

### 5.5.2 Mtera Reservoir

Lake Mtera reservoir is an artificial lake dammed up in 1979 for hydro-power generation, stretching through both the states of Iringa and Dodoma. The water level of the lake moves in the range of about 5 to 10 m and lakeshore also varies by hundreds of metres depending on natural conditions (rainy season, dry season) and power generation demand. The lake has an area of about 660 km<sup>2</sup> when it is full of water. According to fisheries statistics, the fish catch in 1996 is 1,819 (mainly Tilapia).

#### (1) Fishing Method

It is after 1980 when the dam was completed and Lake Mtera reservoir was completed that a fishing camp began to be formed in Lake Mtera. In the succeeding ten years (particularly from 1981 to 1984), although the fishing had already been performed by house inhabiting along the coastal zone, around Lake Tanganyika, Lake Victoria, Lake Nyasa, and so on, fishery came to be started extensively and on a more larger scale by those who moved to Lake Mtera in quest of more fish, or to get their daily bread although they had nothing to do with fishing, or by those who had been living in these areas as dam construction labourers, and fish processing was also performed. Under the circumstances, the colony (so-called kambi, i.e. camp) of 10 to 40-person scale was formed seasonally or temporarily. Settlement has progressed in many camps and villages of 200 to 600 population have been formed. Owing to frame surveys implemented in 1998/1999, 30 landing sites have been formed and 1,572 persons were registered as the fishers operating on Lake Mtera.

Dugout canoe is the main fishing boat used in, and a planked boats which is equipped with an outboard motor and is only seen sometimes is used for transporting goods for people. A dugout canoe is 3 to 5m in full length, and width is 50 to 60cm. The number of boats has increased to about 2,000 boats during the period between 1986 and 1992. A kind of soft wood called Mheme is often used for making the canoe, and the manufacturing of a canoe is Tsh.6,000 to 8,000 a set and its life is as short as one year. When Mondo, a hard wood, is used the production cost is doubled to Tsh.19,000 to 20,000 a set, but the life is elongated to a few years.

The fishing implements mainly used in Lake Mtera are available in two kinds, a gill net and a longline. A gill net of 3.5 to 5 inch mesh type is often used, and a fisher owns 10 to 20 sets on average. Use of gill net of meshes of 3 inches or less is forbidden by regulations. Besides, what is being used as bait in catching Labeo and Alestes for fishing Tiger fish is used. The gill net which is mainly used for catching Tilapia is set towards the evening and is taken up in the next morning, but not a few fishers take only caught fish, set the net into water again and repeating this procedure until net cleaning becomes necessary. The Tilapia fishery is performed in the place very near the shore.

A net is a float network with branch cords of the length of 1 to 2m attached to a longline of about 200 to 300m at intervals of 60cm. The longline is used for catching Tiger fish and Catfish, using No.4 to 5 hooks and Alestes as bait (when catching Tiger fish). For catching catfish, soap or insects are used as a bait. *A longline is set at night and collected next morning. Although few in number, there is also a basket for catching catfish.*

The peak of the fishing season in Lake Mtera is the time when the water level of the dam goes up. Moreover, since Tilapia makes a nest on a shoal and inhabits it, the activity place will spread with the rise of a water level. Rainy-season haul is 3 to 4 times as much as that of the dry season. As a fishery rule, use of a fishing net of less than 3 inches of meshes, a splashing (beating water surface) fishery, poison, and the dynamite fishery are forbidden alike the other water bodies.

**Table 1-49 Fishery Index of Lake Mtera**

	Iringa Region	Dodoma Region	Total
Landing places, number	16	14	30
Number of fishers	664	908	1,572
Number of fishing boats.	531	753	1,284
Number of engines	0	0	0
Gill net 3"	207	1,374	1,581
31/2"	2,396	7,355	9,751
4"	2,428	1,403	3,831
41/2"	0	47	47
5'	0	11	11
Hook	18,236	11,047	29,283
Beach seine	15	2	17
Basket	118	0	118

Source: 1998 to 1999 frame survey.

## (2) Major Fish Species

So far 15 fish species and two types of tortoises, *Trtonyx triungis* (kind of a snapping turtle) and *Sternotaerus sinuatus* have been confirmed in Lake Mtera, among which the following seven sorts are useful from the point of fishing industry.

- ① Tilapia (*Tilapia arolepis*: Local name; Perege)
- ② Tiger fish (*Hydrocynus vittatus*: Local name; Mchena)
- ③ Catfish (*Clarias*: Local name; Kambale)
- ④ Catfish (*Bagrus orientalis*: Local name; Kitoga)
- ⑤ Catfish (*Synodontis*: Local name; Ngogo)
- ⑥ Labeo (*Labeo*: Local name; Ndua)
- ⑦ Alestes (*Alestes*: Local name; Ngalala)

Although 38 sorts of fishes were reported at the time of the river before the construction of the dam (SWECO 1974, by Petr), it is thought that all of these sorts could not adapt to the stop of water flow in the lake and to an environmental change.

SWECO conducted investigations about living species in the water and the fishing in Lake Mtera in 1985 and 1995. According to this, the rate of Tilapia in the fish catch of the whole lake in 1985 was 54 percent, but it stood at 70 percent in 1992, showing an increase of about 16 point. Moreover, considering that the fish catch itself increased from 2,016 tons in 1985 to 7,096 tons in 1992, it seems that the amount of resources of Tilapia has increased gradually in these ten years.

On the other hand, the rate which the Tiger fish, a carnivorous fish which preys on other fish such as Tilapia, shared 26 percent in the fish catch of the whole lake in 1987, but in 1992, it decreased to 7 percent. Moreover, the range of average fish length of 30 to 40cm has shifted to the range of 25 to 30cm, and considering reduction in a fish catch as well as the miniaturization of a fishing village, there may be the possibility of an excessive catch of the fish. As regards clarias which is next to Tilapias in commercial value, its rate in the whole catch of the lake has increased to 17 percent, and its haul is gradually on an increase.

## (3) Marketing and Processing

The fish (mainly Tilapia) captured in Lake Mtera is carried to Dodoma and Iringa in the condition of fresh, and is being circulated as a smoke-dried fish to Dar es Salaam, Morogoro, Mbeya, and Songea, further to Mtwara or Zambia, a neighbouring country. The fish product raised from water is carried by

the donkey, a pickup, the bicycle, etc. to the nearby village where there is bus stop to Dodoma or Iringa, and from thereon carried over about 3 hours to Dodoma or Iringa. Moreover, when transporting to a more distant place, it is transshipped into a railroad, a bus, a truck, etc. in Dodoma and Iringa.

Fish is carried every day from each fishing village to Dodoma and Iringa, and in the dry season, about 60 percent of landed Tilapia is brought as a fresh fish. Since there is no electricity in fishing villages, distribution companies make ice in the deep freezer for store use in Dodoma and Iringa, cover it with chaff, etc. for insulation purpose, put it into the basket, and has it carried into the fishing village to landing place. When carrying from a fishing village to town, the ice is broken, and fish, frozen fish, and ice are arranged neatly in this order, then lastly chaff is put over it again, and it is tied with a string. Although the price of fish in this stage is Tsh.20 to 50/fish, if made smoked fish, the price becomes Tsh.20 to 80/fish.

Sale of a fish catch is performed by the negotiated transaction with the fish trader, the processor, etc. on the landing beach. Since carrying to regional capitals, such as Dodoma and Iringa, fish kept in frozen state sells at the highest price, distribution companies try to carry fish in frozen state as much as possible, but because of limitation in acquisition of ice, transportation measures, and available capital, it becomes about 60 percent in the dry season and 20 percent in rainy season that distribution companies circulates as a fresh fish. The other fish is bought for the fishers themselves or their families, and processors, and is chiefly made into smoked fish. Processing persons comes in such types as Fishers and their families, processors that reside permanently in the village, and those who stay in the village temporarily, being engaged in processing at some rented place. While distribution companies are often run by women, no particular difference between man and women when it comes to running a processing business.

Although no particular movement toward systematization is found, according to the report of the Dodoma prefecture fishery office in 1999, in distribution industry, three groups of the scale of several persons were formed in three villages in the processing business. These groups aim at working together and helping each other in the purchase of original fishes, processing, and sale, and in finance.

#### **(4) Problem of Fishing Villages**

As for problems common to each fishing village, fishers and distribution companies have pointed out the difficulty transporting fish catch in the rainy season. Although the rainy season has a fish catch 3 to 4 times as much as that in the dry season, the present condition is that the road from each fishing village to the village at which the bus stops which is the main transportation means is intercepted in the mud, and that the traffic to Dodoma and Iringa also become difficult, which makes it difficult for the fishers to sell off with a good value the fishes which were taken with much labour, forcing them to turn the fishes to processing. Maintenance of such basic infrastructures as roads is indispensable to the distribution improvement of fish products.

As a problem in fishery, problems about safe operation are pointed out by the fishers such as the attack to the canoe by the hippopotamus and several victims are reported every year. Although it is under jurisdiction of the Wild Life Division which belongs to the same Ministry of Natural Resources and Tourism as the fishery office about wild animals, communication between the two division is not streamlined. As problems at the side of the government offices, since sufficient budget is not assigned, the transportation for various tax collection, the fuel for a boat, etc. are not provided sufficiently. Under the present condition, measures for controlling illegal fishing cannot be implemented properly, nor even collection of fish catch statistics.

#### **5.5.3 Lake Rukwa and Others**

Lake Rukwa is a natural lake is the 5th largest lake second to Lake Nyasa in Tanzania, and has the surface area of 2850 square kilometres. This lake is located ranging over Rukwa Region and Mbeya Region, but fishery statistics are effective only at Mbeya Region. According to this, 1029 fishers were in Lake Rukwa in 1996. The fishers owned 1026 boats and 4451t production was raised. In the

production by the fish stocks, Tilapia shared 74 percent, the largest share, and Synodontis which is a kind of Catfish species occupied about 10 percent.

Near Nyumba ya Mungu Dam constructed in 1945, there are northern cities such as Arusha and Moshi, where fishing is prosperous. As fishery of the water reservoir, 929 fishers and 534 fishing boats are registered, raising 1162 tons fish product (statistics in 1996). It suggests the small scale of fishery in comparison with the four large water bodies having a production of 3 to 5 tons, productivity of 1.25 tons/per fishers a year.

**Table 1-50 Fishery Index of Other Small Water Bodies**

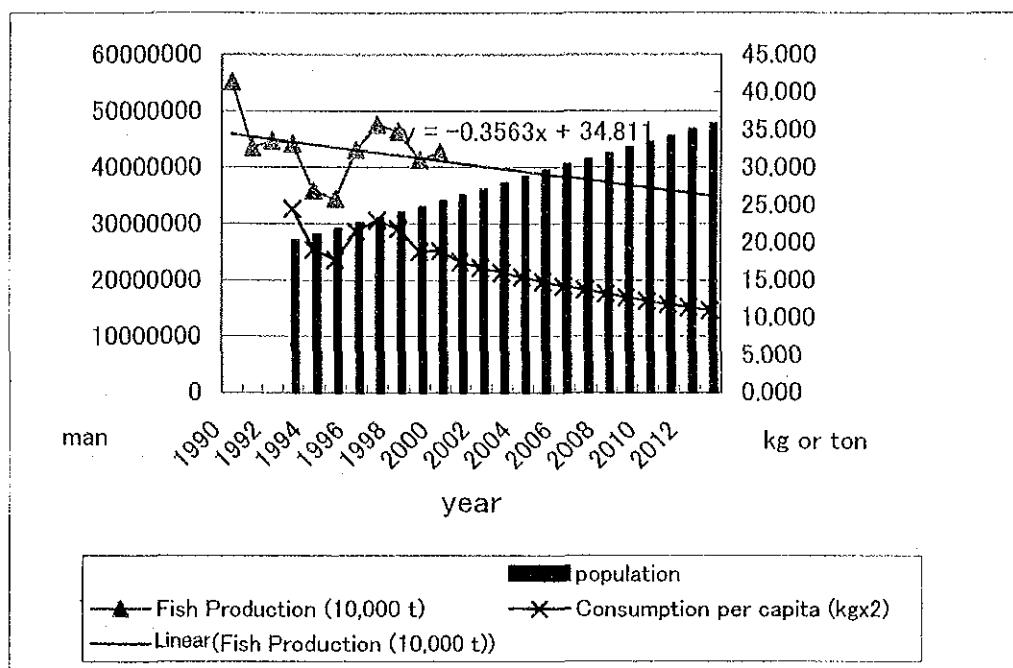
	Nyumba ya Mungu Dam	Tabora	Iringa	Shinyanga	Singida	Morogoro	Rufiji river	Dodoma	Total
Number of fishers	929	1,365	30	368	962	1,043	1,365	242	6,304
Number of fishing boats	534	1,365	21	105	34	461	150	234	2,904
Gill net	5,069	2,048	36	832	10,824	1,436	1,473	2,263	23,981
Purse seine	102	35	0	16	62	0	0	0	215
Cast net	-	0	0	0	0	6	0	0	6
Hooks	7,135	13,079	29	9,293	115,681	17,474	0	17,376	180,067
Basket	815	0	0	0	0	140	0	81	1,036
No. of engines	0	0	0	1	0	0	0	0	1

## **6 MAJOR ISSUES OF THE SECTOR**

### **(1) Stagnant Fish Production, which cannot Meet Population Growth**

Fish production in the last decade in Tanzania has continued to stagnate after peaking in 1996 and 1997 at 350,000 tons, dropping to 310,000 tons in 1999 and 320,000 tons in 2000. In contrast, fish demand has grown in conjunction with a population growth rate of 2.7 percent. Subsequently, the per capita fish consumption volume of 12kg in the 1980s, is surmised to have decreased by 50 percent. Nearly 43 percent of all Tanzanian children under five years of age suffer from developmental disorder and are short in height, of which 18 percent of this ratio suffer from serious malnutrition. The nutritional daily intake in Tanzania is 1,940kcal, which is greatly below the daily average of 2,411kcal for the African continent (FAO statistics, 1999). In particular, the low animal protein intake volume is thought to be a major cause of the low nutritional intake (African average 12.3g/day; Tanzania 9.8g). The decreased fish supply has seriously impacted the health of the people, and there is concern that this will increase social insurance expenditures. The following countermeasures are proposed to secure fish supply as a food source.

- (a) Implement measures to effectively optimise resources while increasing the production of fish and aquaculture.
- (b) Reduce losses in fish production and convert non-food fishery products to food fish.
- (c) Adopt measures to sell export fish in domestic markets and promote imported fishery products to fill the shortage.
- (d) Correct regional imbalances in fish consumption and expand the fishery supply over a wide area.



Source: Population-UNFPA, Fish production in 1990-1996-MNRT 1990, Fish production after 1996-Estimation by members of Master Plan

**Figure 1-17 Estimated Consumption per Capita in 2011**

## (2) Undeveloped Fishers Organization

To increase fishery production, the technical knowledge and productivity of the artisanal fishers must be improved. Organizing production and marketing activities will improve the productivity of the fisheries industry. It is also an important means of raising the incomes of the economically weak artisanal fishers. However, the cooperatives' activities have stagnated and a large-scale cooperative does not exist. Despite the transition from a socialist to a free economy in the 1990s, the meagre business experience of the private sector, the undeveloped business skills and mindset have impeded the development of fishery business and organizations. In addition, the strong socialist dependence on government institutions and the management failures of the cooperatives have produced a strong resistance against joint business activities, which has also hampered the growth of fishery cooperatives. The issues that must be addressed to structurally strengthen fishery cooperatives are: a) lack of capital, b) small scope, c) low management capabilities/low educational background, d) low reliability, and e) frail system of assistance.

## (3) High Post Harvest Loss and Opportunity Loss of the Fresh Fish Trade, which Deprives Fishers of Better Incomes

Reducing post-production losses offers an important means of increasing the real food supply without increasing the fish production volume. The greatest post-production losses occur during the processing of Dagaa during the rainy season. Dagaa are usually sun-dried, but this process is curtailed during the rainy season, and product quality is greatly affected by weather conditions due to the lack of artificial drying facilities or cold storage facilities. Dagaa Kigoma is an important fish species comprising 15 percent of the total fish production volume of the country. Post-production losses not only reduces the income of processors, but also affects the stability of the nation's food supply. Fish processing serves as a major means of fish preservation, and it is not utilized as a means of raising the value added of the product. In contrast, there is a 40 percent loss in price when the fish is sold as a salted and dried product, as opposed to when it is sold fresh. As a result, the processors of small fishing villages lose revenue.

#### **(4) High Fish Prices and Regional Disparities in Fish Price among Production Sites**

Fish price according to the fluctuations in the consumer price index shows that the index which was 100 in 1994, rose to 256 in January 1998 and 581 in October 2001. These statistics greatly exceed the consumer food index for all food products (October 2001:219) and meat (October 2001:252). In contrast, the fish price at production sites, that do not have access to urban areas, is only one-fifth to one-third the price of fish sold at the city fish markets. The per capita production volume of fishers in many of the regional fishing villages is small; and the non-existence of cooperatives and subsequent lack of a joint shipping system has made shipments to urban areas difficult. Consequently, appropriate pricing of fish products does not exist.

#### **(5) Poor Co-management System on Fish Resources**

Although surveys to determine the resource volume of major water bodies in Tanzania have been conducted by TAC, it has not reached a stage where resource management can be applied. The number of fisheries officers overseeing large water bodies is minimal, and fishers are being asked to participate independently in fisheries resource management activities. However, fisher awareness about fishery resources is scanty, and they are strongly resistant to fishing license restrictions or limitations to fishing grounds. A foundation for independent management activities is nonexistent. In Lake Victoria, a fisheries management plan has been implemented and a BMU is being organized. Unfortunately, the lack of fisher identity and understanding about resource management has hampered efforts to establish an effective organization.

#### **(6) Lack of Diversification on Fish Export Products and Under Developed High Value Added Products**

The production of Nile perch exports, which comprise 90 percent of Tanzania's fishery export industry, has stagnated despite investments made by export companies. In recent years, the export of other parts of the Nile perch such as the bladder, rather than the Nile perch fillet has contributed to increased export values. The export volume is not anticipated grow in future due to the increasingly small size of the fish that is harvested. Hence measures to promote exports will shift from volume to quality, but such measures have been lagging in Tanzania. The export market which is centered in the EU will force Tanzania to strengthen its production to shipping process to incorporate EU quality control standards based on HACCP and ISO9000s. Paved sorting areas, toilets, and other sanitary facilities that are lacking in Tanzania are needed to protect fish products from sand and soil pollution during fish transactions that are conducted at the fish landing beaches.

#### **(7) Lack of Technology on Development of Fishing Community by Self-help**

The budget for production and social inputs is extremely scarce for the fishing villages, and the fishers depend heavily on the central government for community development. A system of resident participation to resolve village issues remains inadequate; therefore, the capabilities of the village leaders are important to the community's development. However, in many cases, the leaders have not had adequate opportunities to receive training in development methods to utilize and manage resources and to alleviate poverty. In addition, access to fishing and processing technology is difficult.

#### **(8) Weak Financial Base of the Local Government for Fisheries Development**

It is extremely difficult to accurately grasp the small fishing villages that are subject to taxation due to their dispersal, and it is difficult to adequately collect taxes due to the shortage of government officers. Therefore, the fish landing sites should be utilized as tax collection centres and as base facilities where services for fishers can be provided. Responsible fisheries management and services that meet fisher needs can not be provided by the financial resources of the districts. There is a large disparity between the fishery revenues of the central government at US\$ 5 million, and Mwanza and Dar es Salaam, which has many independent financial sources totalling US\$ 100,000 to US\$ 300,000. Hence a new system of financial assistance from the central Fisheries Division must be created, in conjunction with the districts' efforts to secure stable, independent financial sources.

**(9) Inefficient Administrative Services**

The inadequate placement of government officers and their low level of motivation have contributed to inefficient administrative management. There are currently 59 general staff members employed at the Fisheries Division headquarters, but only 19 fisheries officers have a bachelor's degree or higher. It is difficult to implement a myriad number of administrative tasks in an inefficient working environment with inadequate OA facilities. Despite regional reforms and a reduction in a large number of fisheries extension personnel, retraining programmes for district officers have been extremely limited, and this has lowered the quality of the services that is provided. Additionally, the district fisheries officers and extension personnel are under the direct management of the DED. Subsequently, the work of the extension personnel shifted from supervising fishery activities, data collection and extension activities to tax collection activities that directly affect the district government.

## **II BASIC CONCEPT AND DEVELOPMENT STRATEGY**



## CHAPTER 2 BASIC CONCEPT AND DEVELOPMENT STRATEGY

### 1. BASIC CONCEPT AND DEVELOPMENT STRATEGY

#### 1.1 Development Objectives

The objectives of this Master Plan in line with the national policies are to strengthen the capabilities of artisanal fisheries in Tanzania on a national scale in both the public and private sectors; contribute to the national economy, the nutritional intake of the populace, and raise the livelihood and social welfare conditions of the rural fisheries communities.

The fisheries management mainly at Lake Victoria and Lake Tanganyika are assisted by donors from Europe, World Bank, United Nation, etc. Constraints for the fisheries policy implementation are the low awareness of fishers for fisheries management and the weak institutional structure of the fisheries communities. Therefore, the Master Plan focuses on strengthening the fisheries organization/cooperatives and promoting effectiveness of public fisheries services.

This Master Plan consists of 'basic concepts', 'development strategies' and 'priority programmes'. Basic concepts for Fisheries development aim to solve the 9 issues in Tanzanian fisheries explained in Chapter 1 Section 6 and suggest the direction for the future Fisheries development. In other words, Basic Concepts is considered as Goals of their Master Plan. For the basic concepts, supply of fisheries products to Tanzanian people as a national role, together with improvement of the livelihood of fishers, establishment of the stable macro-economy and environmental conservation is focused.

- Basic Concept 1: Stable Supply of Fish for Domestic Consumption
- Basic Concept 2: Sustainable Use of Fishery Resources
- Basic Concept 3: Sustainable Development of Fishery Exports
- Basic Concept 4: Reduction of Poverty and Improvement of the Livelihood in the Fisheries communities
- Basic Concept 5: Efficient Administrative Services and Financial Management

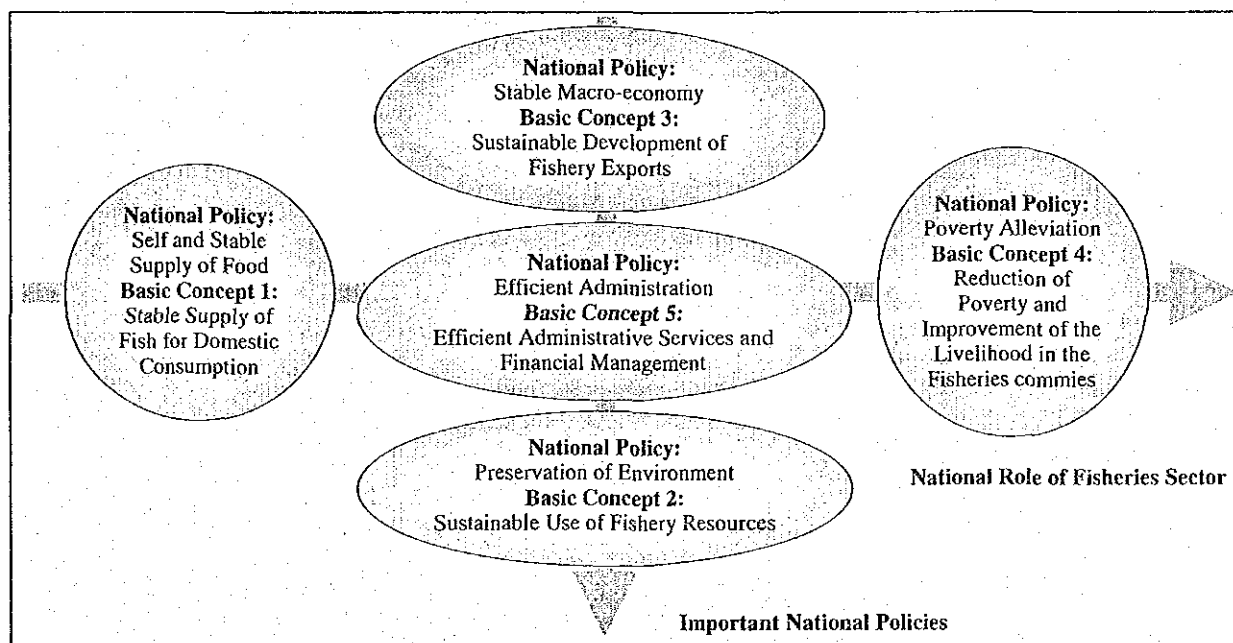
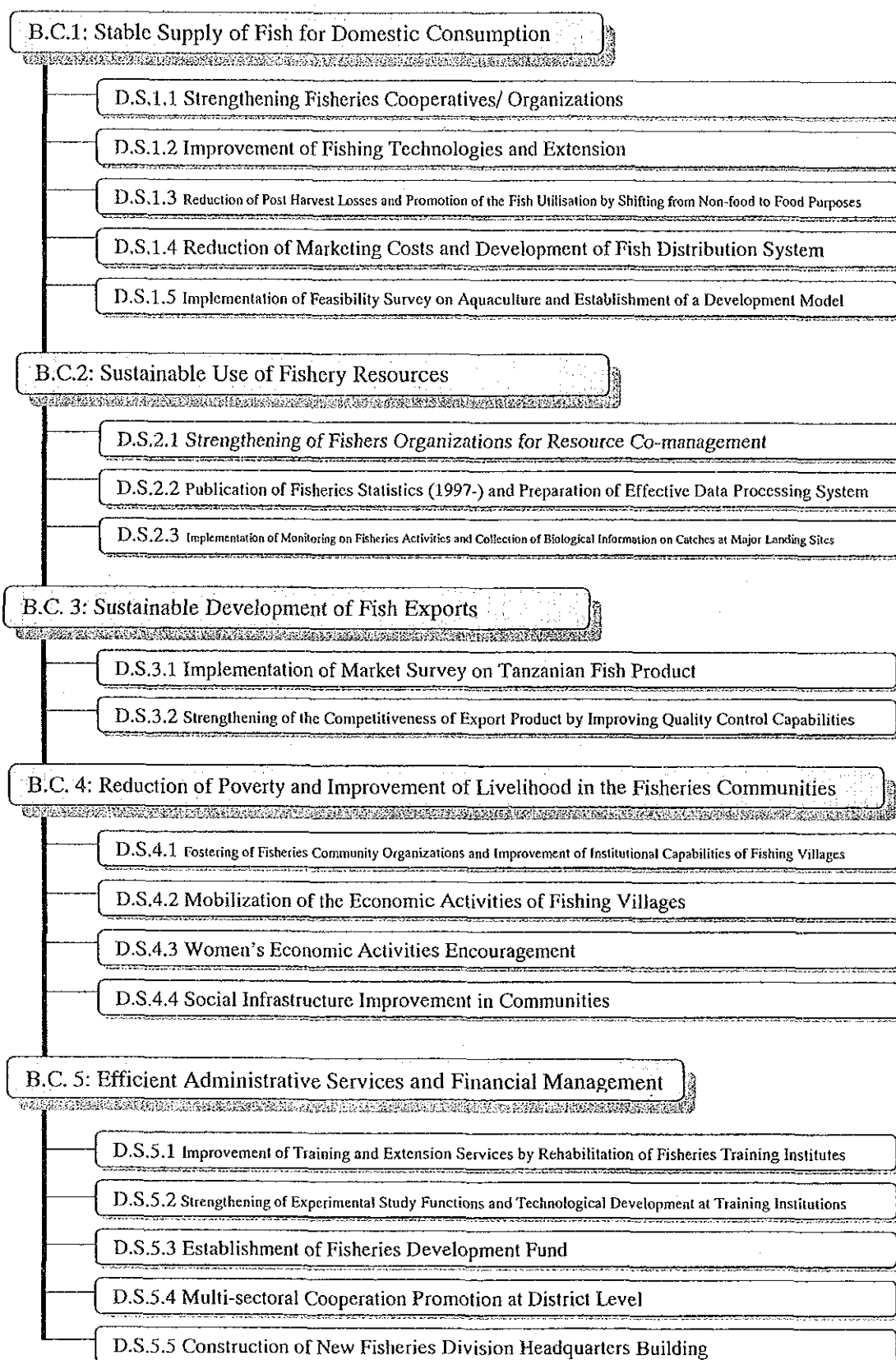


Figure 2-1 Basic Concepts in Relation



B.C.: Basic Concept, D.S.: Development Strategy

**Figure 2-2 Basic Concepts and Development Strategies in Relation**

## **1.2 Basic Concept and Strategy to Develop Fisheries**

### **1.2.1 Basic Concept 1: Secure a Stable Domestic Fish Supply**

Fishery products are an important source of protein for the Tanzanian people. The food demand for fishery products in 2012 is estimated at 280,000 tons, or about 80,000 tons higher than the current demand, due to a projected population growth of 37 percent from 2001 levels. Presently, the self-sufficiency ratio is 100 percent. To fully utilize fishery resources, production must be increased in combination with the development of aquaculture and fishery imports. Furthermore, to ensure that the harvested fish is not wasted and rational consumption is promoted, the accelerated development of fish processing and marketing will be targeted and integrated with the task of securing the minimal volume of food supply needed to meet the demand of the populace.

Fishery production can be greatly increased by introducing large fishing boats and modernized fishing gear and other measures to improve fishery technology. But the demand for capital by fishers also rises in conjunction with a rise in production equipment and materials. To introduce efficient fishing technology among the artisans with limited finances, financial support is needed. But in Tanzania where a financial system for fisheries is nonexistent, a countermeasure to overcome these constraints for the time being is to organize the fishers and procure capital through mutual finances based on shared capital or contributions. Therefore, it is vital that the government support measures to strengthen the SACCOS programme of fishery cooperatives. Due to restrictive factors such as unstable production levels and the risk of damages to fishing boats and gear, it is difficult for fishery cooperatives to be responsible for both the finances of the organization and for such inherent risks. Although the source of the capital stems from the shared contributions and savings of its members, the government should introduce policies to guarantee liabilities and to provide financial support for fishery cooperatives. Additionally, measures to educate executive members of the cooperatives are essential to enable the cooperatives to operate efficiently.

Although the development potential of the fishery resources of Tanzania's major water bodies is known, the fish that is harvested from major landing sites are small in size and the fishing grounds are remotely located. Such factors indicate a decline in resources. Hence the immediate issue is to reduce the processing and marketing loss in order to maximize the utilization of food fish. Presently, food fish is produced throughout the country, and the losses incurred due to the poor quality of sun-dried Dagaa, which comprises 12 percent of the total fishery production volume, and measures to effectively utilize the head, bone, and other wastes produced by the Nile perch processing plants are supposed to have greatly impacted the national food supply because of their enormous volume. In addition, the consumer commodity index for fish quintupled in 2000 in comparison to 1994, and it exceeded the index for general food products and livestock products by 2.5 times. Much of the fresh fish sold in the urban areas is no longer an inexpensive source of protein since fish prices are higher than the price of livestock meat. Hence the reasonable pricing of fishery products has become a major issue. In conjunction with the completion of the road network by 2012, a joint shipping system, cold chain, and other efficient shipping systems must be created.

Culture and restocking are the only means of increasing fish production when the development of natural resources is limited. Basic foundations must be created to achieve long-term development. In Tanzania, where much of the fish supply is dependent on natural fisheries, aquaculture production has been largely ignored. In the inland urban areas where fish supply is scarce, the development of aquaculture has been impeded by the lack of understanding and cooperation by farmers and other investors, despite its potential in the market economy. Additionally, in many cases, the difficulty of securing adequate pond water throughout the year, due to the low rainfall volume during the dry season, has discouraged many potential aquaculturalists, despite the cheap labour and relatively inexpensive cost of constructing ponds in Tanzania. Aquaculture extension activities have been hampered by inadequate training and education in aquaculture technology as well as the need to select areas suitable for aquaculture. To resolve this issue for the present, there is a need to collect data on water resources that can be utilized for culture activities and to accumulate the expertise or know-how needed to conduct aquaculture training activities.

### [The Basic Idea Behind the Goal for Securing a Stable Domestic Fish Supply]

When the situation of declining fish supply in Tanzania today is concerned, it is adequate to set a target for securing a stable domestic fish supply as to maintain the present 5.9kg/ person/ year. In this case, the fish production has to be increased to 400,000 tons by 2012 as population increases (Table 2-1).

The target for the fish supply in the Master Plan should be set forth based on the development potential of natural resources and the available technical supports. However, the present condition in Tanzania is unable to provide reliable information on available resources and therefore, it is impossible to establish a figure for sustainable fish production. In order to prevent over-pressuring the resources, Fisheries development should be implemented through careful monitoring of its impact.

This Master Plan maintains a per capita consumption of 5.93kg/person/year requiring a minimum demand of 400,000 ton provisionally in order to avoid the risk of resource depletion. Yet this figure should not be included in a policy or Act and be carefully re-adjusted through monitoring.

**Table 2-1 Estimated Future Fish Supply Assuming Annual Fish Consumption of 5.9kg per Person is Maintained**

		2000	2005	2010	2012
Population		33,952,136	39,420,144	44,559,396	46,694,552
Annual fish consumption per person in 2000 of 5.9kg assumed constant	kg	5.93	5.93	5.93	5.93
Domestic Consumption	tons	201,336	233,761	264,237	276,899
Export (Amount of all fish)	tons	97,672	97,672	97,672	97,672
Import	tons	3,211	3,211	3,211	3,211
For animal feeding (Amount for fresh fish)	tons	25,000	25,000	25,000	25,000
Total Fish Production	tons	327,219	359,644	390,120	402,782
Difference with the production in 2000	tons	0	32,425	62,901	75,563

Source : Population : Estimated by UNFPA

Export : Based on the statistics from TRA, estimated Nile perch's edible rate of 50 percent.

Import : Average between 1995 to 1997 from FAO statistics

For animal feeding : Estimated from interviews from the Animal Feeding Association.

- For export, the present figure is used for 2012 because the potential stock of Nile perch is not available, and fishers feel its production is decreasing.
- For animal feeding, the present figure is used for 2012, yet it is estimated that the ratio will decrease by 15 percent, more is used for human consumption.
- Above is a target figure of consumption per person. Yet there is not a big difference from the future prediction with the income elasticity of 0.35 because of a big influence of population increase.

### [Development Strategy]

#### **Development Strategy 1.1 Fisheries Cooperatives/ Strengthening Fisher Organizations**

Existing fisher organizations will be categorized. There are two types of fisher organizations in Tanzania. The first is the general fishery cooperatives that are mainly comprised of boat owners and conduct or aim to conduct diverse activities, including credit activities. The second type is small, specialized groups comprised of members who jointly operate one purse seiner. In many cases, the latter type has not been officially registered as a fisher organization. As fisher organizations are voluntarily organized by fishers, its operations should adequately incorporate their ideas and intent; and its potential as an organization should be strengthened according to category, activities and scope.

In the case of general fishery cooperatives, technical guidance, support to strengthen the organization's operations, and financial support will be provided to model cooperatives that meet specific criteria in terms of capital, number of members, etc. Large organizations with more than 300 members will be able to purchase certain equipment and materials, depending on the membership fees and capital collected from members. In contrast, the disadvantage of general fishery cooperatives is the fact that mutual trust decreases as the number of members increases, and the cooperative's active contributions are directly related to the strong leadership capabilities of the executive members of the organization. Therefore, educational support for the executive members in the area of organizational operations, activity management, and others are essential. Additionally, support will be provided to expedite the cooperative's SACCOS activities, activity programme formulation, long-term loans, and others.

In the case of small fishery cooperatives/groups, technical guidance for activity operations aimed at raising the efficiency of the organization/group's activities is needed. To spur collaborative relations between specialized fishery cooperatives/groups, a model project targeting fishing operations using a jointly operated fishing boat will be formulated at the district level.

An important goal of cooperatives/groups that are organized by fishers, especially young fishers and boat crews who are unable to purchase fishing gear, is to provide a solidarity guarantee for loans. The government will support measures to strengthen a credit system for small cooperatives/groups to enable them to set up a financial system to purchase fishing equipment and materials and to provide the fishing village access to private sector loans. Additionally, the fishing technology of cooperatives/groups comprised of young fishers and boat owners is undeveloped in many cases, and assistance measures to improve their technical skills are needed. The traditional educational system of the fishers will be reviewed; and cooperatives/groups and a systematized organization, that will enable technical transfer activities to be carried out by fishers, will be fostered to enable artisans to participate in drafting and assessing fishery policies through their representatives.

### **Development Strategy 1.2 Promotion of Fishing Technology Improvement and Dissemination Reforms in Fishery Technology**

There is an extra room to improve existing fishing methods. A pilot project with the cooperation of the fishers to improve purse seine and long-line fishing technology will be conducted at Mbegani Fisheries Development Center and Nyegezi Freshwater Fisheries Training Institute. These institutions shall promote the joint-survey with fishing boat owners to collect the more relative information.

### **Development Strategy 1.3 Reduction of Post-harvest Loss and Promotion of the Utilisation by Shifting from Non-food to Food Purposes**

Measures to increase the ratio of Dagaa as a fish food product will be pursued. Dagaa is a small pelagic fish that is produced in the marine waters and the three major lakes of Tanzania. Its production ratio of the total landed fish volume is 20 percent. In particular, Dagaa Kigoma and shares of 20 percent of total catch landed in Lake Tanganyika and Dagaa Mwanza landed in Lake Victoria have high marketability. Sun-dried Dagaa is the commonly marketed product, and production loss in the rainy season is especially high. Consequently, Dagaa that is generally consumed as food is poor in quality. Developing and improving the processing and marketing technology of Dagaa as a food commodity will contribute greatly to securing a stable domestic supply of fish.

A different approach is needed to improve the production of the two types of Dagaa, Dagaa Kigoma and Dagaa Mwanza, due to their dissimilar characteristics as a food product. Dagaa Kigoma, which is an expensive, high-demand product, differs according to fish quality and ranges in price from US\$ 1.0 to US\$ 1.5/kg. Therefore, technical improvements will include introducing artificial drying techniques during the rainy season that will raise the portion of edible products as well as the profits of the small-scale processors. In the case of the lower-priced Dagaa Mwanza, the handling functions of the Kirumba fish market, where 90 percent of Dagaa Mwanza is marketed, will be improved to increase the absolute quantity consumed.

By products of the fisheries industry will be effectively promoted. Presently, the utilization rate of Nile perch by the processing plants is 50 percent. The head, belly, and backbone, that are discarded by the processing plants, undergo secondary processing by small-scale processors and are sold and consumed in the domestic and other African markets. These wastes will be 1) processed into high value added products by the processing plants and exported or marketed domestically at high quality food markets, and 2) the domestic market for processed products produced by small-scale processors will be expanded, after the processing technology and sanitary management at small-scale plants have been improved. For these purpose, the product development capabilities of the Nyegezi Freshwater Fisheries Training Institute will be strengthened. Measures to strengthen the cold storage and freezer facilities at major markets such as the Dar es Salaam fish market will also be expedited to effectively market small demersal fish that are by catch products of prawn trawlers operating in the coastal zone.

#### **Development Strategy 1.4 Reduction of Marketing Costs and Development of Fish Distribution System**

The national highway connecting Dar es Salaam and Mwanza, that will be completed in the next five years, provides a major advantage in transporting fresh fish from Mwanza. Consequently, the joint shipment of surplus fish produced at Lake Victoria will be promoted and marketing of Nile perch and Tilapia to major cities will be expedited, together with cost reduction in marketing. Presently, the majority of exported Nile perch (700 to 1,000Tsh./kg, Dar es Salaam) are competitively viable with coastal fishery products. As a result, fresh fish marketing have already begun at some markets such as Kariakoo market. To efficiently ship fresh fish from the production sites, measures to organize the fishers and to provide cold storage will be carried out.

Furthermore, to ensure that marketed fresh fish is safe for consumption, guidelines on handling fresh fish will be formulated and disseminated to fish markets and fish retailers, in conjunction with measures to improve quality management and water sanitation standards at fish landing facilities and fish markets.

#### **Development Strategy 1.5 Implement a Basic Survey on Inland Aquaculture and Set Up a Model**

Farmers normally are cautious about engaging in aquaculture due to the cost of ponds construction, fish mortalities, theft, and other inherent risks. One means to change the conservative mindset of these farmers effectively is to foster aquaculture pilot farms by setting up a model fish culture farm where farmers can experience firsthand the profits generated from aquaculture. Aquaculture in Tanzania are presently limited to a few areas in Ruvuma, Morogoro, Lindi, and Mtwara region. Therefore, an effective strategy is to conduct extension activities in these areas, where the existing aquaculture farms can serve as pilot farms. The economic viability of the NADC's trial aquaculture project based on private sector consignment and use, and the subsequent results will be made public.

Aquaculture extension activities will target 1) mixed agriculture aimed at achieving self-sufficiency, 2) commercial aquaculture, and 3) seed production. Criteria such as water resources for aquaculture use, soil suited for culture activities, and marketing routes for cultured fish will have been adequately surveyed and confirmed prior to the start of these activities. The training programme and equipment and materials will be provided based on the training needs and the technical levels of both the extension personnel and the farmers who will undergo training in aquaculture technology.

### **1.2.2 Basic Concept 2: Sustainable Use of Fishery Resources**

The cornerstone of Tanzania's fishery policy is to sustain and manage its fishery resources and to develop resource management based fisheries that will ensure the sustained use of its fishery resources. Some of the resource management measures that have been pursued are regulated management of fishing grounds, controls on harvested fish species, regulated production volume, and others, but due to the enormous land area within its national boundaries and the more than 1,000 fisheries communities dispersed throughout the country, the effectiveness of government agencies to oversee individual fishing activities is limited. Hence the hitherto adopted procedure of enforcing controls in

fisheries must change to a system of controls and regulations based on voluntary, self-enforced co-management by fisheries communities and fisher organizations.

Resource management by fisher organizations is the core of a management system. Organizations such as the Beach Management Unit (BMU) that manages fish landing sites have begun to appear as the fishers start to organize themselves according to different projects, and strengthening the functions of these organizations is a priority issue. With the advent of fisher participation in resource management, an important factor that supports the sustained activities of fisher organizations are policies and measures that lead to increased incomes. Furthermore, in order for fisher organizations to achieve independent management, the organization must establish a revenue base and appropriate assistance for fisher management activities must be provided.

Scientific data on resources are essential in order to establish resource management based fisheries. Although MSY estimates on resource volume have been made based on fishery resource survey studies, official administrative targets have not been established. Hence, in view of the importance of monitoring indexes that indicate the impact of production activities on resource management, a data collection and analysis system will be developed immediately in order to accurately assess management indexes on fish production volume, fishing pressure, fish size, fishing grounds, and others.

### **[Development Strategy]**

#### **Development Strategy 2.1 Strengthen Fisher Organizations for Resource Co-management**

A nationwide co-management system of fishery resources conducted mainly by fishers will be developed. It will be difficult to solicit the independent participation of fishers in such a system unless it is tied to resource usage rights. Although the Tanzanian government requires all fishers to register, a system of fishing rights that regulate exclusive fishing operations in specific water areas or fishing licenses that regulate different types of fishing operations do not exist. The rights of fishers have not been secured and this has greatly impeded the active participation of fishers in resource co-management activities. As a result, establishing fishing rights and regulations on fishing operations must be enacted together with the task of educating fishers in resource management. Thus an immediate task of the Fisheries Division is to create fishing laws governing fishing rights.

The main body that will implement fishery management will be the fishery cooperatives/groups, the BMU, or other new fisheries community organizations. It is important that the entire fisher community in the region participate in regional fishery management. However, organizations that meet the criteria are nonexistent at present. Hence measures to strengthen the resource management capabilities of these three parties will be implemented during the ten-year Master Plan. Therefore, it is important to achieve a record of successful cases in regional fisheries according to respective fishing characteristics. Although more than 600 BMU's have been organized at Lake Victoria by the government administration since 1997, the majority are no longer in operation. A survey study to assess the conditions of the BMU currently in operation will be implemented, and efforts to clarify their legal status and functions will be carried out. The BMU has been managing the fishers instead of the government. However, it should be noted that they have not evolved sufficiently to implement fishery management activities.

Short-term training programmes in resource management education for fisher organizations and BMU will be implemented by visiting fisheries communities and by institutions that will provide leadership training programmes. The knowledge and technology needed to cope with environmental conservation, sanitation control, quality control, identification of poisoned fish, trawling nets, and other existing issues will be strengthened. In addition, training courses in organizational operations, problem-solving methods, and measures useful for establishing an organization will also be included.

To implement an independent and self-reliant system of co-management by the fisheries community and fisher organizations, the fishers must possess an awareness about the fishing environment and resources (arouse their interest and deepen their understanding). Therefore, a model environmental

programme will be developed for the fisheries communities and environmental education will be included in the fishery development project that will be implemented. It is particularly important that the environmental education programme focus on fostering leaders and the next generation of young fishers who will be able to play a major role in implementing environmental conservation activities.

#### **Development Strategy 2.2 Publication of Fisheries Statistics (1997) and Preparation of Effective Data Processing System**

The existing fishery information processing system (TANFISH) will be reviewed and improved. The annual fishery statistics, that have not been published since 1996, will be supplemented by estimated values and promptly published. To accomplish this task, the statistical data processing equipment of the Fisheries Division will be replaced and simultaneously, a training programme will be implemented for the personnel in charge of statistics at the Fisheries Division and at the district level. To increase the accuracy of fishery statistics, the sampling method used at the landing sites must be reassessed. The prevailing conditions and the primary processing capabilities of the fish landing sites that are presently designated as data collection points will be reviewed.

#### **Development Strategy 2.3 Implementation of Monitoring on Fisheries Activities and Collection of Biological Information on Catches at Major Landing Sites by Fishers' Group**

With the cooperation of the artisanal fishers (boat owners) and fishery cooperatives/groups, biological catch species data on living organisms landed at major landing sites will be collected. As data on harvested fish (the length, etc.) is presently collected at Lake Victoria by the LVEMP, a survey system on economically important fish species in Lake Tanganyika and the coastal area will be established. A contract to measure the harvested fish will be signed with boat owners; and fishing nets, GPS unit, echo sounder will be leased to boat owners and training programmes for fishers will be provided. Monitoring the impact of the project is also very important during implementation of the Fisheries Development Projects.

### **1.2.3 Basic Concept 3: Sustainable Development of Fishery Exports**

Fishery exports in Tanzania comprises more than 10 percent of the country's foreign currency. The growth of traditional export products such as coffee and raw cotton has stagnated due to a surplus supply in the international market. As the global demand for fishery products is anticipated to continue, developing and sustaining fishery exports as the mainstay foreign currency earning industry is an important strategy in terms of the macro economy. In addition, the royalties (export tariffs) generated by fishery exports will be an important financial source for the Fishery Division in future, due to the central government's policy that will allow the ministries and agencies to possess an independent financial source. Therefore, stable fishery exports must be achieved.

To strengthen the competitiveness of its export fishery products, the government will substantiate its market survey activities, provide relevant information, and strengthen its publicity activities. Presently, the market in fishery products is growing globally. Therefore, the market surveys are anticipated to become increasingly important as a source of relevant information on international market trends. In the area of product quality which greatly affects competitive viability, a uniform management system overseeing production, processing, and marketing will be established, and advanced sanitation and quality control of fishery products will be promoted. Unlike agricultural products, fishery product is limited since it is a natural resource product. In promoting fishery exports, the use of sustainable resources based on resource management is an important issue.

To efficiently re-input royalties into the private sector, private sector participation in policy planning will be expedited, while strengthening the financial base with the creation of a Fisheries development Fund. The aim will be to achieve a more stable export industry.



## **[Development Strategy]**

### **Development Strategy 3.1 Implementing of Market Survey on Tanzanian Fish Product**

A market survey on major fishery export products to the advanced nations-- Nile perch, prawn, eucheuma (a certain species of seaweed), and aquarium fish--will be conducted to collect information on market trends and export related systems and to disseminate this information to export companies. An evaluation analysis of international market demands and Tanzania's products will be made, and an export strategy aimed at reducing production and marketing costs and expediting stable product quality will be drafted. In particular, the raw supply of Nile perch, which comprises 90 percent of the total export volume, is not expected to drastically increase due to resource restrictions. Therefore, in addition to the processed fillet product, an increase in value added processing such as seasoned or fried products must be targeted to raise export values. Therefore, the trial development of new products will be implemented with the cooperation of the processing cooperatives/groups and the Nyegezi Freshwater Fisheries Training Institute; and a market survey of Europe, Asia, and North America will be implemented.

A distribution and marketing survey on the regional marketing of the Dagaa will be conducted (particularly Kigoma, Democratic Republic of Congo) to ascertain the export volume that is not officially known at present. Although the official export volume statistics for Kigoma Dagaa, the high demand food fish, from 2000 to the present is 500 tons, an export volume exceeding this figure by tenfold is exported mainly to the Democratic Republic of Congo. This export does not pay royalties or export tariffs, and therefore, it is believed to be illegal. To meet the increased domestic demand in future, the supply of Dagaa to the domestic market must be raised. An export strategy that includes the collection of tariffs will be drafted based on the market survey findings.

### **Development Strategy 3.2 Strengthening of the Competitiveness of Export Product by Improving Quality Control Capabilities**

Sanitation standards and control based on HACCP will be pursued to ensure the safety of fishery export products, and a quality control testing laboratory in Mwanza and Dar es Salaam will be established. To strengthen the system to address contamination of fishery products caused by the gold mining industry, industrial waste water, and agricultural pesticides, the capabilities of the laboratory to analyse mercury, cyanide compounds, pesticides, and other substances will be enhanced. Further, coordination with related ministries and agencies will be targeted and comprehensive pollution countermeasures to improve the water quality will be pursued.

## **1.2.4 Basic Concept 4: Reduction of Poverty and Improvement of the Livelihood in the Fisheries Communities**

The key to achieving a stable livelihood for fishers is to establish a stable fishery industry and to implement a resource management system based on co-management. The fishing villages, which are the focal centres in the fisheries community, form the base of the fishery industry. Therefore, comprehensive measures aimed at developing the fishing village economy, improving the living environment and welfare activities must be implemented.

Many of the fishing villages which have extremely limited access to administrative services, have the potential to become self-reliant by learning the technology and methods needed to resolve issues and by fostering independence and self-reliance. Sharing an awareness of existing problems through participation by fishing village residents and strengthening fisheries community organizations to resolve these problems will help create a system to effectively utilize the resources needed in rural development.

Improving the income poverty of fishers is an important issue to increase income and provide a high quality living environment in the fisheries community. But as long as measures to raise fisher income are dependent on exploiting the limited resources through fishing activities, effective progress is not expected unless the fishing grounds are extensively developed. In particular, the majority of the artisanal fishers in the small fishing villages do not own motorized fishing boats, and the fishing

pressure tends to concentrate in the surrounding areas of the fishing village, which may eventually lead to over fishing. Therefore, management of fishing grounds according to fishing village units will be pursued, while achieving a uniform level of fisher income. To accomplish this task, the practice of financial savings, and the knowledge and capabilities needed to improve fisher livelihoods at the individual level will be strengthened. Economic activities at the village level will be based on a labour intensive strategy to utilize the surplus labour, and they will include producing high value added processed fishery products and other products as a means of securing income outside fisheries.

#### **[Development Strategy]**

#### **Development Strategy 4.1 Fostering Fisheries Community Organizations and Improvement of Institutional Capabilities of the Fishing Villages**

A micro project that will be implemented within the scope of the fishing villages and aimed at strengthening the joint functions of the villages, will be supported technically and financially. This project will be planned and implemented with the participation of village residents. The institutional capabilities of the village such as educating the fishing village leaders and strengthening the village meeting functions will be improved.

#### **Development Strategy 4.2 Mobilization of the Economic Activities of the Fishing Villages**

Activities to increase value added processed fishery products and their distribution in the market to mobilize the economic activities of the fishing villages will be supported. The financial source of the village budget must be strengthened in order to improve the living environment and social welfare activities of the villages, and the cash economy of the villages must be stimulated. The villages are hampered by the lack of infrastructure such as electricity and transport that is needed to expand their fresh fish marketing activities. Therefore, processing of surplus fish will help preserve the fish for marketing, and the processed fish product will greatly affect profitability. Thus an effective means of achieving increased income is to produce specific high value added processed products for the market. TAFIRI and the experts from training institutions, in conjunction with the fishing village women, have developed and improved specific products for hotels and restaurants, as well as establishing antenna shops that promote mutual understanding between producers and consumers. These activities have assisted the fisheries community's expansion into the market. The majority of the processing activities are carried out by women. Hence management training for women processors will be conducted to improve their capabilities and to stimulate the participation of village women in economic activities.

#### **Development Strategy 4.3 Women's Economic Activities Encouragement**

Stimulate the participation of village women who mostly play role in processing activity in economic activities by promoting women to participate seminar of management.

#### **Development Strategy 4.4 Social Infrastructure Improvement in Communities**

Adjusting the public institution related to life in fishing village. Establishing the system for mutual understanding among fishers. This system is utilized for information sharing for the purpose of living environment improvement.

### **1.2.5 Basic Concept 5: Efficient Administrative Service and Financial Management**

Achieving efficient administrative operations is fundamental to implementing policies efficiently. Due to the rapid regional decentralization which has started in 1997, district governments are required to respond to the needs of fishers and fisheries communities at the district and village levels. The independence of these autonomous bodies must be enhanced to enable them to fulfil their responsibilities and to further expedite administrative reforms. To achieve these goals, the role of the administrations must be clarified; and the efficiency of administrative management will be pursued through adequate placement of staff personnel and measures to improve their capabilities. Presently,

the major issue that must be addressed is the shortage of technical fishery officer at the district level and the training personnel at the central level.

Presently, a priority issue is to improve the technical levels of district fisher officers who work directly with fishers, in order to implement administrative measures efficiently. Priority will be given to district fishery officers and extension personnel, who work at the village level and who have not received technical training in fisheries, to participate in a training and accreditation programme. To accomplish this, the government must secure a budget for retraining appropriate government officers. This training programme must be economically efficient. Therefore, a comprehensive short-term practical training course will be set up at a training institution with adequate facilities and equipment.

An adequate financial source must be secured to implement fishery policies, improve administrative services and fishery facilities. Increasing appropriate taxes and the tax collection ratio of fish landing tariffs and export royalties are important. The disparity in the efficiency of the financial management operations of the central and regional governments is large. The financial source of the district governments for the fisheries sector is limited solely to fish landing tariffs. Hence it is difficult for district governments to conduct responsible fisheries management and to provide services that answer the needs of fishers. Therefore, in conjunction with efforts to secure a stable and independent financial source for these governments, a system of financial assistance from the Fisheries Division Headquarters is needed. The Fisheries Division should assist the district governments in administering the fisheries sector by establishing efficient management of financial sources, reviewing current activities and clarifying their priority, and helping to achieve effective distribution of public finances.

The promotion of the fishing industry is greatly dependent on input from the other sectors. Regional roads, education, health, water supply, and other infrastructure is vital in order to foster the fisheries sector and improve fishing villages. Therefore, a multi-sectoral approach that involves the related projects of other ministries and agencies that are implemented in rural farms and fishing villages, must be adopted in the actual enforcement of fishery policies. Furthermore, basic rural development policies are drafted based on the country's Rural Development Strategy and the Agriculture Sector Development Strategy. Therefore, it is important that the Ministry of Natural Resources and Tourism is involved in drafting these policies, in order to coordinate these policies with other sectors.

### **Development Strategy 5.1 Improving Training and Extension Services by Rehabilitation of Fisheries Training Institutes**

The depreciated facilities and equipment of both the Nyegezi Freshwater Fisheries Training Institute and Mbegani Fisheries development Centre will be replaced to enable both institutions to provide practical and high quality educational services and to strengthen the refreshment course for government fisheries officers. Additionally, an adequate budget must be procured for this refreshment programme. In view of the scope of domestic demand for vocational training in Tanzania, the scope of the existing training facilities and the necessity for two schools must be reviewed. The integration of the two schools, the development of an unified training programme, and the shared use of facilities are some of the measures that can be taken to reduce the operational budget of the training schools, while endeavouring to procure a budget for the refreshment programme for government officers.

The major fishing ground for the three East African countries of Tanzania, Kenya, and Uganda is Lake Victoria, and a mutual framework for fisheries management is being pursued. Hence it is surmised that the three countries share a common training need for fishers and government fisheries personnel. Presently, Kenya does not possess a fisheries training institution, and the fisheries training school in Uganda is depreciated and beset with problems. Therefore, regional cooperation for fisheries training activities should be promoted in conjunction with improvements that will be implemented for the Nyegezi Freshwater Fisheries Training Institute, and efficient education at the regional level should be pursued.

## **Development Strategy 5.2 Strengthening of Experimental Study Functions and Technological Development at Training Institutions**

To achieve the integrated development of applied technology and training extension, the applied technical research and development functions of both the Nyegezi Freshwater Fisheries Training Institute and the Mbegani Fisheries development Centre will be strengthened. Collaborating with the regional fishers to resolve the technical issues faced by artisanal fishers, will also serve to enhance the application of the education provided by the training schools. Therefore, a research panel (external organization) comprised of artisanal fishers, small-scale processors and distributors, will be established at the training schools; and the selection of study issues, drafting projects, and a system of evaluating findings will be created. Services that meet the needs of artisanal fishers will be provided.

## **Development Strategy 5.3 Establishment of Fisheries Development Fund**

A National Fisheries Development Fund that is financially sourced by royalties will be established to secure a financial source to fund technical assistance for artisanal fishers and fishing village development. Fish landing tariffs paid by fishers and royalties generated by export processing companies are an important financial source for the fisheries administration. The amount generated from royalties alone was five million dollars in 2000. In contrast, government services for the private sector in return for these tariffs have been unclear and unregulated. As a result, the private sector's distrust of the government is large. Therefore, a fund will be created using a portion of the royalties collected and financial assistance for the private sector will be provided governed by uniform rules. A stable system that can be utilized by fishers must be created immediately. A Fisheries development Assistance Committee will be created to evaluate the content and priority of projects requested for financial assistance and to ensure that the funds are efficiently managed. The key to the success of the National Fisheries Development Fund is the transparency of fund management activities. Therefore, academic societies, private companies, and the artisanal fisheries sector, in addition to the Fisheries Division will participate in the committee's activities.

## **Development Strategy 5.4 Multi-sectoral Cooperation Promotion at District Level**

Cooperation between the district fisheries officers, executive members of the cooperatives/groups, and agricultural government officers will be pursued in fisheries extension activities and fisheries community development at the district level. These government officers and executive cooperative/group members from different sectors are directly involved in technical extension activities and organizing villages. Hence educating these personnel in basic fisheries will increase the services for fishers. Since these three groups of personnel belong to the Economic Division at the district level, a combined team of these three groups can be easily formed by the division director as needed. Such teams will be especially effective in organizing cooperatives/groups, aquaculture extension, and fishing surveillance activities. Therefore, in conjunction with implementing a basic fisheries training programme, model examples of such cooperative activities will be collected.

## **Development Strategy 5.5 Construction of New Fisheries Division Headquarters Building**

The headquarters of the Fisheries Division is presently located in a segment of the Ministry of Land building. Therefore, the Fisheries Division will move its headquarters to a newly constructed office located in an extended lot of the Dar es Salaam fish market.

# **1.3 Development Strategies by Major Water Body**

## **1.3.1 Development Strategies by Major Water Body**

For the implementation of development strategies, effectiveness of each strategy is examined based on the characteristics of major water bodies on fisheries.

**Table 2-2 Effectiveness of Development Strategy in Each Water Body**

Development Strategies	Major Water Bodies					
	Central Government	Marine	Lake Victoria	Lake Tanganyika	Lake Nyasa	Other Small Water Bodies
1 D.S.1.1 Strengthening Fisheries Cooperatives/Organisations		●	●	●	●	●
2 D.S.1.2 Improvement of Fishing Technologies and Extension		●	●	●	●	●
3 D.S.1.3 Reduction of Post Harvest Losses and Promotion of the Fish Utilization by Shifting from Non-food to Food Purpose		●	●	●		
4 D.S.1.4 Reduction of Marketing Costs and Development of Fish Distribution System		●	●			●
5 D.S.1.5 Implementation of Feasibility Survey on Aquaculture and Establishment of a Development Model	●					●
6 D.S.2.1 Strengthening of Fisher Organizations for Resource Co-management			●	●		
7 D.S.2.2 Publication of Fisheries Statistics (1997-) and Preparation of Effective Data Processing System	●					
8 D.S.2.3 Implementation of Monitoring on Fisheries Activities and Collection of Biological Information on Catches at Major Landing Sites		●	●	●		
9 D.S.3.1 Implementation of Market Survey on Tanzanian Fish Product			●			
10 D.S.3.2 Strengthening of the Competitiveness of Export Product by Improving Quality Control Capabilities			●			
11 D.S.4.1 Fostering of Fisheries Community Organizations and Improving the Institutional Capabilities of the Fishing Village		●	●	●	●	●
12 D.S.4.2 Mobilization of the Economic Activities Encouragement		●	●	●	●	●
13 D.S.4.3 Women's Economic Activities Encouragement		●	●	●	●	●
14 D.S.4.4 Social Infrastructure Improvement in Communities		●	●	●	●	●
15 D.S.5.1 Improvement of Training and Extension Services by Rehabilitation of Fisheries Training Institutes			●			
16 D.S.5.2 Strengthening of Experimental Study Functions and Technological Development at Training Institutions		●	●			
17 D.S.5.3 Establishing a Fisheries Development Fund	●					
18 D.S.5.4 Multi-sectoral Cooperation Promotion at District Level		●	●	●	●	●
19 D.S.5.5 Construction of New Fisheries Division Headquarters Building	●					

● Where the effect is strong when Development Strategy is implemented

### 1.3.2 Indian Ocean Coast

The development of the coastal region bordering the Indian Ocean has been given priority in the national development strategy due to the presence of Dar es Salaam, the country's largest consumption area with a population of three million people, and the improved fishery transport network that links this huge market and the production sites in each region. In addition, Dar es Salaam is also the country's largest fish landing site and its concentration of fishing boats and fishers provides an enormous potential for the development of large cooperatives/groups. Technical training activities can also be efficiently implemented here. These conditions greatly contribute to strengthening cooperatives/groups and improving marketing activities. Other characteristics of the coastal region along the Indian Ocean are given in the table below.

**Table 2-3 Characteristics of the Coastal Region Bordering the Indian Ocean that Actualize the Development Strategy**

	Development Strategy	Fisheries Characteristics from the Standpoint of Development Strategy
Strategy 1.1	Strengthening fisheries Cooperatives/Organisations	Dar es Salaam has been the center of activities to organize fishers. UWAWADA in Dar es Salaam has more than 200 members, and measures to strengthen the functions of general cooperatives such as SACCOS, and purchasing activities have been pursued.
Strategy 1.2	Improvement of Fishing Technologies and Extension	The Mbegani Fisheries development Center, located in Coast state, has the human resources to engage in technical development and extension activities. Dar es Salaam is the Tanzania's largest fish landing site, where there is a large concentration of fishers and fishing boats. Intensive technology transfer activities are possible.

	Development Strategy	Fisheries Characteristics from the Standpoint of Development Strategy
Strategy 1.4	Reduction of Marketing Coasts and Development of Fish Distribution System	There is potential to develop a strategy to link the production sites and Dar es Salaam.
Strategy 2.3	Implementation of Monitoring on Fisheries Activities and Collection of Biological Information on Catches at Major Landing Sites	Data collection is expected to be an easy task since Dar es Salaam is the country's largest fish landing site; a new modern market was built in 2002; and TAFIRI and the Fisheries Division have their headquarters in Dar es Salaam and are a potential source of human resources.
Strategy 3.1	Implementation of Market survey on Tanzanian Fish Product	A market survey on prawn, an export marine fisheries product, was conducted in 2001.
Strategy 3.2	Strengthening of the Competitiveness of Export Product by Improving Quality Control Capabilities	Inspection and testing services for prawn products are needed. The National Food Testing Laboratory, where inspection and tests can be consigned, is located in Dar es Salaam.
Strategy 4.1	Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages	It is possible to employ an expert from the Mbegani Fisheries development Center to expedite the task of organizing fisheries communities. Coast state has the highest poverty ratio in Tanzania, and it is advantageous to implement a development model.
Strategy 4.2	Mobilization of the economic Activities of Fishing villages.	Same as above.
Strategy 5.1	Improvement of Training and Extension Services by Rehabilitation of Fisheries Training Institutes.	The facilities of the Mbegani Fisheries development Center are excessive in terms of the demand for training activities. Therefore, its functions should be reviewed first.
Strategy 5.2	Strengthening of Experimental Study Functions and Technological Development at Training Institutions	Same as above.

Specific development strategies that have been implemented in the coastal region of the Indian Ocean are explained below.

### **Strategy 1.1 Strengthening fisheries Cooperatives/Organisations**

Cooperatives such as UWAWADA in Dar es Salaam and on Mafia Island will be selected and fostered as model cooperatives to help strengthen their organizational operations that are engaged in progressive activities. These cooperatives have established bank accounts, audit their accounts, and actively pursue other activities. They have the potential to develop into general or small specialized fisheries cooperatives. Formulating guidelines based on successful cases of fisheries related cooperatives will enable cooperatives/groups to be organized efficiently in future.

### **Strategy 1.2 Improvement of Fishing Technologies and Extension**

The capabilities of fishing boats will be increased, in conjunction with improved fishing methods and equipment to raise the fish production volume without placing excessive pressure on resources. There is also the need to move away and expand fishing grounds that have been limited to shallow reef areas, to outside water areas. For small fishing boats with limited navigational capacity and inadequate fishing gear and equipment, the fishing grounds will be restricted to nearby coastal water areas that are easily approachable. Therefore, measures to organize fishers and to strengthen their financial capabilities will be expedited, in order to increase the number of large, mashu-type fishing boats and to improve the fishing technology of purse seiners engaged in pelagic fish production.

Facilities will be built to assist fishing boats at Dar es Salaam and Mafia Island due to their high potential as a base for purse seiners, and the goal is to achieve high productivity fisheries in purse seine fishing using larger purse seines (longer, deeper) using fishing lamps, and improved nets will be

introduced to improve fishing efficiency. Fishing efficiency will also be improved by promoting fishing methods such as the daytime purse seines method presently used by some of the fishing boats in Dar es Salaam and Mafia Island. The efficiency of fish scouting activities for pelagic fish and fishing operations will also be improved.

### **Strategy 1.3 Reduction of Post Harvest Losses and Promotion of the Fish Utilisation by Shifting from Non-food to Food Purpose**

Much of the by-products of prawn trawlers are either purchased by fishers in coastal fishing villages near the fishing grounds or thrown overboard at sea. Therefore, a survey on the usage of such by-products will be conducted, and the possibility of setting up a distribution network by freezing the fish and distributing them to the urban areas will be studied.

### **Strategy 1.4 Reduction of Marketing Costs and Development of Fish Distribution System**

To strengthen the fresh fish marketing system from the production sites to Dar es Salaam, measures to strengthen the core market functions of the fish market will be pursued. A new fish market will open in March 2002, as part of the countermeasure to provide a more sanitary environment, and cold storage and ice-making facilities will be installed in the surrounding areas to improve the marketing and distribution base and to strengthen the increased flow of fishery products.

Fishers and distributors in the fisheries communities will be organized and cooperative/group activities will be promoted to reduce transport costs, raise fisher income, and increase the distribution volume of fishery products to Dar es Salaam. The use of outboard engines and ice by fishing boats since the 1980s has increased the purchase of ice-packed fish from Dar es Salaam boats and this has become standard practice on Mafia Island as well. As a result, fish from the production sites which had to be either sun-dried or salted could now be shipped fresh. In addition, the road from Dar es Salaam to Kilwa, which enabled the overland transport of fish even during the dry seasons, increased the fresh fish purchasing activities by trucks from Dar es Salaam. Fresh fish sales have increased due to improved roads, storage capabilities, and transport means, and the shift in the shipment and sales of processed to fresh fish has continued to progress. In future, the cooperative/group operations of boat and truck transport in fresh fish marketing will be expedited.

Due to the improved road network from Tanga state to Dar es Salaam, private retailers have utilized the bus system to ship and sell fresh fish packed in small portable freezers to inland urban areas. However, due to a shortage of capital and the inability to purchase larger capacity freezers, they have been unable to increase their handling volume and to meet the local demand for fresh fish. Subsequently, there is a need to foster and assist private retailers by establishing financial assistance measures that will provide needed capital. The residents of Lindi and Mtwara prefer fresh fish, but presently most of the transported fish that is sold in the inland consumption areas is grilled. A small group of retailers with portable freezers transport and sell fresh fish in the area. Providing financial assistance that will enable individual retailers to purchase portable freezers is an effective means of promoting fresh fish marketing activities in the region.

### **Strategy 1.5 Implementation of Feasibility Survey on Aquaculture and Establishment of a Development Model**

Focusing on the follow-up services of the RIPS assistance measures in Lindi and Mtwara states is the appropriate strategy to adopt.

### **Strategy 2.1 Strengthen Fishers Organizations for Resource Co-management**

The TCZCDP in Tanga region will be introduced to other regions. Observation tours by fishing leaders from other fisheries communities will be carried out to promote communication and exchange between fishers.

### **Strategy 2.2 Publication of Fisheries Statistics (1997-) and Preparation of Effective Data Processing System**

Information related equipment will be provided to establish an information network between the Fisheries Division headquarters and the coastal projects (TCZCDP, RIPS, Marine Park).

### **Strategy 2.3 Implementation of Monitoring on Fisheries Activities and Collection of Biological Information on Catches at Major Landing Sites by Fishers' Group**

The fishery data collection function of the new Dar es Salaam fish market will be strengthened. A statistics and information room will be created, and a statistician from the Fisheries Division Headquarters will be sent to train the municipal fisheries officers.

### **Strategy 3.1 Implementation of Market survey on Tanzanian Fish Product**

The approach that was used in the Japanese prawn market survey that was implemented in 2001 will be adopted. The Fisheries Division will coordinate communication between Japanese and local companies that are interested in conducting transactions for prawn harvested in Tanzania.

### **Strategy 3.2 Strengthening of the Competitiveness of Export Product by Improving Quality Control Capabilities**

A quality inspection laboratory will be built in Dar es Salaam to strengthen the quality control of exported prawn, and a control system based on the HACCP method will be adopted for prawn handled onboard fishing boats.

### **Strategy 4.1 Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages**

### **Strategy 4.2 Mobilization of the Economic Activities of Fishing villages**

Technical guidance service tours of fishing villages carried out jointly by technical experts from the Mbegani Fisheries development Centre, district fisheries officers, and district cooperative officers will be implemented. A model development project will be set up in coast state due to the poverty level of the fishing villages and the efficiency of the tour services.

### **Strategy 4.3 Women's Economic Activities Encouragement**

### **Strategy 4.4 Social Infrastructure Improvement in Communities**

### **Strategy 5.1 Improvement of Training and Extension Services by Rehabilitation of Fisheries Training Institutes**

### **Strategy 5.2 Strengthening of Experimental Study Functions and Technological Development at Training Institutions**

The technical development and extension functions of the Mbegani Fisheries Development Centre will be strengthened.

### **Strategy 5.3 Establishment of Fisheries Development Fund**

If royalties are used as financial source for the Fisheries Development Fund, a development budget based on the contributing ratio of prawn exports will be secured. A system will be created that will enable UWAWADA, the largest private fisher cooperative, and others to actively participate in deciding the usage of the fund.

### **Strategy 5.4 Multi-sectoral Cooperation Promotion at District Level**

A seminar for the executive administrative personnel at the Economics Division and the DED to promote the understanding of the importance of the fisheries sector will be conducted to promote inter-sectoral cooperation in Fisheries development at the district level.



### Strategy 5.5 Construction of New Fisheries Division Headquarters Building

The Dar es Salaam fish market expansion plan will be expedited with the move of the Fisheries Division to the new building, and measures to strengthen the fisheries support functions in the region will be targeted. This move should be negotiated between municipal administration and Fisheries Division.

#### 1.3.3 Lake Victoria

Fish production at Lake Victoria comprises about 50 percent of Tanzania's total production volume, and it has the largest surplus production volume in terms of fish consumption by residents. According to the contracted consumption survey, the per capita annual fish consumption volume in Mara and Mwanza regions were 45.3kg and 36.8kg, respectively, much higher than the national average. This signifies that the lakeshore residents have an adequate supply of fish. But what is presently demanded of Lake Victoria is how efficiently, swiftly, and hygienically the fish is shipped from the lakeshore production sites to Dar es Salaam and other large consumption areas.

In addition, the Nile perch harvested from Lake Victoria comprises 90 percent of the country's fishery export, and the lake plays a major role in the sound development of Nile perch fisheries. Presently, the operating ratio of the eight Nile perch processing factories is 70 percent, and the supply of raw material has not been able to adequately meet the factories' processing capabilities. Subsequently, the approach to promoting exports in future will be to develop value added products since a large increase in Nile perch production cannot be expected. In the area of resources management, in addition to measures such as restricting mesh net size and protecting spawning grounds, management methods that will sustain the maximum profitability.

Due to the presence of the district fisheries office, the Nyegezi Freshwater Fisheries Training Institute, TAFIRI, and other fisheries institutes, Mwanza region is ideally capable of providing administrative assistance for the project's implementation. In addition, the existing LVEMP and LVFRP projects provide a framework for the survey in fisheries management. Future measures must focus on strengthening and supplementing this framework.

**Table 2-4 Characteristics of the Lake Victoria Region in Implementing Development Strategies**

	Development Strategy	Characteristics in Fisheries for Development Strategies
Strategy 1.1	Strengthening fisheries Cooperatives/Organisations	Cooperatives are not active. However, organizing fishers will help them in price negotiations with processing factories for Nile perch transactions and secure a potential increase in their income.
Strategy 1.2	Improvement of Fishing Technologies and Extension	The Mbegani Fisheries development Centre and the Nyegezi Freshwater Fisheries Training Institute will serve as a base for technical development.
Strategy 1.3	Reduction of Post Harvest Losses and Promotion of the Fish Utilisation by Shifting from Non-food to Food Purpose	Increasing the volume of Dagaa Mwanza as food fish will provide a stable food source. Using the fish remains from Nile perch processing factories is expected to increase the food fish supply.
Strategy 1.4	Reduction of Marketing Costs and Development of Fish Distribution System	The road construction works between Mwanza and Dar es Salaam will be completed in five years. With the completion of the road, the truck transport time for fresh fish will be greatly reduced.
Strategy 2.1	Strengthen Fishers Organizations for Resource Co-management	Presently more than 600 BMU have been organized at the lake, and the foundation for resource management education exists.
Strategy 2.3	Implementation of Monitoring on Fisheries Activities and Collection of Biological Information on Catches at Major Landing Sites	Biological data is currently collected by the LVEMP. A new system is not needed.
Strategy 3.1	Implementation of Market survey on	The Nile perch harvested at Lake Victoria comprises

	Development Strategy	Characteristics in Fisheries for Development Strategies
	Tanzanian Fish Product	90% of the total export value of the country, and it is the most economically important fish species.
Strategy 3.2	Strengthening of the Competitiveness of Export Product by Improving Quality Control Capabilities	Same as above. Presently, there is a quality inspection laboratory at the Nyegezi Freshwater Fisheries Training Institute.
Strategy 4.1	Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages	The LVEMP is presently implementing a micro project. Duplication of micro projects will be avoided.
Strategy 4.2	Mobilization of the economic Activities of Fishing villages.	
Strategy 5.1	Improvement of Training and Extension Services by Rehabilitation of Fisheries Training Institutes.	It is possible to strengthen the functions of the Nyegezi Freshwater Fisheries Training Institute.
Strategy 5.2	Strengthening of Experimental Study Functions and Technological Development at Training Institutions	Same as above.

The specific actualisation of the development strategies for Lake Victoria is explained below.

### **Strategy 1.1 Strengthening fisheries Cooperatives/Organisations**

One of the objectives in organizing fishers at Lake Victoria is to give fishers collective bargaining power in negotiations related to the sales of their Nile perch catch. Presently, the buying agents of each processing factory controls the pricing system and price negotiations with fishers are not conducted. Subsequently, a long-standing issue of Nile perch fishers is the extremely low and unfair landing prices. The direct cause is the inability of producers to market their catch. The LVEMP micro project currently underway aims to break up the existing marketing structure and to enable the producers to utilize the margin presently taken by agents to market their fish. The project is highly rated. In the neighbouring country of Kenya, fisher cooperatives/groups are engaged in consignment sales activities, have established their own marketing routes, and conduct price negotiations. Subsequently, Nile perch is marketed under advantageous conditions and profits are revolved back to the fisher members of the cooperative/groups. In Tanzania, the BMU have been organized under the LVEMP, and measures to establish and strengthen the BMU and the parent organization, the fisher cooperative, will be taken. In conjunction with these measures, the government must provide guidance for fishers and provide the equipment and materials needed to conduct shipping and marketing activities, as well as improve the marketing infrastructure.

The foremost problem faced by artisanal fishers at Lake Victoria is the theft of fishing gear and outboard engines, and there is a need to organize a anti-theft surveillance group. Although the marine police patrol the lakeshore areas, they have been unable to adequately make arrests and conduct patrol activities due to the shortage of patrol boats and budget. Fishers are forced to take measures into their own hands by spending the nights next to their nets. However, in the face of armed groups of thieves, the fishers are helpless. In view of these circumstances, the possibility of fishers to organize their own patrol groups, purchase patrol boats, and patrol the fishing areas has been reviewed. To assist the self-help efforts of the fishers, the government must establish a theft-prevention system by setting up a wireless communications network, coordinate activities with the marine police, transfer fisheries officers with police authority and BMU members to the area, and other measures that will enable a swift response.

### **Strategy 1.2 Improvement of Fishing Technologies and Extension**

Since long line fishing requires adequate bait, the introduction of fishing gear to efficiently harvest *Haplochromis* such as cast nets, four-arm lift nets used with fishing lamps, and cages will be studied. Since these fishing methods have not been used at Lake Victoria, the Fisheries Division must conduct trial testing activities to ascertain its effectiveness prior to introducing the technology to fishers.

By upgrading the hurry-up net to a purse seine will prevent fish from escaping from the net and improve fishing efficiency. The hurry-up net becomes cylindrically shaped in the water and the bottom of the net is not completely closed. As a result, it is believed that many fish escape from the net through this opening. The use of purse seines will resolve this problem. An additional benefit of the hurry-up net is that it can be used in single-boat fishing operations and the net size can be enlarged as needed.

A portable fish finder will be introduced in lift net fishing operations. Lift net fishing is a method that was introduced by the Kigoma fishers and is mainly used in the Mwanza, Sengerema and Mureba districts. Technically, it is a highly accurate fishing method. Kerosene lamps are used as fishing lamps and the fish is gathered and harvested at night, but due to the low degree of transparency of the waters in Lake Victoria, the effectiveness of fishing lamps as a means of gathering fish is limited. Therefore, it is more effective to use a fish finder initially to detect the presence of the Dagaa and to use the fishing lamps at the sites where the fish have been detected.

### **Strategy 1.3 Reduction of Post Harvest Losses and Promotion of the Fish Utilisation by Shifting from Non-food to Food Purpose**

To develop a higher use of the remains of the Nile perch, the sanitation environment and facilities of the processing factories that process Nile perch remains will be improved. Presently, there are six fish processing companies along the shores of Lake Victoria, and one processing factory in Magu district, Mwanza city and an estimated annual 54,050 tons (FY2000) of fish remains (head, spinal cord, fins, etc.) are produced by these factories. The remains that are rejected for use as chips (meat scraps that have been trimmed off the fillet) or for export due to inferior quality, are salted, dried and shipped to the Democratic Republic of Congo (formerly Zaire). The fins are dried and processed into fish powder. The task of processing the remains is labour intensive work. Presently, there are two processing places engaged in processing Nile perch remains in Mkolani and Igombe. But their sanitation environment is very poor due to an inadequate water supply and wastewater facilities, storage facilities, etc. Subsequently, measures to improve the sanitation conditions of the processed product, raise product quality, as well as the working environment will be carried out to secure a stable source of employment.

### **Strategy 1.4 Reduction of Marketing Coasts and Development of Fish Distribution System**

To market Tilapia and Nile perch nationwide, the marketing base at fish landing sites and a marketing network will be developed. In particular, Tilapia is a favourite food fish among the Tanzanians (according to a socio-economic survey, 70 percent of the lakeshore residents said that Tilapia was the fish they most preferred to eat). In Dar es Salaam and in other cities, the price of Tilapia was a high 1,000 to 1,300 Tsh./kg. It is competitively viable, and there is a high consumer demand. However, the factors that impede the nationwide marketing of Tilapia, are the poor road conditions surrounding the fishing villages that harvest the Tilapia, the extremely difficult access to production sites by motor vehicles, and the weak capital of the local buyers. Hence a shipping system to Mwanza that utilizes the cargo boat of the Tanzania Railway Corporation will be developed.

### **Strategy 1.5 Implementation of Feasibility Survey on Aquaculture and Establishment of a Development Model**

A demonstration of aquaculture activities utilizing the culture training ponds of the Nyegezi Freshwater Fisheries Training Institute will be conducted. In addition, the possibility of linking up with the culture project of the National Aquaculture Centre will also be reviewed. In particular, the provision of information through the survey study and consultant functions of the institutes will be strengthened.

### **Strategy 2.1 Strengthening of Fishers Organizations for Resource Co-management**

### **Strategy 2.2 Publication of Fisheries Statistics(1997-) and Preparation of Effective Data Processing System**

Information collection equipment will be provided to establish an information network between the Fisheries Division headquarters, the existing projects at Lake Victoria (LVEMP, LVFRP), the training institutes, and TAFIRI.

### **Strategy 2.3 Implementation of Monitoring on Fisheries Activities and Collection of Biological Information on Catches at Major Landing Sites by Fishers' Group**

The capabilities of the BMU within the LVEMP framework will be strengthened. The BMU leaders will undergo a training course at the Nyegezi Freshwater Fisheries Training Institute in organizational management, environmental conservation, and other fields, and field training activities will also be conducted. In addition, to improve the accuracy of the fishery data collected by the BMU, OJT will be provided by district fisheries officers and staff members of the Nyegezi Freshwater Fisheries Training Institute touring the fishing villages.

### **Strategy 3.1 Implementation of Market survey on Tanzanian Fish Product**

A market survey study on the Nile perch will be implemented in the markets in the United States and Japan.

### **Strategy 3.2 Strengthening of the Competitiveness of Export Product by Improving Quality Control Capabilities**

The functions of the quality inspection laboratory in Mwanza will be strengthened. Since a budget to construct a new inspection laboratory has been procured, the focus will be on providing equipment that is needed to conduct heavy metal contamination and agricultural pesticide residual tests.

### **Strategy 4.1 Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages**

#### **Strategy 4.2 Mobilization of the Economic Activities of Fishing villages**

#### **Strategy 4.3 Women's Economic Activities Encouragement**

#### **Strategy 4.4 Social Infrastructure Improvement in Communities**

Develop a new fishery processed product using regional resources such as the Dagaa and the Nile perch.

- Develop smoked Nile perch and other special products targeting the tourist market.
- Generally the Dagaa Mwanza are deheaded by the consumer household prior to its cooking. A trial project to develop a new product by utilizing the abundant labour of the fishing villages for this initial stage of preparation which will then be packed and shipped will be implemented.

### **Strategy 5.1 Improvement of Training and Extension Services by Rehabilitation of Fisheries Training Institutes.**

### **Strategy 5.2 Strengthening of Experimental Study Functions and Technological Development at Training Institutions**

### **Strategy 5.3 Establishment of Fisheries Development Fund**

If the financial source of the Fisheries Development Fund is royalties, it is recommended that a development budget is secured which is in correlation to the contribution that is made by Nile perch exports. A system that will enable the fishery processing cooperatives/groups and fisher cooperatives/groups to actively decide the objectives of the fund will be created.

## Strategy 5.4 Multi-sectoral Cooperation Promotion at District Level

A seminar for the executive administrative personnel at the Economics Division and the DED to promote the understanding of the importance of the fisheries sector will be conducted to enable inter-sectoral cooperation in Fisheries development at the district level.

### 1.3.4 Lake Tanganyika

Nearly 70 percent of the fisheries production at Lake Tanganyika is comprised of Dagaa. Fisheries development in this water area has aimed at comprehensive development ranging from technical improvements in Dagaa production, processing, and marketing to strengthening the cooperatives/groups in the region. The widely marketed Dagaa Kigoma is a high demand fishery product and an improved supply volume will contribute greatly to stabilizing the national food supply. However, a restricting factor to its further development is the dependence on the railways to ship the product to Dar es Salaam and other cities and the deteriorating public safety factor due to the influx of refugees.

**Table 2-5 Characteristics of the Lake Tanganyika Region in Implementing Development Strategies**

	Development Strategy	Characteristics in Fisheries for Development Strategies
Strategy 1.2	Strengthen Fishers Organizations for Resource Co-management	A stable food supply and fish prices will be achieved by improving the productivity of Lake Tanganyika, where fishery resources are believed to be abundant.
Strategy 1.3	Reduction of Post Harvest Losses and Promotion of the Fish Utilisation by Shifting from Non-food to Food Purpose	Improving post-harvest losses during the rainy season will not increase fishing pressure, but will contribute greatly to the food supply. Women processors will directly benefit through improved incomes.
Strategy 2.1	Strengthen Fishers Organizations for Resource Co-management	Fisheries at Tanganyika is becoming specialized. Task of resource management is facile due to accumulated ecological short lifespan of Dagaa. Branch office of TAFIRI is in Kigoma and potential use of human resources exist.
Strategy 3.1	Implementation of Market survey on Tanzanian Fish Product	It is important to grasp the existing conditions on the inland export of the Dagaa.
Strategy 4.1	Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages	The NGO and local government have cooperated jointly at Kigoma to organize fishers and provide credit assistance activities.
Strategy 4.2	Mobilization of the economic Activities of Fishing villages.	It is possible to achieve a stable supply of Dagaa as raw material.
Strategy 5.4	Multi-sectoral Cooperation Promotion at District Level	The NGO and local government have cooperated jointly at Kigoma to organize fishers and provide credit assistance activities.

The specific actualisation of the development strategies for Lake Tanganyika is explained below.

#### Strategy 1.1 Strengthening Fisheries Cooperatives/Organisations

The task of organizing processing cooperatives and groups has progressed steadily in Kigoma, and joint activities such as the purchase of a drying table for the Dagaa have been carried out. In addition, as can be seen in the activities of the NGO, TACARE, a system of technical training and financial assistance exists that has been utilized by district fisheries officers and cooperative officers to motivate fishers and processors to organize cooperatives/groups. To strengthen the existing system further, OJT in cooperative management training and processing technology that is linked to the NGO programme will be implemented.

### **Strategy 1.2 Improvement of Fishing Technologies and Extension**

Lift net fishing, the major type of fishing conducted in Lake Tanganyika, was introduced to the region in 1996, and subsequently, the fishing technique in Dagaa production has greatly improved. But improvements to lower the cost of fishing operations and raise productivity are needed. A common practice at the fishing grounds is to turn off the outboard engine and allow the boat to drift according to the wind and tide to save on fuel costs. However, some of the fishers advocate the use of higher HP outboard engines that will enable them to fish in remote fishing grounds and increase their fish catch. In some cases, the fishing grounds may be located in the centre of lake depending on weather and lake conditions, but high HP outboard engines contribute to increased costs and do not necessarily lead to higher profits. Therefore, rather than resorting to larger fishing boats and high HP outboard engines that increase fishing pressure, measures should be pursued that contribute to sustained fisheries by improving existing fishing methods through cost-reduction and efficient fishing.

To develop fisheries in Rukwa district where development lags compared to Kigoma district, there is a need to replace and upgrade fishing gear, i.e., dugout canoes must be replaced by planked boat, the use of outboard engines and other fishing gear must become more widespread. Therefore, economic financial assistance in the form of a loan scheme to enable artisanal fishers to purchase fishing gear will be created or the capital of existing funds will be increased. In order to ensure that the economic assistance is utilized effectively, educational programmes for the fishers to foster their understanding of the loan concept and the access methods are needed.

### **Strategy 1.3 Reduction of Post Harvest Losses and Promotion of the Fish Utilisation by Shifting from Non-food to Food Purpose**

The foremost problem that must be addressed is improving the fish drying methods during the rainy season. Measures such as ① reducing the drying time by dipping in boiling salted water, ② introducing warm air drying, and ③ purchasing dry-racks with covers will be reviewed. Of these three measures ① and ③ have already been adopted, but they are not the fundamental solution to the fish drying process during the rainy season. Trial usage of forced warm air drying will be carried out since it is economically viable due to the large price disparity between high quality Dagaa Kigoma and the inferior quality product. The efficacy of this method will be ascertained through this trial usage.

Due to the high demand for the Dagaa Kigoma, a new high value added product can be developed and the manufacture of a smoked product or canned, bottled, frozen, and other types of product can be marketed as one means of developing the fisheries community. A smoked product requires only simple technology and minimal investment. In past trials, it is surmised that consumer tastes and preference have been an impeding factor. The domestic consumption of a canned product, similar to oil sardines is expected to be successful, in addition to becoming a source of cash revenue as an export product. But the content must be imported, and a feasibility study to determine the production and quality control capabilities, management and other factors must be implemented.

A large volume of Migebuga is harvested in the southern area of the lake, and the majority of the catch is processed into smoked fish. The fish are smoked in a temporary smokehouse, and the efficiency of the process is inferior to the method used in Mtwara. An improved smoke processing device introduced in a FAO project implemented in the past should be disseminated.

### **Strategy 1.4 Reduction of Marketing Costs and Development of Fish Distribution System**

Kigoma, which is the distribution base of Lake Tanganyika, is linked to all the other major cities in the country solely by railroad. Subsequently, radical reforms in railway cargo transport are not foreseen and major reductions in the marketing costs for Dagaa cannot be expected.

### **Strategy 1.5 Implementation of Feasibility Survey on Aquaculture and Establishment of a Development Model**

Training to foster basic knowledge in aquaculture will be provided to enable district fisheries officers to provide advice to farmers interested in aquaculture activities.

### **Strategy 2.1 Strengthening Fishers Organizations for Resource Co-management**

The strategy will be in accordance with the LTR framework.

### **Strategy 2.2 Publication of Fisheries Statistics (1997-) and Preparation of Effective Data Processing System**

### **Strategy 2.3 Implementation of Monitoring on Fisheries Activities and Collection of Biological Information on Catches at Major Landing Sites by Fishers' Group**

Retraining activities will be conducted on the existing data collection method for fish production statistics to ensure that highly accurate data is collected. The minimum amount of equipment that is needed to enable the district Fisheries Division in Kigoma to process data will be provided.

### **Strategy 3.1 Implementation of Market survey on Tanzanian Fish Product**

### **Strategy 3.2 Strengthening of the Competitiveness of Export Product by Improving Quality Control Capabilities**

The official statistics for Tanganyika's export volume for FY2000/2001 was about 500 tons, but the actual volume is estimated to be more than ten times this amount, and it greatly surpasses the 1,700 tons earmarked for domestic consumption. A survey to examine the losses in royalty collection and measures to increase domestic marketing will be conducted to cope with the major increases in fish demand in future.

### **Strategy 4.1 Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages**

### **Strategy 4.2 Mobilization of the economic Activities of Fishing villages**

### **Strategy 4.3 Women's Economic Activities Encouragement**

### **Strategy 4.4 Social Infrastructure Improvement in Communities**

Due to the large presence of women processors in the fisheries communities around Lake Tanganyika, cooperation with TAFIRI and NGOs to develop value added Dagaa products will be pursued.

### **Strategy 5.4 Multi-sectoral Cooperation Promotion at District Level**

A seminar will be held for the executive members of the Economic Division and DED to promote understanding about the importance of the fisheries sector and to encourage intersectoral cooperation in fisheries development in each district.

## **1.3.5 Lake Nyasa**

The fish production volume at Lake Nyasa comprises only a low 5 percent of the nation's total food supply, and much of the harvested fish is believed to be consumed inland. Fisheries is mainly conducted by artisanal fishers with an annual productivity of 3.4 tons/fisher, lower than the 7.7 tons /fisher at Lake Tanganyika. Due to the lack of a large consumption market nearby and the lagging effort to organize fishers, fisheries development in this region should focus on small fisheries community development and technical fisheries extension activities. Fisheries community development that is balanced with the environment should be pursued since Lake Nyasa is an important region in terms of biodiversity and conservation.

**Table 2-6 Characteristics of the Lake Nyasa Region in Implementing Development Strategies**

	Development Strategy	Characteristics in Fisheries for Development Strategies
Strategy 1.2	Improvement of Fishing Technologies and Extension	Fishing technology is greatly lagging in comparison to the other lakes. Replacing dugout canoes and other measures are needed.
Strategy 3.1	Implementation of Market survey on Tanzanian Fish Product	The economic benefits generated from the export of aquarium fish are large.
Strategy 4.1	Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages	Measures to organize fishers are extremely lagging. Priority measures in fisheries community development are needed to rectify the disparity with other lakes.
Strategy 4.2	Mobilization of the economic Activities of Fishing villages	There is market viability for Dagaa and mbasa, and potential development for special value added products.

The specific actualisation of the development strategies for Lake Nyasa is explained below.

#### **Strategy 1.1 Strengthening fisheries Cooperatives/Organisations**

#### **Strategy 1.2 Improvement of Fishing Technologies and Extension**

Measures aimed at shifting fishers using from dugout canoes to plank boats will be conducted. Nearly all the fishers at Lake Nyasa use dugout canoes for their fishing activities. According to the 1998 Frame Survey, a total of 2,324 dugout canoes were reported. The canoes utilize wood that are about 40 to 80 years of age and the ratio of hardwood: softwood of the material wood is 2:1. The lifespan of a hardwood canoe is five years, in contrast to the one year lifespan of a softwood boat, and about 1,080 trees are cut down annually to build canoes. If all the canoes are replaced once every five years, about 468 trees will be cut down annually. Therefore, in terms of forestry resource conservation, there is a need for fishers to shift from dugout canoes to plank boats.

#### **Strategy 1.3 Reduction of Post Harvest Losses and Promotion of the Fish Utilisation by Shifting from Non-food to Food Purpose**

#### **Strategy 1.4 Reduction of Marketing Coasts and Development of Fish Distribution System**

There is a large fish demand in the capital city, Mbeya, which can be met by Kyela. In addition, there is a well-developed arterial road to Mbeya which can serve as an effective route in establishing a fish marketing system to the Mbeye market. However, the impeding factor has been the undeveloped farm roads leading to the arterial road. Visits by outside fish buyers are irregular due to the low productivity of the fishing villages. Subsequently, measures to organize the fishers and processors of the villages to enable collective processing and shipment activities to Mbeya will be implemented.

#### **Strategy 1.5 Implementation of Feasibility Survey on Aquaculture and Establishment of a Development Model**

Training to foster basic knowledge in aquaculture will be provided to enable district fisheries officers to provide advice to farmers interested in aquaculture activities.

#### **Strategy 2.1 Strengthen Fishers Organizations for Resource Co-management**

The strategy will be implemented in accordance with the WWF Biodiversity Conservation Project.

#### **Strategy 2.2 Publication of Fisheries Statistics (1997-) and Preparation of Effective Data Processing System**



### **Strategy 2.3 Implementation of Monitoring on Fisheries Activities and Collection of Biological Information on Catches at Major Landing Sites by Fishers' Group**

Retraining activities will be conducted on the existing data collection method for fish production statistics to ensure that highly accurate data is collected. The minimum amount of equipment that is needed to enable the district Fisheries Division in Kyela to process data will be provided.

### **Strategy 3.1 Implementation of Market survey on Tanzanian Fish Product**

### **Strategy 3.2 Strengthening of the Competitiveness of Export Product by Improving Quality Control Capabilities**

Basic data on aquarium fish export will be collected and organized. The benefits for fishing villages and artisanal fishers to harvest and collect aquarium fish will be calculated and evaluated.

### **Strategy 4.1 Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages**

### **Strategy 4.2 Mobilization of the Economic Activities of Fishing villages**

### **Strategy 4.3 Women's Economic Activities Encouragement**

### **Strategy 4.4 Social Infrastructure Improvement in Communities**

The fishing villages at Lake Nyasa do not have a high fish production volume, but increased revenues can be generated by developing and marketing special high value added processed Lake Salmon and *Stolothrissa tanganicae* (Dagaa) products.

### **Strategy 5.4 Multi-sectoral Cooperation Promotion at District Level**

A seminar will be held for the executive members of the Economic Division and DED to promote understanding about the importance of the fisheries sector and to encourage intersectoral cooperation in Fisheries development in each district.

## **1.3.6 Other Small Water Bodies**

Similarly to Lake Nyasa, the other small water bodies in Tanzania are characterized by small-scale, traditional fishing methods and have very little access to government services. However, the productivity of the fishers at these small water bodies average about 1 to 2 tons/fisher and it is even smaller than the productivity of 3.4 tons/fisher at Lake Nyasa. But these small water bodies are scattered throughout the inland areas and are an important source of fish supply for the inland cities. Fresh fish shipments to Dodoma and Morogoro from Mtera Dam are possible. Similarly, Arusha and Moshi are in the commercial zone for Nyumba ya Mungu Dam. The geographical location of these areas provide a potential source of increased income for the fishers, if the marketing system between these inland cities is improved. However, these small water bodies are scattered over a vast land area, and the fisheries environment differs at each site. Therefore, the development approach that must be taken will differ according to each water body. Presently, the fish that is harvested are markedly small in size, and it is clear that development must introduce a system of fisheries management and improved post-harvest technology. A system of fisheries management must also be strengthened at the other small water bodies as a precondition to enacting measures to strengthen development. Presently, it is difficult for the district to assign an adequate number of fisheries officers in view of the minimum economic impact of fisheries in the area. Additionally, the training opportunities for such officers are extremely limited, and an issue that must be addressed is the re-education of extension personnel to strengthen their capabilities in basic fisheries knowledge.

Based on the characteristics explained above, specific actualisation of development strategies for these other water bodies is explained below.

### **Strategy 1.1 Strengthening Fisheries Cooperatives/Organisations**

### **Strategy 1.2 Improvement of Fishing Technologies and Extension**

There is a high risk of overexploitation if high productive fishing gear and technology are introduced before a system to control fishing effort is introduced. Therefore, such measures will not be enacted at the present time.

### **Strategy 1.3 Reduction of Post Harvest Losses and Promotion of the Fish Utilisation by Shifting from Non-food to Food Purpose**

### **Strategy 1.4 Reduction of Marketing Costs and Development of Fish Distribution System**

Measures to organize fishers at fishing villages with access to the inland cities will be carried out to establish a collective system of fish shipment and marketing activities. To accomplish this, technical guidance for district fisheries officers and cooperative officers is needed.

### **Strategy 1.5 Implementation of Feasibility Survey on Aquaculture and Establishment of a Development Model**

*Training to foster basic knowledge in aquaculture will be provided to enable district fisheries officers to provide advice to farmers interested in aquaculture activities.*

### **Strategy 2.1 Strengthening Fishers Organizations for Resource Co-management**

Education on resource management will be implemented to increase fisher income that accompanies the task of organizing fishers in conjunction with Strategy 1.1. Ideally, fishing will become more effective, if the gill mesh net size of 3 inches currently in use among fishers, is enlarged. Measures to change fisher awareness will be implemented in readiness for a system of voluntary self-restrictions by fishers.

### **Strategy 4.1 Fostering of Fisheries Community Organisations and Improvement of Institutional Capabilities of Fishing Villages**

### **Strategy 4.2 Mobilization of the Economic Activities of Fishing villages**

### **Strategy 4.3 Women's Economic Activities Encouragement**

### **Strategy 4.4 Social Infrastructure Improvement in Communities**

In fishing villages with low productivity, composite community development that includes cooperation with agricultural community development measures will be implemented. Micro projects aimed at the socio-economic development of the rural community will be implemented, and basic capabilities and experience in rural development will be accumulated.

### **Strategy 5.4 Multi-sectoral Cooperation Promotion at District Level**

A seminar will be held for the executive members of the Economic Division and DED to promote understanding about the importance of the fisheries sector and to encourage intersectoral cooperation in fisheries development in each district.