Feed Formulation For Fish And Poultry

Tilapia Culture, Second Edition, covers the vital issues of farmed tilapia in the world, including their biology, environmental requirements, semi-intensive culture, intensive culture systems, nutrition and feeding, reproduction, seed production and larval rearing, stress and disease, harvesting, economics, trade, marketing, the role of tilapia culture in rural development and poverty eradication, and technological innovations in, and the environmental impacts of, tilapia culture. In addition, the book highlights and presents the experiences of leading countries in tilapia culture, thus making it ideal for tilapia farmers and researchers who seek the most relevant research and information. The new second edition not only brings the most updated information within each chapter, but also delivers new content on tilapia transfers, introductions and their impacts, the use of probiotics and other additives in tilapia culture, tilapia trade, including marketing, and sustainability approaches and practices, such as management practices, ecosystem approaches to tilapia culture, and value chain analyses of tilapia farming. Presents the biology of tilapia, including taxonomy, body shapes, geographical distribution, introductions and transfers, gut morphology, and feeding habits Covers semi-intensive tilapia culture in earthen ponds, tanks,

raceways, cages, recirculating systems, and aquaponics Provides the latest information on brood stock management, production of monosex tilapia, seed production, and larval rearing under different culture systems Highlights the most common infectious and non-infectious diseases affecting farmed tilapia, with a full description of disease symptoms and treatment measures Provides an in-depth exploration of tilapia economics, trade and marketing

Aquaculture is now recognized as a viable and profitable enterprise worldwide. As aquaculture technology has evolved, the push toward higher yields and faster growth has involved the enhancement or replacement of natural foods with prepared diets. In many aquaculture operations today, feed accounts for more than one-half the variable operating cost. Therefore, knowledge of nutrition and practical feeding of fish is essential to successful aquaculture. This book is not written exclusively for scientists but also for students, practicing nutritionists, and aquaculturists. It covers the known nutrient requirements and deficiency effects for different fishes, and digestion and metabolism of nutrients and energy. It discusses nutrient sources and preparation of practical and research feeds. It gives directions for conducting fish nutrition and feeding experiments. Feeding practices for salmonids, channel catfish, tilapias, shrimps and hybrid striped bass are presented. Since the first edition of this book was printed, the National

Research Council of the National Academy of Sciences has revised the nutrient requirements for fish. These revisions are in the present edition. Other additions to this revised edition are chapters on nutrition and fish health, and bioavailability of nutrients. Each original chapter has been meticulously revised and updated with new information. Aquaculture is a dynamic area and new technologies are being introduced continuously; therefore, some of the material discussed in this revised edition may become obsolete quickly. Nonetheless, the material presented has been thoughtfully selected and updated to make it of maximum use to persons whose interests range from general aquaculture to animal nutrition to feed manufacture.

This technical paper provides a comprehensive review of on-farm feeding and feed management practices in aquaculture. It comprises of ten case studies on feeding and feed management practices carried out in seven selected countries of Asia and Africa for eight species that belong to four major farmed species of freshwater finfish and shellfish. The paper also includes an analysis of the findings of all case studies and a separately published case study for Indian major carps carried out in India. A review from ten invited specialist on feed management practices from regional and global perspectives and an overview of the current status of feed management practices are also part of this technical

paper.

The intake of food by fishes is an area of study that is of great importance to the applied sciences of fisheries and aquaculture for a number of reasons. For example a thorough knowledge of factors influencing the ingestion of feed can lead to successful manipulation of the rearing environment of cultured fishes, thereby ensuring improved growth performance and feed utilisation, and decreasing the amount of waste (and consequent pollution) per unit of fish produced. This important book, which has arisen out of a European Union COST programme, illustrates how insights into the biological and environmental factors that underlie the feeding responses of fish may be used to address practical issues of feed management. Food Intake in Fish contains carefully edited contributions from internationally recognised scientists, providing a book that is an invaluable tool and reference to all those involved in aquaculture, especially those working in the aquaculture feed industry and scientific personnel in commercial and research aquaculture facilities. This book should also find a place on the shelves of fish biologists and physiologists and as a reference in libraries of universities, research establishments and aquaculture equipment companies.

Learn to maximize tilapia production in different areas around the world Tilapia is

the second-most cultured fish species in the world, and its production is increasing each year. However, for several reasons profit margins remain slim. Tilapia: Biology, Culture, and Nutrition presents respected international experts detailing every aspect of tilapia production around the world. Biology, breeding and larval rearing, farming techniques, feeding issues, post-harvest technology, and industry economics are clearly presented. This concise yet extensive reference provides the latest research and practical information to efficiently and economically maximize production in diverse locales, conditions, and climates. Tilapia: Biology, Culture, and Nutrition comprehensively explores all types of tilapia with a detailed biologic description of the fish that takes readers from egg through harvesting. The book authoritatively discusses production issues such as feed nutrition, temperature, water quality, parasites, and disease control to guide readers on how to best encourage fast, efficient growth. Economic and marketing information are examined, including industry data and projections by country. Each chapter approaches a specific facet of tilapia and provides the most up-to-date research available in that area. This resource gives the most current, detailed information needed for effective tilapia farming in one compact economical volume. Extensively referenced with an abundance of clear, helpful tables, photographs, and figures. Tilapia: Biology, Culture, and Nutrition

discusses in detail: complete biology, including sex ratios, optimum temperatures for growth and spawning, water quality parameters, and disease tolerance industry predictions hormonal control of growth genetic improvement sex determination, manipulation, and control seed production culture practices earthen and lined pond production culture in flowing water cage culture feed formulation and processing, and feeding management soil, water, and effluent quality saline tolerance levels with optimum rate of acclimation to seawater polyculture of tilapia with shrimp bottom soil conditions nutrient requirements with non-nutrient components parasites and diseases Tilapia: Biology, Culture, and Nutrition is essential reading for aquaculturists, nutritionists, geneticists, hatchery managers, feed formulators, feed mill operators, extension specialists, tilapia growers, fish farmers/producers, educators, disease specialists, aquaculture veterinarians, policy makers, educators, and students.

This issue of The State of World Fisheries and Aquaculture aims to provide objective, reliable and up-to- ate data and information to a wide range of readers – policy-makers, managers, scientists, stakeholders and indeed all those interested in the fisheries and aquaculture sector. As always, the scope is global and the topics many and varied. This edition uses the latest official statistics on fisheries and aquaculture to present a global analysis of trends in fish stocks,

production, processing, utilization, trade and consumption. It also reports on the status of the world's fishing fleets and analyses the make-up of human engagement in the sector. Twenty years on from the introduction of the Code of Conduct for Responsible Conduct, and now with the recently adopted Sustainable Development Goals, 2030 Agenda for Sustainable Development, Paris Agreement, and the Small-Scale Fisheries Guidelines, the focus on governance and policy has never been greater. This edition covers recent developments as they relate to fisheries and aquaculture, and reports, inter alia, on the Common Oceans ABNJ Program, FAO's Blue Growth Initiative and efforts to combat illegal, unreported and unregulated fishing. It also discusses issues such as valuing inland fisheries, cutting bycatch and promoting decent work. Other topics highlighted include: nutrition; aquatic invasive alien species; responsible inland fisheries; resilience in fisheries and aquaculture; and governance of tenure and user rights.

Experiments were carried out to compare the possibility of culturing fresh-water tilapia in sea-water while comparing the effectiveness of some formulated feeds using agro-waste by-products and trash fish. [Author's abstract].

This third edition of Fish Nutrition is a comprehensive treatise on nutrient requirements and metabolism in major species of fish used in aquaculture or scientific experiments. It

covers nutrients required and used in cold water, warm water, fresh water, and marine species for growth and reproduction. It also highlights basic physiology and biochemistry of the nutrients and applications of these principles to scientific and practical diet formulations and to manufacturing techniques for major species used worldwide in aquaculture. *Nutrient requirements for dietary formulations for fish farming *Digestive physiology *Comparative nutritional requirements of different species *Fish as unique animals for certain metabolic pathways

Good nutrition is fundamental to the success and sustainability of the aquaculture industry in terms of economics, fish health, high quality product production and minimizing environmental pollution. This book provides a unique, complete coverage of current information on nutrientrequirements, feed formulations and feeding practices of commercially important aquaculture species cultured around the world. Each chapter contains detailed feeding information on specific species and is written by an expert nutritionist on that species. The book is of interest to those workingprofessionally in the industry, graduate level students and researchers.

Aquaculture now supplies half of the seafood and fisheries products consumed worldwide and is gaining international significance as a source of food and income. Future demands for seafood and fisheries products can only be met by expanded aquaculture production. Such production will likely become more intensive and will depend increasingly on nutritious and efficient aquaculture feeds containing ingredients

from sustainable sources. To meet this challenge, Nutrient Requirements of Fish and Shrimp provides a comprehensive summary of current knowledge about nutrient requirements of fish and shrimp and supporting nutritional science. This edition incorporates new material and significant updates to information in the 1993 edition. It also examines the practical aspects of feeding of fish and shrimp. Nutrient Requirements of Fish and Shrimp will be a key resource for everyone involved in aquaculture and for others responsible for the feeding and care of fish and shrimp. It will also aid scientists in developing new and improved approaches to satisfy the demands of the growing aquaculture industry.

This book is the result of collaborative work between INRA and the Association FranÃ§aise de Zootechnie (AFZ). The tables in this book present the chemical composition and nutritional values of the feed materials fed to the main farm species. The feed materials included in this publication are used both in the formulation of compound feeds and as straight feedstuffs (concentrates and by-products). The values of chemical composition were mainly obtained using field data collected by AFZ from laboratories specialising in animal feeding (the data base includes over one million values). The nutritional values result principally from experimental work performed by INRA and its partners. The data used take into account the evolution in feed materials and nutritional concepts. Important characteristics have been introduced, namely net energy for pigs (growing pigs and sows), amino acid digestibility, mineral availability

and starch degradability for ruminants. In the present context of animal feeding and the new challenges that it faces (product quality and safety, animal health and welfare, environmental issues), this publication provides a reliable scientific reference document for feed manufacturers, veterinarians, extension officers, farmers, lecturers and students. Daniel Sauvant is professor of animal sciences at INA P-G, director of the Physiology of Nutrition and Feeding Research Unit at INRA/INA P-G, president of AFZ and a member of the expert committee on Animal Feeding at AFSSA. Jean-Marc Perez is deputy director of the Animal Physiology and Livestock Systems Department at INRA and scientific director of the journal INRA Productions Animales. Gilles Tran is the French Feed Database project manager at AFZ.

In this monograph, experts provide current knowledge on nutrient requirements and effects of deficiencies on commercially important aquaculture species. The information presented affects the development of more cost-effective feeds, the increased use of and market demand for agricultural and aqua-cultural products and by-products, and the potential for decreased pollution. This monograph is useful to students, nutritionists, food technologists, feed formulators and manufacturers, oilseed producers, and aquaculturists.

Students in animal science, industry personnel involved in the feeding of animals, and professionals working for feed-mixing companies will all benefit from this current, comprehensive package - a text on the economic and nutritional aspects of feed

formulations that optimize nutritional content while minimizing costs. Animal Feed Formulation applies a well-tested, easy-to-use computer program called UFFDA that illustrates the principles of least-cost food formulation. Developed in a cooperative effort by the Departments of Poultry Science and Agricultural and Applied Economics at the University of Georgia, UFFDA is menu-driven software that has the editing capabilities of a spreadsheet program for altering the ingredient and nutrient matrix. The book begins by solving a simple ration-balancing problem, providing step-by-step instructions with the computer program that any user - even one without computer training - can readily follow. It then discusses specific feed formulation techniques in terms of their practical applications and economic implications. Included are such techniques as sensitivity analysis, parametric cost and nutrient ranging, optimum-density formulation, multi-blending, and risk analysis, among others. Applying these and other techniques using the special features of UFFDA, users can select the proper ingredients, adjust proportions among nutrients, determine which feeds might require scarce ingredients, consider the risks involved in dealing with ingredients with below-average compositions, and ultimately determine the costs and nutritional content of various feed formulations. The program can be applied to determining feed formulations for any animal, including sheep, beef and dairy cattle, swine, turkeys, broilers, catfish, and horses. Practitioners who are growing animals will be able to maximize the nutritional content of their feed while keeping costs down. Professionals working in feed-mixing companies will be able

to maximize profits by offering products composed of low-cost ingredients that are also of good nutritional value. Students will gain a firm background in nutritional and economic concepts, insight into how to apply them to practical problems, and an understanding of the way good nutrition and good value can be achieved by applying the latest computer technology.

Composition of feeds; Analytical and biological data.

Chapter I - Importance of Nutrition of Species in Aquaculture, Chapter II - Nutritional Requirements of Finfish, Chapter III - Nutritional Requirements of Crustaceans (Shrimps and Prawns, Lobsters and Crabs), Chapter IV - Broodstock and Larval Nutrition, Chapter V - Feed Ingredients, Chapter VI - Feed Additives, Chapter VII - Feed Formulation An Feed Technology, Chapter VIII - Feeding Management and Sustainability, Chapter IX 0- Biofloc Technology, Chapter X - Aquaponics. Fish and shellfish are contributing highly nutritious and healthy food to the food basket the world over. The world per capita seafood consumption reached a record level of 20 kg per person per year for the first time in history. This is twice the level of average per capita fish consumption in 1960s in the world. The global trade value of seafood has increased to $ 150 billion. The total fish production in the world is 150 million tons in 2014 (FAO) out of which 70 million tons is contributed by aquaculture. While the natural capture fishery resources are fast dwindling, contribution by aquaculture is ever increasing. The culture of crustaceans and finfishes is propelled mainly by intentional

feeding of formulated feeds. As the demand for fish as food for human consumption is ever-increasing, aquaculture is the only alternative to bridge the gap between supply and demand. Indian aquaculture production has shown impressive growth with total aquaculture production nearing 7 million tons contributing almost 70% to the total seafood production. Indian aquaculture sector is mainly represented by the large scale culture of Indian Major Carps (catla, rohu and mrigal), exotic carps (grass carp, silver carp and common carp) and Pangasius catfish. Freshwater prawn and Penaeid shrimp are the crustaceans that are adding to seafood exports from the country. Aquaculture of Asian seabass, milkfish, mullets, grouper and cobia etc. has been gaining momentum. The total aqua feed production is touching almost 300,000 tons per annum.

A study was undertaken to know about the fish feed formulation, production, quality control and to investigate the nutrient contents of fish feeds in Shushama Feed Limited. The formulation of feed was done with indigenous ingredients and ingredients imported from different countries. The feed formulation was accomplished through Trial and Error method and Pearson's Square method. During formulation raw ingredients were selected according to the nutrient availability of the feedstuffs to obtain desired nutrient composition in finished feeds. The feed production was accomplished through feed milling process which involved several steps. The quality control program which involved the verification of quality standards, close monitoring of the quality of ingredients through the period of storage prior to usage and during its

processing.Proximate composition such as moisture, crude protein, crude lipid, ash, fibre and NFE (nitrogen free extract) of finished feeds were evaluated.

Aquaculture is a growing industry. A vital component of the subject is feeding the organisms under cultivation. This book provides a thorough review of the scientific basis and applied aspects of fish nutrition in a user-friendly format. It will be of great use to individuals working or training in the industry, and to fish feed manufacturing personnel.

This classic reference for poultry nutrition has been updated for the first time since 1984. The chapter on general considerations concerning individual nutrients and water has been greatly expanded and includes, for the first time, equations for predicting the energy value of individual feed ingredients from their proximate composition. This volume includes the latest information on the nutrient requirements of meat- and egg-type chickens, incorporating data on brown-egg strains, turkeys, geese, ducks, pheasants, Japanese quail, and Bobwhite quail. This publication also contains new appendix tables that document in detail the scientific information used to derive the nutrient requirements appearing in the summary tables for each species of bird.

This book focuses on the animal husbandry and nutrition based on significant evaluations by the authors of the chapters. Many chapters contain general overviews on animal husbandry and nutrition from different countries. Also, the sections created shed light on futuristic overlook with improvements for animal husbandry and feeding

sector. Details about rearing and feeding different animal races are also covered herein. It is hoped that this book will serve as a source of knowledge and information on animal husbandry and nutrition sector.

Feed and fertilizer are significant costs in aquaculture operations and play an important role in the successful production of fish and other seafood for human consumption. This book reviews the key properties of feeds, advances in feed formulation and ingredient choices and the practicalities of feeding systems and strategies. Feed and Feeding Practices in Aquaculture provides an authoritative and comprehensive coverage of the topic and is an essential guide for nutritionists, farm owners and technicians in aquaculture, as well as those working in R&D in the feed production industry and academics/postgraduate students with an interest in the area. Reviews the key properties of aquafeed, advances in feed formulation and manufacturing techniques, and the practicalities of feeding systems and strategies Provides an overview of feed and fertilizer in aquaculture Covers feeding strategies and related issues in different areas of aquaculture

Aquafeed Formulation is the only resource that provides summaries with examples and formulation techniques specifically to meet the needs of anyone in the aquaculture industry. As feed is the largest single cost item in aquaculture production, and formulating aquaculture feed requires many combinations of several ingredients and nutrient requirements, this book takes a clear-and -concise approach, providing

essential information on formulation and covering relevant available software, feed nutrients, and additives such as enzymes and phytase and conjugated fatty acids, as well as best industry practices to improve aquafeed production. Users will find this to be a one-stop resource for anyone interested or involved in, the global aquaculture industry. Includes the latest software evaluation for calculating protein and amino acid sources, trace minerals, and vitamins for aquaculture diets Provides essential information on formulation, covering feed nutrients and additives such as enzymes and phytase and conjugated fatty acids Presents factors affecting nutrient recommendations for aquaculture diets and nutritional effects on aquaculture nutrient excretion and water quality Covers a broad range of techniques to understand the nutrient recommendations in the NRC guide

Aquaculture - culture of aquatic organisms including aquatic vegetations under controlled conditions which are now recognized as a viable and profitable farming or enterprise worldwide. As aquaculture technology has evolved, the push toward higher yields and faster growth has involved the enhancement or replacement of natural foods with prepared diets. In many aquaculture operations today, feed accounts for more than a half of the variable operating cost. Therefore, knowledge of fish nutrition and practical feeding of fish is essential for successful aquaculture. This teaching manual aims for a better understanding of fish nutrition and feed technology. There are six major areas of interest in which 25 chapters are included. This teaching manual is a guide for anyone interested in fish nutrition and feed technology areas and student communities in particular.

Drawing on laboratory and farm studies, the book reviews in detail the current state-of-the-art scientific research knowledge of fish and crustacean nutrition, from larvae to juvenile fish, through to the final stages of harvesting. Topics covered include issues surrounding the formulation, manufacture and delivery of feedstuffs to fish farms and the text provides a dual focus on fish and shrimp feeding requirements addressing practical applications as appropriate for the European aqualculture industry.

Fish Nutrition aims to present the state of knowledge of basic and applied nutritional requirements of fishes. Most of the information found in this book involves salmonids, their nutrition, and metabolism of nutrients. This is in view of the fact that more research has been done and completed with this fish. Although applied fish nutrition is a very broad field, this book focuses on some of its aspects. These include the classes of nutrients and requirements for several types of fishes. This book comprises of 11 chapters. The first few chapters deal with the general nutrient requirements of fishes. Then, other chapters discuss calorie and energy as well as micro- and macronutrient needs and requirements. The following chapters deal with the non-nutrient components of the diet, or those that influence the characteristics of food products including texture, odor, flavor, and color. Other topics covered are enzymes and systems of intermediary metabolism (Chapter 6); feed formulation and evaluation (Chapter 7); and salmonid husbandry techniques (Chapter 9). Nutritional fish diseases are also discussed in this book. Some of these diseases include thyroid tumor, gill disease, anemia, lipoid liver degeneration, and visceral granuloma. In Chapter 11, the relationship of nutrition and pathology is given emphasis. This chapter also tackles the diet and general fish husbandry. This topic is very important, because an adequate diet for fish husbandry is the foundation of

fish farming.

In the years since the third edition of this indispensable reference was published, a great deal has been learned about the nutritional requirements of common laboratory species: rat, mouse, guinea pig, hamster, gerbil, and vole. The Fourth Revised Edition presents the current expert understanding of the lipid, carbohydrate, protein, mineral, vitamin, and other nutritional needs of these animals. The extensive use of tables provides easy access to a wealth of comprehensive data and resource information. The volume also provides an expanded background discussion of general dietary considerations. In addition to a more user-friendly organization, new features in this edition include: A significantly expanded section on dietary requirements for rats, reporting substantial new findings. A new section on nutrients that are not required but that may produce beneficial results. New information on growth and reproductive performance among the most commonly used strains of rats and mice and on several hamster species. An expanded discussion of diet formulation and preparation--including sample diets of both purified and natural ingredients. New information on mineral deficiency and toxicity, including warning signs. This authoritative resource will be important to researchers, laboratory technicians, and manufacturers of laboratory animal feed.

This new release presents the wealth of information gleaned about nonhuman primates nutrition since the previous edition was published in 1978. With expanded coverage of natural dietary habits, gastrointestinal anatomy and physiology, and the nutrient needs of species that have been difficult to maintain in captivity, it explores the impact on nutrition of physiological and life-stage considerations: infancy, weaning, immune function, obesity, aging, and more. The committee also discusses issues of environmental enrichment such as opportunities for

foraging. Based on the world's scientific literature and input from authoritative sources, the book provides best estimates of nutrient requirements. The volume covers requirements for energy: carbohydrates, including the role of dietary fiber; proteins and amino acids; fats and fatty acids; minerals, fat-soluble and water-soluble vitamins; and water. The book also analyzes the composition of important foods and feed ingredients and offers guidelines on feed processing and diet formulation.

"The culture of tilapia ... and freshwater prawns ... has the potential to produce protein and income for small-scale fish-farmers in Fiji and PNG. However, lack of appropriate resources and capacity has contributed to low productivity of aquaculture in both countries. One of the key constraints identified is the poor quality and limited availability of supplementary feeds. Where commercial feeds are available, they are often prohibitively expensive. The alternative is for farmers to make their own feeds ... In 2004 and 2005 ... potential feed ingredients for aquaculture in both countries were surveyed and a new simple feeds were formulated, some of which were later tested with tilapia in Fiji. This brochure briefly introduces the science (and art) of aquaculture feed formulation including sections on components of fish feeds, information on selecting ingredients, how to make simple feeds on farm, feed storage and feeding rates. Several formulations (recipes) are given."--P. 5.

The feed manufacturing business; Composition and digestibility of feedstuffs; Nutrients, their uses and deficiencies; Effect of processing on feed quality; Effect of storage on nutritional value; Beef cattle formulations; Dairy cattle formulations; Horse formulations; Poultry formulations; Sheep formulations; Swine formulations; Dog formulations; Utilization of a ration; Variation in feed ingredients; How to make a feed formula; Selection of feeds for formulas;

Classification of feedstuffs; Costs of procuring, manufacturing and distributing mixed feeds; Microingredients and premixes; Linear programming; Special points to feed manufacturers; Cautions to feed manufacturers; Feed standards and the feed control service.

This special publication is designed to describe the basic elements of salmonid nutrition. Described are the requirements and functions of nutrients. The feed formulation for salmonids is described, together with the quality control parameters for the most important ingredients in salmonid diets. All fish feeds must be processed to produce feed particles of appropriate size for fish of different ages and sizes. The digestibility and balance of nutrients assumes greater importance in diets for fish because of the importance of preventing eutrophication and increasing the biological oxygen demand in the fish pond. Guides have been established indicating the amount of feed to give daily to fish of various sizes and water temperatures. Fish are poikilotherms whose body temperature, metabolic rate and feeding activity varies with the ambient water temperature. Feeding rates and growth rates are reduced as the temperature is decreased from 15 to 4 C.

Current growth in global aquaculture is paralleled by an equally significant increase in companies involved in aquafeed manufacture. Latest information has identified over 1,200 such companies, not including those organizations in

production of a variety of other materials, i. e. , vitamins, minerals, and therapeutics, all used in varying degrees in proper feed formulation. Aquaculture industries raising particular economically valued species, i. e. , penaeid shrimps and salmonids, are making major demands on feed ingredients, while relatively new industries, such as til apia farming, portent a significant acceleration in demand for properly formulated aquafeeds by the end of the present decade and into the next century. As requirements for aquafeeds increases, shortages are anticipated in various ingredients, especially widely used proteinaceous resources such as fish meal. A variety of other proteinaceous commodities are being considered as partial or complete replacement for fish meal, especially use of plant protein sources such as soybean meal. In the past five years, vegetable protein meal production has increased 10% while fish meal production has dropped over 50%, since 1989, largely attributed to overfishing and serious decline in wild stock. Throughout fisheries processing industries, traditional concepts as "waste" have given way to more prudent approaches, emphasizing total by-product recovery. Feed costs are a major consideration in aquaculture where in some groups, i. e. , salmonids, high protein-containing feeds using quality fish meal, can account for as much as 40 to 60% of production costs. This book is the proceedings of a meeting held in Bangkok in December 1992 on

the use of farm-made feeds in Asia. It contains eleven country reviews of the topic, for Bangladesh, Cambodia, China, India, Indonesia, Malaysia, Nepal, the Philippines, Singapore, Thailand and Vietnam. Nine technical papers are also included. Three are on-farm feed preparation and feeding strategies - for carps and tilapias, for catfish and snakehead, and for marine shrimp and prawns. Five other working papers are on economics, the selection of equipment, feed ingredients, formulation and on-farm management, and supplementary feeding in semi-intensive aquaculture, all directed at farm-made, rather than commercial feeds. The ninth working paper is a regional overview of aquafeeds in Asia. An analysis of the material in the eleven country papers is also presented.

Using the latest research in fish nutrition, this volume revises and combines the 1981 edition on coldwater fish and the 1983 edition on warmwater fish and shellfish. In addition to updating requirements for energy, protein, minerals, and vitamins, this book provides, for the first time, summary tables on nutrient requirements of a variety of fish species, including channel catfish, rainbow trout, Pacific salmon, carp, and tilapia. Tabular data on amino acid requirements of 11 species are also included. Shellfish are not included in this edition because of lack of scientific information.