winds and water currents. However, with care and intelligent site selection, most pollution problems can be avoided.

## Geographic Limits

In aquaculture (farming aquatic animals), successful results seldom are transferable from one geographic region of the country to another. Climate often limits aquacultural enterprises. The growing season for frogs is longer in tropical than temperate climates, therefore the potential for frog farming may be better in South America or Louisiana than in Virginia or other temperate climate states. Clearly, outdoor frog farming in the Northern states would not be advisable.

Other important variables to consider are the lower labor costs, greater water availability, and the high demand in Southern states where frogs, crayfish, catfish, and other aquatic animals are traditional foods.

## Harvesting

Techniques for collecting and harvesting pond-cultured bullfrogs are the same as those used in capturing wild frogs. These methods include nets, hand capture, spearing, and fishing with a hook and line. Hooks baited with live insects, earthworms, or artificial lures (a piece of red cloth or yarn) are dangled in front of the frog. Spearing and band capture techniques are done most effectively at night, using a bright spotlight to momentarily daze and immobilize the frog. Obviously, new methods to efficiently harvest large numbers of frogs need to be developed.

## Diseases

The most common disease of frogs, red-leg disease, is due to a bacterial infection (*Aeromonas*), often resulting from overcrowded conditions. The best preventative methods are adequate nutrition and space. Infected individuals should be isolated immediately, and treated with antibiotics. In severe cases, it may be necessary to drain the ponds and allow them to dry out for several weeks.

## Economic Factors

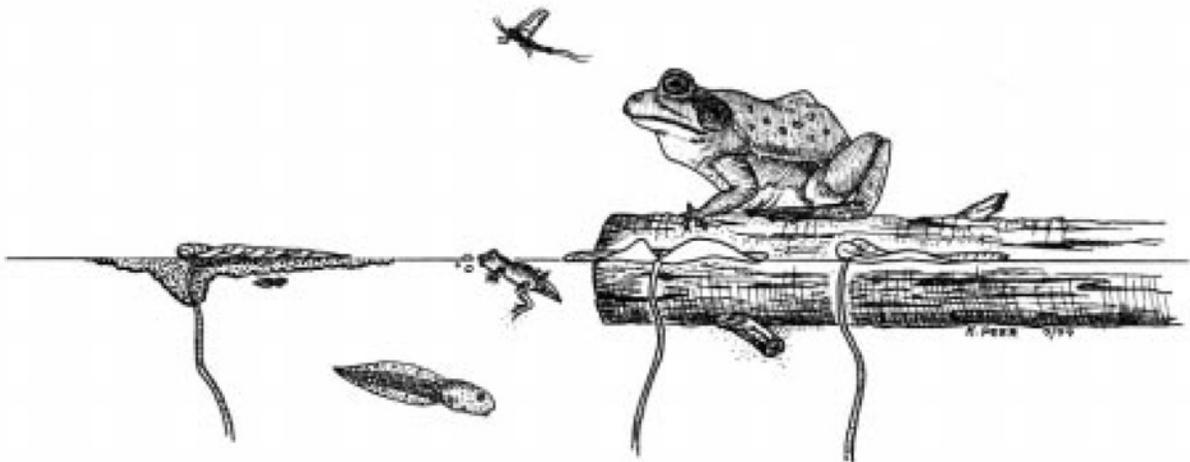
Good management and operational skills are critical to an aquaculture enterprise. The success of aquatic farming depends largely on the cost to grow and market for the product. Before attempting to raise frogs or any other aquatic crop, the prospective culturist should conduct a survey of the local or regional markets to determine the current supply, present and expected demand, price elasticity, extent of competition, and other socioeconomic factors.

Large numbers of wild frogs imported into the United States or captured locally and sold at low prices will reduce the potential profitability of frog farming. Market price fluctuations of frog legs are volatile. Prospective frog farmers realistically should assess their own financial status because most aquaculture enterprises require a high initial investment, have a number of associated “hidden” costs, and produce low realized return on short term investments. **Expectations of large or easy profits are extremely unrealistic.**

As in agriculture, aquatic farming a risky business. A number of unpredictable and uncontrollable catastrophes include prolonged droughts, severe floods, toxic chemicals, intense predation, infectious diseases, and contagious parasites literally can destroy an entire year’s crop overnight. Prospective frog farmers should be well aware of these and other associated risks and be prepared to sustain some periodic losses.

## Future Potential

At present, there is no well-established frog farming industry in the United States. Current practices and past efforts at commercial frog farming have been unsuccessful largely because of physical, chemical, biological, and economic constraints. Opinions concerning the feasibility of frog farming in Virginia range from the optimistic to those that maintain it is not possible economically.



Considering the current state of the art, frog farming as a **commercial** venture appears to have severely limited potential. However, as intensive hunting and increased drainage of natural wetlands continue to reduce the wild frog populations, the demand for frogs may reach a critical point, permitting skilled culturists to profitably farm frogs.

### **Declining Wild Amphibian Populations**

Wild populations of frogs, toads, salamanders and other amphibians are declining throughout the world. Scientists suspect greater atmospheric ozone and the increased incidence of ultraviolet radiation, acid rain, and other forms of environmental pollution, but the

exact causes for the rapid disappearance of frogs and other amphibians are unknown. Researchers fear extinction of many species of amphibians worldwide. This decline will reduce the supply of wild frogs for food and for farming operations. It also may impose new regulations and restrictions on frog farming enterprises.

In Virginia and most other states, it is lawful to capture and possess no more than a few wild native or naturalized amphibians for private use and not for sale. A permit for capturing, holding, propagating, and selling of wildlife, including amphibians, is required in most states.