

# The production of poultry in integrated aquaculture-agriculture systems

## Part II: The integration of laying hens with fish and vegetables in integrated aquaculture-agriculture food production systems

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### Abstract

The incorporation of laying hens in an integrated aquaculture-agriculture family-based food production unit, was investigated. The Hyline-silver laying hen hybrid was found to be extremely suitable with an exceptionally high egg production as well as a 100% survival rate over more than 200 d. Fish used included the sharptooth catfish *Clarias gariepinus* and the three-spot barb *Barbus trimaculatus*, both stocked at a relatively low density. Fish yields were satisfactory without any supplementary diet. Water quality conditions were generally good with no signs of oxygen depletion. Problems were encountered with fungal diseases amongst some of the vegetable crops during the wet season of the summer-autumn cycle. Recommendations are made to remedy the problems encountered and to improve fish yields.

### Introduction

Attempts to establish warm-water pond-fish farming in Southern Africa did not always succeed, largely due to the high costs of pelleted fish feeds which contained fish meal from marine fish resources. Another reason for the general lack of success of this kind of venture can be ascribed to the volatility of the market for pond fish products (Cross, 1991; Lightfoot et al., 1993).

In South Africa, aquaculture as such, is not a concept with which our rural populations are familiar even though it has been shown that it can provide the vital animal protein necessary to relieve much of the prevailing problems of malnutrition (Steyn et al., 1995).

In contrast to stand-alone pond-fish culture, the success of which is subject to the already mentioned factors, integrated aquaculture-agriculture farming systems are less risky because of the efficiency derived from synergisms amongst the different components of such food production ecosystems (Lightfoot et al., 1993). Integrated aquaculture-agriculture farming systems also provide a more acceptable and familiar form of agriculture to the rural population, of which the production of fish now becomes only a subcomponent. New (1991) supported by Lightfoot et al., (1993), are of the opinion that the integration of aquaculture with agriculture can contribute substantially towards the actual reduction in costs and the eventual success of the fish culture component. New (1991) is of the opinion that the future bulk of fish produced world-wide, may well be generated by fish-farming ventures of an integrated aquaculture-agriculture nature.

In recent years water has been provided widely to the rural communities in South Africa. It remains, however, a scarce resource and must be utilised optimally by the various communities. With the necessary scientific and technical extension

services which are now available, small family- or community-scale integrated, sustainable aquaculture-agriculture systems can be practically implemented. Components of these systems such as poultry and vegetables, which as stated, are already familiar food and farming practices, can now be integrated with fish farming. If, during this process, the amount of fish feed normally required can be reduced substantially, total food production costs of such an integrated system can then be minimised.

The present paper is the second in a series of investigations on the integration of aquaculture-agriculture food-production systems largely aimed at rural community development in South Africa. Specific attention is given to the egg production of Hyline-silver laying hens, which is a hardy commercial hybrid bird developed at the Department of Animal Health, Medunsa, and which is particularly suitable for egg production under rural conditions.

### Materials and methods

#### Fish ponds

A total of five 30 m<sup>2</sup> earthen ponds sealed with a 400 µ plastic lining, were used in the investigation. The fish ponds were stocked with two species of fish, grown at relatively low densities during a summer-autumn (*Clarias gariepinus* (Burchell)), and a winter-spring cycle (*Barbus trimaculatus* (Peters)), respectively. The nutrient-rich water from the fish ponds was then used to irrigate a variety of vegetable crops. Yields of eggs, fish as well as the various vegetable crops, are evaluated.

#### Chickens

Five chicken sheds of a simple inexpensive construction were suspended over the ponds and were insulated with plastic material. Each shed contained nine 18 week-old laying hens housed in specially constructed welded mesh batteries supplied with feeding troughs and water. All hens were inoculated against the

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