

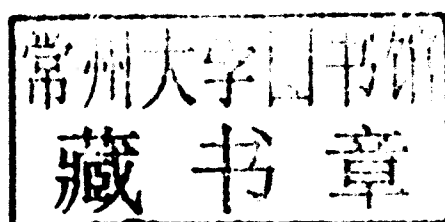
Report of the

**FAO WORKSHOP ON THE ON-FARM FEEDING AND FEED
MANAGEMENT IN AQUACULTURE**

Manila, the Philippines, 13–15 September 2010



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ISBN 978-92-5-106713-0

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PREPARATION OF THIS DOCUMENT

This document presents the Report of the FAO Expert Workshop on “On-farm feeding and feed management in aquaculture” that was held in Manila, the Philippines, from 13–15 September 2010. The workshop was organized by the Aquaculture Service of the FAO Fisheries and Aquaculture Department (FAO FIRA) in collaboration with the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC/AQD), Iloilo, the Philippines. The report was prepared by Dr Mohammad R. Hasan (Aquaculture Officer, Aquaculture Service, FIRA) with the assistance of Dr Thomas A. Shipton, FAO Consultant.

ACKNOWLEDGEMENTS

The FAO Fisheries and Aquaculture Department would like to gratefully acknowledge all staff of the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC/AQD), and in particular, Dr Joebert D. Toledo (Chief, SEAFDEC/AQD) and Dr Mae R. Catacutan (Head of Nutrition & Feed Development, SEAFDEC/AQD), for their excellent cooperation and hospitality provided during the workshop. In addition, the organizers would like to thank all the participants for their time and effort.

FAO.

Report of the FAO Expert Workshop on On-farm feeding and feed management in aquaculture. Manila, the Philippines, 13–15 September 2010.

FAO Fisheries and Aquaculture Report. No. 949. Rome, FAO. 2010. 37p.

ABSTRACT

The FAO Expert Workshop on “On-farm feeding and feed management in aquaculture” was convened in Manila, the Philippines, from 13–15 September 2010. The workshop was attended by a wide range of aquaculture researchers, development specialists and industrial experts from around the world. The workshop was convened by the FAO Fisheries and Aquaculture Department, Aquaculture Service (FIRA) and was hosted by the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC/AQD) based in Iloilo, the Philippines. The workshop was organized with three objectives: a) to review and analyze the existing knowledge on the application of feed management as a tool for reducing feed costs in aquaculture, b) to identify the major issues and constraints of feed management and those that need to be addressed and c) to prepare a list of recommendations to define/suggest the future course of action, including the preparation of technical manuals/guidelines for dissemination to farmers. The workshop convened both in plenary and in working groups. In the plenary, participants heard technical presentations intended to orient them to the issues and constraints pertaining to on-farm feeding and feed management. These presentations included invited reviews, case studies and synthesis of the case studies. Following several working group deliberations and a general plenary discussion, the participants identified seven primary issues that currently constrain feed use and management in aquaculture, namely: 1) limited access to information on feed and feed ingredients (availability, prices and quality); 2) poor feed preparation, processing, handling and storage at the farm level; 3) inadequate monitoring of feed and farm performances; 4) low impact of current dissemination strategies on improved feeding and feed management; 5) gaps in the understanding of the economic aspects of feed management; 6) health aspects and their implications on feed management; and 7) feed quality – lack of regulatory mechanisms. A comprehensive set of recommendations was developed to overcome the constraints that were identified, and it is anticipated that these recommendations will guide FIRA’s future work in this arena. The workshop proceedings and recommendations, invited reviews, case studies and syntheses will form the basis for an FAO Fisheries and Aquaculture Technical Paper entitled “On-farm feeding and feed management in aquaculture” which will be published in due course.

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BACKGROUND TO THE WORKSHOP

The issue: on-farm feeding and feed management in aquaculture

It is generally accepted that feed costs account for the highest single production cost in aquaculture grow-out production systems. Typically, in intensive production systems, feed accounts for between 60 and 80 percent of operational costs. In contrast, in semi-intensive systems, feed and fertilizer use represents between 30 and 60 percent of the total cost of production.

From an economic perspective, the high costs that accrue to feed use suggest that the optimization of feed management practices will have a significant impact on the economic viability of an operation. In this regard, farmers' perceptions play a critical role. Misconceptions and a poor understanding of the effect that feed management practices have on feed utilization and productivity often result in overfeeding stock in the belief that more feed will produce more fish. In many instances, these perceptions are created and perpetuated by feed manufacturers and result in production inefficiencies and the overuse of feeds. Often high quality, commercially produced feeds are provided to aquaculture systems with little regard to the economic or nutritional rationale for their use. Such practices may result in feed wastage and the poor economic performance of the production systems. Factors affecting the poor feed utilization and resulting in high feed conversion ratios (FCRs) include the inappropriate selection of feed type (pellet type and formulation), quality and the feeding strategy. Among others, the quality of the feed is influenced by the quality and digestibility of the feed ingredients, the suitability of the formulation in terms of supplying the nutritional requirements of the culture species, the stability of the feed in the water, the storage and handling of the feed, and whether the feed is extruded or pelleted. In this regard, some farmers have shown an inclination to use extruded floating pellet, probably without attempting to use other management options to best utilize the sinking pellet or farm-made aquafeeds (please see Appendix C for definition).

Two of the most important factors that can lead to feed wastage are overfeeding and the application of poor feed management strategies by farmers. In this regard, farmers can significantly improve FCRs by regulating rations and optimizing feeding frequency, duration and timing. Importantly, the application of appropriate feed management techniques and/or improving feed quality can improve feed utilization and overall farm productivity without increasing the cost of production. There have been many studies that have indicated that while the use of high-quality feed may not necessarily provide high returns, improvements to feed management protocols can significantly increase returns, and in this regard, it has been reported that improvements to feed management practices can reduce the feed cost by 15–20 percent.

The context

Taking the above considerations into account, the FAO Fisheries and Aquaculture Department Aquaculture Service (FIRA) has initiated the work programme: "On-farm feeding and feed management in aquaculture". The objectives of this work programme are to evaluate the mechanisms available for introducing cost- and ingredient-saving feed management strategies for finfish and crustacean aquaculture and to develop suitable guidelines for their dissemination to farmers. The ultimate objective of the programme is to promote a reduction in feed use through the promotion of improved feed management practices.

The following activities have been proposed under this work programme:

- a. a desktop study on the scientific information and concepts related to on-farm feeding and feed management, and a synthesis of the strategies that could be employed to reduce feed costs and the efficient use of feed ingredients;
- b. reviews and country-specific case studies on feed management in selected species/species-groups that are widely cultured;

- c. an expert workshop to discuss the findings of a) and b); and
- d. the development of technical manuals/guidelines and regional mechanisms to disseminate them.

The species/species-groups that have been included in the work programme comprise the Nile tilapia, Indian major carps, striped catfish, whiteleg shrimp, tiger shrimp and freshwater prawn. For Asia, country coverage for the case studies includes Bangladesh, China, India, the Philippines, Thailand and Viet Nam; and for Africa, Egypt and Ghana. The broad thematic areas that were addressed in the case studies and reviews are:

- current feed types (including fertilizers) and their use in semi-intensive and intensive farming systems;
- on-farm feed production and management;
- reviews of existing feeding strategies, feed procurement, transportation and storage;
- identification of research needs; and
- identification of appropriate regulatory and legal frameworks.

In the future, country coverage may be expanded as deemed appropriate.

SCOPE AND ORGANIZATION OF THE WORKSHOP

In support of the above work programme, FIRA, in collaboration with the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC/AQD), organized an expert workshop entitled “On-farm feeding and feed management in aquaculture” in Manila, the Philippines, from 13-15 September 2010.

Objectives

The objectives of the workshop were to:

- review and analyze the existing knowledge on the application of feed management as a tool for reducing feed costs in aquaculture;
- identify the major issues and constraints of feed management that need to be addressed; and
- prepare a list of recommendations to define/suggest the future course of action, including preparation of technical manuals/guidelines for their dissemination to the farmers.

Outputs

The workshop proceedings, including the working group discussions and recommendations, invited reviews, country-specific case studies on feed management in selected species/species-groups, and recommendations to promote improved on-farm feed management practices, will form the basis of an FAO Fisheries and Aquaculture Technical Paper entitled “On-farm feeding and feed management in aquaculture”.

Participants and workshop venue

The workshop brought together acknowledged international experts in the relevant fields, including the authors of invited reviews and case studies, and experts from government agencies, universities, international and regional organizations and private industries and organizations. The workshop was attended by 47 participants including 10 members of the local organizing committee and five observers. Participants came from Africa, Asia, Europe and North America. The workshop was hosted by the SEAFDEC/AQD and was held at the Microtel Mall of Asia, Pasay City, the Philippines.

The opening ceremony of the workshop was inaugurated by Dr Joebert D. Toledo (Chief, SEAFDEC/AQD). Introductory messages were provided by Mr Kazuyuki Tsurumi (FAO Representative, the Philippines) and Dr Mohammad R. Hasan (FAO, Rome). Dr Evelyn Grace T. De Jesus-Ayson (SEAFDEC/AQD) introduced the keynote speaker, the Honourable Proceso Alcala (Secretary, Department of Agriculture, the Philippines). Dr Mae R. Catacutan (SEAFDEC/AQD) provided the vote of thanks.

Modus operandi of the workshop

The workshop convened both in plenary and in working groups. In the plenary, participants heard technical presentations intended to orient them on the issues and constraints pertaining to on-farm feed management. These presentations included regional reviews, case studies and global syntheses.

Following the plenary sessions, the participants were divided into three working groups to discuss specific issues relating to on-farm feed management, namely:

- production and logistics (e.g. procurement, transportation and storage) of feeds (farm-made and commercial);
- feeding strategies and the assessment of feed quality and performance; and
- economics of feed management and the assessment of regulatory and legal frameworks.

Each working group elected a chairperson and a rapporteur. The groups were tasked with identifying the five major issues within their thematic areas, to prioritize these issues, recommend the actions that would be required to address them, and identify the primary stakeholders who should be responsible for the implementation of the actions required to address the issues. Following the working group deliberations and subsequent reporting to plenary, the workshop agreed on a series of recommendations and actions that could be implemented to improve on-farm feed management.

The workshop agenda and timetable is presented in Appendix I and the list of participants in Appendix II. A Technical Secretariat comprising of Dr Mohammad R. Hasan (FAO FIRA), Mr Miao Weimin (FAO RAP) and Dr Diego Valderrama (FAO FIRA) was responsible for the technical coordination of the workshop. Appendix III contains a glossary, Appendix IV presents a summary of statements made during the opening and closing ceremonies, and Appendix V provides summaries of the technical presentations.

ISSUES AND RECOMMENDED ACTIONS TO IMPROVE ON-FARM FEED AND FEED MANAGEMENT IN AQUACULTURE

The workshop identified seven major issues that need to be addressed, namely:

Issue 1: Limited access to information on feed and feed ingredients: availability, prices and quality

In many countries, there is a paucity of information pertaining to local feed ingredient supply, costs, quality (including nutrient composition) and their optimal inclusion rates for use in farm-made feed formulations. To make informed decisions about the most appropriate feed ingredients to use in their formulations, farmers/small-scale feed manufacturers (please see Appendix C for definition) need up-to-date information on ingredient availability (sources and suppliers), costs and inclusion rates in formulations. Failure to supply farmers/small-scale feed manufacturers with this information may result in available ingredients being excluded from formulations or being included at suboptimal levels.

Recommended actions:

- Identify and encourage local media and local agencies to disseminate feed ingredient information (e.g. quality, availability, cost, suppliers) at regular intervals and in local languages.
- Disseminate species-specific information on the recommended/optimal quality and inclusion rates of feed ingredients. Prior to dissemination, this information should be translated into local languages.
- Launch a pilot database (small area-specific programme) to inform farmers and feed suppliers of the current status of feed ingredient availability and price. If this intervention proves successful, it could be replicated in other areas.

Issue 2: Poor feed preparation, processing, handling and storage at the farm level

The feed preparation, processing technologies, storage and handling systems that are employed often result in feed spoilage or inefficiencies in feed formulation and usage. In the Asia-Pacific region, farm-made or semicommercial feeds, particularly for finfish farming, constitute a significant supply chain for semi-intensive, small-scale practices. Information and training on the use of the basic machinery required to make good quality farm-made/semicommercial feeds is often absent. Storage and handling systems are often rudimentary or absent, resulting in the spoilage of feed and feed ingredients and a concomitant reduction in their nutritional value. In some countries, the practice of “top-dressing” feeds with therapeutants and nutritional supplements of questionable efficacy remains problematic.

Recommended actions:

- Improve farm-made/small-scale feed manufacturing through the development and promotion of simple on-farm feed processing (grinding/pelleting/drying, etc.) technologies.
- Maintain feed quality through the development and promotion of simple feed storage systems to protect feed products from deleterious environmental parameters (sunlight, humidity, rain, etc.).
- Discourage the unregulated top-dressing of commercial and farm-made feeds.

Issue 3: Inadequate monitoring of feed and farm performances

The adoption of inappropriate feeding strategies and the inadequate monitoring of feed usage can result in feed wastage that negatively impacts production parameters. Farmers may not have the necessary knowledge required to optimize their feeding strategies, most notably the interactions between feeding behaviour and environmental parameters and the contribution that natural productivity makes to the nutritional status of the culture system. The use and efficacy of feeding devices needs to be established and promoted. The absence or poor quality of record keeping (e.g. stocking rates, feed use, growth, water quality parameters) makes it difficult to assess feed performance and the effect that feed use (quality and quantity) has on production.

Recommended actions:

- Develop feeding tables based on species, body mass, developmental stage, culture system and the associated environmental parameters.
- Promote the use of feeding devices to monitor feed consumption and feeding behaviour.
- Conduct on-farm research to evaluate and establish the nutritional contribution from natural productivity (qualitative and quantitative analyses), the nutritional status of the particular culture system, and the interaction between natural productivity and the supplemental feed requirement.

- Develop and adopt simple indicators that can be used by farmers to gauge the natural productivity in their production systems.
- Encourage farmers to improve their record keeping and monitoring activities through the use of record books and simple record tables outlining feed use, stocking, harvesting and sampling activities.
- Farmers need to be provided with training to improve their record keeping activities, and improve their abilities to assess the performance of their production systems (e.g. growth, FCR, health management, survival). Where appropriate, farmers need to be trained to undertake corrective actions to improve farm performance.

Issue 4: Low impact of current dissemination strategies on improved feeding and feed management

The existing strategies that have been developed to disseminate information to encourage farmers to adopt improved feeding and feed management practices are often ineffective. Weak extension and information dissemination networks result in low adoption rates of novel feed production technologies and management practices. Better management practices (BMPs) need to be developed and promoted at a species-specific level, and strategies that will improve the dissemination and uptake of these practices need to be developed. A number of opportunities exist to improve dissemination strategies. These include the identification and training of key innovative farmers to demonstrate techniques and technologies to other farmers, the organization of farmer groups and cooperatives, the establishment of farmer networks to promote farmer to farmer training, and farmer field schools.

Recommended actions

- Identify good/better feed management practices and demonstrate/disseminate them to other farmers through a cluster approach (farmer networks).
- Encourage dissemination of farmers' innovations on novel feed management practices.
- Identify key leader/innovative farmers, provide leadership training and encourage them to promote BMPs. Organize farmers into groups/cooperatives or establish networks of farmers and develop farmer-to-farmer training programmes/farmer field schools.

Issue 5: Gaps in the understanding of the economic aspects of feed management

Many farmers use feeds and apply feed management practices with inadequate attention to the economic implications of their actions. Typically, feed is one of the major costs associated with aquaculture production. Subtle changes to feed management practices and changes in feed formulations can significantly impact feed costs and the overall economic performance of an operation. Farmers are often unaware of the economic weighing of their feed-related activities (choice of feed/feed management practices) and would benefit from a better understanding of the economical use of feeds on the farm.

Recommended actions:

- Farmers need to be provided with training in business management techniques that will enable them to make informed economic decisions in terms of feed choice and the feed management protocols that they apply.
- Develop and disseminate to farmers user-friendly economic tools that are designed to demonstrate the impact of feed choice and feed management on the economic viability of the farming operation.

Issue 6: Health aspects and their implications on feed management

Regular performance assessments (e.g. monitoring of fish health and survival rates, standing stock, growth) to monitor the status of the standing stock are often lacking. In this regard, farmers either fail to collect and collate the necessary information or fail to interpret performance criteria correctly. In order to maximize feed utilization, feeding protocols need to be adjusted according to stock performance criteria and indices. With respect to fish health and the effect that the health status of a cultured population has on feed consumption and utilization, there is a need to develop species-specific indicators of fish health and integrate these into feed management protocols.

Recommended action:

- At a species-specific level, develop simple and practical methodologies and indicators to assess fish health and integrate these into feed management protocols.

Issue 7: Feed quality – lack of regulatory mechanisms

Feed and feed ingredient quality remains problematic, with farmers often having little or no control over the quality of the feeds that they purchase from commercial feed manufacturers or the quality of the feed ingredients that they purchase to prepare their own feed. The use of substandard feed or feed ingredients will result in low production in the culture system and poor returns to the farmer. In this regard, many countries that have established aquaculture sectors have developed feed monitoring and product labelling systems that are designed to ensure that the farmers are aware of the quality of the feed and feed ingredients that they are purchasing.

Recommended action:

- Encourage government and farmers to monitor the quality of feeds and feed ingredients.

APPENDIX I WORKSHOP AGENDA AND TIMETABLE

Manila, the Philippines, 13–15 September 2010

Time	ACTIVITIES
12th September	
	Arrival of the participants in Manila
13th September - Workshop day 1	
0800–0900	Registration
Session I: Opening and Welcome Remarks	
0900-0945	<ul style="list-style-type: none"> Welcome remarks – <i>Dr Joebert D. Toledo, Chief SEAFDEC/AQD</i> Message – <i>Mr Kazuyuki Tsurumi, FAO Representative, the Philippines</i> Message – <i>Dr Mohammad R. Hasan, FAO, Rome</i> Introduction of the keynote speaker – <i>Dr Evelyn Grace T. De Jesus-Ayson, SEAFDEC/AQD</i> Keynote Speaker– <i>Honourable Proceso Alcala, Secretary, Department of Agriculture, the Philippines</i> Vote of thanks – <i>Dr Mae R. Catacutan, SEAFDEC/AQD</i>
0945-1005	Coffee/Tea Break
1005-1015	Group photo
Session II: Presentation of Invited Reviews and Case studies – Nile tilapia	
Chair: Dr Joebert D. Toledo; Co-chair: Dr Albert G.J. Tacon; Rapporteur: Dr Thomas A. Shipton	
1015-1030	Introduction and Objectives of the Workshop – <i>Mohammad R. Hasan, FAO, Rome</i>
1030-1055	On-farm feeding and feed management in tropical aquaculture: issues, challenges and opportunities – <i>Amararatne Yakupitiyage, Asian Institute of Technology, Thailand</i>
Presentation of Case Studies and Invited Reviews – Nile tilapia	
Case Studies	
1055-1115	On-farm feed management practices for Nile tilapia (<i>Oreochromis niloticus</i>) in Ghana – <i>Lionel Kofi Amewusika Awity, Department of Fisheries, Ghana</i>
1115-1135	On-farm feed management practices for Nile tilapia (<i>Oreochromis niloticus</i>) in Egypt – <i>Abdel-Fattah M. El-Sayed, Alexandria University, Egypt</i>
1135-1150	On-farm feed management practices for Nile tilapia (<i>Oreochromis niloticus</i>) in China – <i>Jiashou Liu, Chinese Academy of Sciences, China</i>
1150-1210	On-farm feed management practices for Nile tilapia (<i>Oreochromis niloticus</i>) in Thailand – <i>Ram Chandra Bhujel, Asian Institute of Technology, Thailand</i>
1210-1230	On-farm feed management practices for Nile tilapia (<i>Oreochromis niloticus</i>) in the Philippines – <i>Maria Rowena R. Romana-Eguia, SEAFDEC/AQD, the Philippines</i>
1230-1330	Lunch
Invited Reviews	
1330-1355	An overview of tilapia feed management practices in Sub-Saharan Africa – <i>Abdel-Fattah M. El-Sayed, Alexandria University, Egypt</i>
1355-1420	On-farm feeding and feed management of tilapia aquaculture with special focus on Malaysia – <i>Wing-Keong Ng, Universiti Sains Malaysia, Malaysia</i>
1420-1520	General discussion on case studies and reviews
1520-1540	Coffee/Tea Break
Session III: Presentation of Case Studies and Invited Review – Indian major carps	
Chair: Dr Joebert D. Toledo; Co-chair: Dr Sena S. De Silva; Rapporteur: Dr Dave H.F. Robb	
Case Studies	
1540-1600	On-farm feed management practices for three Indian major carp species (rohu <i>Labeo rohita</i> , mrigal <i>Cirrhinus mrigala</i> and catla <i>Catla catla</i>) in Bangladesh – <i>Md. Rafiqul Islam Sarder, Bangladesh Agricultural University, Bangladesh</i>
1600-1620	On-farm feed management practices for three Indian major carp species (rohu <i>Labeo rohita</i> , mrigal <i>Cirrhinus mrigala</i> and catla <i>Catla catla</i>) in India – <i>R. Rama Krishna, Sri Venkateswara Veterinary University, India</i>

Invited Review	
1620-1645	Feed management of major carps in India with special reference to management practices adopted by carp farmers in Tamil Nadu, India – <i>M.C. Nandeesha, Tamil Nadu Veterinary and Animal Sciences University, India</i>
1645-1730	General discussion on case studies and invited review
1900-2100	Reception cocktail hosted by SEAFDEC (Abe Restaurant, Mall of Asia, Bay City, Manila)
14th September - Workshop day 2	
Session IV: Presentation of Case Study and Invited Review– catfish	
Chair: Dr Joebert D. Toledo; Co-chair: Dr Sadasivam J. Kaushik; Rapporteur: Dr M.C. Nandeesha	
Case Study	
0800-0820	On-farm feed management practices for striped catfish (<i>Pangasianodon hypophthalmus</i>) in Viet Nam – <i>Nguyen Thanh Phuong, Can Tho University, Viet Nam</i>
Invited Review	
0820-0840	A review of feed management practices for North African catfish in Sub-Saharan Africa – <i>Thomas Hecht, Rhodes University, South Africa (presented by Thomas A. Shipton)</i>
0840-0910	General discussion on case study and invited review
Session IV: Presentation of Case Studies and Invited Reviews – shrimp and prawn	
Chair: Dr Joebert D. Toledo; Co-chair: Dr Sadasivam J. Kaushik; Rapporteur: Dr M.C. Nandeesha	
Case Studies	
0910-0930	On-farm feed management practices for whiteleg shrimp (<i>Litopenaeus vannamei</i>) in Viet Nam – <i>Le Thanh Hung, Nong Lam University, Viet Nam</i>
0930-0950	On-farm feed management practices for giant tiger prawn (<i>Penaeus monodon</i>) in India – <i>A. Bala Chandra Mohan, MPEDA, India</i>
0950-1010	On-farm feed management practices for giant freshwater prawn (<i>Macrobrachium rosenbergii</i>) in Bangladesh – <i>Nesar Ahmed, Bangladesh Agricultural University, Bangladesh</i>
1010-1040	Coffee/Tea Break
1040-1105	Shrimp feed management: issues and perspectives – <i>Albert G.J. Tacon, Aquatic Farms Ltd., United States of America</i>
1105-1135	On-farm feed management practices in tropical aquaculture: a synthesis of case studies from selected Asian and African countries and their implications for sustained aquaculture production – <i>Krishen J. Rana, University of Stirling, United Kingdom</i>
1135-1215	General discussion on case studies and invited review and synthesis
1215-1315	Lunch
Session V: Presentation of Case Studies and Invited Reviews	
Chair: Dr Joebert D. Toledo; Co-chair: Dr Amararatne Yakupitiyage; Rapporteur: Mr Weimin Miao	
Perspectives of the farmers	
1315-1340	Farmer's innovation in improving feed management practices for pond culture of striped catfish – <i>Nguyen Ngoc Hai, Peoples Committee of Thoian Commune, Viet Nam</i>
Perspectives of feed industries	
1340-1405	On-farm feeding and feed management: perspectives from the feed industry – <i>Dave H.F. Robb, EWOS, Viet Nam</i>
Experience from Salmonids	
1405-1430	Control of feed intake, feeding strategies and feed management practices with special reference to salmonids – <i>Sadasivam J. Kaushik, INRA, France</i>
Environment/Economics/Regulatory	
1430-1455	Environmental consequences of feed quality and feed management – <i>Patrick G. White, Akvaplan-niva AS, Norway</i>
1455-1515	Coffee/Tea Break
1515-1540	Economic, regulatory and legal review of feed management practices in aquaculture – <i>Thomas A. Shipton, Enviro-fish Africa (PTY) Ltd., South Africa</i>
1540-1700	General discussion
1900-2100	Welcome dinner hosted by SEAFDEC (Unit 8 Café, Bay City, Ocean Boulevard, Manila)
15th September- Workshop day 3	
Session VI: Working Group Discussions	
Chair: Dr Mohammad R. Hasan; Co-chair: Dr Krishen J. Rana; Rapporteur: Dr Ram Chandra Bhujel/Marc Metian	

0800-0820	Mechanisms and guidelines for Working Group (WG) Discussions – <i>Diego Valderrama, FAO, Rome</i>
0820-1000	Working Group break up for discussion on key thematic areas
1000-1200	Working Group preparation for plenary presentation
1030-1045	Coffee/Tea Break
1200-1220	Working Group I – presentation to plenary – <i>A. Bala Chandra Mohan</i>
1220-1240	Working Group II – presentation to plenary – <i>Dr Amararatne Yakupitiyage</i>
1240-1300	Working Group III – presentation to plenary – <i>Dr Thomas A. Shipton</i>
1300-1400	Lunch
1400-1530	Plenary discussion of working group recommendations
1530-1545	Coffee/Tea Break
Session VII: Presentation of Final Workshop Recommendations in Plenary	
1545-1700	Presentation of summary recommendations of the workshop Discussion, next step – <i>Mohammad R. Hasan</i>
1700-1730	Wrap up and closure – <i>Mohammad R. Hasan and Mae R. Catacutan</i>
1900-2100	Closing dinner hosted by FAO (Fish & Company, Ocean Boulevard, Bay City, Manila)
16th September 2010	
	Participants depart Manila

APPENDIX II

LIST OF PARTICIPANTS

- | | |
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