Computer Based Data Acquisition and Control in Agriculture

Critical Information Design for House Broilers Used by Artificial Neural Network

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ABSTRACT

Meat is one source of protein for humans. Meat became an important commodity in nutritional needs. One of flesh as a source of animal protein is chicken. Chicken is a common poultry reared people to be exploited as a source of livelihood. In the development of broiler chicken breeding experience of technology development, among others in the field of maintenance, feeding, vaccination, human resources management, and enclosure design. Success in building the productivity of broiler chickens, there are three that must be considered is the management, breeding, feeding. Many studies carried out must have characteristics that healthy broiler growth undisturbed by external influences, diet drink. The purpose of this study namely: the first, knowing information about the management (of temperature), feeding (total protein, breeding (weight) on house broiler from starter to finisher by using artificial neural network. The second, Analyze the relationship of temperature with age of broiler , the amount of protein with age, weight with age brolier by using artificial neural network. Model analysis was performed Artificial Intelegent used by Artificial Neural Network. In the resulting management temperature 18^0C-32^0C. Breeding of broiler chicks to be healthy, breeding originating from the superior, more or less weight size 2-3 kg. Feeding quality or protein content of feed consisting of 18-24%.Conculation; the first By using the ANN can know information about the management (of temperature), feeding (number of proteins, breeding (weight broiler) from starter to finisher, the second By using the ANN showed good validation coefficient of determination R = 1 at temperatures, protein, weight of broilers

Keywords; Critical, Information, House, Broilers, Feed Forward, Artificial Neural Network

Introduction

Meat is one source of protein for humans. Meat became an important commodity in nutritional needs. One of flesh as a source of animal protein is chicken. Chicken is a common poultry reared people to be exploited as a source of livelihood. In the development of broiler chicken breeding experience of technology development, among others in the field of maintenance, feeding, vaccination, human resources management, and enclosure design. Success in building the productivity of broiler chickens, there are three that must be considered is the management, breeding, feeding. Many studies carried out must have characteristics that healthy broiler growth undisturbed by external influences, diet drink. The contribution to heat exchange of surfaces whose temperature is close to the environmental temperature is small,

whereas the surface whose temperature is constantly greater or lesser than the environmental temperature contributes significantly to heat exchange. Thus, in calculations of sensible heat transfer of different surface parts (of a bird) surface temperature measurement is a key element (Yahav et al., 2005). The surface temperatures decreased as a function of age from approximately 36 to 28°C. Using supervisory control on temperature are 29^0C-34.2^0C successful in in suitable standar of temperature poultry house in Indonesia (Alimuddin, et al., 2009)

With the continual genetic progress that is being made, the age at which the bird reaches its kill weight continues to be reduced. A consequence of this is that the brooding period accounts for a much bigger proportion of the bird's life. Therefore, successful brooding management within the flock is extremely important, particularly when birds are being grown to low kill weights This describes the key factors in the first 7 days of a chick's life for optimizing broiler performance when birds are to be grown to low kill weights (1.5–1.8 kg or 3.3-4.0 lb) (Garden Michael and Singleton Robin, 2008).

Several studies have been conducted on feeding programmes for male broiler breeder. Bucknet *et al.* (1986) tested five levels of a diet containing 13 % protein and 3170 kcal ME kg^{-1} of feed on male adult broiler breeders. The intake of 91 and 102 g feed per day of such a ration reduced the number of males producing semen at 40 weeks of age compared with 136g. Brown and McCartney (1986) recommended a daily intake of 346 kcal ME per male per day for normal body weight maintenance and productivity of broiler breeder males grown in individual cages. Buckner and Savage (1986) fed caged broiler breeder males ad libitum diets containing 5, 7 or 9 % crude protein and 2310 kcal ME kg^{-1} from 20 to 65 weeks of age. At 24 weeks of age, body weight, semen volume and sperm counts were reduced for the males fed the 5 % protein diet. Average daily protein and energy intake was 10.9,

14.7 and 18.7 g per day and 495, 479 and 473 kcal ME per day for the males fed the 5,7 and 9 % protein diets, respectively. Wilson *et al*,(1987) and Daghir, N.J, 1995, reported that broiler breeder males can be fed 12-14% crude protein on a restricted basis after 4 weeks of age with no harmful effects on body-weight, sexual maturity or semen quality. More males fed 12 % protein continued production of semen beyond 53 weeks than those fed higher protein levels. Hocking (1994), after a series of experiments conducted at the Roslin Institute in the UK, concluded that low-protein diets (11%) increase semen yiled in aged broiler breeder males but have little effect on fertility in floor pens. He further recommended that optimum male body weight at the start of the breeding period is 3.0 kg and should increase to 4.5 kg at 60 weeks of age. There are several models in the development of manage information among the field of artificial intelligence neural networks. Research on the neural networks include; Development of Chili Growth Control System Using Artificial Neural Network (Suroso, et al, 2001), Neural Network Applications and Principal Component Analysis for sorting, (Seminar , et al, 2002), Design and Test Determination of gentle Parallel computing algorithm Probabilistic Neural Network (PNN) for classification of Iris Flower, seminars, et al (2005) Estimation of Chlorophyll-a Vertical Distribution for Neural Network Based (Ach. Fachruddin Syaha, et al, 2009)

This Paper will explan information design for house broilers used by artificial neural network. The purpose of this study namely: the first, knowing information about the management (of temperature), feeding (total protein, breeding (weight) on house broiler from starter to finisher by using artificial neural network. The second, Analyze the relationship of temperature with age of broiler, the amount of protein with age, weight with age brolier by using artificial neural network.

Materials And Methods

Artificial Neural network is a digital

information processing system which has characteristics such as neural networks in living organisms. In essence, infromasi processing that occurred in the biological nerve cells that relay electrical signals via the chemical nerve fibers (neurons) (Fu, 1994). Artificial neurel networks are composed of nodes or units connect by directed links has input layer, hidden layer, output layer.(Rusel Stuart and Norvig Peter, 2003, Purnomo Mauridhi Hery, 2005). In this paper we present several results related to optimization of feed-forward neural networks structure. Such a network must satisfy some requirements: it must learn the input data, it must generalize and it must have the minimum size allowed to accomplish the first two tasks. The processing element of this type of network is shown in figure 1.
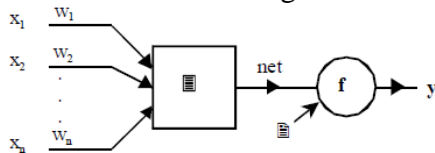

Fig. 1. The model of artificial neuron used

The present paper is dealing with feed-forward neural network so we concentrate on steps 2 and 3. Network dimension must satisfy at least two criteria: the network must be able to learn the input data and the network must be able to generalize for similar input data that were not in training set.

In this figure x_1, x_2,...x_n are neuron's inputs, w_1, w_2, ...w_n are interconnection weights, 2 is neuron's threshold, f(x) is activation function and y is neuron's output. We shall denote $\mathbf{x}=[\ x_1, x_2,...x_n]^T$ input vector, $\mathbf{w}=[\ w_1, w_2, ...w_n]^T$ synaptic connections vector, 2 thresholds vector,

$$\mathbf{net} = \sum_i \mathbf{w}_i \mathbf{x}_i = \mathbf{w}^T \mathbf{x}$$

The output of the neuron may be written:

$$y = f\ (net-2) = f\ (\mathbf{w}^T \mathbf{x}-2)$$

In practical applications, the neural networks are organized in several layers as shown in figure 2.
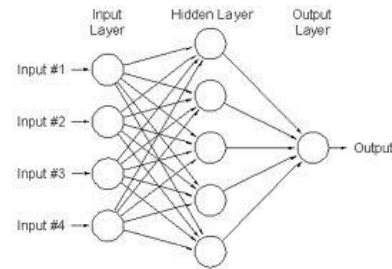

Fig. 2. Architecture of a feed-forward neural network

Artificial Neural Networks Principles, functioning and applications of artificial Neural Networks have been adequately described elsewhere (Russel Stuart and Norvig Peter, 2000). A-layer feed-forward network formed by one input layer consisting of a number of neurons equal to the number of descriptors, 1 output neuron and a number of hidden units fully connected to both input and output neurons, were adopted in this study. The most used learning procedure is based on the back propagation algorithm, in which the network reads inputs and corresponding outputs from a proper data set (training set) and iteratively adjusts weights and biases in order to minimize the error in prediction. To avoid overtraining and consequent deterioration of its generalization ability, the predictive performance of the network after each weight adjustment is checked on unseen data (validation set).

In this research, training gradient descent with momentum is applied and the performance function was the Mean Square Error (MSE), the average squared error between the network outputs and the actual output. Model development The Artificial Neural Network model with Neural Network of Matlab program for 5 weeks data set of temperature of broiler management,weight of broiler feeding,protein of broiler breeder. Prior to fit the ANN feed forward model, data set was divided into 2 sets of training and validation . The validation set was used to test the prediction ability of feed forward during the training processes.

A quantitative examination of the fit of the predictive models was made using error measurement indices commonly used to evaluate

forecasting models (Oberstone, 1990). The accuracy of the models was by computed as:

Mean Square Error (MSE), computed as:

$$MSE = \frac{\sum_{t=1}^{n}\left|y_t - \hat{y}_t\right|^2}{n}$$

where:

y_t = Equals the observed value at time t
$\hat{y}_t$ = Equals the estimated value and
n = Equals the number of observations bias, computed

ANN optimization A -layer Neural Network was used and starting network weights and biases were randomly generated. Weekly age was used as input of network and the signal of the output node represent the hatchability. Thus, this network has 1 neurons in input layer and 1 neuron in output layer. The network performance was optimized for the number of neurons in the hidden layer (hnn), the learning rate (lr) of back-propagation, momentum and the epoch. As weights and biased are optimized by the back-propagation iterative procedure, training error typically decreases, but validation error 1st decreases and subsequently begins to rise again, revealing a progressive worsening of generalization ability of the network. Thus, training was stopped when the validation error reaches a minimum value.

Results And Discussions

In the broiler house information system is analyzed by using an artificial network neuran matlab version 7.0.This discussion are three parts: the first, the management of broiler house, the second, the Feeding of broiler house, the three Breeding of broiler house.

Simulation of Management for House Broiler

The chart below shows the results explain the simulation output in matlab with artificial neuran network with feed forward learning model.
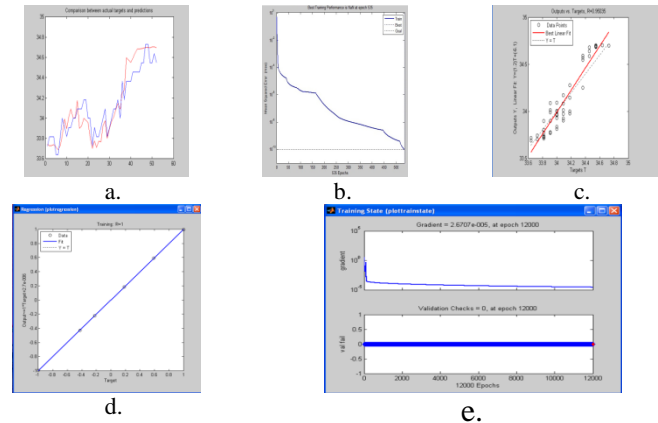

a. b. c.

d. e.

Fig. 3. Simulation of Management for House Broiler

Fig. 3a This graph shows that the temperature as the feed from 9% to 60% that should be consumed first the chicken start to harvest.

Fig.3b This graph shows the training performance managed in accordance ditandaiai temperature according to the expected MSE can recognize the pattern passed 10^{-10}.
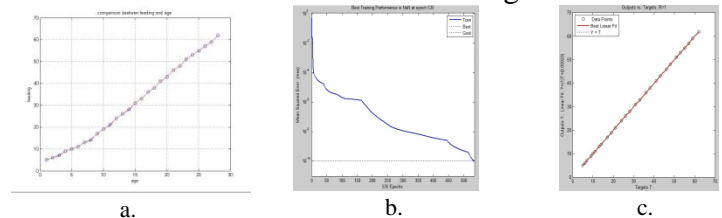
Fig. 3c The graph indicates the temperature with regression testing to meet the training y r = 1 means fit the desired target.

Fig. 3d Temperature with an output of training / training of regression r = 1 means that both the target indicates that the correlation pattern as a training data input and the target line or variable can be trusted.

Fig. 3e Analysis of temperature levels in the chart above that the gradient to explain the limits of learning to know the maximum limit minimum = 2.6707e-006, at epoch 535 Validation error that the value approach.

Simulation of Feeding for House Broilers

The chart below shows the results explained in matlab simulation outputs with neuran artificial network feed forward model of learning.
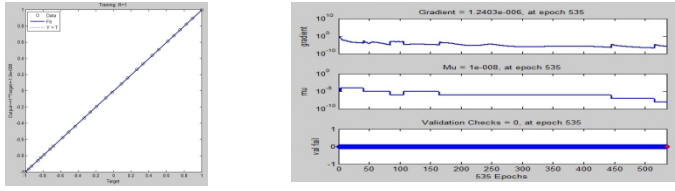

a. b. c.

d.   e.

Fig. 4. Simulation of Feeding for House Broilers

d.   e.

Fig. 5. Simulation of Breeding for House Broiler

Fig. 4a This graph shows that the amount of protein as a feed from 9% to 60% that should be consumed first the chicken start to harvest.

Fig. 4b This graph shows the training performance ditandaiai protein levels managed according to appropriate the expected MSE can recognize patterns through 10^{-10}.

Fig. 4c The graph indicates the level of protein with regression testing to meet the training y r = 1 means fit the desired target

Fig. 4d Protein with an output level training / training of regression r = 1 means that both the target indicates that the correlation pattern as a training data input and target appropriate or variable can be trusted.

Fig. 4e Analysis of protein levels in the chart above that explains the limits of gradient learning to know the maximum limit minimum = 1.2403e-006, at epoch 535, mu is positive momentum =1e-008 so that the optimum value, that value is approaching validation error.

Simulation of Breeding for House Broiler

Weight graph below shows the results of the simulation output in matlab with artificial neuran network with feed forward learning model.
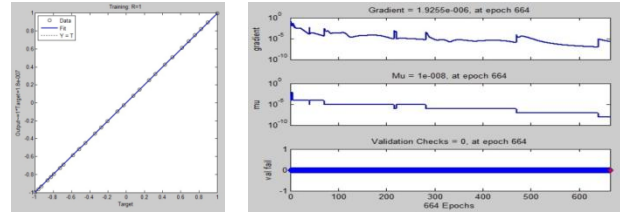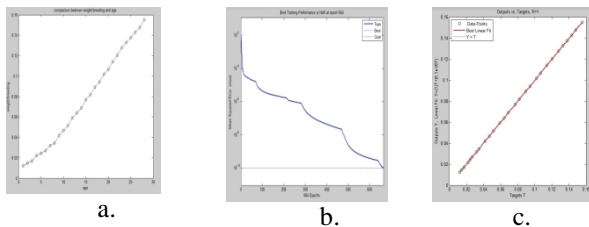

a.   b.   c.

Fig. 5a This graph shows the weight training performance managed in accordance ditandai fit the expected MSE can recognize patterns through 10^{-10}.

Fig. 5b The graph above shows the test weight training regression y satisfy R = 1 means according to the desired target.

Fig. 5c The graph above shows that the output weight training / training of regression R= 1 means either the target correlation indicates that the pattern of training data and target appropriate as a inputs or variables can be trusted.

Fig. 5d Weight with an output level training / training of regression r = 1 means that both the target indicates that the correlation pattern as a training data input and target appropriate or variable can be trusted.

Fig. 5e Analysis of weight levels in the chart above that explains the limits of gradient learning to know the maximum limit minimum = 1.9255e-006, at epoch 664, mu is positive so the optimum momentum value =1e-008, that value is approaching Validation error.

Conclution

By using the ANN can know information about the management (of temperature), feeding (number of proteins, breeding (weight broiler) from starter to finisher by using ANN.

By using the ANN showed good validation coefficient of determination R = 1 at temperatures, protein, weight gain of broiler chickens.

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