

The production of poultry in integrated aquaculture-agriculture systems

Part I: The integration of Peking and Muscovy ducks with vegetable production using nutrient-enriched water from intensive fish production systems during the winter period of March to September 1996

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Abstract

An investigation was made into the growth and production of Peking and Muscovy ducks on ponds using nutrient-enriched water from a water-recirculating intensive fish production system. The same water which received additional nutrients during a duck feeding programme was then used to irrigate selected vegetable crops. The production potential of Peking and Muscovy ducks was evaluated and the yields of different vegetable crops were compared with each other as well as with yields obtained during standard production practices. The application of this type of integrated aquaculture-agriculture system in rural areas as part of family-/community-based food production schemes is discussed.

Introduction

Integrated aquaculture-agriculture production systems have largely been developed in south-east Asian countries where they are at present well established as an important source of essential plant and animal protein (Pullen and Shehadeh, 1980; Hopkins and Cruz, 1982; Edwards and Pullen, 1990). In Africa, this type of food production system is still poorly developed (Pullen and Prein, 1995) and where in use, appears to be largely based on the integration of fish farming with rice (Diallo, 1992; Noble and Costa-Pierce, 1992). Commercially orientated integrated aquaculture-agriculture systems in South Africa since 1987 were investigated (Prinsloo and Schoonbee, 1987) when intensive studies were made into the feasibility of a duck-fish-vegetable integrated aquaculture-agriculture system for developing areas. This approach to food production is not only of particular importance to South Africa in view of the general scarcity of water resources (Department of Water Affairs and Forestry, 1997) but also because of its potential to combat the widespread problem of malnutrition which prevails in our rural populations (Tichelaar et al., 1995). The production of animal protein can do much to alleviate this situation in these areas (Steyn et al., 1995). It also serves as a good example of the possible approach towards the conservation, reuse and efficient management of our scarce water resources.

The present paper can be seen as a continuation of the developmental research originally done by Prinsloo and Schoonbee (1987) on integrated aquaculture-agriculture systems and of which this paper constitutes the first in a series on the establishment of farming- and community-based poultry-fish-vegetable

farming systems aimed at sustainable food production in Southern Africa. Future papers will mainly deal with summer and winter production studies using laying hens and the grow-out of broiler chickens integrated with the propagation of fish and vegetable crops.

Materials and methods

Production layout

Five 30 m³ earthen ponds, sealed with a 400 µ plastic material, were used in the investigation. Duck sheds of a simple, inexpensive construction and insulated with plastic material, were erected over the ponds. The floors of the duck sheds were covered with welded mesh to allow duck faeces and wasted food to fall directly into the pond water below. During day-time, ducks were allowed to enter the ponds.

Nutrient-enriched water from a water recirculating intensive fish production unit (Prinsloo et al., 1999a, b), was used to fill the duck ponds prior to stocking.

Aeration was applied to each pond by means of perforated plastic pipes connected to a low-pressure Elector side channel blower unit, model SE2-1057.

Water chemistry

Chemical parameters of the duck pond water were analysed according to *Standard Methods* (1995). Water temperature (°C) were measured using Thies hydro-thermographs. Dissolved oxygen concentrations (mg·l⁻¹) of the wastewater were determined using an Oxy 92 oxygen meter. pH values were determined with a portable Hanna 8244 pH meter. The electrical conductivity (µS·cm⁻¹) was recorded with a Hanna HI 8633 conductivity meter. Ammonia (NH₃- mg·l⁻¹), nitrite (NO₂- mg·l⁻¹), nitrate (NO₃- mg·l⁻¹), orthophosphate (PO₄- mg·l⁻¹), as well as

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