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THE INFORMATIONAL SYSTEM FOR RESOURSES ADMINISTRATION IN FISH FARMS

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The informational system for aquaculture activities provide a financial planning and analysis tool. The software can also be of assistance to land-based farmers who want to more thoroughly utilize their water resources by developing small-scale fish farm systems to provide supplementary income. Informational model has been enhanced to produce a comprehensive software package for aquaculture feasibility modeling, financial planning, sales and harvesting planning and management information tools.

Keyword: *aquaculture resources, bussines plan, informational system, financial instrument for aquaculture activities, farm model, casf flow, performance and profitability measures, FCR (feed conversion rate).*

1. Introduction

The objective of this article is to present an informational model of the business plan for aquaculture activities. Policy-makers and development agents are increasingly viewing aquaculture as an integral component of the search for global food security and economic development. Fisheries and aquaculture can provide a key contribution to food security and poverty alleviation. However, productivity gains in fisheries do not always imply long-term increases in supply. In fact, in wild capture fisheries such gains can ultimately lead to the demise of stocks and reduced production.

This informational system has been specifically designed for *recirculation aquaculture technology*. The bio-economic model used can be classified as a non-optimizing budget simulation which uses the growth, and FCR(feed conversion rate) and mortality characteristics of a particular species and cash and accrual accounting principles to arrive at performance and profitability measures. Various scenarios (including farm size, species characteristics, harvesting and sales strategies) using different bio-economic inputs (including risk) can be compared and contrasted. Informational system provides the currently operating fish farmer and the potential new investor with critical information that will allow the user to model expected cash flows and associated profitability ratios and indices for a particular sized operation farming a particular species of fish. The informational system has built into its program the ability to enter **risk aversion** details in order to more adequately depict the learning curve situation that new entrants experience at the beginning, and also build into the ten year production cycle the one in ten year production shortfall that normally occurs in farm production due to unforeseen circumstances. As a result the ten year cash flow stream will more adequately depict reality by accounting for risk.

The aquaculture informational system will be able to answer the following critical questions in relation to investment decisions or ongoing financial management of a fish farm operation:

- How much do I have to invest to attain a certain cash flow stream?
- What will be the return on that investment?
- How much will I have to borrow?
- What is the minimum sale price that can be accepted for the product?
- What is the profit margin?
- How much do I have to increase production by to maintain profit levels if sale prices fluctuate?
- Which harvesting and sales strategy maximizes cashflow?
- How does fluctuating FCR affect profit?
- How is profit affected by a learning curve?
- What is the current equity position?

Informational model is a financial planning, harvesting and sales management tool, which enables you to plan your investment and determine the size of your commitment before you begin, taking the risk out of your investment. It allows to develop and evaluate sustainable aquaculture systems and management practices at both an operational and strategic level. The system can determine potential profitability of the farm as investment levels and other key performance indicators vary. You can see how critical movements in the key elements of fish farming can affect the performance of your farm, enabling you to determine the amount of production required in relation to cost. Relevant data such as fish growth and mortality statistics

are used to calculate key performance and profitability indicators. Other key data information includes:

• Sale price of fish;
• Type of product (live or processed);
• Number of tanks or ponds;
• Stock density;
• Cost of feed;
• Cost of fingerlings;
• Loan size and costs;
• Risk aversion (production assumptions incorporating learning curves);
• Harvesting planning charts;
• Water cost and use.

The software provides easy-to-read accounts, giving you a concise summary of your farm's potential. You can see how critical movements in this key data can affect the performance and profitability of your farm, and demonstrate the feasibility of investing in this exciting new industry. The software package is delineated into eight major modules, each capable of producing custom-built reports for business plan development and on-going farm financial management and monitoring. The modules include the following areas of Accounts:
• *General Report,* brings major variables together to allow scenario mapping;
• *SpeciesVariables,* includes industry best practice growth rates, FCR's and mortality;
• *Bio-economicVariables*, includes all the variables necessary to develop a fish farm;
• *FishFarm Model Accounts,* over a ten year period;
• *Internal Rate of Return Analysis;*
• *Cash Flow Statement,* describes opening and closing cash balance;
• *Key Financial Ratios, p*roduces accounts to calculate critical financial and profitability ratios;
• *Volume Cost Analysis, p*roduces fixed and variable cost accounts for volume planning;
• *Harvesting and Sales Strategy, p*roduces annual harvesting by product type;
• *Charts,* produces a series of charts and diagrams.

2. The Farm Model

The farm model is a ten year account of the farm enterprise calculated from the various bioeconomic inputs and the species characteristics. The software assumes that capital is purchased in Year 0 and that the revenue streams begin in year 1, depending on the time taken for final growout.

The fish farm account assumes that once costs (except those costs associated with biomass such as feed, electricity, and product insurance) have been set in year 1, they remain the same throughout the ten year cycle. The fish farm account therefore presents what is *expected* from the parameters.

The farm is set up using a particular set of data relating to a particular species. This data includes:
• Cohort growth to final growout;
• Mortality;
• FCR;
• Recovery rates from fish.

This module shows the critical variables which affect production and financial performance of your farm. The informational system feasibility results include the following performance measurements:
• Internal Rate of Return;
• Benefit Cost Ratio;
• Profit Margin;
• Assets Turnover;
• Return on Total Assets;
• Debt to Equity;
• Leverage Return;
• Return on Equity;
• Contribution to Overheads;
• Cost per Kilo (variable and total);
• Harvesting Strategy and Cashflow[1].

3 Critical Bio-economic Data

The critical bio-economic data that interacts with the feasibility results includes data associated with the size of the farm and other crucial assumptions which impact on the feasibility of an aquaculture venture. These data items include:

• ***Fingerling Price***: This price is either taken from commercial reality or calculated from on-farm nursery costs associated with raising a fingerling to a certain size (RON).
• ***Number of Fingerlings***: The number of fingerlings for each stocking (one to twelve times per year) will determine the size of the farm and the revenue generated from product sold.
• ***Initial Weight of Fish***: This will determine what part of the growth table will be used to start the fish farm operating.
• ***Feed Price*****:** This is an average price of feed per kilo over the growout period of the fish (RON).
• ***Stocking Density (initial grow)***: This is described in k/g per cubic metre.
• ***Stocking Density (final grow)***: This is described in k/g per cubic metre.
• ***Production Sold Live***: The proportion of fish production sold live.
• ***Production sold HOGG***: The proportion of fish product sold HOGG (head on, gutted and gilled).
• ***Production sold fillet***: The proportion of fish product sold filleted.

 This paper was recommended for publication by Prof. Ioan DAVIDOVICI, PhD.

• ***Price of fish*:** The farm gate sale price (RON) of fish product (live, HOGG and filleted).

4. AquaFarmer Feasibility Results

The AquaFarmer Feasibility Results are key profitability ratios and indices that have been calculated from reports and tables attached to the program. These include the following:

• ***Net Present Value (NPV):*** This is the discounted value of the ten year cashflow stream. The NPV will depend on the discount rate (which is entered in the bioeconomic variables input table); the value is usually equal to the current rate of interest.

• ***Internal Rate of Return*[2]*:*** The Internal Rate of Return (IRR) is the discount rate that equates the present value of net cash flows with the initial outlay. It is the highest rate of interest an investor could afford to pay, without losing money, if all of the funds to finance the investment were borrowed, and the loan was repaid by application of the cash proceeds as they were earned. Conventional projects involve an initial outlay followed by a series of positive cash flows. In this case, if the IRR is higher than the required rate of return then the NPV is positive.

• ***Benefit Cost Ratio***: Instead of showing the NPV as an absolute amount, the benefit cost ratio relates the present value of cash flows to the initial outlay. If the ratio (sometimes called the profitability index) is greater than one, then the project is acceptable.

• ***Profit Margin (PM)***: Profit Margin is the sales return *before* interest. The Profit Margin is equal to the Net Income (NI) before interest {NI + after tax interest expense (ATI)} (averaged over 10 years) *divided* Revenue (averaged over 10 years). This ratio indicates the percentage of sales revenue that ends up as income. It is a useful measure of performance and gives some indication of pricing strategy or competitive intensity.

• ***Asset Turnover (AT)*:** The Asset Turnover is equal to Revenue divided Total Assets (applicable to the year of the ten year production cycle). This ratio relates to the farm's dollar sales volume to its size, thereby answering the question, "How much volume is associated with a dollar of assets?". This ratio tends to move in the opposite direction to the Profit Margin. Companies with high turnover tend to have low margins, and those with low turnover tend to have high margins.

• ***Return on Total Assets (ROTA)***: This is the operating return, which indicates the company's ability to make a return on its assets *before* interest costs. ROTA equals Profit Margin (PM) times Asset Turnover (AT).

• ***Debt to Equity Ratio (DER):*** This relates ratio reveals the extent of debt that is part of the venture's financing. The ratio equals Liabilities *divided* by Equity (Owners investment contribution plus the value of assets already owned that are used for the venture plus retained earnings).

• ***Leverage Return***: Measure the relationship between borrowings and equity. Financial leverage is measured by the Debt to Equity Ratio *times* {Return on Total Assets (ROTA) *minus* the Average Interest Rate after Tax (IN)}. The Average Interest Rate After Tax (IN) is equal to the After-tax Interest Rate Expense (ATI)
divided by Liabilities.

• ***Return on Equity* (ROE)**: This is equal to Return on Total Assets *plus* Leverage Return. The company's return is made up of returns from operations and from borrowed funds. If there is a positive difference between the operating return and the cost of borrowing, a company may take advantage of this difference via using leverage to enhance its returns by borrowing relative to the owner's equity base.

• ***Hasegawa Index***: The Hasegawa index is a convenient way to obtain an indication of the profitability of an aquaculture venture (given that detailed economic data may not be available). This index compares the *ratio* of the selling price and the price of feed to the *ratio* of the conversion ratio and the ratio of feed cost to total costs.

• ***Contribution to Overhead (CTO)***: CTO is the portion of revenue from each unit or RON of sale that remains after variable costs are covered. Therefore the CTO equals RON 1.00 minus (total variable costs / revenue). The residual must cover fixed costs to make a profit.

• ***Cost per Kilo***: The cost per kilo of fish is equal to current costs (minus depreciation) divided by total production (tones). Expressed as RON per kilo, this cost
can be related to the sale price of the fish.

Cash Flow Statement[3]

The Cash Flow Statement shows the calculated Closing Cash Balance over the ten year cycle. This balance is assumed to be reported as cash in hand after each period, and can be used to reduce debt faster, buy more capital equipment or place in special savings portfolios such as a superannuation fund

Financial Ratios Modul

This modul details the Assets and Liabilities over each of the ten years. By inserting the Year number at the top of the screen, the accounts will change depending on the depreciation and liabilities.

The financial ratios calculated from this are:
• Profit Margin
• Asset Turnover
• Equity
• Return on Total Assets

• Debt to Equity Ratio
• Leverage Return
• Return on Equity.

Equity is calculated by subtracting total liabilities from total assets. It is calculated in the profit linkage model in a different way to show how the accounts interact.

Trading Results

The Trading Results Report summarizes the Assets/Liabilities and the resulting (Loss/Surplus) or equity and the trading results. This module is used to calculate the Cash Available for Debt Service (CAFDS) Ratio, which is used by financial institutions to determine the capacity of a proposed business to cover loan repayments. Financial institutions have certain performance measures that are used to determine the eligibility for a financial loan. For example, a bank may require that the minimum interest cover is a CAFDS which is twice the amount of an interest repayment. Equity is defined as the owner's capital investment for setup capital costs and the value of any assets contributed to the venture[4].

Volume Cost Analysis

This system modul shows a breakdown of Fixed and Variable Costs and calculates the following major indicators:
• Contribution to overheads
• Breakeven Volume

Profit Planning module is included to assist the farmer in determining what volume (sales) is required to attain a particular gross profit.

Fixed Cost module is included to assist the farmer in determining the amount of
additional sales required to cover an addition to fixed costs (e.g. a new pump).

Variable Cost module has been included to determine the impact of expected inflation and its impact on variable cost.

Profitability Linkage Model

This screen shows how Return on Equity (ROE) is calculated. The calculations take into account the following data from the various accounts:
• Net Income
• Total Assets
• Total Liabilities
• Equity
• Return on Total Assets
• Debt to Equity Ratio
• Leverage Return

Print out Reports

Informational system produces a general report which summaries the farm scenario outlined in the assumptions laid down. Reports and graphics include:
• Consolidated Report
• Bio-economic variables
• Profit and Loss Account
• Financial Ratios (Assets and Liabilities)
• Trading Results (Cash available for Debt Service)
• Cash Flow Account
• Internal Rate of return Analysis
• Volume Cost Analysis
• Profitability Linkage Model (Return on Equity)
• Capital Start up Payback Period Bar Chart
• Current Costs Pie Chart
• Fish Tonnage Chart

5. Conclusions

Fisheries and aquaculture can be developed in a sustainable manner to generate food and jobs and improve the income and livelihoods of rural and urban populations, thus alleviating hunger and poverty.

The informational model of bussines plan represent an engine for economically resilient and sustainable fisheries and aquaculture is the government's will and resolve to establish sound policies to support and develop the sector. The informational model allowed to analisys the influence of production system inputs to the farm yield and cost.

The input of fish farm production system (fingerlings, feed, water, etc.) determine yield and cost in both a direct and indirect way. When an input is used more intensively (for example, when more fish are stocked per ha) yield may rise enough to offset the increase in cost, resulting in a more profitable farm. As production intensity increases, however, the greater use of an input, such as feed, can have an indirect and negativ effect efect on yield via changes in pond water quality. This can result in a lower yield and higher cost per kg harvested, reducing profit to the farm.

Full employment of productive factors, including human resources, continuous improvements in the legal and regulatory framework for the development of the sector, and scientific breakthroughs in production technologies will strengthen aquaculture and ensure its sustainability. Thereby making it a good contributor to the country's overall economic growth through the supply of food, employment and foreign exchange and the creation of infrastructure, especially in rural areas.

The aquaculture represent a component of rural development policies. The aquaculture activites

 This paper was recommended for publication by Prof. Ioan DAVIDOVICI, PhD.

offers the perspective of multisectorial development in rural areas.

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