COMPUTERISATION OF POULTRY FEED FORMULATION (A CASE STUDY OF ABU TURAB FARMS MINNA, NIGER STATE)

BY

RIHANAT RONKE BELLO

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CERTIFICATION

This is to certify that this project work titled: Computerisation of Poultry Feed Formulation was carried out by Rihanat, Ronke Bello (Mat.No.: PGD/MCS/2008/1247) of the Department of Mathematics and Computer Science, Federal University of Technology, Minna, Niger State.

_____ _____

Alhaji Danladi Hakimi
(Project Supervisor)

Date

_____ _____

Prof. N.I. Akinwande
(Head of Department)

Date

_____ _____

External Examiner

Date

DEDICATION

This project is dedicated to my children: Abdullahi, Hudallahi and AbdurRahman.

ACKNOWLEDGEMENT

I thank Almighty Allah for His guidance in making this work a success.

My gratitude goes to my supervisor in person of Alh. Danladi Hakimi for his positive criticism, advice and encouragement. I also thank all the lecturers in the department of Mathematics and computer for their support.

Gratitude also goes to the manager of Abu Turab Farm, Mallam. Y. M Baba for providing necessary information for making this work a success.

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To all my course-mates, I say thank you.

ABSTRACT

This project work is concern with the application of computer to poultry feed formulation using Abu Turab poultry farm. The main emphasis here is the balancing of ration with the aid of computer system which evolved the term least cost formulation. The advantage of using computer in ration formulation is the speed and elimination of many human errors in calculation.

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CHAPTER ONE

1.0 INTRODUCTION TO FEED FORMULATION

1.1 Introduction

Feed formulation is the process of quantifying the amounts of feed ingredients that need to be put together to form a single uniform mixture (diet) for poultry that supplies all of their nutrients requirement s. It is one of the central operations of the poultry industry in view of its role in ensuring good nutrition. Feed costs account for more than 70% of the total production costs for the most types of poultry, so it is important that returns are maximized through the use of adequate diets.

Feed formulation is a central operation in poultry, ensuring that feed ingredients are economically used for optimum growth of chickens. It requires a good knowledge of poultry and feed ingredients. Most large – scale poultry farmers depend on commercial feed mills for their feed to obliviate the need to do their own formulation or feed preparation. It is therefore essential that formulations are accurate to ensure a large number of flocks are not adversely affected.

1.1.1 Typical Formulations

Typical formulations indicate the amounts of each ingredient that should be included in the diet, and then provide the concentration of nutrient

composition in the diet. The nutrient composition of the diet will indicate the adequacy of the diet for the particular class of poultry for which it is prepared (e.g. egg layers, meat chickens or breeders). It is common to show the energy and protein contents of the diet but comprehensive information on concentrations of mineral elements and amino acids may also be provided. Because some nutrients interfere with the utilization of other nutrients, relationships between nutrients particularly amino acids, also show if each of the nutrients will be used efficiently.

1.1.2 Why are Diets Formulated for Poultry?

One of the reasons for formulating diets for poultry has already been identified, that is to produce a single uniform feed that can be delivered efficiently to poultry. The production rates expected on modern poultry forms also dictate that the dietary requirements of poultry be carefully identified and precisely met. Diet formulation enables the poultry industry to maintain some uniformity in levels of production. Industry nutritionists tend to use the same formulations over relatively long periods of time, so that the quality of the product (meat or eggs) remains stable over time. The product quality can also be easily predicted if the same diet formula is used and all other factors remain unchanged. It is worth stating that the chickens are able to select from different ingredients placed separately in order to grow and lay normally. Such

a practice is known as choice feeding and is practised on a limited scale by some poultry producers. However, choice feeding is cumbersome and cannot be economically applied in large scale modern commercial situations without modifications to the infrastructure.

1.1.3 Important Considerations in Feed Formulation

Feed (or ration) formulation does not merely involve mathematical calculations to meet the requirement of the animals, since the result of the calculation may turn out to be impractical and not ideal for feeding animals. An experienced animal nutritionist therefore needs to evaluate the feed formulation before it can be given to the animals. Factors to be considered in making good feed formulation are:

1. **Acceptability to the Animal**

   The ration being formulated has to be palatable enough to stimulate intake by the animal. Feed refused by the animal is worthless, since feed has to be consumed and utilised by animals to serve its purpose. Moreover, feeds left too long in the feed trough may spoil and become unfit for the animal.

2. **Digestibility**

   The nutrients in the feed have to be digested and released into the gastrointestinal tract to be utilised by the animal. Rations with high fibre content cannot be tolerated by poultry and swine.

3. Cost

The requirement of the animal can be met through several combinations of feed ingredients. However, when the costs of these ingredients are considered, there can only be one least-cost formulation. The least cost ration should ensure that the requirements of the animal are met and the desired objectives are achieved.

4. Presence of Anti-Nutritional Factors and Toxins

The presence of anti-nutritional factors in the feed, such as anti-trypsin factor in soy bean meal affects the digestion of some nutrients by making them available to the animal. Some feed ingredients may also contain toxic substances, which may be detrimental to the animal when given in excessive amount. The inclusion of these feed ingredients should therefore be limited or eliminated from the formulation.

1.1.4 Poultry Feed Ingredients

Poultry feeding is a major item of cost of production. It is estimated to account for between 60 and 80 percent of the cost of producing egg and poultry meat.

When animals are raised under total confinement as in the case of extensive poultry production, the diets must contain all six classes of

nutrient namely carbohydrates, fats, proteins, minerals, vitamin and water. Feed ingredients have been classified based on their nutrient contents into the following:

Carbohydrates or Energy Sources

All animals require energy and amount required depends on the physiological process of the animal. Major sources of energy for poultry ration includes the grains – maize, guinea corn, millet, wheat and rice; cereal by-products – maize bran or offal and guinea corn offal and starchy roots and tubers – cassava flour, cassava chips and sweet potato. Energy for poultry ration is usually based on the metabolizable energy (ME kcal/kg diet) or it may be measured in kilo joules/kg diet.

Protein Concentrate Feed Sources

All animals require protein for growth, reproduction and production. The amount required depends on the physiological state of the animal. Common protein feed ingredients for poultry ration formulation include the following:

Vegetable Sources – such as groundnut cake, soya bean cake, full – fat soyabean, cotton seed cake and palm kernel cake.

Animal protein sources – fish meal, meat and bone meal and blood meal.

Adequacy of protein in a poultry ration is usually based on the total protein or the crude protein content. The need of the animal is however based on the building blocks of protein known as amino acids. There are twenty two amino acids that are required by the animal body out of which twelve are essential and therefore they must be supplied in the feed. The remaining can be synthesised directly in the body. Four or five of these essential amino acids are very critical in poultry rations and so they need special attention when formulating the rations. The critical amino acids include: lysine, methionine, cystine, tryptophan and sometimes arginine.

Fats and Oils

Fat and oil are required to increase the energy density of feeds as required for broiler birds. It contains twice the energy of the carbohydrates or the proteins. Fats are made of the fatty acids and two of such fatty acids (unsaturated fatty acids are linoleic and arachiodonic acids) are essential in poultry diets. Fat source include hard fat, soft fat and vegetable oils.

Minerals Sources

Minerals are required in the body of the animal for skeletal tissue development and maintenance. They are also found in soft tissues and in the blood cells. They also exist as components of vitamins, enzymes, hormones,

etc. Minerals make body fluids physiologically compatible with the tissues and help to maintain the acid-base balance of the body fluids. Minerals are also involved in nerve irritability as well as in muscle stimulation and activity.

Sources of the major minerals for poultry rations include di-calcium phosphate, de-flourinated rock phosphate, limestone or oyster shell, bone meal and sodium chloride.

Vitamins Sources

Vitamins are organic substances required by animals in very small amounts for regulating various body processes to maintain normal health, production and reproduction. There are thirteen vitamins listed as required by the chickens. Vitamins are classified either as fat soluble vitamins A, D, E and K and water soluble - the B complex vitamins and vitamin C. Feed stuffs do not usually contain enough of the vitamins to meet the requirements of the birds. Therefore the needs for vitamins are usually met by supplementation with specially prepared vitamin and trace mineral premixes.

Water Supply

Water is not normally added to poultry feeds but the feeds that are usually fed naturally contain between 9 and 10 percent water. The bulk of water needed by the animal must be separately provided in drinking cans. For every kilogramme of feed consumed, 2 to 3 kilogramme of water is consumed. When

water intake is reduced, feed intake is also reduced and the higher the environmental temperatures the higher the rate of water intake.

1.1.5 Selection of Feedstuffs

No single feed ingredient can provide all of these classes of nutrients in the right proportion required by the animal. Therefore, ingredients for ration formulation are usually selected by consulting a table of feedstuff composition. Feedstuffs that are beyond reasonable costs should be avoided using the table of feed composition. Feedstuff selection should be made from different classes in such a way that when the various component feedstuffs are put together, they could easily satisfy the requirements of the animal for all the nutrients. No single feed ingredient can provide all the 6 classes of nutrient in the right proportions required by the animal. It is therefore, necessary to apply the process of scientific ration formulation in order to obtain a good ration. A carefully formulated and compounded feed, when fed at the recommended levels is expected to meet the nutritional requirements of the animals for a defined physiological state.

1.2 Background to the Study

Different species or classes of animals have different requirements for energy, proteins, minerals and vitamins in order to maintain its various functions like reproduction, egg production and growth. This study focussed on the application of computer to the poultry feed formulation. This is because feed

formulation does not merely involve mathematical calculation to meet the requirements of the animals as the result of the calculation may turn out to be impractical and not ideal for feeding animals.

1.3 Statement of the Problem

This study was to design a computer program that determines the proper combination of ingredients and formulate the least cost ration to satisfy the requirements of poultry.

1.4 Aims and Objectives of the Study

1.4.1 Aim of the Study

This study has the overall aim of designing a program that will formulate a balanced ration to meet all the requirements of the animals.

1.4.2 Objective of the Study

The objectives of the study are:

i. To increase the efficiency and effectiveness of an operation

ii. To reduce the operating cost

iii. To increase the quality of the feed produced.

iv. To determine the choice of proper combination of feed ingredients

v. To save time and maximise profit

1.5 Significance of the Study

Some of the importances of the study are as follows:

1. Farmers need to know how best to formulate feed with required ingredients, hence the new system will enable to farmers to formulate this with ease
2. There is need for the farmer to know when certain ingredient is in excess in the formulation as well as when not in the right proportion, which can be verified easily by comparing the results got from the system.
3. Farmers will know when to reduce certain ingredient and at the same time to what quantity in order to achieve a balanced diet without affecting the required composition by the birds.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

The formulation of poultry diet is an important aspect of poultry production. The success of any animal production enterprise depends greatly on proper feeding and nutrition based on economic rations. For this study, the literature review covers the following area of study:

1. Computer
2. Application program
3. Feed formulation
4. Poultry and poultry farming.

2.2 Computer

A computer is defined by Berkeley et al (1956) as quoted by Bappa (2003 unpublished) as any device which is capable of accepting data, applying reasonable processes (arithmetical and logical) to the data and supplying information from such data. Borko (1962) puts it thus "Computers in broadest sense are tools developed to help man calculate, standardise and understand the events that occur in the world around him". The Encarta (2009) defines computer as machine that performs tasks such as calculation or electronic communication under the control of a set of instructions called a program.

A computer is a device that works under the control of stored programs, automatically accepting, storing and processing data to produce information that is the result of that processing (Jonathan 2008 unpublished).

A computer is an electronic device which is capable of recording, analysing, calculating and storing raw fact without human intervention (Sobowale, 2005).

Ajao & Onowola (2000) in their book "Fundamentals of Computer Hardware System" defines computer as an electronic device which can accept data presented to it in a prescribed form, carry out some operations on the input and supply the required results in a specified format as information or as signal to control some other machine or process.

2.3 Computer Application Program

Application programs are software written by the computer programmers in one of several types of programming language to be used by the computer to solve specific problems for the users (Sobowale, 2005).

A program is an algorithm specifically expressed in a high level language capable of execution by a computer.

A program is a list of instructions that the computer must follow in order to process data into information. The instructions consist of statements used in a programming language such as BASIC (Jiya, 2009).

2.3.1 Stages of Programming Steps

i. Problem Definition

ii. Program Design

iii. Program Coding

iv. Program Testing

v. Program Documentation and Maintenance, (Jiya, 2009)

2.4 Feed Formulation

Feed formulation is the process of computing a ration (feed) from a range of available feedstuffs that will supply adequately all the required nutrients for optimum growth, productivity, feed efficiency and for the maintenance of good health of the animal (Fetuga, 1989).

Diet formulation is an important aspect of animal production. The success of any animal production enterprise depends greatly on proper feeding and nutrition based on economic rations. The animal production practitioner should have a good knowledge of different aspects of nutrition, feeding, feedstuffs interactions and limitations, as well as economics of production and feeding. Diet formulation properly carried out is the result of this knowledge (Church & Pond, 1988).

With the advent of personal computers and ready access to appropriate software as said by Church & Pond (1988), even the techniques needed for

complex rations can be used by almost anyone with the proper nutritional knowledge.

Aduku (2004) in his book "Animal Nutrition in the Tropics" said nutrients requirement s of animals is magnitude of nutrients that must be present in the diet optimum maintenance, growth and reproduction. He added that, nutrient requirement spells out how much of each nutrient animal needs in the diet.

Nutritionists should have a good knowledge of diet specifications, should be familiar with formulation and interpretation of results, and should think of the solution as a "black box" (Church & Pond, 1988).

Ration formulations is a process by which different food ingredients are combined in a proportion necessary to provide the animal with proper amount of nutrients needed at a particular stage of production (Scanes Brant & Ensminger, 2004).

2.4.1 Methods of Feed Formulation

There are several methods in formulating rations. All of them have the same objective of providing the required balanced nutrients at the least possible cost. The methods are as follows:

i. Square Method: This is relatively simple and easy to follow. It satisfies only one nutrient requirement and uses only two feed ingredients.

ii. Simultaneous Equation Method: This is an alternative method for the square method using a simple algebraic equation. Here, a particular nutrient requirement is satisfied using a combination of two feed ingredients.

iii. Trial and Error Method: This is the most popular method of formulating rations for swine and poultry. As the name implies, the formulation is manipulated until the nutrient requirements of the animals are met. This method makes possible the formulation of a ration that meets all the nutrient requirements of the animal.

iv. Linear Programming Method (LP): This is a method of determining the least cost combination of ingredients using a series of mathematical equations. There are many possible solutions to each series of equations, but when the factor of cost is applied, there can only be one least cost combination.

An electronic computer is capable of making thousands of calculations in a very short time. However, the machine is incapable of correcting errors resulting from incorrect data and errors in setting up the program. Therefore, the resultant rations obtained from linear programming will be no better than the information and values which are entered into the programming (Scanes, Brant and Ensminger, 2004).

2.4.2 Least Cost Formulation

A great percentage of production cost is due to feed, this diet formulation using least cost techniques has been used extensively during the past 20 years ((Church & Pond, 1988). For any of the mathematical programming techniques to work, the formulation of the problem should be done properly. Once the formulation of the problem is stated, then we can use any linear programming package to solve the diet formulation. Once we have a solution, it is one the functions of the nutritionists to verify if the solution conforms to nutritional knowledge (Church & Pond, 1988).

Fetuga (1989) said, the use of computer in formulating rations eveloved the term 'least cost ration formulation'. This term does not necessarily imply the highest net returns or net profit but net profit is more important to the farmer than cost per tonne of feed. When a computer is employed for ration formulation, it is always certain that the least cost ration obtained is the cheapest balanced ration that can be formulated from the feed ingredients available and at the prices used.

It is however, necessary to emphasise that the man behind the computer, who prepares the data that go in and who evaluates and applies the results that come out becomes more important than ever. It must be realised that an electronic computer knows nothing about the feed palatability,

limitations on the use of certain feedstuffs, the goals of the feeding programme and so on (Fetuga, 1989).

2.5 Poultry

Poultry according to Oxford dictionary refers to chickens, ducks, geese, kept for eating or for their eggs.

Poultry can be defined as those species of birds that render economic services to man and reproduces freely under his care (Chidolue, 1998). Poultry refers to domestic fowls in general but many to chickens, ducks, turkeys, guinea fowls, geese, pigeons, quails, pheasant, and so on (Isiorho, 1998). The rearing of birds can be assumed as a source of meat and egg production for consumption. The economic importance of poultry rearing are revenue generation, food production and source of manure for crop production (Isiorho, 1998).

Chidolue (1998) added that poultry eggs are also used for vaccine production.

2.5.1 Poultry Farming

Poultry farming is the commercial raising of chickens, turkeys, ducks and geese for their meat and eggs. (Encarta, 2009).

Since the 1930s and 1940s, the poultry industry has become one of the efficient producers of protein for human consumption. It expanded rapidly during the World War II because of the shortage of beef and pork, which require a much longer time to develop; only seven weeks are required to

produce a broiler and five months to produce a laying hen. More recently, in response to public concern over dietary fat, poultry has again become a popular substitute for beef and pork. As a result of modern technological development, many poultry houses now provide excellent environmental control and management and marketing of the birds and finely regulated.

CHAPTER THREE

3.0 SYSTEM ANALYSIS AND DESIGN

3.1 Introduction

System analysis is the process of getting, gathering and interpreting facts and is defined as the method of determining how best to use computer system to perform tasks which meet the information requirement of an organisation.

System analysis is a fact finding process and these facts are later on analysed with a view of deriving the requirement for a new or improved system from the shortcomings of the existing system

3.2 Technique of Data Collection

This refers to the technique of gathering data about the existing system. It has to do with the identification of problems and difficulties encountered by the organisation based on the existing method of feed formulation.

There are several methods of collecting data or gathering information. They include observation, questionnaire and interviewing.

For this study, interview method was employed which is the most satisfactory way of obtaining information particularly information about objectives, constraints, allocation of duties and problems and failure in the existing system. In the course of interview, it was revealed by the manager that manual method is not efficient as it is prone to error and time consuming.

The system analysis is therefore concerned with the management objective in applying computer in the feed formulation. If the system was computerised most of the problem encountered in the process of feed formulation would be solved. The computer takes information and is capable of making thousands of calculation in a very short time.

3.3 Review of the Existing System

Abu Turab Poultry Farm based their feed formulation on manual method of feed formulation whereby the formulator uses his hand and brain to produce a feed formula. This present technique of production is based on the following steps of preparation.

3.3.1 Preparation of Poultry Feed Materials

Materials: Grinding machine, palleting machine, oven, weighing balance, pan and pot.

Ingredients: Maize, groundnut oil cake, soya meal, blood meal, bone meal, palm oil, brewer dry grain, vitamin and mineral premix and salt.

These ingredients are mixed together ir different proportions so as to give the desired diet level required by the birds.

The existing manual system serves as a good source of information for the development of the computerised system.

3.3.2 Problems of the Existing System

The present manual system has the following problems

i. It requires a lot of energy and manpower

ii. It is tedious and highly uninteresting

iii. It is time consuming

iv. There is administrative delay

v. Information is not easily accessible.

vi. Misplacement of vital information due to paper documentation.

vii. There is human error due to large volume of data to handle.

3.4. Analysis of the Proposed System

Computers are used for formulating least cost poultry feed and help in handling large amount of data. It offers to all level of management high speed in collecting and reporting data to facilitate decision making. It can be used to assist in matters like personnel inventory and purchasing analysis. Computer does its process at a very high speed as well as storage and retrieval of large amount of data or information. As the price of ingredients change, the new costs are fed into the computer system and it automatically alters the formula to maintain the nutritional value at the lowest possible cost

3.5 System Design

The objectives of the new system are as follows:

i. To formulate least cost poultry ration using the available ingredients.

ii. To accept or reject ingredients based on their costs and nutritive value.

iii. To determine final cost of ration.

iv. To develop an application software for the formulation of poultry feeds.

The program was designed in such a way that it accepts as input the:

a. Various ingredients needed for the feed formulation

b. Nutrient composition of each of the ingredient

c. Nutrient requirement of the birds.

d. The cost of each ingredient.

The first step is to get the nutrient requirement of the bird for which the ration is intended. This is expressed in terms of energy, crude protein, mineral and vitamins elements, fat and fibre. The nutrient analysis of feedstuffs is essential to determine how satisfactory the diet will be. Update analytical data on feedstuffs are prepared where available; if not average composition data can

be used from the NRC (National Research Council) tables. Ration is only as good as the analytical information used in formulating it.

The program is built to be user friendly so that users can alter ingredient composition and requirement data with ease.

3.5.1 Input Specification

a. Nutrient requirement of poultry per kilogram of diet

   i. Class of poultry

   ii. Age of poultry

   iii. Protein

   iv. Energy kcal/kg

   iv. Fat %

   v. Crude fibre %

   vi. Calcium %

   vii. Phosphorous (available)

   viii. Lysine and Methinine%

   ix. Recommended intakes for each nutrient requirement as regard the class of poultry.

b. Feed ingredients

   i. Name of ingredients

   ii. amount of kilogram at the rate of inclusion.

iii. Price per kilogramme of each ingredient

c. Nutritional composition of each type of ingredient

i. Energy kcal/kg

ii. Crude protein %

i. Fat %

ii. Fibre %

iii. Calcium %

iv. Phosphorous (available)

v. Lysine

vi. Methionine

3.5.2 Output Specification

a. The class of poultry

b. The quantity of feed formulated (kg/tonne)

c. Nutrient requirement of the poultry for which the ration if formulated

d. The amount of nutrient contributed by each of the ingredient

e. Cost per tonne or kilogramme

f. Cost at the rate of inclusion.

3.6 Benefits of the New System

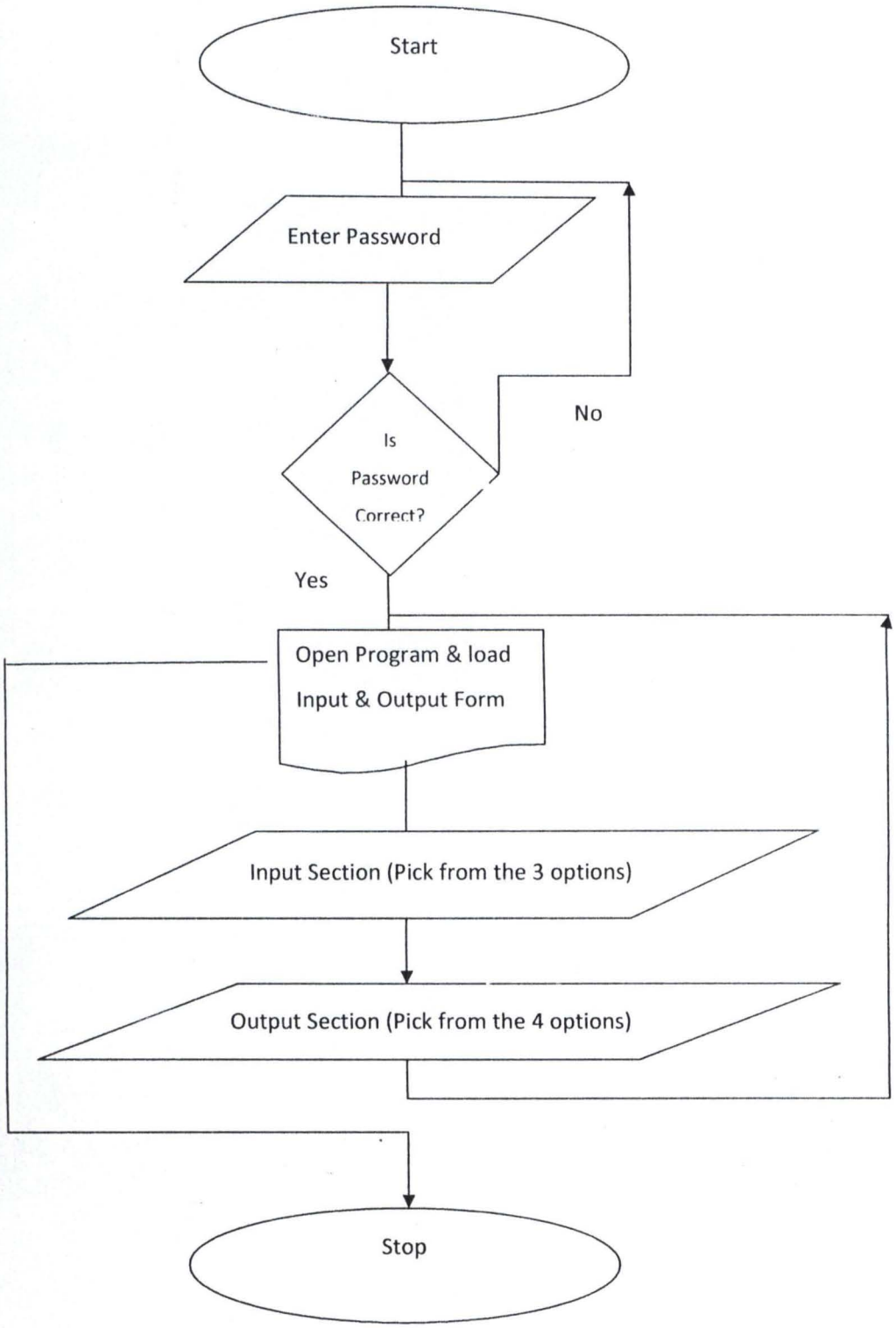
With regards to the many shortcomings by the manual system, there is need for an improved system in order to reduce to the bearest minimum all the shortcomings experienced in the existing system.

Among the benefits of the application of computer to the formulation of poultry feed are:

i. It can handle large amount of tasks in a very short time with high degree of accuracy.
ii. It enhances information keeping in a central database for easier access.
iii. It can perform continuous routine work, in which case staff are relieved to perform other tasks.
iv. Formula costs can sometimes be reduced when calculated on the computer rather than by hand.
v. Change can be done on the data without affecting the whole program thereby eliminating error.
vi. Money will be saved on paper wastage as the information is displayed on the screen and can be corrected before final printout.
vii. Information are stored and could be retrieved whenever they are needed without delay.

It can be seen that the benefits of computer to the organisation is much and therefore, it should be implemented.

3.7 Design of the Flowchart



CHAPTER FOUR

4. 0 SYSTEM IMPLEMENTATION

4.1 Introduction

System implementation is the process replacing the existing/old system with the new system. Software and hardware requirements as well as the installation and testing of the new design are discussed in this chapter.

4.2 Software Requirement

The basic software requirement for the new system to effectively is Windows XP or Vista operating system as well as Office 2007 which contains Microsoft Access used in designing the database program.

4.3 Hardware Requirement

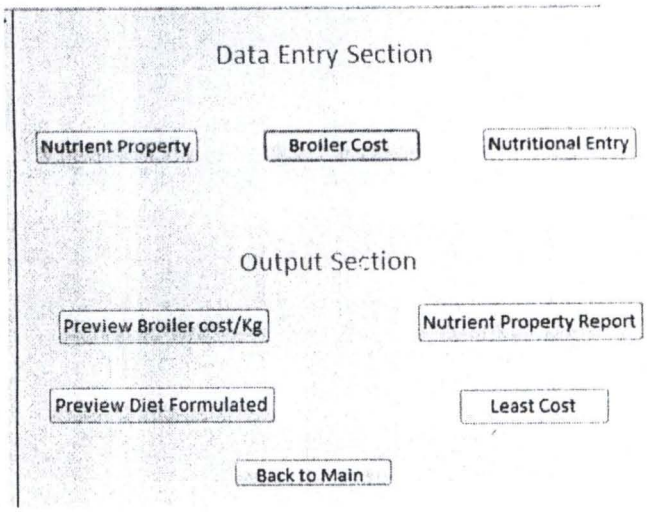
Hardware requirements for the new system are: hard disk of capacity 250gigabytes, 2.0 Gigabytes of RAM, External hard disk for backing up, Keyboard, mouse and monitor. Though laptop can be used provided the specifications above are met, as it will enable easy movement in the farm, but desktop or tower computer can equally be used. Laser printer needs to be available in the farm to help with the generation of necessary hardcopies of the reports. The memory specification is to enable the operating system as well as Office 2007 to run effectively on the computer system.

4.4 Installation

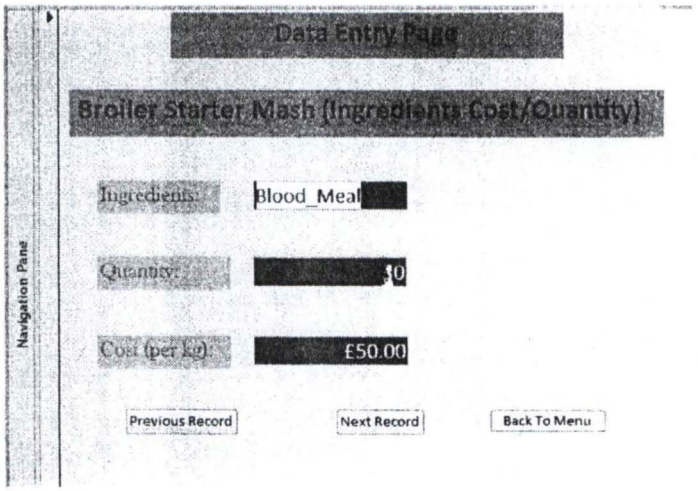
The designed program required no special installation. Once the office 2007 package is running correctly, then the program can be deployed on to the specified folder (directory) for easy access, though short cut can be created on the desktop that will be pointing at the actual location.

4.5 Program Interface

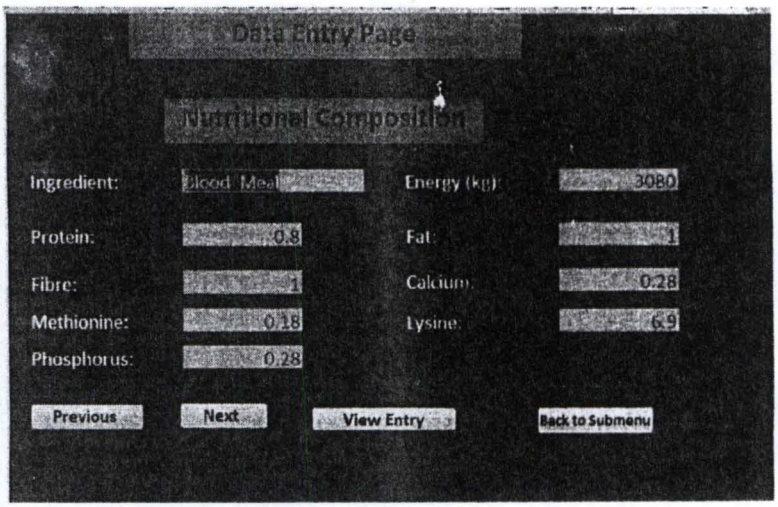
Simple interfaces are used in this program so as to allow end-user to be able to use the program with little or no guidance from an expert. After the deployment of the program, the user can just double click on the icon on the desktop and the input and out section will be selected as shown below:



Input and Output Section Form



Input form of cost/quantity of each ingredient



Input Form for Ingredient composition

4.6 Result / Discussion

The result generated from this program depends solely on the various input data. That is, data from feed composition, ingredient requirements, ingredient quantity/cost as shown below.

General Summary of the Expected Diet Composition and Analysis

Ingredients	Lysine	Methionine	Phosphorous	Calcium	Crude Protein	Energy
Maize	125	90	135	5	45	1716000
Blood_Meal	207	5.4	8.4	8.4	24	92400
Fish_Meal	90	36	60	122	13	53600
Groundnut_cake	240	72	90	30	72	336000
Soyabeans_whole	390	93	90	37.5	55.5	372800
Bone_meal	0	0	600	1480	0	0
Palm_oil	0	0	0	0	0	70400
Methionine	0	0	0	0	1	0
Lysine	0	0	0	0	1	0
Maize_offal	0	0	0	0	4.675	0
Brewer_dry_grain	0	0	0	0	9	0
Total Composition	**1052**	**296.4**	**983.4**	**1682.9**	**225.17**	**2701300**

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The total composition row will tell the farmer whether the required nutrient is got from each feedstuffs based on the constraints. However, to arrive at the least cost, the expected quantity of each of the constraint must be must which implies that there may slight change (increase/reduction) in the quantity of the feedstuffs used which will greatly affect the cost. As shown in the table below.

Least Cost formulated for Broiler Starter Mash

Ingredients	Quantity	Cost per kilogram	Total in Naira
Maize	500	48.00	24000
Blood_Meal	30	50.00	1500
Fish_Meal	20	480.00	9600
Groundnut_cake	150	47.00	7050
Soyabeans_whole	150	68.00	10200
Bone_meal	40	35.00	1400
Palm_oil	10	205.00	2050
Methionine	1	1260.00	1260
Lysine	1	480.00	480
Maize_offal	42.5	34.00	1445
Brewer_dry_grain	50	37.00	1850
28 July 2010 09:14:32		Total(in Naira):	60835.00

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4.7 Maintenance and Recovery Strategy

The essence of the suggested external hard is to be used in backing up the content of the system in case of damage or crash or theft. The farmer needs not to panic provided regular backing up is carried out after every transaction of update to the external hard disk.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5. 0 Summary

This work has been able to treat the various steps to take in applying computer system to poultry feed formulation. The system is designed to provide the management of Abu Turab Poultry Farm with timely information and to ensure proper accountability. Thorough study of the existing system was carried out to get the required information before the design of the new system.

The implementation of the proposed system will ensure improvement in ration formulation as the computer system is effective, reliable and accurate. The security of the data and information would also be ensured.

5.1 Conclusion

The results obtained in this study allow me to conclude that computer system is very useful in the formulation of poultry feeds thereby reducing the cost on feeding thereby maximizing the profit. The computer system executes a given task at a very fast speed; hence a lot of time is saved in formulating feed for different classes of poultry.

Though the cost of computerisation may be high at the initial stage, the benefits of using computer are numerous.

5.2 Recommendation

With the advent of computer to the society, a lot have been benefited which some have highlighted in the previous chapters, I hope Abu Turab Investment will not hesitate in embracing this new system to replace their current way of formulating feeds in order to derive all the benefits and even more. If necessary training of staff is encouraged, users on their own can customise this program in solving other aspects of their work.

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