HOME ECONOMICS FOR AGRICULTURAL SCIENCES IN TERTIARY INSTITUTIONS

E.F. Fabiyi (Ph.D)

CamScanner

HOME ECONOMICS FOR AGRICULTURAL SCIENCES IN TERTIARY INSTITUTIONS

First Edition

E.F. FABIYI (Ph.D.)

Agricultural Economics and Extension Department,
College of Agriculture, Landmark University,

Omu Aran, Kwara State, Nigeria.

CamScanner

Published by:

ABBEY PUBLISHERS

Suit 2, Tijesuni Shopping Complex,

37, Adelaja Street, Uncle Joe Bus-Stop,

Mokola, Ibadan.

Tel: +234 (0) 803 284 0148, +234 (0) 805 165 8305

E. F. Fabiyi, 2015

Illustrated by: E.F Fabiyi

First Published, 2015

ISBN 978-978-088-228-0

Copyright © 2015 by

All rights reserved. No part of this publication may be reproduced, transmitted in any form or by any means, electronically or mechanically, without the prior permission of the author.

Printed in Nigeria by:

ABBEY PRINTING PRODUCTION

CamScanner

FOREWORD

There has been some fundamental transformation in the household patterns, behaviour and lifestyles of the Nigeria consumers. Apparently this is influenced by changes in socioeconomic, demographic and income status of the society. This transformation has resulted to greater awareness of household dieting and the need for healthy sustainable livelihood. This calls for more cognizant information, to which this book aims at providing. Thus, this ever changing behaviour of Nigeria consumers warrants a readily available source of reference for information on what and how to consume products and services.

This book, titled "Home Economics for Agricultural Sciences in Tertiary Institutions", is not meant for students only but also as a reference material for food industries, health institutions and service providers. The book is a valuable source of information for decision-making process and healthy living.

The book is written by an author who is very much conscious of the livelihood need and demand of Nigerian consumers. The author has made use of some ideas in home economic syllabi for tertiary institutions. There is no doubt that the book will narrow down the wide gap between home information need and supply of such information for an

CamScanner

adequate standard of living. Reference to the book will raise its reader's environmental consciousness and concern for more sustainable livelihood in our communities.

Prof. I. Mohammed,
Department of Agricultural Economics and Extension,
Faculty of Agriculture,
Usmanu Danfodiyo University, Sokoto.

CamScanner

TABLE OF CONTENTS

CamScanner

CamScanner

CamScanner

CamScanner

LIST OF FIGURES

CamScanner

LIST OF TABLES

CamScanner

PREFACE

Home economics is a relatively young profession in Nigeria and it is still encountering difficulties in becoming established. The nation is made up of family units of the oldest institution. In most developing countries, little importance has been attached to the studying and teaching of home economics in schools and universities. It has been regarded as a profession mostly involving sewing and cooking for girls and women only. The primary target of home economics is the improvement of the home and family in which women, men, youth and children have paramount interest. Since the home is as strong or as weak as the individual that comprises it, likewise the community and nation are strong or as ineffective as the families that make them. Today there has been increase in basic knowledge about the individual and the household home. The management of the home has become more complex. The introduction of appliances, equipment and modern kitchen tools makes it necessary for an education more comprehensive to help cope with the technological changes. Both men and women need the education that will help them to enjoy what they have which is the main aim of Home Economics.

With the development in technology and increased demands for improved standard of living, both boys and girls need the knowledge of home economics especially, those dealing with producing, processing, cooking and marketing of agricultural products. The planning of the agricultural science courses at every level should be fully coordinated with home economics,

CamScanner

so that students are helped to understand the interrelationships between home economics and agriculture. Home economics utilizes almost all agricultural products in the area of food, clothing, interior and exterior decorations.

What makes home economics so important is that it deals with all aspects of human life and the home. Its flexibility makes it a subject that can be used to improve people's life at any stage and time. Home economics deals with food and nutrition, home management, textiles and clothing, food preparation and family relationship and childcare. This is the more reason why everyone should have knowledge of home economics. Food and nutrition are important for good health, textile and clothing for good physical appearance and dress sense, while good family relationship brings about happiness and satisfaction in the home. Home economics should be taught at all levels of education because of its many roles in the family and national development.

Home economics is flexible this makes it a subject that can be used to include necessary factors or topics that can be taught to solve individual and family problems. Home Science is the best title to replace Home Economics because Home Economics does not capture and reveal all what the subject entails. Home Economics is not only about the economics of the home but it entails the scientific application of all aspects of individual and family living. It is necessary to review school syllabus from time to time to make it meet present standard of living of individuals and families.

The main reasons for teaching home economics to students of agriculture is not just to know how to cook food but to know how to care for self and their family members, and to know the right kind of food to eat. The main objective of

teaching Home Economics to students of Agricultural science is to follow up their farm produce to how they are nutritionally cooked and served on the family table.

This is very important because what we eat determines to a great extent the state of our health. No medicine can do as much for our health as the healthy foods we eat every day.

The main aim of this book is to help students of agriculture and others to be able to face life with confidence. Also to have knowledge that takes care of every aspect of life and to be able to see the importance of self-reliance and become useful members of the family, community and the nation at large.

Dr. (Mrs.) E.F. Fabiyi
Agricultural Economics and Extension Department,
College of Agricultural Sciences,
Landmark University, Omu-Aran, Kwara State.

CamScanner

DEDICATION

This book is dedicated to the Almighty and Omniscient God, for giving me the wisdom and ability to write this book, and also to my darling husband Professor Joseph Popoola Fabiyi for his support and encouragement.

CamScanner

ACKNOWLEDGMENT

I give all the glory and honour to God Almighty for giving me the strength and enablement to write this book, which is the first of its kind in Nigeria.

I wish to express my special appreciation to my dear husband Prof. J. P. Fabiyi for his wonderful advice, which led to the writing of this book. I do appreciate the support and love of all my children; Kemi, Funmi, Yemi, Shola and Tinuke, during the preparation of this book.

I wish to acknowledge and thank Prof. I. Mohammed, Dean, Faculty of Agriculture, Usmanu Danfodoyo University, Sokoto, for the cooperation and time spent to go through this write-up, on several occasions and for useful suggestions made. I am also grateful to him for accepting to write the foreword for the book. Also, I must not forget to show my appreciation to my former lecturer, Dr. (Mrs.) V. O. Babalola who took time to review the book and made valuable contribution and suggestions. I greatly appreciate your effort and the sacrifice of the time you spent in reviewing this book.

The help of Arc. Oluwafemi Akande and Mr Andrew Eso during the course of the preparation of this book is well appreciated. I am also very grateful to Miss Rebecca Magson, Mrs Tinuke Eso, Mrs. Juliana Williams, Miss Victoria Agwanuotu and Abiola Adegbiji for their assistance in typesetting the write up. My special thanks goes to Victor Olamide Akande for doing the major work on the cover page

CamScanner

design and the final typesetting of this book. I am sincerely grateful to Dr. (Mrs) Kemi Eunice Akande for proof-reading and editing this book.

My sincere thanks goes to Prof Joseph O. Afolayan, the Vice Chancellor Landmark University, Pastor (Dr) Daniel Rotimi, the Registrar Landmark University, Prof. E. O. Oyawoye, the Deputy Vice-Chancellor Landmark University, Prof. G. O. Agbaje, the Dean of College of Agricultural Sciences, Dr. O. M. Bamiro, the Head of Department of Agricultural Economics and Extension, Prof. J. O. Olukosi the former Head of Department of Agricultural Economics and Extension and other members of the staff of the College of Agricultural Sciences, Landmark University, Omu-Aran, for their co-operations during the production of this book.

Finally, I wish to thank the contributors of this book; Dr. (Mrs.) K. E. Akande and Dr. U. Haruna for their effort and support.

Dr. (Mrs.) K. E. Akande: a lecturer in Animal Production, wrote two Chapters from her wealth of experience in the field of animal science and nutrition, "The importance of protein in animal nutrition" (Chapter five) and "Effective rearing of backyard poultry" (Chapter six).

Dr. U. Haruna: lecturer of Agricultural Economics, wrote about **"The role of women in agricultural activities"** (Chapter eleven) using his rich teaching experience as a lecturer of agricultural subjects.

AUTHOR: Dr. (Mrs.) E. F. Fabiyi

CamScanner

CHAPTER 5

THE IMPORTANCE OF PROTEIN IN ANIMAL NUTRITION

5.1 Proteins

Proteins are organic compounds that contain carbon, hydrogen, oxygen, and nitrogen and sometimes iron, phosphorus, and sulphur. They are needed to grow new tissues and to repair old tissues in an animal. Three to five percent of the body's proteins are rebuilt on a daily basis. The most common nutrient deficiency is that of proteins (Anon, 2011).

According to Wilson, (2014) who metaphorically defined proteins as compounds that are associated with motion, the basic quality of animal life. He also stated that on one hand, plant life is more concerned with sugars and carbohydrates. While, on the other hand, animal life is more concerned with proteins. However, all life contains both proteins and carbohydrates.

Proteins are highly complex nitrogenous organic compounds occurring naturally in all living organism and forming an essential part of animal food requirements. Proteins are important for gestation, lactation, growth and weight gain.

CamScanner

Young animals require diets higher in proteins than older ones. Higher dietary levels of proteins are needed by animals in gestation or lactation stages (Anon, 2011). Correct protein nutrition is of paramount importance not only for animal performance, but also to minimize nitrogen excretion and reduce pollution (FAO, 2004). The symptoms of protein deficiency include: slow growth rate, anorexia, decreased feed efficiency, lower milk yield and low birth weight.

Proteins are made up of various combinations of up to 26 amino acids. Amino acids are the building blocks of proteins. Amino acids are classified as either essential or nonessential. Most animals can synthesize the nonessential amino acids. However, the essential amino acids must be supplied in the diets of monogastric animals. This because non-ruminant animals are not able to synthesize the essential amino acids and, therefore, require dietary supplementation with proteins containing the 10 essential amino acids. The essential amino acids are phenylalanine, threonine, arginine, histidine, isoleucine, leucine, lysine, valine, methionine and tryptophan. Ruminants are able to synthesize all amino acids by microbial action in the rumen (Anon, 2011).

5.2 The Role and Function of Proteins in the Animal body

All cells synthesize proteins for part or all their life cycle. Proteins are involved in practically every function performed by a cell and without protein synthesis life could not exist (Ihekoronye and Ngoddy, 1985). Protein play distinctive functions in the animal body ranging from body building (growth), repair of body tissues, protection of body surface to

defence against invading organism. Proteins are very important for many cellular functions, some of which are listed here:

(i) Protein plays an important role in the sustenance of neural reaction of the body (homeostasis).

(ii) They are the chief structural unit of protoplasm.

(iii) For the synthesis of enzymes, which catalyze all of metabolic reactions.

(iv) Production of antibodies which are complex defensive proteins of the immune system.

(v) Proteins play an important role in the transport of water, inorganic ions, organic compounds and oxygen.

(vi) Proteins in diet serve as primary source of amino acids, the blocks of cellular proteins. (Kerstetter et al., 2005). The nuclear DNA (deoxyribonucleic acid) controls the synthesis of all proteins regardless of their functions. Thus, proteins are vital to animals and must be appropriately provided in the diet (Church, 1991).

5.3 Sources of Protein

Feedstuffs that in the dry state contain 20 percent or more of protein are classified as protein sources. Protein sources can be of plant origin or of animal origin (Olomu, 1995).

5.4 Major Animal protein sources

Protein concentrates derived from animal sources have been used for several years and they are of high quality. This is because these products come from animal sources, the amino

acid distribution is generally similar to dietary needs. Animal protein supplements are superior to plant protein supplements as sources of essential amino acids (methionine and cystine) and particularly of lysine, the first limiting amino acid in cereals. Animal protein supplements are normally used to balance the amino acid contents of diets rather than as the major source of protein (Ravindran and Blair, 1993). However, it must be known that quality may be quite variable because products with essentially the same label may come from many different sources. In addition, quality may be affected markedly by processing methods and use of appropriate temperatures in cooking and drying the meals.

i. Fish meal

Fish meal provides a good source of quality protein for non-ruminant animals and an excellent source of by-pass protein for ruminants. When compared with other sources of plant protein and cereals, fishmeal can also provide a good nutritional source of calcium and phosphorus in animal diets (FAO, 2004). Fish meal is defined as the clean, dried, ground tissue of undecomposed whole fish cuttings, with or without extraction of part of the oil. It must not contain more than 10 percent moisture (Church, 1991).

Fish meal is an exceptionally good source of high-quality protein. Fish meal has a relatively high metabolizable energy contents and provides high levels of minerals (calcium, phosphorus and trace minerals), B-vitamins and essential fatty acids. It is highly palatable to poultry (Pike, 1975). The

CamScanner

presence of unidentified growth and reproduction factors in fish meal has been reported worldwide. A good quality fish meal is a brown-coloured material, but the colour varies with the type of fish used and the processing conditions. A very dark colour is usually indicative of overheating. Fish meals are produced from different types and varieties of fish that are processed in various ways, this account for the variation in the composition between different types of fish meals (Ravindran and Blair, 1993).

The protein contents of various fish meals vary over a range of about 500 to 750g/kg, but the composition of the protein is relatively constant. It is rich in the essential amino acids, particularly lysine, cystine, methionine and tryptophan, and is a valuable supplement to cereal-based diets particularly where they contain much maize (McDonald et al., 1995). Fish meals have a high mineral content (100 to 220g/kg) which is of value nutritionally since it contains a high proportion of calcium and phosphorus and a number of desirable trace minerals including manganese, iron and iodine. They are a good source of B-complex vitamins, particularly choline, cyanocobalamin and riboflavin.

ii. Meat meal, meat and bone meal

Meat meal is defined as the dry rendered product from mammal tissues and must be substantially free of hair, hoof, horn, hide trimmings, blood and stomach contents. Bone meal are derived mainly from bones and associated tissues such as tendons, ligament, some skeletal muscle,

gastrointestinal tract and lungs. Variation in the proportion of these raw materials contributes to the wide variation in the quality of meat meal. Meat meal is differentiated from meat and bone meal on the basis of phosphorus and protein content. If the product contains more than 4.4 percent phosphorus and less than 55 percent crude protein it is labelled meat and bone meal. When the phosphorus content is less than 4.4 percent and crude protein more than 55 percent then the finished product is designated as meat meal (Church, 1991; Ravindran and Blair, 1993).

Generally, meat meal contains from 66 to 70 percent crude protein compared to 45 to 55 percent for meat and bone meal. The fat content is variable, ranging from 3 to 13 percent but is usually about 9% (McDonald et al., 1995). Meat and bone meal contains more ash than meat meal and is an excellent source of calcium, phosphorus and manganese. Both meals are good sources of vitamins of the B-complex, especially riboflavin, choline, nicotinamide and cyanocobalamin. These meals are however characterized by low methionine and tryptophan levels, this reduces their value since they cannot adequately make up the deficiencies of these amino acids in the high cereal diets of pigs and poultry (McDonald et al., 1995).

iii. Blood meal

Blood meal is manufactured by passing live steam through blood until the temperature reaches 1000°C. This ensures efficient sterilization and causes the blood to clot. It is then drained, pressed to express occluded serum, dried by steam heating and ground. Blood meal contains about 80% crude

CamScanner

protein. It is one of the richest sources of lysine and a rich source of arginine, methionine, cystine and leucine but deficient in isoleucine (McDonald et al., 1995). Blood meal is simply ground dried blood of warm-blooded animals that is free of foreign matter. It is a chocolate-coloured powder. About 6kg of blood meal can be produced from a 1000kg live weight animal (Gohl, 1981). This deficiency in blood meal is aggravated by the presence of a high level of leucine, which is known to elevate the isoleucine requirement (D'Mello, 1988). Owing to the poor balance of amino acids its biological value is low and it also has a low digestibility.

5.5 Major Plant protein sources (conventional)

Plant protein sources include pulses, nuts and legume seeds. Plant proteins are generally nutritionally imbalanced. Unless supplemented with animal proteins or synthetic compounds, plant-based diets may not meet the requirements of certain critical amino acids and vitamin B12 for the production of eggs and meat particularly for monogastric animals (Ravindran and Blair, 1993).

i. Soybeans (*Glycine max Merr.*)

Soybean *(Glycine max Merr.)* occupies a premier position of world crop, it is produced in many parts of the world, and it is an excellent source of protein and edible oil (Kim et al., 2000; Parde et al., 2002). Full-fat soybean (that is soybean from which the oil has not been extracted) has a protein content of about 40% (a range of 36 to 44%), average fat content of 18% (a range of 17 to 22%) crude fibre of about 7.5%, ash content of about 5.5% and dry matter content of between 90 and 94%. The oil is a good source of linoleic and linolenic acids (Olomu,

CamScanner

1995). Soybean is a rich source of lysine and tryptophan that are normally lacking in most grains. However, the concentrations of cystine and methionine are sub-optimal. Methionine is the first limiting amino acid and may be particularly important in high-energy diets. Soybean is also a good source of thiamine, riboflavin, niacin and fairly rich in carotene. The seed contains fair amounts of calcium, phosphorus and other minerals. Soybean contains a number of toxic, stimulatory and inhibitory substances in their raw seeds. The protease inhibitors; namely antitrypsin factor and chymotrypsin inhibitor are partly responsible for the growth retarding property of raw soybean. The retardation has been associated with inhibition of protein digestion, but there is evidence that pancreatic hyperactivity resulting in increased production of trypsin and chymotrypsin with consequent loss of cystine and methionine is mainly responsible. Heat treatment inactivates these factors (McDonald et al., 1995).

Soybean contains goitrogenic substances and its long-term use at high levels may result in goitre in some animal species, particularly if iodine content of the ration is low. Other antinutritional factors include saponins and haemagglutinins that cause agglutination of red blood cells. Soybean also contains genistein, a plant estrogen, which may account, in some cases, for part of the high growth-inducing properties of the meal (Church, 1991).

ii. Groundnut (*Arachis hypogaea Linn.*)

Groundnut seeds (full-fat) contain 25 to 30% crude protein and 35 to 60% oil. The protein of groundnut meal has sub-

optimal amounts of cystine and methionine, although the first limiting amino acid is lysine. Groundnut meal is the product obtained after oil extraction from groundnut and grinding the resulting flakes or cake. It contains 44 to 50% crude protein. Groundnut meal based diets are usually supplemented with synthetic lysine and methionine or with animal protein like fish meal in order to make up for the limiting amino acids

When the meal is used in high cereal diets, adequate supplementation with animal protein is necessary. Marginal levels of tryptophan and threonine have been reported in groundnut (Olomu, 1995).

Groundnut is an excellent source of the B-vitamins. It contains appreciable amounts of tocopherol but is deficient in vitamins A, D and C. Groundnut is rich in phosphorus, however, most of the phosphorus is phytin phosphorus and, therefore, less digestible and absorbable. Raw groundnut contains trypsin inhibitor which interferes with the normal action of digestive enzymes.

Moulds particularly Aspergillus flavus, may grow on the groundnut. This normally occurs due to improper harvesting, drying and storage. This mould produces a toxin known as aflatoxin that may cause high mortality in animals especially ducks and turkeys.

iii. Cottonseed (*Gossypium specie*)

Cottonseed (Gossypium specie) meal is the residue obtained

after the extraction of oil from the cotton seed and grinding the resulting flakes or cakes. Delinted (lint removed) and decorticated (hull removed) cottonseed meal has a protein content of 41 - 42%. Depending on the processing method employed, the energy content is influenced by the residual oil present in the meal. In terms of amino acid profile, cotton seed meal is very much inferior in most of the essential amino acids namely lysine, cystine, methionine, threonine and tryptophan. Also, the digestibility of amino acids is very low and poorly balanced. The meal is low in calcium and carotene. The use of cotton seed meal is limited by the presence of gossypol, a polyphenolic aldehyde. Gossypol is known to be toxic to monogastric animals and may cause a characteristic discolouration of yolks and albumen of eggs. The general symptoms of gossypol toxicity are depressed appetite, weight loss and death from circulatory failure. In addition, a fatty acid (sterculic acid) found in cottonseed meal can cause egg white to turn pink during storage. Some varieties of cottonseed have low gossypol or are free of pigment glands that contain gossypol (Church, 1991).

5.6 Questions

1. Briefly explain what proteins are.
2. List six cellular functions of protein.
3. Enumerate 3 plant proteins sources and 3 animal proteins sources and briefly explain any 3 of them.
4. List 6 essential amino acids.

CamScanner