Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

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Participant Handbook

Sector
Agriculture and Allied

Sub-Sector
Fisheries

Occupation
Assistance (Fisheries)

Reference ID: **AGR/Q5109, Version 1.0**
NSQF Level 4

Feed Technician

Published by
Mahendra Publication Pvt Ltd
Plot No. E- 42/43/44, Sector- 7,
Noida - 201301, Uttar Pradesh, India.
Email: mis.mahendrapublication@gmail.com
Website: www.mahendrapublication.org

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First Edition, March 2019

ISBN 978-1-111-22222-45-7

Printed in India at

Mahendra Publication Pvt Ltd
Plot No. E- 42/43/44, Sector- 7,
Noida - 201301, Uttar Pradesh, India.
Email: mis.mahendrapublication@gmail.com
Website: www.mahendrapublication.org

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> Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India

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for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Feed Technician' QP No. 'AGR/Q5109 NSQF Level 4'

Date of Issuance : June 30th, 2017
Valid Up to* : May 31st, 2021

*Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier)

S.S. Ang

Authorised Signatory
(Agriculture Skill Council of India)

Acknowledgements

We are thankful to all organizations and individuals who have helped us in preparation of this Participant Handbook. We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving quality, coherence and content presentation of chapters. This handbook will lead to successful roll out the skill development initiatives, helping greatly our stakeholders particularly trainees, trainers and assessors etc. We are thankful to our Subject Matter Expert **Dr. Kedar Nath Mohanta** who has given the content and helped us in preparation of Participant Handbook.

It is expected that this publication would meet the complete requirements of QP/NOS based training delivery, we welcome the suggestions from users, Industry experts and other stakeholders for any improvement in future.

About this book

A Feed Technician in Fisheries sector is a very important Job role .The Job role involves a lot of technical knowhow and the individual work in familiar, predictable, routine situation of clear choice.
A Feed Technician is responsible for selection of the appropriate feed ingredients and essential items required for formulation and production of larval, nursery, grow out and brood stock feeds, for different commercially important finnish and shellfish. The Trainees will enhance his /her knowledge under the guidance of the trainer in the following skills

- **Knowledge and understanding:** Adequate operational knowledge and understanding to perform the required task
- **Performance criteria:** Gain the skills through hands on training and perform the required operations with the specific standard
- **Professional skills:** Ability to make operational decisions pertaining to the area of the work

The handbook incorporates well-defined roles of the Feed Technician like procuring feed ingredients and essential items and analyzing their proximate composition, formulating the feed, processing of the ingredients, operating the feed mill, production of feed, regular maintenance and repair of feed mill, packaging, storage and marketing of the feed etc. The individual should have clarity and should be result oriented. The individual should be able to demonstrate the skills to use various tools.

Symbols Used


Key Learning Outcomes


Steps


Time


Tips


Notes


Unit Objectives


Exercise

Table of Contents

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
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1. Introduction

Unit 1.1 - Fish feed ingredient and feed scenario in india
Unit 1.2 - Importance of fish feed
Unit 1.3 - Nutrients and their basic functions
Unit 1.4 - Objective of the program
Unit 1.5 - Job role of the feed technician

Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand the brief status of the feed and feed ingredients in the country.
2. Realize the importance of feed in aquaculture and fish farming.
3. Understand the main nutrients required by the fish with their basic functions.
4. Understand the job role of the feed technician in relation to objective of the program.

UNIT 1.1: Fish Feed Ingredient and Feed Scenario In India

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the present status of fish feed and feed resources in India in vis-à-vis the global context
2. Understand the future demand of fish feed and feed resources for the sustainable aquaculture in the country.

1.1.1 Introduction

Present Status Fish Feed and Feed Resources in India

Aquaculture is the fasted growing food producing sector in agriculture with an average annual growth rate of over 6%. Feed is the most critical input in aquaculture constituting about 60-70% of total operational cost. The importance of supplementary feeding has been greatly realized with the intensification of aquaculture from extensive to semi-intensive or intensive farming as the natural food produced through pond fertilization is not sufficient enough to realize the optimum growth potential of fish and hence, the targeted production could not be met. Therefore, the use of artificial feeds balanced in protein, lipid, carbohydrate, vitamins, mineral with optimum dietary P/E ratio is required to improve the survival, growth, immunity and reproduction of fish. At present, the average freshwater fish production is 2.9 t/ha and to achieve the fish production of 8.0 mmt in next five years, the present fish production level is to be enhanced to 4-5 t/ha. This increase in fish production from the existing level of 2.9 t/ha to 4-5 t/ha is possible only through the provision of supplementary feeding. In 2016, the global industrial compound animal feed production stood about 995.6 mmt, of which the production commercial aquafeeds was 41.0 mmt which is 4.1% of the total animal feed production. Carp feed itself accounts the largest share of about 31.3% total aquafeed production on a global basis. The commercial aquaculture feed sector has grown from 7.6 million tons in 1995 to 41.0 mmt in 2015 and expected to grow 70.0 million tons by 2020 in the world. In India, at present about 43.85 mmt concentrated feed is being used, whereas, the demand for the concentrated feed by the different animal husbandry sector is 142.68 mmt with a deficit of about 70%. Farm-made aquafeed feed plays an important role in the production of low-valued freshwater fish species. More than 97% of the carp feeds used by Indian farmers are farm-made aquafeeds and they are the mainstay of feed inputs. At present, about 7.0 mmt of ingredients are being used for farm-made fish production. The total volume of manufactured feed produced in India is about 1.5 mmt, which comprises 1.0 mmt of pelleted feed for fish. By 2050, the targeted freshwater fish production in India is 17.0 mmt and to achieve this target, about 23 mmt of feed is required. The availability of fish feed ingredients would be the major challenge for the aquaculturists in the coming years. Therefore, the much valued available feed resources must be used judiciously through proper feed and feeding management practices (Mohanta, 2017).

Challenges of Aquafeed Industry in India

The sustainability as well as profitability of aquaculture depends on the provision of compounded feed. The fish feed resources are mainly comprised of the by-products of the agro-processing industries and the availability of these by-products depends on the production of the main crops like oilseeds, cereals and pulses, which in turn largely influenced by the success/failure of monsoon. There is a very remote possibility of significant increase in production of these agricultural by-products in near future as there is a marginal increase in agricultural production (oilseeds, cereals and pulses) in the country. However, during the last decade, the price of the most of the fish feed ingredients had increased significantly to the tune of 3-4 times in India. Therefore, identification of alternate feed ingredients and their use in the fish feed would be one of the major challenges in the future. The fish feed ingredients are finite resources and many of these ingredients are having multiple users from other animal production systems such as dairy and poultry and therefore, it is envisaged that there will be an acute shortage of ingredients in the days to come. In order to better utilize and also to save the scarce and much valued fish feed resources, proper feed and feeding strategies are also required. The use of sinking/floating pellets must be encouraged rather than relying on use of conventional feed mixture for better feed consumption, low wastage and efficient nutrient utilization and gain. Therefore, to save the scarce and costly feed resources, emphasis must be given for the establishment of more numbers feed mills to produce the required quantities of floating feeds (Jayasankar and Mohanta, 2015). In India, currently 13 feed mills are being operated for the production of 1.33 mmt shrimp feed. For the production of fish feed, there are 26 aqua-feed mills operating in the country producing 1.55 mmt feed and their production capacity is 43.4% of the installed capacity. As per one critical analysis, it is anticipated that the fish feed industry should grow at the compound annual growth rate (CAGR) of 20% from 2013-15 and the CAGR for shrimp feed for the corresponding period around 12% to meet the feed demand in aquaculture (Sahu, 2017).

Non-Conventional Feed Resources

Many of the potential non-conventional feed resources have been identified in the country for the development of cost-effective region based fish feeds. These non-conventional feed resources which are to be used for fish feed must be available in a sizable quantity, should have wider distribution in different parts of the country, must be available at least 4-5 months in a year, should contain good amount of nutrient for which it is being used and must have permissible levels of anti-nutritional factors.

Exercise

1. What is the aquafeed scenario in India?

Ans:_____

_____

_____

_____

Notes

UNIT 1.2: Importance of Fish Feed

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the importance of fish feed at different life stages

1.2.1 Importance of Fish Feed

The Main Importance of Use of Quality Feeds in Aquaculture are:

- **For better growth and survival of fish**

For commercial fish production at semi-intensive/intensive level, the desired targeted fish production per unit area can only be achieved with the provision of nutritionally balanced supplementary feed. Because, the natural feed produced due to pond fertilization may not be sufficient enough to meet the nutrient requirement of the fish due to their high stocking in culture pond. Hence, for the better growth and survival of fish and to increase the production/unit area, the fish need to be fed.

- **Improving the immunity and health status of fish**

Incorporation of immune-stimulants and anti-oxidants like probiotics, carotenoids and other phytochemicals, beta-glucans, chitins, vitamin C and vitamin E, nano-particles improves the immunity and health status of fish.

- **Developing the healthy broodstock, improving the breeding performance, producing the quality eggs and hatchlings**

Broodstock feed is prepared by incorporating the required levels of PUFAs/HUFAs, specific vitamins and minerals, and trace metals along with high quality feed ingredients (mainly the protein source) to develop the healthy broodstock. Breeding performance of the healthy brood fish increases in terms of breeding frequency, quantity and quality of eggs produced, percentage of hatching, duration of hatching and the quality of seed produced. Broodstock diet also advances the maturity of the fish by 2-3 months.

- **Producing the quality seed**

The survival of fish larvae to the stockable size fingerlings is very low (<15-20%). To improve the larval survival and to produce quality seed/stocking materials, at present the species-specific larval and nursey diets are being used. These diets are being developed based on study of ontogeny and the digestive hormone and enzyme profiles of larvae at different days of culture and accordingly, the nutrient requirements are met.

- **Shortening the larval cycle of fish**

The provision of quality feed and better husbandry practices will help in shortening the larval cycles of many of the fish. Shortening the larval cycle not only reduces feed cost, but also increases the larval survival rate (%) mainly for the carnivorous fish.

- **Shortening the grow out culture period of fish**

The supply of quality feed also results faster growth of fish in culture pond, thereby; the culture period is reduced significantly. The reduced culture period will help in increasing the cropping frequency; the farmers can take up more crops per year by stocking relatively little bigger size fish with the provision of quality feed.

- **Providing the health benefits to the consumers**

By supplying the health benefitting elements such as n-3 HUFA/FUFA; specific vitamins, minerals and trace metals, phytochemicals, antioxidants and other functional food aids in the finisher diets of the fish, the fish fillet quality is increased, the consumption of which provide health benefits to the consumers.

- **Improving the fillet quality of fish and to enhance the storage life**

The fillet quality and the storage life are improved by using mainly the different antioxidant in fish feed.

- **Enhancing the colouration of ornamental fish**

The price of the ornamental fish is determined based on the colouration of the skin. The skin colouration of the ornamental fish is enhanced by incorporating the feed ingredients which are rich is carotene such as beet root, carrot, yellow maize, petals of the different flowers, leaf extracts, microalgae, sea weeds, etc.

- **Preventing the soil and water quality deterioration**

When a good quality feed with better acceptability and palatability is supplied to the cultured fish, it is consumed by the fish with 30-45 minutes and there is no wastage of fish. Similarly, the production of excreta also low because, the better digestion and utilization of the nutrients. Therefore, the organic/nutrient/ammonia load is low, preventing the soil and water quality deterioration in culture system.

Exercise

1. The main importance of use of quality feeds in aquaculture?

Ans:_____

_____

_____

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_____

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Notes

UNIT 1.3: Nutrients and their Basic Functions

Unit Objectives

At the end of this unit, you will be able to:

1. Understand types of different major and minor nutrients required for fish growth.
2. Know the basic function of nutrients required for fish growth & their survival

1.3.1 Nutrients and their Basic Functions

Nutrients Required For The Better Growth and Survival of Fish

The nutrients which are required by the fish are divided in to two main categories; the major nutrients and minor nutrients. Major nutrients are protein, carbohydrates and lipids and the minor nutrients are vitamins and minerals. Protein is known as body building nutrients, carbohydrates and lipids as energy giving nutrients and the minerals and vitamins are as protective nutrients.

Protein and amino acids

Among the different nutrients in fish feed, the protein is considered to be the costliest one and is essentially required for growth, tissue repair, reproduction and health of fish. It also serves as substrates for carbohydrate and fatty acid synthesis. It is reported that about 40-80% of the feed cost is due to protein alone. As protein represents the most expensive component in fish feed, it is important to determine the optimal requirement level for growth and survival. The most recent approach to reduce the feed cost is to reduce the protein level as much as possible without compromising growth and health of fish. However, insufficient protein level in the diet results reduction or cessation of fish growth. On the other hand, if too much protein is supplied in the diet, only part of it will be used to make new proteins and the remainder will be converted to energy. Moreover, incorporation of dietary protein beyond the optimum level results in high level of ammonia production, which affects the voluntary feed intake and growth of fish. The utilization of dietary protein by an organism depends on types of diet, digestibility of dietary protein, its amino acid profile, the ratio of energy to protein in diet and the amount of protein supplied. Other factors that affect protein utilization are animal size, sex, genotype and environmental conditions. It is reported that the dietary protein could be efficiently utilized by i) maintaining the optimum protein to energy ratio, ii) meeting the energy need of fish through non-protein sources, iii) use of protein at sub-optimum level, iv) maintaining the amino acid balance as per the requirement of the fish and formulating the diet according to the ideal protein concept, v) proper selection of the ingredients, vi) protein sparing effect of carbohydrate/lipid, vi) restricted feeding and refeeding (taking advantages of compensatory growth phenomenon of fish), vii) alternate feeding of high and low protein diet, viii) removal of anti-nutritional factors, ix) improving the digestibility of protein through exogenous enzymes or through microbial digestion. The judicious and efficient use of protein not only increases the fish production per unit area but also decreases the production cost significantly. Since protein acts both as structural component as well as an energy source, its requirement for fish is 2-3 times higher than that of mammals. The protein requirement varies from 25-55% for different fish species. The gross protein requirement decreases with increase in age and size of fish. Generally 25-30% protein is optimum for practical diets for herbivorous and omnivorous fishes for pond feedings. However, carnivorous fish requires higher 40-50% dietary protein.

Amino acids are mainly two types viz.,

1. Essential Amino Acids: There are 10 amino acids which cannot be biosynthesized *de novo* by fish and hence to be essentially supplied through the diets are methionine, arginine, threonine, tryptophan, histidine, isoleucine, lysine, leucine, valine and phenylalanine.

2. Non-Essential Amino Acids: There also 10 amino acids which can be biosynthesized *de novo* by fish and hence need not be supplied through the diet are alanine, asparagine, aspartate, cysteine, glutamate, glutamine, glycine, proline, serine and tyrosine.

3. Lipids and fatty acids

Lipids are important nutrients in the diets of finfish as sources of energy, essential fatty acids and phospholipids, provide a vehicle for absorption of other fat-soluble nutrients such as sterols and vitamins, play a role in the structure of cell and cellular membrane, serve as precursors of many hormones and also precursors for prostaglandin synthesis, influence the flavour and textural quality of prepared feed as well as fish carcass, and regulate the storage characteristics of fish products. Dietary lipids supply energy and provide essential fatty acids needed for structural maintenance of membranes and proper functioning of many physiological processes. Lipids are almost completely digestible by fish and seem to be favoured over carbohydrate as an energy source. Special attention is now being given by researchers, feed manufactures and farmers to develop feeds, which maximize nutrient retention and minimize nutrient loss. Fish are known to utilize protein preferentially to lipid or carbohydrate as an energy source. Therefore, it is important from a nutritional, environmental and economical point of view to improve protein utilization for tissue synthesis rather than energy purposes. The optimization of dietary digestible protein/dietary energy ratio (DP/PE) has proven to have an important role on protein and energy utilization. The increase of DE content of fish diets, by lipid supplementation, has been shown to have a protein sparing effect, therefore reducing nitrogen to the environment. The increase in dietary lipid levels, must, however, be carefully evaluated as it may affect the carcass composition, mainly due to an increase of lipid deposition. The localization and composition of lipid deposits also strongly influence the nutritional value, organoleptic properties, transformation yields and storage time of fish carcass. Lipid being highly digestible has greater sparing action than dietary carbohydrate or protein and it playing a definite role in feed utilization. Since dietary lipid level is also a dominant factor in determining the quality of the fish, it is important that a proper amount of lipid be incorporated in fish diet. Excess lipid not only suppresses *de novo* fatty acid synthesis, but also reduces the ability of fish to digest and assimilate it, leading to reduced growth rate. Again, excess lipid in the diet may also result in the production of fatty fish ultimately having a deleterious effect on flavour, consistency and storage life of the finished product. Excessive amounts of lipid in diet also possess problem in feed manufacturing.

There are five major classes of lipids: fatty acids, triglycrides, phospholipids, sterols and sphingolipids. Fatty acids are components of lipids. Over 40 different fatty acids are known to occur in nature. Fatty acids are mainly two types: Saturated fatty acid which are without any double bonds (butyric acid, lauric acid, myristic acid, palmitic acid, stearic acid, arachidic acid, behenic acid, aproic acid) and Unsaturated fatty acids with double bonds (palmitoleic acid, oleic acid, linoleic acid, linolenic acid, arachidonic acid, eicosapentaenoic acid, docosahexaenoic acid).

Carbohydrates

Carbohydrates not only serve as the least expensive source of dietary energy but also help in improving the pelleting quality of practical fish diets. Therefore, some form of digestible carbohydrate should be included in fish diets. Feed cost per unit of fish produced can be minimized by optimal use of low-cost energy carriers such as carbohydrate-rich ingredients, ensuring that the use of costly protein is kept as low as possible. Replacing dietary protein by carbohydrate or lipid energy may result in a higher production per unit spent of costly protein sources such as fishmeal, and the effluent nitrogen can be reduced per unit of fish produced. Carbohydrates may also serve as precursors for the various metabolic intermediates necessary for growth, i.e., dispensable amino acids and nucleic acids. Thus, in the absence of adequate dietary carbohydrates or lipids, fish have only protein available to meet their energy needs. When other energy sources are available, the protein is utilized mainly for growth instead of energy. This relationship between protein and carbohydrates has been referred to as the protein-sparing action of carbohydrates. It is important to provide an adequate carbohydrate level in the diet in order to reduce catabolism of protein for energy and for synthesis of glucose, which reduce protein retention and increases the nitrogen release to the environment. The ability of fish to utilize carbohydrate appears to be related to their digestive and metabolic systems adapted to the different aquatic environment and dietary carbohydrate level and complexity. The carbohydrate utilization of the fish depends up on the feeding habit, structure and function of the digestive system. The capacity of fish to utilize carbohydrate varied by species and in response to variables such as digestibility and starch complexity.

Carbohydrate are mainly categorized in to 4 types (i) Monosachharides (glucose, fructose and galactose) which are the simple sugars and quickly absorbed; (ii) Dischharides (lactose, maltose, sucrose,); (iii) Oligosachharides (raffinose, starchyose, verbascose) and iv) Polysachharides such as a) Homopolysachharides (starch, cellulose, β-glucans, fructans, galactans, mannans and b) Heteropolysachharides (hemicellulose, pectins, guar-gums, chitin, mucilages).

Energy

Energy is not a nutrient, but it is required for different metabolic activities and physiological function of the fish. Successful fish culture depends up on the provision of diets containing adequate levels of energy and appropriate balance of nutrients to permit the most efficient growth and to maintain the health of the animal under given circumstances. Dietary energy level is also critical because protein in the feed is utilized as an energy source when feed deficient in energy is fed to fish; whereas, when feed excessive in energy is fed, feed consumption decreased and result in growth reduction due to lack of other necessary nutrients for normal growth. As protein constitutes the single most expensive item in fish diets, it is imperative to incorporate only the amount necessary for normal maintenance and growth. Any excess dietary protein is considered as biologically and economically wasteful. Incorporation of appropriate levels of non-protein energy sources in the diet determines the efficiency of protein utilization and hence the growth of fish. Carbohydrate and lipid are the major non-protein sources in fish diet. Compared to lipid, carbohydrate is much less expensive, available abundantly and a ready source of energy. Carbohydrate also improves the pelleting quality of the diet due their reasonably good binding properties.

Therefore, it is suggested that the carbohydrate may be added in excess of the required amounts that can be efficiently utilized for energy by fish. Again, use of high level of lipid as dietary energy source may create problem in pelleting and keeping quality of feed in addition to adversely affecting the fish whole body composition.

Dietary Protein (p) : Energy (e) Ratio

Carbohydrate is considered as the cheapest source of energy, lipid is the most concentrated source of energy and the protein is the most preferable source of energy. While preparing the fish feed, it is to be noted that the energy requirement of the fish should be met through non-protein sources (either from carbohydrate in case of herbivorous/omnivorous fish or from lipid in case of carnivorous fish). Since protein is the most costly nutrients, meeting the energy requirement thorough protein will not only increase the feed cost but also the production cost in aquaculture. Proper balance between protein and energy is essential. Provision of low-protein diet will result poor growth in fish. At the same time excess protein is not only wasteful and uneconomical but also lead to more ammonia and nitrogen load in the culture environment causing stress to fish. Diets containing excess energy due to the addition of more carbohydrate and lipid, leads to lipid accumulation in fish muscle resulting in fatty fish. Therefore, a proper balance between protein and energy is considered to be very important in fish diet, so that protein can be spared for growth.

Vitamins and Minerals

They are known as protective nutrients. Since they require in minor quantity, they are also known as minor nutrients. These are essential for fish growth and to improve the health and immunity of fish. They are required for metabolism of other nutrients in tissue components. Many of the water-soluble vitamins also act as co-enzymes. Fish requires both water and fat soluble vitamins. The four fat soluble vitamins required by fish are A, D, E and K and the 11 water soluble vitamins required by fish are the thiamin, riboflavin, vitamin B_6 (pyridoxine), pantothenic acid, niacin, biotin, folic acid, vitamin B_{12}, choline, myoinositol, and vitamin C.

Fishes derive required vitamins from natural food, which become limited in intensive fish culture due to high stocking densities. Minerals are required for osmotic balance of various metabolic processes and for structural functions in fish. Some minerals such as calcium are directly obtained by fish through gills and skin or both, while others are made available from natural food and ingested detritus. Vitamins and minerals are, therefore, provided as premix in balanced artificial feeds. So far, the importance of vitamin and mineral nutrition is not being realized in India, because, the fish are cultured in comparatively low-stocking density and they obtain a good amount of vitamins and minerals from live feed produced through pond fertilization in supplementary feeding type of culture.

The important macrominerals used in fish feed are calcium, chloride, magnesium, phosphorus, potassium, and sodium. Similarly, the microminerals which fish require are copper, cobalt, chromium, iodine, iron, manganese, molybdenum, selenium and zinc.

Feed Additives

Binders, antioxidants, exogenous enzymes, co-enzymes, attractants, digestibility enhancers, metabolic modifiers, nucleotides, peptides, acidifiers, carotenoids, probiotics and prebiotics are used as feed additives used in minor quantity to enhance the feed and nutrient utilization of feed and also improve the immunity and health status of the fish.

Exercise

1. What are the different major and minor nutrients required by fish?

Ans:_____

2. What are the basic functions of the major and minor nutrients?

Ans:_____

Notes

UNIT 1.4: Objective of The Program

Unit Objectives

At the end of this unit, you will be able to:

1. Understand importance of the training operating a program on "Fish Feed Technician".

1.4.1 Objective of The Program

Objective of Operating the "Fish Feed Technician"

To generate sufficient human resources required by the aquafeed industry in the country

At present, the average freshwater fish production is 2.9 t/ha and to achieve the fish production of 8.0 mmt in next five years, the present fish production level is to be enhanced to 4-5 t/ha. This increase in fish production from the existing level of 2.9 t/ha to 4-5 t/ha is possible only through the provision of supplementary feeding. By 2050, the targeted freshwater fish production in India is 17.0 mmt from the present level of 4.65 mmt and to achieve this target, about 23 mmt of feed is required for meeting the demand of freshwater fish only. The fed fish culture by using the industrial aquafeed is about 15-16% in our country. To enhance the aquaculture production three times by 2050 (4.65 to 17.0 mmt), the fed fish culture has to increase at least three time (15-16% to 45-50%). To produce 23.0 mmt fish feed, about 80-100 commercial feed mills of different scales are to be established in different parts of the country for which is huge numbers of skilled man powers in the form of "Fish Feed Technician" are required. Similarly, many of the progressive fish farmers are now shown their interest to establish their own feed mills which also require a large numbers of qualified skilled man powers in the near future. The shrimp feed industry also forecasted to grow at a cumulative average growth rate of 12% per annum from 2013-15 and therefore, enhancement of production capacity of the existing feed mills or establishment of new feed mills will require qualified feed technicians. Similarly, the cage culture of fish in open water, which is growing very fast in our country, is a complete feed based culture system will also require a huge quantity of feed in the imminent future.

The skilled "Feed Technician" is not only required for the running of feed mill, but also he/she is also responsible for timely procurement of required feed ingredients of desirable qualities and quantities so as to run the feed mill uninterruptedly. He/she also help in proximate analysis of feed ingredients and prepared feed. Feed Technician is also responsible evaluation of physical, chemical and biological properties of feed ingredients and feed at the time of production and intermediary quality check. The future Research and Development (R and D) division of the feed industries in the country will also require a huge chunk of "Feed Technicians" for feed quality evaluation. Many skilled "Feed Technicians" may also go for self-employment by establishing their own feed analysis laboratories by availing the loans from different developmental and financial agencies. A large numbers of "Feed Technicians" will also be required for marketing the feed produced by the large industrial houses.

Exercise

1. Why there will be a huge requirement of "Fish Feed Technician" in our country in the near future?

Ans:_____

Notes

UNIT 1.5: Job Role of The Feed Technician

Unit Objectives

At the end of this unit, you will be able to:

1. Understand various work and responsibilities of a feed technician in a feed mill.

1.5.1 Job Role of The Feed Technician

A "Feed Technician" is responsible for procuring feed ingredients and essential items (laboratory chemicals) and analysing their proximate composition, formulating the feed (with the help & guidance of the researcher), processing of the ingredients, operating the feed mill, production of feed, regular maintenance and repair (minor, if any) of feed mill, packaging, storage and marketing of the feed in addition to assigning the day to day activities to the workers involved in production of feed in the feed mill. He/she is also accountable for the time to time quality check of the prepared feed by random sampling procedure.

The Main Job Roles of "Feed Technician" are to:

- **Identify the suitable fish feed ingredients and feed additives and determine their quality, quantity and market price:** identifying the different locally available conventional and non-conventional feed ingredients (both plant and animal origins) which are used as protein and energy sources and ensuring their quality, quantity, availability, market price (over the year) to meet the demand, identifying the suitable feed additives and other functional food aids to enhance the feed and nutrient utilization efficiency.
- **Formulate the species specific diets for different life stages of fish (with the help of a researcher):** identifying specific ingredients required for production of diets for larvae, fry, fingerling, adults and brood stock of commercially important fresh, brackish and marine fish and shellfish, collecting the fresh feed ingredients samples and analysing their chemical composition and formulating the diets for different life stages of fish.
- **Procure the required/appropriate quantities of feed ingredient as per the demand:** assessing the quantity of feed ingredients required to meet the feed demand and accordingly procuring the feed ingredients well in advance and timely supplying the required quantity of suitable feed ingredients to produce the species specific diets for different life stages of fish.
- **Carry out suitable processing of fish feed ingredients:** ensuring proper grinding and mixing of major and minor ingredients/nutrients used, adding adequate of moisture/water to the feed mix, pelleting the feed mix and drying of the feed pellets.

- **Operate different components of feed mill:** carrying out regular check-up and maintenance of the different components/machineries of the feed mill before and during operation so as to avoid major break down or damage and evaluating performance efficiency of the different machineries of the feed mill.
- **Carry out production of feed:** ensuring standardization and maintenance of different processing conditions like ideal temperature, pressure and screw speed, etc., based on different types of ingredients used for feed formulation and size of the feed pellets to be made, carrying out production of feed of required particle size, shape and forms as per the requirement of different life stages of fish.
- **Assess the physical, chemical and biological quality of the prepared feed:** observing physical (water stability, sinking rate, floating percentage, nutrient leaching and keeping quality), chemical (nutrient status) and biological (microbial infestation) properties of the prepared feed and assessing its quality.
- **Carry out packaging and storage and intermediary quality check of stored feed:** identifying and using of the suitable packing material to avoid/minimize transportation loss, storing the prepared feed in dry, well ventilated and illuminated house with suitable platform, less humidity, normal room temperature and free from insects and rodents, collecting the feed samples randomly from the stored feed bags and checking the physical, chemical and biological properties of feed and discarding the nutritionally inferior quality and microbial infested feed.
- **Carry out marketing related activities:** assessing the demand for different types of feed and accordingly, arranging feed production and also developing marketing strategy to promote feed sale.
- **Maintain a clean and efficient workplace:** undertaking basic safety checks, reporting all potential hazards, assessing risks prior to performing manual handling jobs and recommending the safe practices, using equipment and materials safely and correctly, disposing off waste safely and correctly in a designated area, minimizing environmental damage, following work instructions, reporting any accidents, incidents or problem immediately to the appropriate authority.
- **Render appropriate emergency procedures:** follow emergency procedures, standards and equipment for dealing with accidents, fires and emergencies, providing treatment appropriate to the patient's injuries, providing appropriate first aid equipment and reporting details of first aid administered in accordance with workplace procedures.

Exercise

1. What are the main job roles of the "Feed Technician" in a feed mill?

Ans:_____

Notes