



Ministry of Agriculture, Irrigation
and Fish Wealth (MAIFW)

Plan to Strengthen the Role of the Agriculture, Irrigation and Fish Wealth Sector to Improve Food Security (2023-2027)



Aden-June 2022

Speech of the Ministry of Agriculture, Irrigation and Fish Wealth

The Agriculture and Fish sector played a major role to contribute to the achievement of food security in our country, it achieved self-sufficiency in most vegetable crops, fish and poultry eggs and semi self-sufficiency in fruits, sheep meat, goat, and cows. Most of agricultural products such as wheat, white meat and cooking oil is imported from abroad. During the past years, the Agricultural and Fish sector was affected by several causes which led to decrease in agricultural yield and fish and deterioration of agricultural and fish resources, and the main causes were the war in the country since 2015 and climate change which caused thunder, flood and spread of corona disease which had impact on agricultural and fish activities and other factors, apart from the deficit in required budget for agricultural activities.

With the present global changes, and global food crisis particularly, since the outbreak of Russia – Ukraine war, the importance in agricultural and fish production locally to provide food. This warrants to put more effort to update the agricultural and fish sector to respond to the present and future requirements.

On this basis, the plan was prepared for five years aimed to support the role of agricultural and fish sector to improve food security.

In order to implement this plan, all partners from different government institutions and private sector and donors in their specialization to support the ministry to implement all contents of plan in response to general interest and in benefit of the country.

I express gratitude and appreciation to all who participated in preparation of the plan from workers, and researchers in the ministry and its branches

Major General Salem Abdulla Al Soqotry
Minister of Agriculture, Irrigation and Fish Wealth.

Table of contents

| | |
|---|----|
| 1. Introduction | 4 |
| 2. Entities, Authority, and agricultural and fish Institutions relevant to implement the plan and support the Agricultural and fish sector and improve food security. | 4 |
| 3. Tables of plan summary to support food security | 8 |
| 4. Global food security indicators (GFSI). | 9 |
| 5. The status and indicators of agricultural and fish sector. | 10 |
| -Agricultural acreage and yield | 10 |
| - Fish production | 10 |
| - Social dimension | 10 |
| - Economical dimension | 11 |
| - Environmental dimension | 11 |
| - Agricultural resources | 11 |
| - Agricultural lands | 11 |
| - Water resources | 12 |
| 6. Agriculture and food security | 12 |
| - The Status of Food Security | 12 |
| - Provision of agricultural food | 13 |
| - Potential opportunities for wheat production | 14 |
| 7. Fish wealth and food security | 15 |
| 8. Major challenges which face agricultural and fish sector | 16 |
| - Agricultural and fish resources | 16 |
| - Plant production | 17 |
| - Animal wealth | 17 |
| - Fish wealth | 18 |
| - Institutional Structure | 20 |
| 9. Aims | 20 |
| - General aims | 20 |
| - Particular aims | 20 |
| 10. Plan Implementation Approach | 21 |
| The main component and subcomponent of the plan to support the role of agriculture and fish sector to improve food security. | 22 |
| Plan matrix | 23 |
| Approximate cost | 23 |
| The period of implementation of plan | 23 |
| Management of plan | 23 |
| Evaluation of plan | 23 |
| Expected results of economic, social and environment for plan | 24 |
| Tables. | |
| Table 7. Total cost of plan components | 24 |
| Table 8. Plan matrix to support the role of agriculture and fish sectors to improve the food security | 26 |
| Table 9. Approximate cost for the plan to support the role of agriculture and fish sector to improve food security | 45 |

Plan to support the role of agriculture and fish sector to strengthen food security

1. introduction

Yemen suffers from deterioration of agricultural and fish sector, particularly, since the outbreak of war in 2015, the farmers and fishermen suffer equally to get the production inputs from fertilizers, pesticides and improved seeds and necessary equipments for fishing and fuel derivatives. The activities of most who depend on pumping water from well utilizing the engines which operate using the fuels, and the trips of most fishermen to the sea for fishing stopped. Also, the government support for maintenance and operating the spate irrigation system led to low benefit from the flood flowing in the valleys and consequently the water goes to the sea. The deterioration expanded to include the agricultural institutions activities which support the production process and led to weaken or almost stop the activities of these institutions due to non-availability of operational budget or transferring the staff to retirement. All these accumulated factors led to retardation in agricultural and fish production in different governorates of the republic and simultaneously, raising the prices to create obstacle for the consumers to buy. During recent years, agricultural sector was affected much due the influence of climate change, there was heavy flood which causes considerable damage in spate irrigation systems and eroded agricultural lands and agricultural crops, also the storm and thunder led to loss of boats and fishing equipments owned by fishermen. Concurrently, the spread of corona disease (Covid – 19) directly or indirectly led to precautionary steps hindered the process to movement and internal and external transportation and mobility and its impact on agricultural and fish performance.

Despite the obstacles which hinder the agricultural and fish sector performance, yet agriculture forms the main economic pillar in Yemen and occupies second in rank after fuel derivatives.

Agriculture sector played a major role to contribute in achievement of food security, it attained complete self-sufficiency for most vegetables crops, fishes, poultry eggs and semi self-sufficiency in fruits, goat meat, sheep, and cows, but most of agricultural products such as wheat, white meat, cooking oil are imported from abroad.

The main current challenges are the impact of Russia – Ukraine war on importation of wheat, and cooking oil, since these two countries are the major sources for import of wheat and oil

2. Entities, authorities and agriculture and fish institutions relevant to implement the plan to support agricultural and fish sectors to improve food security

1. Government role to support agricultural and fish sectors to improve food security

The legal government encounters several challenges due to war and internal dispute, apart from the Russia-Ukraine war. These challenges represent the level of poverty, unemployment, and lack of food with rise in population, displacement, and limited resources. in addition to challenges related to

security situation and political instability. Therefore, the development of the rate of agricultural and fish sector to improve food security must play important role to encounter these challenges to increase the rate of production in agricultural sector and will help to create job opportunities and alleviate the rate of poverty and unemployment through improvement in food security and contribute to limit the factors affecting the sustainability in agricultural development , whereas, the continuation of dispute and unstable economy will continue to be the major challenges in development of agricultural and fish sector due to limited resources.

2. Ministry of Agriculture, Irrigation and Fish Wealth

The ministry of agriculture, irrigation and fish wealth is the main entity for agriculture and fish sector after the amalgamation of two ministries in one according to the outcome of dialogue in Riyadh and in accordance with the resolution (7) for year (2020). The ministry and its sectors are responsible for planning and agricultural policies and follow up and supervision of different issues related to development and agricultural and fish production and consequently, strengthen the agriculture and fish sectors to improve food security through supervision ,monitoring and follow up the strategies of plans which will be implemented by different sectors , authorities and institutions of the ministry through providing services and possible support for production . The main agricultural and fish authorities which will implement the food security plan and economic recovery for agriculture and fish sectors.

3. General Authority for Agricultural Research and Extension Authority

The duties of agricultural research and extension authority (AREA) and its research stations (5 research stations) in liberated governorates and two research centers carry the implementation of studies and research experiments related to improvement of production and provide improved seeds for varieties of cereals and implement trials on vegetable crops and fruits and maintain the available natural resources , The authority represented by its researchers was capable to produce several varieties of high yielding varieties (HYV) of wheat and cereals, resistant to diseases and agricultural pests and breed the foundation seeds and improved seeds which support the improvement of food security .

4. Authority for Marine science and marine Biology

The duties of the authority and its branches in the governorates (with two research centers) is to conduct studies and biology research on marine creatures (biology) and assess the status of fish stock and marine resources in coastal water and water of economical area and monitor the short and long term changes in environment and natural factors which affect in formation of commercial gathering of marine biology and marine environment and biotechnology related to raising selected types of commercial marine creatures , and improving the quality of related studies and research , with preparation of studies and scientific research in the area of raising economical fishes ,particularly, those on demand and develop fish traps and other marine biology with caution to protect the marine environment and protect it from pollution. The authority arranges investment in fish wealth sector

related to ideal economical exploitation for marine resources which will contribute to improvement of fish food security.

5. Authorities for fish traps

The authorities for fish traps work as part of the ministry and are four authorities (Gulf of Aden authority, Red sea authority, Arab sea authority and Al Mahrah governorate authority) distributed in governorates to implement the policies and plans and approved plans in fish sector in management , operation monitoring and development of fish traps and arrange exploitation of marine biology and their protection in gulf of Aden sea , Red sea ,Arab sea , AlMahrah and Soqotra islands , and complete monitoring on traditional fishing boats aimed to safeguard the marine biology and its sea environment from random fishing , detrimental behavior , development and improvement of its quality which may lead to sustainability and increase in its stock (population) with the aim of improvement of fish food security.

6. General Institution for seed Multiplication

General institution for seed multiplication and improved seeds and its branches and fields in the governorates is responsible for multiplication of foundation seeds which is provided by Agricultural Research Authority, executes the ministry policy to distribute improved seeds for different agricultural crops, particularly, cereal crops and legumes which is directed to improve security for farmers in cooperatives.

7. Agricultural Extension

Agricultural Extension carry out the duty of awareness program and agricultural extension media, apart from transfer of agricultural technology from institution affiliated to the ministry to the farmers. The extension is also a connecting link between farmers and other official entities and supporting organizations. The extension personal are available in all governorates and districts and agricultural locations and contribute in transfer of everything related agricultural production inputs and strengthen and improve food security.

8. General Institution for Agricultural services

It carries out the duty of importation and distribution of agricultural inputs which strengthen the food security (fertilizer, seeds, pesticides, machineries, and agricultural equipment's) which are according to specifications approved by the ministry.

9. Fund to Support Agricultural Production and Fish

The fund for support of agricultural production and fish through agricultural plant production animal and fish is aimed to support food production to fulfil the local need from wheat and other cereals, apart from fish wealth which contribute in improvement of self-sufficiency and food security.

10. Credit and Agricultural Cooperative Bank (CAC)

Credit and Agricultural Cooperative Bank was established to undertake the responsibility of funding agricultural sector and fish, as it provides loan and grants to small farmers and fishermen according to credit plan which is prepared annually in cooperation and consultation with ministry of agriculture, irrigation, and fish wealth in order to create sustainable development in agricultural and fish sector and contribute to improvement and strengthen food security.

11. Farmers and Fishermen

Farmers and fishermen are main source to crop management and fish wealth. The wheat production is strengthened from unit area according to farmers' awareness and crop management starting from ploughing, seeding to production, and marketing and it applies to fishermen from beginning to fish and marketing of fish.

12. Agriculture and fish cooperative union, and cooperative societies

The role of agriculture and fish cooperative union and cooperative societies is to strengthen supporting role for farmers and fishermen in production and marketing process in coordination with concerned entities.

13. Agricultural Input Merchants

Single enterprises or cooperative is engaged in business of agricultural inputs through importation and selling in market according to the plan, supervision and monitoring by Ministry of Agriculture and Fish Wealth.

14. Merchants and Societies for Marketing of Agricultural Products

It is a single enterprise or cooperative which purchases, stores and sells the local agricultural products or importation of agricultural products from abroad and marketing, as this involves a series of marketing process starting from the farm to local and central markets until it reaches to the consumer. In this chain of marketing process the marketing price is added to the produced or imported commodity. At this stage, it is necessary to set control and regulation and monitoring actions.

15. The Role of Donors to Support the Plan for Improvement of Food Security for Agricultural and Fish Sectors

The donors supported and financed several programs during the period of war, starting from humanitarian and rescue aids directed to malnutrition and famine and economic recovery and projects to improve living standard and food security apart from training program and rehabilitation of workers in agricultural and fish sector in target areas. Most support from international donors was implemented directly on target groups through selection of local partners to implement the activities and programs far from the actual participation of government and official enterprises, as most implemented program was restricted to limited areas and the implemented projects are not sustainable. The donors are requested to reconsider the necessity to switch from cash support and humanitarian and rescue aids to sustainable projects in order to achieve economic recovery and

economical empowerment .There are new directions from donors to support agriculture development in Yemen through preparation of strategy for agriculture and fish sector , and in future, the projects and programs will be implemented by donors in coordination with Yemeni government and to participate in supporting to finance the plan for role of agriculture and fish sector in improving food security in agriculture and fish wealth.

3. Tables summary of plan to strengthen and improve food security

Table 1. Summary of total cost of components for plan to strengthen the role of agriculture and fish sector to improve food security (for period 2023 -2027)

| Component | Name of main component | No Of activities | Estimated cost (\$) | Estimated cost 1000 rials | Rate % |
|----------------|--|------------------|---------------------|---------------------------|------------|
| First | Agriculture and fish resources | 27 | 27,363,000 | 30,445,019 | 34 |
| Subcomponent 1 | Agricultural lands | 7 | 3,465,000 | 3,856,545 | |
| Subcomponent 2 | Irrigation water | 8 | 18,480,000 | 20,568,240 | |
| Subcomponent 3 | Aquatic biology | 2 | 4,410,000 | 4,908,330 | |
| Subcomponent 4 | Labors | 10 | 1,008,000 | 1,121,904 | |
| Second | Wheat, cereals and legumes | 39 | 5,581,800 | 6,212,543 | 7 |
| Subcomponent 1 | Wheat | 10 | 3,177,300 | 3,536,335 | |
| Subcomponent 2 | Sorghum and millet | 10 | 966,000 | 1,075,158 | |
| Subcomponent 3 | Maize | 10 | 798,000 | 888,174 | |
| Subcomponent 4 | Legumes | 9 | 640,500 | 712,877 | |
| Third | Vegetables and fruits | 11 | 12,117,000 | 13,486,221 | 15 |
| Subcomponent 1 | Palm | 8 | 9,649,500 | 10,739,894 | |
| Subcomponent 2 | Cultivation in protected house | 3 | 2,467,500 | 2,746,328 | |
| Fourth | Cash crops | 19 | 4,292,925 | 4,778,026 | 5 |
| Subcomponent 1 | Cotton | 6 | 2,378,372 | 2,647,284 | |
| Subcomponent 2 | Coffee | 5 | 812,175 | 903,951 | |
| Subcomponent 3 | Sesame | 4 | 551,119 | 613,395 | |
| Subcomponent 4 | Groundnut | 4 | 551,119 | 613,395 | |
| Fifth | Animal wealth | 48 | 5,701,500 | 6,345,770 | 7 |
| Subcomponent 1 | Goat and sheep | 14 | 2,404,500 | 2,676,209 | |
| Subcomponent 2 | Cows and camel | 14 | 1,050,000 | 1,168,650 | |
| Subcomponent 3 | Poultry | 11 | 966,000 | 1,075,158 | |
| Subcomponent 4 | Honeybee | 9 | 1,281,000 | 1,425,753 | |
| Sixth | Fish wealth | 25 | 7,010,850 | 7,803,076 | 9 |
| Subcomponent 1 | Fish traps | 4 | 577,500 | 642,758 | |
| Subcomponent 2 | Marine landing center | 7 | 2,818,200 | 3,136,656 | |
| Subcomponent 3 | Fish cooperative society | 6 | 2,217,600 | 2,468,188 | |
| Subcomponent 4 | Fish export | 8 | 1,397,550 | 1,555,474 | |
| Seventh | Institutional structure | 50 | 18,474,750 | 20,562,397 | 23 |
| Subcomponent 1 | Gen Authority for Agric. Research and Ext. | 18 | 1,989,750 | 2,214,592 | |
| Subcomponent 2 | Gen. Author. For Marine science and Mar. Biology | 8 | 1,732,500 | 1,928,273 | |
| Subcomponent 3 | Gen. Corporation for seed multiplication | 4 | 577,500 | 642,758 | |
| Subcomponent 4 | Gen Corporation for agric. Service | 8 | 3,885,000 | 4,324,005 | |
| Subcomponent 5 | Agric. Institutions and govt. Offices | 10 | 10,290,000 | 11,452,770 | |
| Total | | 219 | 80,541,825 | 89,643,052 | 100 |

Table 2. summary of total cost for activities of wheat and cereal production in ministry plan to strengthen the role of agriculture and fish wealth sector to improve food security for period 2022-2027

| Main component | Subcomponent | No of activities | Estimated cost (\$) | Estimated cost 1000 rials |
|----------------|---|------------------|---------------------|---------------------------|
| First | Agricultural lands | 7 | 3,465,000 | 3,856,545 |
| | Irrigation water | 6 | 9,869,712 | 10,984,989 |
| | Labor | 3 | 105,001 | 116,866 |
| Second | Wheat, cereals and legumes | 39 | 5,581,800 | 6,212,543 |
| | Agricultural machinery | 2 | 157,500 | 175,298 |
| Seventh | Improved seeds | 3 | 520,508 | 579,325 |
| | Encourage investment in wheat cultivation | 2 | 315,000 | 350,595 |
| Total | | 62 | 20,014,521 | 22,276,162 |

Table 3. Summary for total cost of activities for fish wealth in the ministry plan to strengthen the role of agriculture and fish sector to improve food security for period 2022-2027.

| Main component | Subcomponent | No of activities | Estimated cost in (\$) | Estimated cost in 1000 rials |
|----------------|---|------------------|------------------------|------------------------------|
| Sixth | Aquatic biology | 2 | 4,410,000 | 3,908,330 |
| | Subcomponent for fish wealth | 25 | 7,010,850 | 7,803,076 |
| Seventh | Marine science authority | 8 | 1,732,500 | 1,928,273 |
| | Fish institutions and authority | 4 | 7,739,694 | 8,614,279 |
| | Preparation of studies (from total ministry budget) | 1 | 400,000 | 445,200 |
| Total | | 40 | 21,293,044 | 23,699,158 |

Dollar= 1,113 Yemeni rials

4. Global Food Security Indicators (GFSI)

According to the latest record of global food security indicators (GFSI, 2021)¹, there is improvement in global food security during the past ten years, the degree of GFSI reached its peak in all countries in 2019, before it decreases during the past two years during Covid -19, the dispute and climate variability, there was a decline in GFSI degree in all countries with all levels of different income. According to GFSI reports, the famine and absence of food security continues, whereas the risk related to weather and climate change, in addition to the distorted government food policy causes risk on the prices of food products and availability of food now and in future. The countries with high income in Europe still on the top of indicator list, as Ireland occupied first place among 113 countries, and scored

⁽¹⁾ <https://impact.economist.com/sustainability/project/food-security-index/index>

84 degrees, whereas Burundi occupied the last place and scored 34.7 degrees only and Yemen occupied before the last and scored 35.7 degrees, with the rate of 42.5 % from Ireland. At the level of food security components, Yemen occupied 96 and 39.3 degrees for the capability to tolerate the costs, and 112 in rank, and 27.6 degrees for food provision, and 108 rank and 37.4 degree for goodness and food safety and 96 rank and 42.1 degree for natural resources and ability to resilience.

5. Status and indicators of agriculture and fish sectors

Agricultural area and yield

The area of Yemen is 55 million hectares ,of which 1.4 million hectare is cultivable at the rate of 2 % and cultivated lands during 2016 -2020 is 1104182 hectares , of which the area occupied under cereals is 523985 hectares at the rate of 47.5 % from total cultivated area and produced the yield 456714 tons, whereas, the average area under wheat is 59190 , at the rate of 10.7 % from the total area under cereals during the same period yielded 102256 ton , This quantity of yield does not exceed 4% from the total wheat consumption which is 2.9 million ton, and it forms a large gap , which require political and other action to reduce it and alleviate the burden of importation on the government , and this is the main goal from preparation of this project. The area of fodder reached 135593 hectares at the rate of 12.3 % from total cultivated area and produce 1655718 tons, the area under fruit is 89811 hectares at the rate of 8.1 % from total cultivated land and produce 906938 ton, the area occupied under vegetable 67066 hectare at the rate of 6.1 % from total cultivated area and produce 852049 ton. The area under legume is 42993 hectares at the rate of 3.9 % from total cultivated area and yield 80187 ton, the area under cash crop is 77216 hectares at the rate of 7 % from total cultivated areas and produce 75983 ton and the area under qat is 167518 hectares at the rate of 15.2 % from total cultivated area and produce 207336 ton².

Fish Production

Yemen is distinguished by long coastal strip nearly 2500 km long and has a diverse coastal habitat rich in marine resources, the fish sector is considered a promising sector to achieve economic diversification and accomplish food security in the country through creating job opportunities and achieve economic development for poor citizens. Estimations show that the production of Yemen from fish and marine biology was nearly 200 thousand tons before the outbreak of dispute and exported between 40 % to 50 % from this produce.

Social dimension for fish and agriculture sector

The agricultural sector employs nearly 60 % from the population and provide the means of living (livelihood) for rural population which constitute 76 % from the total population. The role of rural women is always evident in different aspects of life in Yemeni village, particularly, her economical role

⁽²⁾ Agriculture Statistics yearbook, 2020.

through contribution in agricultural production activities with or without wages, as women workers in agricultural sector are 72 % from the total women worker force. On the other side, the working women in agriculture sector and fish hunting occupy 51 % from total worker in different professions against 26 % of men³ . The fish sector is a source of livelihood and income for 9 million population⁴ .

Economic dimension for agriculture and fish sector

Agriculture sector plays a major role provide the population food, agricultural products and necessary raw material for different agricultural industries and agriculture and fish sector contribute at the rate of 20.3 % of which fish sector contribute at the rate of 3.6 % from gross domestic product (GDP) in Yemen⁵. These rates may be reduced if all the oil activities are not resumed. The contribution of agriculture sector in export and trade balance, the statistics of foreign trade in Yemen, that total cost of export in agriculture and fish occupy the rate of 47.2 % from total export for 2017⁶.

Environmental dimension for agriculture and fish sector

Yemen enjoys dry and semi dry climate with limited water resources. Temperature and rainfall are variable, and rainfall is adequate due to wide range of altitudes from the sea level and reaches more than 3700 meters. the annual temperature fluctuates less than 15°C in high altitudes to 30°C in coastal plain. The temperature rises in summer up to 40 °C at coastal areas and more than 40 °C in desert plateau areas. Due to variability in topography and climate, Yemen is divided into three environmental and agricultural regions, coastal region, high altitude, and desert plateau. With this environmental division, Yemen is fortunate to have agricultural products particularly, fresh vegetables throughout the year. Yemen suffer from water scarcity which is necessary to alleviate this situation with actions to be taken, particularly, to improve the use of water efficiency in the field.

In terms of fishing, Yemen is distinguished with coastal strip 2500 km long, and include three marine ranges which are, red sea, Gulf of Aden, and Arab sea.

Agricultural Resources

Agricultural lands

The area of Yemen is 55 million hectares, of which nearly, 1.4 million hectares is suitable for cultivation, at the rate of 2.5 %. The area under pasture is 22.6 million hectares and at the rate of 48.6%. The area of forests and woodland is 1.5 million, at the rate of 3% from total area of Yemen.

³ Statistics center. results of manpower 2013/ 2014)

⁴ UNDP, Economic Resilience and recovery unit, Fisher value chain, A market study with potential COVID-19 impact analysis, supporting resilience livelihood and food security in Yemen, A joint programme July 2020 (<https://www.impactresearch.ce/>)

⁵ Center for Statistics, Statistics yearbook 2017, July 2019

⁶ Center for Statistics, Statistical yearbook ,2019

Water resources

Rainfall: The total rainfall is estimated nearly 67.2 billion cubic meter /year, whereas the annual average rainfall in Yemen does not exceed 157 mm/ year, as the rainfall cover 100 mm/ year (72.8 %). The rainfall covers 100- 300 mm/ year (16.8 %), as more than 300 mm/year covers 10.4 % of total area.

Surface water: Yemen is divided into four main basins which are, red sea basin, Gulf of Aden basin, and Arab sea basin and Empty Quarter basin, and each basin is considered of several valleys and surface waterways, and subsurface waterways and its quantity is estimated nearly 2.5 billion cubic meter /year⁷.

Groundwater: Total stored water is estimated nearly 10370 billion cubic meters, of which 1525 million cubic meter are renewable water, at the rate of 0.02 % from total ground water. In Mukalla, (area of governorate) and Ramlat Al Saba'ateen has stored water estimated 10,000 billion m³, at the rate of 96.4 % from total groundwater. The rainfall which falls directly or indirectly to the saturated surface is the main source to feed groundwater, as the direct feeding to groundwater is generally low due to dry climate and low rainfall. More than 85 % of groundwater which are pumped from wells for irrigation, is estimated nearly 50,000 wells in the country.

The agricultural sector is affected by series of linked natural factors and human intervention. This require considering the balance for these factors to ensure sustainability particularly, due to limited natural resources as it is in our country.

Marine water Resources

The Republic of Yemen has extended coastal strip 2500 km long, in addition to Soqotra Archipelago and other islands, and the area of Continental shelf which is rich in biological production for northern Yemen coast of Gulf of Aden, Red Sea and Soqatra archipelago coast and exceed 50 thousand sq. Km. The production of one sq. Km. 2.7 ton, and this estimation exceeds the biological production for tropical sea in the world, and estimated 0.2 ton/ sq. Km. Which puts the Republic of Yemen among the countries due to its living marine resources in the world. The types are numerous, as more than 360-430 types fishes are found and 35 types of other marine biology (slugs and crustaceous), and the type which has commercial importance are exploited. Among the fishes less than hundred types of marine biology are exploited.

6. Agriculture and Food Security

The Status of Food Security

The absence of food security is a chronic problem since a long time, as it is deteriorated to the level, which is alarming during the past few years, the dispute is the main process to aggravate the situation.

⁷ Ministry of oil and mineral Resources-General Department of Hydrology; TNO Institute of Applied Geoscience. The Netherland, The water resources of Yemen Report WRAY -35, March 1995.

The armed conflict and relevant trauma led to acute absence of food security in all the country, as the result of integrated stages of classification analysis revealed the absence of food security during period from January to May 2022 , and 17.4 million population at the rate of 54 % of the population suffer from famine , and it is expected that this figure may increase in December 2022 to 19 million population at the rate of 60 % from the total population which is 31.9 million according to population projection for 2022⁸.

Provision of agricultural food

Wheat is considered as old crop which the man planted and improved it for thousand years till today⁹ and occupies the second rank according to world yield for cereals after maize. The area harvested globally in 2022 was 219 million hectare and produced 761 million metric ton of cereals and average yield 3.5 metric ton /hectare¹⁰. In Arab countries, the cultivated land for year 2019 nearly 1.1 million hectare and yielded 26 million metric ton of cereals with average yield 2.38 /hectare ¹¹. In Yemen, the wheat cultivation is under rainfed and irrigated systems, but the production of wheat cover only 4 % of total consumption, and the food gap is emerging at the rate of 96 % and is covered through importation from world wheat market, also the provision of cooking oil, sugar, rice and milk is dependent on importation, despite there is milk production and its derivatives, but is very limited as it is for white meat. For vegetables and eggs, there is self-sufficiency, for fruit provision and meat, there is semi self-sufficiency as it is in the following table 4.

Table 4. Provision of main food commodities

| Commodity | Local consumption (ton) | Local production (ton) | Per capita consumption (kg) | Self-sufficiency (%) | Food gap % |
|--------------------|-------------------------|------------------------|-----------------------------|----------------------|------------|
| Wheat | 3,011,240 | 118,348 | 94,4 | 3,9 | 96,1 |
| Sorghum and millet | 319,000 | 287,023 | 10,0 | 90,0 | 10,0 |
| Vegetables | 618,810 | 852,049 | 19,4 | 137,7 | 0,0 |
| Fruits | 992,090 | 906,938 | 31,1 | 91,4 | 8,6 |
| Red meat | 271150 | 220244 | 20 | 81.2 | 18,8 |
| White meat | 312620 | 193,086 | 9,8 | 61,8 | 38,2 |
| Eggs (million) | 1200 | 1449 | 38 | 120,8 | 0,0 |
| Milk | 1072786 | 388158 | 33,6 | 36.2 | 63,8 |

Source: Annual agricultural statistics year book 2016 2020

<https://ourworldinsata.org/grapher/vegetable-consumption-per-capita>

⁸ Fao, Integrated stage characterization for food security in Yemen 2022.

⁹ Wolde , G.m. , Mascher ,M ., and Schnurbusch ,T. (2019) : Genetic modification of spikelet arrangement in wheat increases grain number without significantly affecting grain weight . Molecular Genetic and Genomics, 294,468-457

¹⁰ Fao (2021) Food and Agricultural Organization of the United Nations. <http://faostat.fao.org/site/339/default.aspx>.

¹¹ Arab League for Agricultural Development (2020) Statistical Yearbook for Arab Agriculture, League of Arab States

Wheat occupies the rate 37 % from the total import invoice for main food commodities which costs 3.23 billion dollars during the year 2021 followed by rice 18 %, cooking oil 16 %, milk 13 %, and flour 8 % and sugar 8 %. Due to armed confrontation between Russia and Ukraine, the price of wheat increased globally in last February, which reflects mostly to the condition of uncertainty in world offer under potential disturbances in export from Russia and Ukraine, which are the main source for wheat. The trade activities with Ukraine and Russia were reduced at the rate of 5.3 % and 4.8 % on monthly basis in the price of the origin of Russia. On the contrary, this led to the resulting shift in demand to other main sources to increase the price American wheat, Argentinian and Australian at the rate of 2.0 %, 2.6 % and 2.3 % respectively¹². No doubt that this situation will affect the quantities of imported main food commodities, particularly, wheat and their nutritional safety, if the nuclear weapon is not used in this conflict, as this will increase the suffering from non-existence of food security in Yemen, and this matter require immediate political and prudent action to help anticipated confrontation of crisis.

Potential opportunities for wheat production

The main promising regions for cultivation are eastern region and high mountainous regions (northern and central) which include governorates Marib, Hadhramaut, Shabwa and AlGawf and has unique advantages from other regions such as groundwater availability, suitability to introduce agricultural machineries which gives priority in wheat cultivation with profitability, with twice the current level in the same agricultural area.

In case of adapting integrated package of modern production technology, there is a potential opportunity unexploited to increase the wheat production in promising regions (Eastern regions and mountainous altitudes) and achieve an increase in the rate of self-sufficiency of wheat apart from providing job opportunities and increase in agricultural family income.

The total return from irrigated wheat crop production per hectare is \$2700 and the cost of production \$ 1750 with net return \$950¹³. These data indicate the economic feasibility and encourage its cultivation locally, considering that cost of production of wheat locally is higher than the cost of imported wheat and its return is less than the return from vegetables and fruit crops and cash crops particularly, qat. Despite this available data , the wheat is still a strategic commodity connected to the security and independence of the country and need to deal with the food gap in wheat with the view of strategic on short, medium and long term and is focused on vertical and horizontal expansion for wheat production and strengthen the agricultural trade balance with increasing the yield and export for comparative advantage crops and reduce the qat production and the effect on consumption

¹² FAO, FPMA, ISSN2707 -1952, 10, March 2022.

¹³ Ministry of Planning and International Cooperation _ Studies and Economic Expectations and Economic and Social sectors in Yemen. (38), November 2018.

pattern and direct aid programs from international humanitarian organizations to support and stimulate the Yemeni farmer to activate production , training and switch from aid consumer to producer of crops.

7. Fish Wealth and Food Security

Considering the large stock of fish wealth that Yemen own and enable it to contribute in implementation of food security strategy and forms the development of fish sector important to achieve the aims of the plan to alleviate poverty and unemployment through job opportunities and improve the income of poor in coastal communities, apart from its participation in diversification of production sources and income in Yemen economy. This sector also strengthens the export in infinite quantities of fish and marine biology increases the return in foreign currency, in case of support to the fish sector which is exposed to several obstacles due to war and dispute apart from the damage due to flood disaster and climate change.

Table 5. Fish food provision. Total fish and marine biology production for Republic of Yemen during 2010-2021

| Year | Fish production (ton) | Fish Export (ton) | Local consumption (ton) | Average per capita (kg) |
|------|-----------------------|-------------------|-------------------------|-------------------------|
| 2010 | 196,762 | 111,779 | 84,983 | 3,663 |
| 2011 | 198,554 | 114,162 | 84,392 | 3,545 |
| 2012 | 207,315 | 115,258 | 92,057 | 3,757 |
| 2013 | 203,121 | 109,119 | 94,002 | 3,730 |
| 2014 | 192,014 | 97,685 | 94,329 | 3,642 |
| 2015 | 82,268 | 0 | 0 | 0 |
| 2016 | 89,121 | 47,627 | 41,494 | 1,514 |
| 2017 | 100,885 | 63,855 | 37,030 | 1,317 |
| 2018 | 121,163 | 67,094 | 54,069 | 1,870 |
| 2019 | 169,548 | 76,595 | 92,953 | 3,129 |
| 2020 | 188,958 | 93,346 | 95,612 | 3,145 |
| 2021 | 191,375 | 147,000 | 44,375 | 1,422 |

Source: Fish production and marketing service sector +Planning and projects sector in ministry of Agriculture, Irrigation, and fish Wealth

Annual growth in yield at the rate of 10 % to 20 % during the last three years, as the production declined during the outbreak of war to nearly half in 2021 (Table 5). The total export for fish was 147000 tons (table 6) with total cost 372 million dollars, and it is noted that increase in fish export quantities from 111,779 ton in 2010 to 147,000 ton in 2021. This increase is attributed to increasing demand in Yemeni fish in Europe markets. The trap experts expect increase in fish export to countries of European Union in case of continuation of Russia –Ukraine war in next years

Table 6. Exported quantities of fish (2010-2021)

| Year | Export quantities(ton) | Cost (million) \$ | Year | Export quantities(ton) | Cost (million) \$ |
|------|------------------------|-------------------|------|------------------------|-------------------|
| 2010 | 111,779 | 272 | 2016 | 47,627 | 107 |
| 2011 | 114,162 | 290 | 2017 | 63,855 | 161 |
| 2012 | 115,258 | 292 | 2018 | 67,094 | 146 |
| 2013 | 109,119 | 294 | 2019 | 76,595 | 180 |
| 2014 | 97,685 | 269 | 2020 | 93,346 | 228 |
| 2015 | 0 | 0 | 2021 | 147,000 | 372 |

Source: Agriculture and Fish production and marketing sector in Ministry of Agriculture, Irrigation and Fish wealth

8. Main challenges which face the agricultural and fish sector

Agricultural and fish sector encounter several challenges which are classified according to resources and production sector as follows:

1. Agriculture and fish resources:

- Limited land and water resources.
- Desertification due to climate change and overgrazing and erroneous agricultural practices.
- Deterioration of several agricultural lands irrigated from well water, with continuous depletion of groundwater and its deterioration.
- Fluctuation in agricultural crop production under rainfed system due to variation in quantity of rainfall and irregular followed by years of drought.
- Deterioration of spate irrigation system and difficulty to control spate (flood) water flowing in valleys and deprive agricultural lands to benefit from it.
- Urban sprawl on agricultural lands.
- Lack of information on animal types, and strains in Yemen.
- Deterioration of some genetic characteristics in some animal strains due to internal raising (inbreeding) between members of same herd.
- Low awareness among raisers in genetic improvement of animals through the application of different ways of raising from genetic selection, hybridization, and genetic mixing.
- instability which is noted in Yemen cities, which not only affected fish activities in general, but on several government institutions and most of these are not functioning.
- Absence of the role of fish extension in fishing area, which is important to transfer and set correct concept for fishing and increase the fishing culture among fishermen and

amateurs and commitments during closing period and open fishing seasons to preserve fishing wealth.

2. Plant Production

- Low yield in most agricultural crops compared to yield at regional or global level and is attributed to several causes, mainly deterioration of varieties, weak crop management.
- Spread of pests particularly migrated pests and its impact on fruiting trees and vegetables.
- Difficulty in application of thrasher and harvester due to absence of modern technologies and farmers depend on traditional methods with low production and high cost.
- Low price of imported wheat compared to local production and this situation does not encourage farmers to cultivate this crop unless there is encouraging policy for local producers.
- Small agricultural holdings (lands) and fragmentation caused by inheritance is the main obstacle to introduce technologies for crop management such as modern irrigation system and machineries (thresher and harvester).
- Marketing lacks the presence of integrated mechanism which ensures the marketing of agricultural products and local cereals as the farmer suffer from loss related to marketing their products, as it happens every year during the production season of tomato.
- High cost of production due to high prices of agricultural inputs and prices of fuel derivatives due to deterioration of local currency.
- Deterioration of cotton cultivation due to decrease in prices of cotton produced and deterioration of gins and marketing mechanisms.
- The storage of grains is restricted to personal efforts of farmers in storage of their products in case of incapability to marketing. There is no entity which undertakes the process of storage except imported grain merchants and in limited range.

3. Animal Wealth

- Low production of farm animals due to deterioration in production and reproductive traits.

- Low awareness among raisers in genetic improvement in animals through application of different methods of raising in selection, hybridization, and genetic mixing.
- Low response in animal production due to negligence of raisers to provide suitable shelter.
- Selling animals in early age and ignore fattening process.
- Dependence of herd management on women with spread of illiteracy and low skill.
- Lack of technical, specialized knowledge in animal production.
- Low production of concentrated feed from cereals and legumes.
- Weakness of traditional management to manage pastures and deterioration of natural pastures.
- Low features of production, and types of fodder crops and waste of fodder due to offering to the animals in unsuitable ways.
- Low education level of raisers in animal feeding through the use of concentrated feed system at different stages in age, and stages of production.
- Weak application of veterinary quarantine action on imported live animals due to inadequate wild quarantine.
- Weak monitoring of risk of transboundary diseases and common between human being and animals.
- Poor protection from epidemic diseases with poor treatment of disease.
- Rise in prices of veterinary medicines with shortage in veterinary laboratories.
- Absence of the role of veterinary extension related to veterinary services and principles of animal health.
- Less areas planted with fodder crops of different kinds under rainfed and irrigated cultivation.
- Follow the traditional storage system, not suitable, with poor marketing system for fodder.
- Poor local experience in honeybee raising (keeping). Weak government projects which serve

4. Fish Wealth

- Absence of scientific studies and research on condition of fish resources and fish stores, and quantities permitted to fish, not to exceed the specified ceilings for fishing due to lack of facilities, information and knowledge on the quantity and type of stored

fishes in terms of commercial feasibility, endangered species and coral reefs and other related aspects in marine environment and marine habitat.

- Random fishing by some traditional fishermen also destroyed the fish stores and led to decline in production quantity and subsequently, low income of fishermen despite the availability of legislative structure and fishing regulations.
- Storage of data and information related to the size and type of fish stock in terms of commercial feasibility and endanger species and coral reefs and other aspects related to marine environment and marine habitat.
- The hunting (fishing) tools and methods are traditional in Yemen and lessen the use of equipments and developed technologies and consequently, this lowers the quantities of production. Also, the destructive fishing practices which is used among fishermen, threaten the sustainability of this sector.
- Weak infrastructure of fish sector and low operational efficiency.
- Less interest in development of human capability.
- High cost of fuel and different fish production inputs.
- Poor maintenance of boats and equipments due to lack of central workshop serving the farmer in coastal areas with lack of capability to buy modern equipments for fish and determine the location of fish.
- Strict monitoring for fish tools and equipments which is detrimental to marine environment and fish stock.
- Weak organizational and administrative structure for fish cooperative societies and control of individual work spirit on collaborative work spirit.
- Deterioration of fish export mechanism and low quantity of fish limits the process of competition in foreign markets.
- Modernize the process of marine monitoring and control fishing beyond the laws to achieve ideal fishing and monitor tools and suitable methods for marine environment and development of stock of marine biology and set necessary policies for extension, fish media and awareness of environment.
- Turbulent rise in fuel prices and fishing tools and rise in cost of living generally, creates difficulty to practice fishing profession and continue it, many fishermen left this profession due to its danger, and search for other easy source of livelihood to secure

food for him and his family. This poses threat to food security in fish and marine biology for inhabitants in different governorates.

- Continue fish farming experience and encourage investment in this viable activity and extract biological techniques with economic feasibility in commercial marine biology farming suitable for Yemeni environment.

5. Institutional structure for Agriculture and fish sector

- Extinction of human potential in agriculture and fish resources, due to transfer of cadres and agriculture and fish manpower on retirement and employment stopped since ten years.
- Deterioration of infrastructure of agricultural and fish institutions and authorities due to intentional destruction of institutions during war, stealing the properties of most institutions.
- Weakness of the elements of research activities in agriculture and fish sector (Plant, animal and fish laboratories, veterinary quarantines, marine biology research center, environmental pollution etc.. Low technical and administrative efficiency and poor experience of majority of it.
- Weak financial budget for government institutions subject to the government accounts sector, and no availability of financial budget for institutional and authority activities affiliated to economical unit sector. No budget for fellowships, training, awareness and education and media.

9. Objectives

1. General objectives:

General aim is to participate in alleviation of poverty and improvement of food security in Yemen through improving agricultural and fish production qualitatively and quantitatively through ideal use of natural resources and introduction of modern technologies.

2. Particular objectives:

1. Idea use of agricultural and fish resources
2. Increase in cereal production particularly, wheat to narrow the food gap.
3. Expansion of palm trees cultivation and increase production of dates as source of food and energy.
4. Expansion of cash crop cultivation and improve its management.
5. Increase income and improve farmers 'and fishermen livelihood.

6. Improve infrastructure for institutions and authorities in agriculture and fish.
7. Establish modern statistics system in fish sector.
8. Rehabilitation of infrastructure for irrigation and improved water use.
9. Improve the environment of investment in agriculture and fish sector.
10. Increase cattle production and animal production and increase economic return and well-being from livestock keepers.
11. Strengthen integration between animal and plant production.
12. Strengthen integration between agriculture and fish sector and other economic sectors.
13. Improve research and agricultural extension and fish and use of modern technology in agriculture and fish.
14. Improve research in marine science, marine (aquatic) biology and use of modern technologies in fish.
15. Development of agricultural and fish export and diversification of export market.
16. To strengthen the relationship between agriculture and fish production and export with requirements.
17. To strengthen participation of women in agricultural development.

10. Plan implementation approach

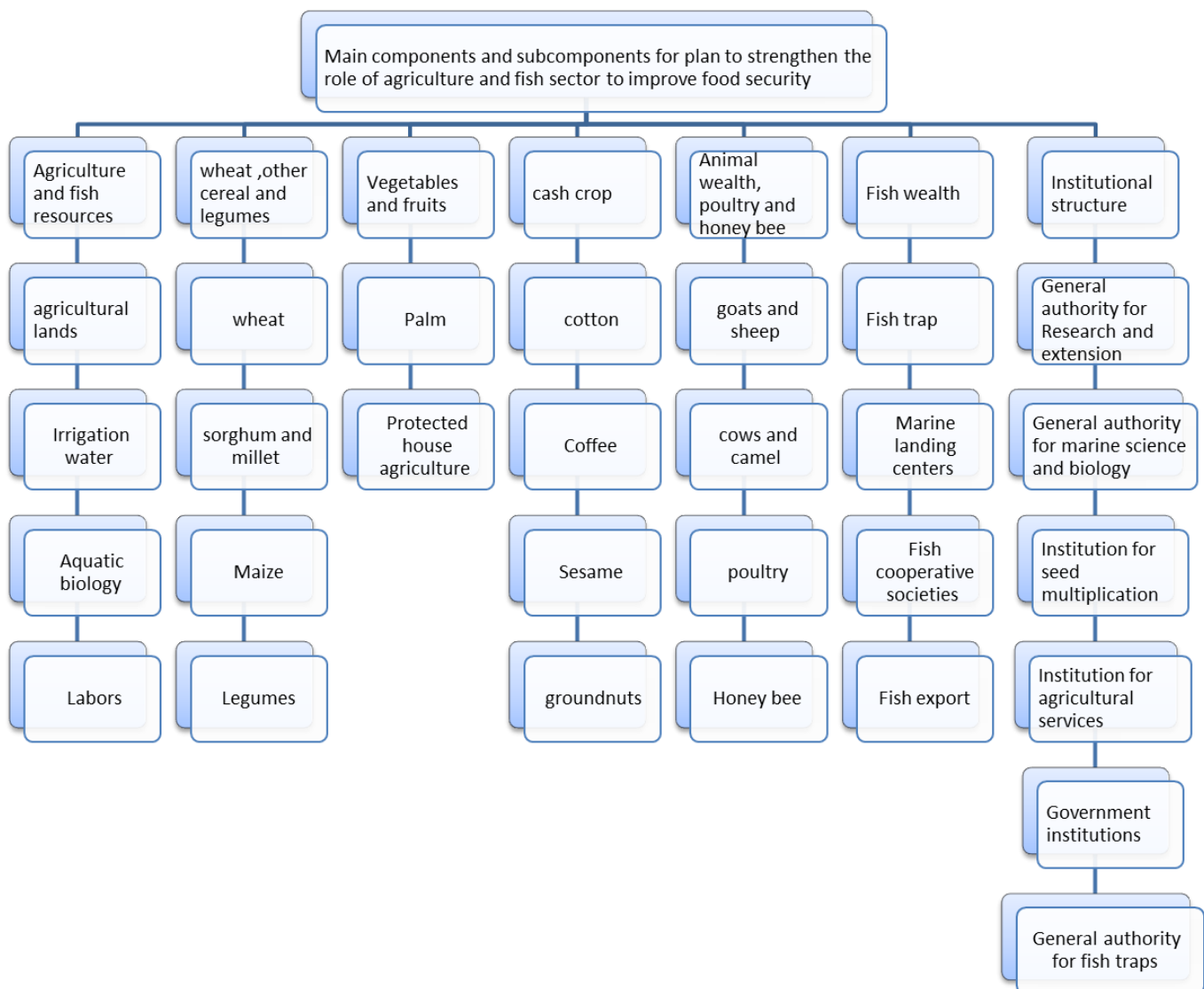
The approach to plan implementation depends on ideal use of available agricultural and fish resources and consider new technologies worth to achieve sustainable management of resources and increase in yield from unit area, the approach to ideal use of resources is related to improved agriculture and high quality fish to ensure food safety and the relationship with famine and on climate change and also with general aims of the plan. This plan will be implemented to reduce the food gap from wheat and cereals, sorghum, millet and improve production and quality vegetables and fruits and cash crops, in addition to, development of animal wealth and poultry and improve its production to ensure achievement of agriculture and fish development and strengthen the role of agriculture and fish sector to improve food security in Republic of Yemen.

Production: Sustainable increase in the yield of agriculture and fish and increase in farmers' and fishermen income, without negative effect on agriculture and marine environment. This will improve food security in a positive manner.

Adaptation: To reduce exposure of farmers to short term risks strengthening their capabilities to resilience through building capacity for adaptation and flourishing to cope with long term shocks and pressure. This is essentially emphasized on technology transfer and capacity building of end users for the plan which includes cereal growers with limited resources to safe the production and capacity to adapt with climate change. Within this context, the present plan approach will be divided into seven main components and accommodate the agriculture and fish sector as follows:

1. Agriculture and fish resources.
2. Wheat and other cereal and legumes
3. Vegetables and fruits
4. Cash crops
5. Animal wealth, poultry, and honeybee
6. Fish wealth
7. Institutional structure.

The main components accommodate subcomponents as stated in the following scheme:



Plan Matrix

The plan includes activities matrix distributed in seven main components, described earlier and includes 28 subcomponents; the total activities included in this plan are 219 activities (Table 8).

Estimated cost:

The estimated cost is US \$ 80,541,825 (Eighty million, five hundred forty thousand and eight hundred twenty-five) as stated in table 7 and table 9.

Period of Implementation of the plan: Five years (2023- 2027)

Plan Management:

The Ministry of Agriculture, Irrigation and Fish Wealth and its specialized branches in the center and governorates will undertake the responsibility of supervision and follow up to implement all the activities included in this plan. The follow up committee for plan implementation will be appointed, headed by Minister of Agriculture and Irrigation and membership of representatives of relevant entities, efficient specialists will be selected to determine the implementation requirements from machineries, equipment's etc. Necessary for work, The Authority for Agricultural Research is responsible to produce technologies to improve agricultural and animal production quantitatively and qualitatively and provide improved seeds, consistent with sustainable management for renewable natural resources. Similarly, the Authority for Marine Science and Marine Biology will be responsible to generate improved technologies to improve fish production qualitatively and quantitatively, consistent to sustainable management for marine resources, also the General Institution for seed multiplication will be responsible for improved seed multiplication and its distribution to farmers. Also, other institutions for services affiliated to Ministry of Agriculture and Irrigation and Fish Wealth all in the field of specialization to follow up and implement the activities included in this plan. There will be coordination in different aspects of agricultural and Fish wealth activities in the plan with partners related to ministries and government institutions particularly, and merchants. The Agriculture and Fish cooperative union and cooperative societies and private sector, Credit and Agricultural cooperative Bank (CAC) as real partner to strengthen food security through implementation of this plan.

Evaluation of the plan

Specialists in the area of plan and projects evaluation will be appointed, to assess the performance and return at farmers' level and all relevant entities related to institutions and merchants at state level, and review the benefit level from financial resources approved to implement the plan.

Table 7. Total Cost of plan components

| Main components | No of activities | Estimated cost (\$) |
|--------------------------------|-------------------------|----------------------------|
| Agriculture and Fish resources | 27 | 27,363,000 |
| Wheat, cereals and legumes | 39 | 5,581,800 |
| Vegetables and Fruits | 11 | 12,117,000 |
| Cash Crop | 19 | 4,292,925 |
| Animal wealth | 48 | 5,701,500 |
| Fish Wealth | 25 | 7,010,850 |
| Institutional Structure | 50 | 18,474,750 |
| Total | 219 | 80,541,825 |

11. Expected results of economic, social and environment for plan

Economical results:

- Increase in area under wheat from 60000 hectares to 170000 hectares, with increase in wheat yield from 118348 ton /year to 510000 ton/year and reduce food gap from 96 % to 83%.
- Increase in yield from unit area planted sorghum and millet from 0.76 to 1.7 ton /hectare, to increase the yield from 237120 ton/ year to 530400 ton /year.
- Increase in yield from unit area planted with maize from 0.48 to 1.5 ton /hectare, and subsequently, increase in yield from 16704 ton /year to 52200 ton /year.
- Increase in yield of legumes (cowpea, kidney bean and beans) from 80000 ton /year to 100000 ton / year
- Increase in dates production from 64000 ton to 70000 ton /year.
- Increase in production per unit area planted vegetables from 12.7 to 15 ton / hectare and reduce the area cultivated with vegetables from 70000 hectare to 60000 hectares.
- Increase in production of red meat from 220244 ton to 271494 ton /year with rate of increase 23.3 %.
- Increase in production of white meat from 193086 to 271494 ton /year with rate of increase 51.8 %.
- Increase in production of honeybee from 2500 ton to 3750 ton /year with rate of increase 50 %.
- Increase in production of fish from 50000 ton to 250000 ton /year.

The increase in agriculture and fish production stated above will contribute in increase the share of agriculture and fish sector in gross domestic product (GDP), as it is expected increase in price of agriculture production from 240 billion in 2017 to 1030 billion rials in2027.

12. Social results

- Availability of job opportunity for rural and coastal residents.
- Strengthen the role of women and increase their participation in agriculture and fish production.
- Training rural population particularly, youth in activities of income generating.
- Strengthen the role of agriculture and fish cooperative societies in production and marketing activities.

13. Environmental Results

- Protect agricultural lands from degeneration and desertification.
- Minimize waste of irrigation and subsequently,
- Rehabilitation of natural degenerated pasture.
- Ideal use of seasonal flood (spate) water.
- Monitoring of plant and animal insects and diseases and limit their spread.
- Organize the fishing process and maintain the sustainability of fish stock.

Table 8. Plan matrix to strengthen the role of agriculture and fish sector to improve food security

1. Agricultural and Fish Resources

| Subcomponents | Outcome | Activity | Relevant Entity | Indicators |
|------------------------------|---|---|--|---|
| 1. Agricultural lands | 1. Increase in area cultivated with wheat, cereals (sorghum and millet) | 1. Rehabilitation of neglected and degenerated agricultural areas, including mountain terraces (60000 hectares). 2. New land reclamations in wheat growing areas (50000 hectares). | Irrigation and land reclamation sector | Increase in production of wheat, sorghum, and millet |
| | 2. Protection of agricultural lands from desertification | 1. Sand dune stabilization creeping on agricultural lands in (coastal and desert areas). 2. Rehabilitation of degenerated natural pastures. | Irrigation and land reclamation sector | To limit degeneration of agricultural lands. |
| | 3. Planning to use agricultural lands | 1. To prepare studies on suitability of land use for agriculture. 2. Produce digital maps for agricultural soils. 3. Produce digital map for vegetations | General Authority for Agricultural Research. | To determine the suitability of lands for different agricultural crops. |
| 2. Irrigation water | 1. Efficient use of irrigation water | 1.Rehabilitation of spate irrigation system. 2. Operation of spate irrigation system 3. Introduction of irrigated system (spray) on cereal crops (20 irrigation unit). 4. Introduction of modern irrigation system (spray, drip and bubble) on vegetable crops (600 irrigation unit) 5. Introduction of modern irrigation system (spray, drip, and bubbles) on fruit crops (60 irrigation unit) 6. Application of alternative energy (solar) for pumping irrigation water (importation, installation 200 unit pumping with solar energy. | Irrigation and land reclamation sector+ General Authority for Research and Extension +Agricultural service sector + Agricultural cooperative union and societies + Credit and agricultural cooperative bank+ Agricultural and fish encouraging fund . | Increase in production from unit area and minimize waste of irrigation water. |

| | | | | |
|---------------------------|--|--|--|---|
| 3. Aquatic Biology | 2. to improve use of technology for rainwater harvesting | <ol style="list-style-type: none"> 1. Construction of dams and water barriers 2. Dissemination of rainwater harvesting technology at field level. | General Authority for Research and Extension + Agriculture service sector + Agricultural cooperative union and societies + Credit and Agricultural cooperative Bank (CAC)+ agricultural and Fish encouragement fund. | Increase in production under rainfed production system. |
| | Ideal use of fish stock | <ol style="list-style-type: none"> 1. Estimation of fish stock. 2. Produce digital map for types of fish and its quantity and movement in Yemeni marine range | General Authority for marine science and marine biology. | Knowledge on size of fish stock, and exploitable stock |
| 4. Labor | 1. Technical and administrative capacity building | <ol style="list-style-type: none"> 1. Rehabilitation of cadres working in agricultural and fish sector. 2. Rehabilitation of Irrigation institute 3. Establishment of agricultural and fish cooperative institute 4. Training of researchers, engineers, and technicians 5. Training of finance and administrative cadres in the ministry and its branches | Agricultural and fish planning sector, Ministry of Agriculture, irrigation, and Fish wealth | To improve technical and administrative efficiency |
| | 2. To improve agricultural practices | <ol style="list-style-type: none"> 1. To train farmers on water management at field level. 2. Implement mobile workshop among farmers. 3. To develop agricultural school approach at field level. 4. capacity building for beekeepers to improve honeybee production. 5. Training farmers on installation and operation of agricultural system in protected houses. | Agricultural services sector | To improve farmers' and beekeepers' skills. |

2. Wheat and other cereals and legumes

| Subcomponent | Outcome | Activity | Relevant Entity | Indicator |
|------------------------------|--|---|---|--|
| 1. Wheat | 1. Increase in wheat production and reduce food gap for wheat. | <ol style="list-style-type: none"> 1. Implement applied agricultural research to increase wheat production from unit area. 2. Produce improved seeds for wheat by General Authority for Agricultural Research. 3. Multiplication of wheat improved seeds by General institution for seed multiplication. 4. Provide improved seeds of wheat to farmers 5. To strengthen agricultural machinery services for wheat. 6. Improve soil fertility. 7. Improve plant protection services. 8. Improve agricultural extension services. | Agricultural services sector+ General Authority for research and Extension + General institution for Seed Multiplication+ cooperative union and societies+ Credit and agricultural cooperative Bank (CAC) + Fund for encouragement of agriculture and fish sector. | Reduce 15 %- 20 % of food gap for wheat |
| | 2. Improve marketing services and storage. | <ol style="list-style-type: none"> 1. To establish marketing for wheat grains (societies, institutions, cereal marketing complex. 2. Construction of grain silos. | Agricultural services sector + General Authority for Research and Extension+ Institution for seed multiplication + Cooperative union and agricultural cooperative societies + private sector+ credit and agricultural cooperative bank + Fund for encouragement agriculture and fish sector . | Improve market supplies with local wheat and minimize post-harvest losses. |
| 2. Sorghum and millet | 1. Increase production of sorghum and millet | <ol style="list-style-type: none"> 1. Implementation of applied agricultural research to improve and increase yield of sorghum and millet from unit area. 2. Production of improved seeds for sorghum and millet by | Agricultural services sector + general authority for research and extension + General institution for seed multiplication + cooperative union and societies for agricultural cooperatives + private sector + | Limit importation of sorghum and millet |

| | | | | |
|------------------|---|---|---|---|
| | | <p>general Authority of agricultural research.</p> <p>3. Multiplication of improved seeds of sorghum and millet by general institution of seed multiplication.</p> <p>4. Provide improved seeds of sorghum and millet to farmers</p> <p>5. To strengthen agricultural machinery services for sorghum and millet.</p> <p>6. improve soil fertility.</p> <p>7. Improve plant protection services for sorghum and millet</p> <p>8. Improve agricultural extension services.</p> | <p>credit and agricultural cooperative bank + Fund for encouragement of agriculture and fish wealth sector.</p> | |
| | 2. Development of marketing and storage services. | <p>1. to establish marketing system for sorghum and millet (societies, institutions, grain marketing complex etc.</p> <p>2. construction of grain silos.</p> | <p>Agricultural service sector</p> | <p>Improve market supplies with grains of local sorghum and millet and minimize post-harvest losses</p> |
| 3. Maize. | 1. Increase in yield of maize. | <p>1. Implement agricultural applied research to improve and increase production of maize from unit area.</p> <p>2. Produce improved seeds of maize by general authority for agricultural research.</p> <p>3. Multiplication of improved seeds of maize by general institution for seed multiplication.</p> <p>4. Provide improved seeds of maize to farmers.</p> <p>5. To strengthen agricultural machinery services for maize.</p> <p>6. Improvement of soil fertility.</p> | <p>Agricultural services sector+ General authority for research and extension + General institution for seed multiplication + Cooperative union and societies for agricultural cooperatives+ private sector+ Credit and agricultural cooperative bank+ Fund for encouragement of agriculture and fish wealth.</p> | <p>To limit importation of maize.</p> |

| | | | | |
|------------|--|--|--|--|
| | | <p>7. Improve plant protection services for maize.</p> <p>8. Improve agricultural extension services.</p> | | |
| | 9. Improve marketing services and storage. | <p>1. To establish marketing system for maize (societies, institutions, cereal marketing complexity.)</p> <p>2. construction of grain silos</p> | Agricultural services sector + cooperative union and agricultural cooperative societies + private sector + credit and agricultural cooperative bank (CAC) + fund for encouragement of agriculture and fish wealth. | To improve supply of market with local maize and minimize post-harvest losses. |
| 4. Legumes | 1. Increase in yield of legumes (Beans, green pea, and cowpea) | <p>1. implementation of applied research to increase and improve the yield of legumes (bean, pea and cowpea) from unit area.</p> <p>2. Production of improved seeds of legumes (bean, green pea and cowpea) by general authority for agricultural research.</p> <p>3. Multiplication of improved seeds for legumes (beans, green pea and cowpea) by general institution for seed multiplication.</p> <p>4. provide improved seeds of legumes (bean, green pea, cowpea) to farmers.</p> <p>5. strengthen the services of agricultural machinery for legumes.</p> <p>6. Improve soil fertility.</p> <p>7. Improve plant protection services for legumes.</p> <p>8. To improve agricultural extension services.</p> | Agricultural services sector + General authority for research and extension +General institution for seed multiplication + cooperative union and agricultural cooperative societies +private sector+ Credit and agricultural cooperative bank (CAC) + Fund for encouragement of agriculture and fish sector. | To limit importation of legumes. |
| | 9. Development of marketing and storage services | To establish marketing system for legumes (societies, institutions, marketing complex | Agricultural services sector + Cooperative union and agricultural cooperative societies +credit and agricultural cooperative bank +Fund for encouragement of agriculture and fish wealth sector | Improve supply of local legumes to market and minimize post-harvest losses. |

3. Vegetables and Fruit

| Subcomponent | Outcome | Activities | Relevant Entity | Indicators |
|-------------------------------------|---|---|---|--|
| 1. Palm | 1. Increase in dates production from unit area. | <ol style="list-style-type: none"> 1. Planting 100000 palm trees for production of dates. 2. Establish 3 laboratories for tissue culture for production of palm seedlings. 3. To strengthen agricultural machinery services for palm trees. 4. Improve soil fertility. 5. Improve plant protection services for date palm trees (Red Palm Weevil, Dobas pest) 6. Improve agricultural services. | Agricultural services sector+ Institution for Agricultural services+ General authority for research and extension+ Cooperative union and societies for agricultural cooperatives + private sector+ Credit and agricultural cooperative Bank+ Fund for encouragement of agriculture and fish sector. | <ol style="list-style-type: none"> 4. to increase in production of dates, improve its quality and provide as source of nutrition. 5. Protection of palm trees from deterioration and yield free from infestation by pests. |
| | 2. To develop services for marketing and storage of dates. | <ol style="list-style-type: none"> 1. To establish marketing system for dates (societies, institutions, dates marketing complex etc.) 2. To build system for manufacture of dates derivatives 9 % laboratories). | Agricultural marketing and agricultural trade+ private sector+ cooperative union and societies for agricultural cooperatives+ credit and agricultural cooperative bank+ Fund for encouragement of agriculture and fish wealth. | Marketing of dates and its derivatives in different containers compatible with nature and according to market specifications. |
| 2. Agriculture in Greenhouse | 1. Increase in vegetable production from unit area, under conditions of green house and hydroponic agriculture. | <ol style="list-style-type: none"> 1. To install 500 greenhouses for vegetable cultivation (potato, tomato, and cucumber etc.) 2. installation of 50 greenhouses for aquatic cultivation (without soil, hydroponic) 3. To transfer the technology of integrated management for production and protection under greenhouse conditions. | General authority for research and agricultural extension+ Plant protection+ Cooperative union and agricultural cooperatives+ private sector+ Credit and agricultural cooperative bank+ Fund for encouragement of agriculture and fish sector. | <ol style="list-style-type: none"> 1. Minimize waste of irrigation water and increase efficiency of agricultural efficiency (soil, water, labor). 2. Reduce cost of production of vegetables and reach the consumer in reasonable price. 3. To produce vegetables with nutritional value and healthy. |

4. Cash crop

| Subcomponent | Outcome | Activities | Relevant Entity | Indicator |
|------------------|--|---|---|--|
| 1. Cotton | 1. Increase in production of cotton | 1. Increase in annual area planted with cotton area (30000 hectares) 2. Improve cotton crop management at field level. 3. Introduction of cotton harvester. | Agricultural production sector+ Agricultural services sector+ General Authority for Research and Extension+ General institute for seed multiplication. | Improve farmer's income |
| | 2. Improve cotton marketing system. | 1. Rehabilitation and modernization of cotton gin in Abyan and Lahj. 2. To establish marketing system for cotton (societies, institution etc.) | Agricultural services sector +cooperative union and agricultural cooperative societies + private sector+ credit and agricultural cooperative bank+ Fund for encouragement of agriculture and fish sector | To improve cotton quality and its competition in local and world market. |
| | 3. Production of cotton seed oil. | 1. Building plant for cotton seed oil extraction. | Agricultural services sector+cooperative union and agricultural cooperative societies +Private sector+ credit and agricultural cooperative bank+ fund for encouragement of agriculture and fish sector. | Reduce import bill for cooking oil. |
| 2. coffee | 1. Increase in coffee production | 1. Increase in area of coffee (10000 hectares) 2. Improve coffee crop management at field level. 3.Introduction of harvester (machinery)for coffee. | Agricultural production sector+agricultural services sector+ General Authority for Research and Extension +cooperative union and societies for agricultural cooperatives+ private sector+ credit and agricultural cooperative bank+private sector+ fund for encouragement of agriculture and fish sector. | To improve farmer's income. |
| | 2. To improve coffee marketing system. | 1. Introduction of machineries for sorting and packaging grains of coffee. 2. To establish coffee marketing system (societies, institutions etc.) | Agricultural service sector+cooperative union and agricultural cooperative societies +private sector+ Credit and agricultural cooperative bank + Fund for encouragement of agriculture and fish sector | Improve the quality of coffee and its competition in local and world market. |
| 3. Sesame | 1. Increase in yield of sesame. | 1.Increase in acreage (area) of sesame (10000 hectare) 2.Improvement of sesame crop management at field level. | Agricultural production sector+ agricultural services sector+ General Authority for Research and Extension + cooperative union and societies for agricultural cooperatives+ private sector+ CAC bank + fund for encouragement of agriculture and fish. | To improve farmer's income and limit of sesame. |

| | | | | |
|----------------------|--|--|---|---|
| | 2.To improve post-harvest technologies for sesame | 1.Introduction of sorting and packaging of sesame mechanism. 2.To develop manufacture of sesame oil (societies, institutions private sector etc.) | Agricultural services sector +Center for food research and post-harvest technologies+ cooperative union and societies for agricultural cooperatives+ private sector+ CAC bank+ fund for encouragement of agriculture and fish sector | To minimize losses and improve the quality of sesame oil. |
| 4. Groundnuts | 1. Increase peanut yield | 1. Increase area under peanut (10000 hectares) 2.To improve peanut crop management on field level. | Agricultural production sector+ agricultural services sector+ general authority for research and extension + cooperative union and societies for agricultural cooperatives+ private sector+ CAC bank + fund for encouragement of agriculture and fish | To improve farmer's income and limit peanut import. |
| | 2. to improve post-harvest technologies for peanut | 1.Introduction of peanut peeling mechanism. 2. To develop peanut manufacturing (societies, institutions, private sector etc.) | Agricultural services sector+ Center for food research and post-harvest technologies+ cooperative union and societies for agricultural cooperatives+ private + CAC bank+ Fund for encouragement of agriculture and fish sector | To improve quality of peanuts |

5. Animal Wealth, Poultry and Honey bee

| Subcomponents | Outcome | Activities | Relevant Entity | Indicators |
|---------------------------|--|---|--|--|
| 1. Goats and sheep | 1. Maintaining strains of goat and sheep and enhance their production. | <ol style="list-style-type: none"> 1. Survey and classification of goats and sheep. 2. To improve productive and reproductive capacities for local strains of goats and sheep for production of milk and meat. 3. To introduce purification of artificial fertilization. 4. Dissemination of genetically improved strains. 5. increased number of goats and sheep (5000000). | National center for animal wealth research + cooperative union and agricultural cooperative societies + private sector+ CAC bank+ Fund for encouragement of agriculture and fish. | To improve reproductive ability and production of local goats and sheep. |
| | 2. To improve sheep and goats feeding | <ol style="list-style-type: none"> 1. Increase the yield per unit area for fodder by introduction of improved varieties. 2. To encourage introduction of alternative fodder cultivation. 3. Manufacture of feed blocks from agricultural crop residues. | National center for animal wealth research +general dept. For development of animal wealth+ cooperative union and societies for agricultural cooperatives+private sector+ CAC bank+ fund for encouragement of agriculture and fish sector. | To improve the production of local sheep and goats from meat and milk. |
| | 3.To improve the health of sheep and goats | <ol style="list-style-type: none"> 1. To implement field survey on epidemiological diseases. 2. Epidemiology control and epidemiological surveillance for diseases of sheep and goats on domestic and regional level. 3. Support preventive veterinary services and to benefit in improvement of sheep and goat health. | National center for animal wealth research +general dept. For development of animal wealth+ cooperative union and societies for agricultural cooperatives + private sector+ CAC bank+ fund for encouragement of agriculture and fish sector. | To enhance resistance to diseases. |
| 2. Cows and Camels | 1. To maintain the strains of cows and | <ol style="list-style-type: none"> 1. Survey and classification of cows and camels. 2. To improve productive and reproductive capacities for local strains of cows and camels. | National center for animal wealth research+ cooperative union and societies for agricultural | To improve the capacity of production and |

| | | | | |
|-------------------|--|--|--|--|
| | camels and increase production | 3. To introduce purification of artificial fertilization. Dissemination of genetically improved strains 5. increased number of cows and camels (300000 cows, 200000 camels) | cooperatives+ private sector+ CAC bank+ Fund for encouragement of agriculture and fish. | reproduction for local cows and camels. |
| | 2. To improve cows and camel feeding. | 1. Increase the yield per unit area for fodder by introduction of improved of improved varieties. 2. to encourage introduction of alternative fodder cultivation. 3. Manufacture of feed blocks from agricultural crop residues. | National center for animal wealth research +General Dept. For development of animal wealth+ cooperative union and societies for agricultural cooperatives +private sector +CAC bank+ Fund for encouragement of agriculture and fish. | To improve production of cows and camels from meat and milk. |
| | 3. To improve the health of cows and camels | 1. To implement field survey on epidemiological diseases for cows and camels. 2. Epidemiology control, and epidemiological surveillance for diseases of cows and camels on domestic and regional level. 3. Support preventive veterinary services for cows and camels 4. Establishment and rehabilitation of veterinary quarantine stations for cows and camels in all land, sea and airports entries. 5. Establishment of network of veterinary laboratories (the control veterinary laboratory in Aden and rehabilitation of veterinary laboratories and establishment of field laboratories in veterinary quarantines. 6. Improve veterinary extension services for cows and camels. | National center for animal wealth research +General Dept. For development of animal wealth+ cooperative union and societies for agricultural cooperatives +private sector +CAC bank+ Fund for encouragement of agriculture and fish. | To enhance resistance to diseases. |
| 3. Poultry | 1. to improve the poultry strains and increase production. | 1. Survey and classification of local poultry strains. 2. To improve genetic characteristics and production for local poultry strains. 3. Dissemination of genetically improved poultry strains. 4. increased number of poultry (100000). | National center for animal wealth research+ Gen. Dept. To develop animal wealth+ cooperative union and societies for agricultural cooperatives+ private sector+ CAC bank+ Fund for | Improve production capacity of poultry. |

| | | | | |
|-------------------|---------------------------------------|---|---|--|
| | | | encouragement of agriculture and fish. | |
| | 2.To improve poultry feeding | 1. Manufacture of poultry feed from local resources. | National center for animal wealth research + Gen. Dept. For animal health+ cooperative union and societies for agricultural cooperatives+ private sector+ CAC bank+ fund for encouragement of agriculture and fish sector. | To improve poultry production for eggs and meat. |
| | 3. To improve poultry health | 1.To implement field survey for poultry epidemiological diseases. 2. Epidemiology control and epidemiological surveillance for diseases of poultry on domestic and regional level. 3. Support health protection services for poultry. 4. Establishment and rehabilitation of veterinary quarantine stations.at all land, sea and airports entries. 5. To establish a network of veterinary laboratories (the central veterinary laboratory in Aden and rehabilitation of regional veterinary laboratories and establish field laboratories in veterinary quarantine. 6. Improve veterinary extension services. | National center for animal wealth research+General Dept. For development of animal wealth. | Enhance resistance to poultry diseases |
| 4.Honeybee | 1. To increase production of honeybee | 1. Increase in numbers of bee keepers, through establishment of network of beekeepers, and increase in number of youth and women in bee keeping. 2. Increase in beehives (500000 beehives). 3. Improve production of honeybee with good quality, registered trade mark and approved as good quality which meets the standard and expectations of consumer. 4.To establish technical, consulting mechanism linked with agricultural experts, government and private sector. | Agricultural production sector+ General Authority for Research and Extensions + General Dept. For development of animal wealth+ cooperative union and societies for agricultural cooperatives+ private sector+ CAC bank+ Fund for encouragement of agriculture and fish sector. | To improve beekeepers' income. |

| | | | | |
|--|---|---|--|---|
| | 2. To improve marketing mechanism for honeybee. | 1.To improve capacity and update honeybee transactions and overcome restrictions of quality and quantity. 2. To establish market for honeybee with emphasis on specialized markets with high value and application of quality standards. 3. Production of market products and information and disseminate it to the producer, private sector, and consumer to create enthusiasm among beekeepers. | Agricultural services sector+ General Authority for Research and Extension + General Dept. For development of animal wealth+ Cooperative union and societies for agricultural cooperatives+ private sector+ CAC bank+ fund for encouragement of agriculture and fish | To improve honeybee qualitatively and quantitatively. |
| | 3. Improve health of honeybee. | 1. Support of health services and protection of honeybee. 2. Improve extension services for honeybee. | Agricultural services sector +General Authority for Research and Extension+ General Dept. for Animal Health. | Protection of honeybee and increase production. |

6. Fish Wealth

| Subcomponent | Outcome | Activities | Relevant Entity | Indicators |
|---|--|--|--|---|
| 1. Fish Traps | 1. To maintain fish resources and its sustainability | 1. To prepare biological studies on surface and bottom fishes | fish production sector | To create database on types and quantities of fish. |
| | 2. To update the mechanism of monitoring and marine inspection | 1. support the efforts of monitoring and marine inspection in marine boats, equipment, and necessary tools. 2. To provide network of control and monitoring along coastal strip. 3. Enhance capacities of marine inspectors. | Production services sector+ Fish marketing + Coastal guards | Limit excessive fishing. |
| 2. Marine Landing Centers | 1. to strengthen infrastructure | 1. Rehabilitation of fish landing centers and auction yards along the coastal strip. 2. Building capacities of supervisors in the office of landing centers 3. To provide health centers in landing centers. 4. To provide fuel station near landing centers. | Production services sector+ Fish marketing. | To provide markets with fish products |
| | 2. To expand and develop infrastructure services. | 1. To construct ice production plant. 2. To provide stores for fish storage in landing centers. 3. to provide landing centers with water and electricity. | Production services sector and fish marketing + Cooperative union and societies for fish cooperatives. + private sector+ CAC bank+ Fund for encouragement of agriculture and fish. | To maintain fish quality. |
| 3. Societies for fish cooperatives | 1. To improve the methods and techniques of marketing and fish export. | 1. To develop and update methods, and techniques and fish tools | Cooperative societies for fish. | Improve income of societies of fish cooperatives. |

| | | | | |
|------------------------------|---|--|--|---|
| | | <p>2. To strengthen technical capacities to improve methods and technique of marketing and export.</p> <p>3. To build and establish ideal (model) markets in provincial capitals.</p> | | |
| | <p>2. To contribute in development of traditional fishing.</p> | <p>1. to adopt support of local enterprises and boat factories to design and build modern boats with international specifications.</p> <p>2. Provide and install tanks on the present boats with modern specifications to store fish in ice.</p> <p>3. To support the construction of fish canning factory in order to reduce the importation of canned fish.</p> | <p>Production services sector and marketing of fish + cooperative societies for fish+ Ministry of Industry and Commerce+ Cooperative union and cooperative societies for fish + private sector+ CAC bank + Fund for encouragement of agriculture and fish.</p> | <p>Enhance production capacity and marketing by fishermen</p> |
| <p>1. Fish Export</p> | <p>1. To improve the fish quality to meet the local and international standards</p> | <p>1. Increase technical and knowledge awareness among the fishermen on maintaining the quality.</p> <p>2. Support technical facilities to maintain the quality.</p> <p>3. Training and rehabilitation of quality control inspectors technically and administratively.</p> <p>4. To support the laboratories in order to obtain ISO certification (ISO 17025).</p> <p>5. Training at the manufacturer's level on application of HACCP system</p> | <p>Production services sector and fish marketing + Ministry of Industry and Commerce + Private sector.</p> | <p>To improve the quality and type of exported fish.</p> |

| | | | | |
|--|---|--|--|--|
| | | and international standards for food safety. | | |
| | 2. To encourage investment and projects of export nature. | <ol style="list-style-type: none"> 1. prepare institutional structure for export through construction of storage at export entry land and air. 2. provide export inputs and auxiliary services for export process. 3. To prepare a program for promotion and definition of Yemeni products in world market. | Production services sector and fish marketing +Planning and fish projects+ Ministry of Industry and Commerce+ private sector+ Cooperative union + CAC bank +fund for encouragement of agriculture and fish | Raising the economic value of fish export. |

7. Institutional Structure

| Subcomponents | Outcome | Activities | Relevant authorities | Indicators |
|---|--|--|---|--|
| 1. General Authority for agricultural Research and Extension | 1. Rehabilitation and update laboratories. | <ol style="list-style-type: none"> 1. Renewal of soil and water laboratories. 2. Renewal of food research and post-harvest technologies. 3. Renewal of tissue culture laboratory. 4. Renewal of insect (pest) laboratories. 5. Renewal of plant pathology laboratories. 6. Building laboratories for animal diseases. 7. Building laboratory for honeybee. 8. Building laboratory for cotton analysis. | General Authority for Agricultural Research and Extension | To improve the quality of agricultural research. |

| | | | | |
|---|---|---|--|--|
| | | 9. establishment of laboratories for biological analysis. | | |
| | 2. To record data on agricultural climate (meteorological data) | 1. To establish automatic meteorological station at stations and research centers. 2. To establish ground moisture monitoring station. | General Authority for Research and Extension | To provide climate data base for research purposes. |
| Subcomponent | Outcome | Activities | Relevant Entity | Indicators |
| | 3. Rehabilitation of research farms | 1. Introduction of modern irrigation system 2. Provide soil preparation machinery (plough, survey, and levelling machinery) 3. Provide crop service machineries (soil hoeing machinery. Sprayer for pesticides spray, sowing machineries, machineries for harvesting and threshing. 4. To fence research farm. | General Authority for Research and Extension. | To strengthen infrastructure for applied agricultural research. |
| | 4. Preservation of genetic resources. | 1. To establish national center for genetic resources 2. To establish plant and animal gene bank. 3. To record local plant types (crop, pastoral and forest). | General Authority for Research and Extension | To support the activities of genetic improvement for agricultural crops. |
| 2. General Authority for Marine Science and Marine Biology Research. | 1. Rehabilitation and update laboratories. | 1. Renewal of physics and chemistry laboratories. 2. Renewal of marine biology laboratories and studies on fish stock. 3. Establish laboratory for phytoplankton and animal living in bottom. | General Authority for marine science and marine biology research | Improve quality of marine science and biology research. |

| | | | | |
|---|--|---|---|---|
| | | <p>4. Laboratory to monitor marine environment from pollution.</p> <p>5. Laboratories to study marine biology raising (fish farming).</p> | | |
| | 2. To establish information system for marine monitoring. | <p>1.To build marine monitoring station.</p> <p>2. To collect and analyze data on marine monitoring.</p> | General Authority for marine science and marine biology research | To provide database for marine science and marine biology research. |
| | 3. To adopt technologies for fish farming. | 1. National center for fish farming | General Authority for marine science and marine biology research. | To develop fish resources. |
| 3. General Corporation for seed Multiplication | 1. Rehabilitation of General corporation for Seed Multiplication. | <p>1. To repair the buildings of General Corporation for Seed Multiplication.</p> <p>2. Rehabilitation of seed multiplication farm in Wadi Khair, Lahj.</p> <p>3. To provide harvester, thresher, and sorting machineries.</p> <p>4. To build silos for preservation of improved seeds.</p> | General Corporation for seed Multiplication + Cooperative union and societies for agricultural cooperatives+ CAC bank+ Fund for encouragement of agriculture and fish. | To provide improved seeds to farmers |
| 4. General Corporation for Agricultural Services | 1. Rehabilitation of General Corporation for Agricultural Services | <p>1. To complete building offices of General Corporation for Agricultural Services.</p> <p>2. Provide office, institutional equipment.</p> <p>3. To update the gabion mesh factory.</p> <p>4. Manufacture of greenhouse structure.</p> | General Corporation for Agricultural Services+ Cooperative union and societies for agricultural cooperatives+ private sector+ CAC bank+ Fund for encouragement of agriculture and fish. | To strengthen providing agricultural services to farmers. |
| | 2. Provide agricultural inputs | 1. To establish centers for agricultural machineries renting. | General Corporation for Agricultural Services+ Cooperative union and | To provide automated labor services to farmers. Provide agricultural inputs . |

| | | | | |
|---|---|---|---|--|
| | | <p>2. Importation of seeds of varieties, plant hybrids in collaboration with General Authority for Agricultural Research.</p> <p>3. Importation of fertilizers, pesticides in coordination with General Authority for Agricultural Research</p> <p>4. Importation of machineries, equipment and agricultural tools.</p> | <p>societies for agricultural cooperatives+ private sector+ CAC bank+ Fund for encouragement of agriculture and fish.</p> | |
| <p>5. Government agricultural institutions</p> | <p>1. To develop institutional, organizational building for institutions.</p> | <p>1. Institutional capacity building for Ministry of Agriculture, Irrigation and fish wealth and its branches.</p> <p>2. To provide machineries and agricultural equipment and vehicles to Ministry of Agriculture, Irrigation and Fish Wealth.</p> <p>3. To establish Irrigation Institute.</p> <p>4. To establish center for development of rural women.</p> <p>5. To develop and improve the efficiency of agricultural extension.</p> <p>6. To develop and improve the efficiency of plant protection and agricultural quarantine.</p> <p>7. To develop and improve the efficiency of veterinary services and veterinary quarantine.</p> <p>8. To establish modern statistical system for fish</p> | <p>Ministry of Agriculture, Irrigation and Fish wealth</p> | <p>Enhance the performance of agricultural government institutions</p> |

| | | | | |
|--|---|---|---|---------------------------------|
| | | sector through support of fish information center. 9. Rehabilitation of central laboratory for quality in Aden and Mukalla and marine pollution center in Bureika by providing equipment and supplies. | | |
| | 2. To encourage investment in agricultural sector | 1. To support investors to invest in agriculture and wheat production. 2. Support of investors in mechanized agriculture. | Ministry of Agriculture, Irrigation, and fish wealth + Ministry of Industry and Commerce + Cooperative union and societies for agricultural and fish cooperatives + private sector+ CAC bank+ Fund for encouragement of agriculture and fish. | |
| | 3. Studies and Design | 1. To implement studies and design related to plan implementation. | Ministry of Agriculture, Irrigation, and fish wealth | Technical and economic studies. |

Table 9. Estimated cost of the plan to strengthen the role of Agriculture and Fish sector to improve food security

1. Estimated cost of activities in agricultural resources component

| Subcomponent | Outcome | Activity | Human resources | Equipment and tools | Different inputs | Training and workshops | Internal duty | Operational cost | Total direct cost | Supervision and follow up (5%) | Total | |
|------------------|------------------|----------|------------------|---------------------|-------------------|------------------------|----------------|------------------|-------------------|--------------------------------|-------------------|------------------|
| 1 | 1 | 1 | 60,000 | 150,000 | 155,000 | 30,000 | 20,000 | 60,000 | 475,000 | 23,750 | 498,750 | |
| | | 2 | 300,000 | 750,000 | 775,000 | 150,000 | 100,000 | 300,000 | 2,375,000 | 118,750 | 2,493,750 | |
| | 2 | 1 | 18,750 | 45,000 | 52,500 | 9,750 | 7,500 | 16,500 | 150,000 | 7,500 | 157,500 | |
| | | 2 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | 3 | 1 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 2 | 6,250 | 15,000 | 17,500 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 3 | 6,250 | 15,000 | 17,500 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | Sub total | | | 416,250 | 1,035,000 | 1,087,500 | 209,250 | 142,500 | 409,500 | 3,300,000 | 165,000 | 3,465,000 |
| | 2 | 1 | 1 | 625,000 | 250,000 | 3,000,000 | 325,000 | 250,000 | 550,000 | 5,000,000 | 250,000 | 5,250,000 |
| 2 | | | 125,000 | 50,000 | 600,000 | 65,000 | 50,000 | 110,000 | 1,000,000 | 50,000 | 1,050,000 | |
| 3 | | | 62,500 | 25,000 | 300,000 | 32,500 | 25,000 | 55,000 | 500,000 | 25,000 | 525,000 | |
| 4 | | | 225,000 | 90,000 | 1,080,000 | 117,000 | 90,000 | 198,000 | 1,800,000 | 90,000 | 1,890,000 | |
| 5 | | | 25,000 | 10,000 | 120,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| 6 | | | 1,000,000 | 400,000 | 4,800,000 | 520,000 | 400,000 | 880,000 | 8,000,000 | 400,000 | 8,400,000 | |
| 2 | | 1 | 125,000 | 150,000 | 500,000 | 65,000 | 50,000 | 110,000 | 1,000,000 | 50,000 | 1,050,000 | |
| | | 2 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| Sub total | | | 2,200,000 | 990,000 | 10,450,000 | 1,144,000 | 880,000 | 1,936,000 | 17,600,000 | 880,000 | 18,480,000 | |
| 3 | 1 | 1 | 500,000 | 2,000,000 | 600,000 | 260,000 | 200,000 | 440,000 | 4,000,000 | 200,000 | 4,200,000 | |
| | | 2 | 25,000 | 100,000 | 30,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| Sub total | | | 525,000 | 2,100,000 | 630,000 | 273,000 | 210,000 | 462,000 | 4,200,000 | 210,000 | 4,410,000 | |

| | | | | | | | | | | | |
|------------------|---|---|------------------|------------------|-------------------|------------------|------------------|------------------|-------------------|------------------|-------------------|
| 4 | 1 | 1 | 25,000 | 50,000 | 80,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 |
| | | 2 | 31,250 | 62,500 | 100,000 | 16,250 | 12,500 | 27,500 | 250,000 | 12,500 | 262,500 |
| | | 3 | 31,250 | 62,500 | 100,000 | 16,250 | 12,500 | 27,500 | 250,000 | 12,500 | 262,500 |
| | | 4 | 12,500 | 25,000 | 40,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| | | 5 | 2,500 | 5,000 | 8,000 | 1,300 | 1,000 | 2,200 | 20,000 | 1,000 | 21,000 |
| | 2 | 1 | 2,500 | 5,000 | 8,000 | 1,300 | 1,000 | 2,200 | 20,000 | 1,000 | 21,000 |
| | | 2 | 6,250 | 12,500 | 20,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | | 3 | 3,750 | 7,500 | 12,000 | 1,950 | 1,500 | 3,300 | 30,000 | 1,500 | 31,500 |
| | | 4 | 2,500 | 5,000 | 8,000 | 1,300 | 1,000 | 2,200 | 20,000 | 1,000 | 21,000 |
| | | 5 | 2,500 | 5,000 | 8,000 | 1,300 | 1,000 | 2,200 | 20,000 | 1,000 | 21,000 |
| Sub total | | | 120,000 | 240,000 | 384,000 | 62,400 | 48,000 | 105,600 | 960,000 | 48,000 | 1,008,000 |
| Total | | | 3,261,250 | 4,365,000 | 12,551,500 | 1,688,650 | 1,280,500 | 2,913,100 | 26,060,000 | 1,303,000 | 27,363,000 |

2. Estimated cost for activities in component wheat cereals and legumes

| Subcomponent | Outcome | Activity | Human resources | Equipments and tools | Inputs (Improved seeds, fertilizers, pesticides etc.) | Training and work shops | Internal duty | Operational cost | Total direct cost | Supervision and follow up (5%) | Total |
|------------------|------------------|----------|-----------------|----------------------|---|-------------------------|---------------|------------------|-------------------|--------------------------------|----------------|
| 1 | 1 | 1 | 120000 | 288000 | 336000 | 62400 | 48000 | 105600 | 960000 | 48000 | 1008000 |
| | | 2 | 24000 | 57600 | 67200 | 12480 | 9600 | 21120 | 192000 | 9600 | 201600 |
| | | 3 | 12000 | 28800 | 33600 | 6240 | 4800 | 10560 | 96000 | 4800 | 100800 |
| | | 4 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 5 | 120000 | 576000 | 48000 | 62400 | 48000 | 105600 | 960000 | 48000 | 1008000 |
| | | 6 | 12000 | 28800 | 33600 | 6240 | 4800 | 10560 | 96000 | 4800 | 100800 |
| | | 7 | 12000 | 28800 | 33600 | 6240 | 4800 | 10560 | 96000 | 4800 | 100800 |
| | | 8 | 12000 | 28800 | 33600 | 6240 | 4800 | 10560 | 96000 | 4800 | 100800 |
| | 2 | 1 | 24000 | 57600 | 67200 | 12480 | 9600 | 21120 | 192000 | 9600 | 201600 |
| | | 2 | 36000 | 86400 | 100800 | 18720 | 14400 | 31680 | 288000 | 14400 | 302400 |
| Sub total | | | 378250 | 1195800 | 771100 | 196690 | 151300 | 332860 | 3026000 | 151300 | 3177300 |
| | | 1 | 62500 | 150000 | 175000 | 32500 | 25000 | 55000 | 500000 | 25000 | 525000 |
| 2 | 1 | 2 | 12500 | 30000 | 35000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 3 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 4 | 2500 | 6000 | 7000 | 1300 | 1000 | 2200 | 20000 | 1000 | 21000 |
| | | 5 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 6 | 3750 | 9000 | 10500 | 1950 | 1500 | 3300 | 30000 | 1500 | 31500 |
| | | 7 | 3750 | 9000 | 10500 | 1950 | 1500 | 3300 | 30000 | 1500 | 31500 |
| | | 8 | 5000 | 12000 | 14000 | 2600 | 2000 | 4400 | 40000 | 2000 | 42000 |
| | | 2 | 1 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 |
| | 2 | | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | Sub total | | | 115000 | 276000 | 322000 | 59800 | 46000 | 101200 | 920000 | 46000 |

| | | | | | | | | | | | | |
|----------|------------------|----------|----------|---------------|----------------|----------------|---------------|---------------|---------------|----------------|---------------|----------------|
| | | 1 | 37500 | 90000 | 105000 | 19000 | 15000 | 33000 | 300000 | 15000 | 315000 | |
| 3 | 1 | 2 | 12500 | 30000 | 35000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 | |
| | | 3 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 | |
| | | 4 | 2500 | 6000 | 7000 | 1300 | 1000 | 2200 | 20000 | 1000 | 21000 | |
| | | 5 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 | |
| | | 6 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 | |
| | | 7 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 | |
| | | 8 | 5000 | 12000 | 14000 | 2600 | 2000 | 4400 | 40000 | 2000 | 42000 | |
| | | 2 | 1 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | 2 | | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 | |
| | Sub total | | | 95000 | 228000 | 266000 | 49400 | 38000 | 83600 | 760000 | 38000 | 798000 |
| | | 1 | 37500 | 90000 | 105000 | 19000 | 15000 | 33000 | 300000 | 15000 | 315000 | |
| 4 | 1 | 2 | 12500 | 30000 | 35000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 | |
| | | 3 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 | |
| | | 4 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 | |
| | | 5 | 3750 | 9000 | 10500 | 1950 | 1500 | 3300 | 30000 | 1500 | 31500 | |
| | | 6 | 1250 | 3000 | 3500 | 650 | 500 | 1100 | 10000 | 500 | 10500 | |
| | | 7 | 1250 | 3000 | 3500 | 650 | 500 | 1100 | 10000 | 500 | 10500 | |
| | | 8 | 1250 | 3000 | 3500 | 650 | 500 | 1100 | 10000 | 500 | 10500 | |
| | | 2 | 1 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | Sub total | | | 76250 | 183000 | 213500 | 39650 | 30500 | 67100 | 610000 | 30500 | 640500 |
| | Total | | | 664500 | 1882800 | 1572600 | 345540 | 265800 | 584760 | 5316000 | 265800 | 5581800 |

3. Estimated cost for activities of component vegetables and fruits.

| Subcomponent | Outcome | Activity | Human resources | Equipments and tools | Inputs (Improved seeds, fertilizers, pesticides etc.) | Training and work shops | Internal duty | Operational cost | Total direct cost | Supervision and follow up (5%) | Total |
|------------------|---------|----------|------------------|----------------------|---|-------------------------|----------------|------------------|-------------------|--------------------------------|-------------------|
| 1 | 1 | 1 | 750,000 | 1,800,000 | 2,100,000 | 390,000 | 300,000 | 660,000 | 6,000,000 | 300,000 | 6,300,000 |
| | | 2 | 271,250 | 651,000 | 759,500 | 141,050 | 108,500 | 238,700 | 2,170,000 | 108,500 | 2,278,500 |
| | | 3 | 37,500 | 180,000 | 15,000 | 19,500 | 15,000 | 33,000 | 300,000 | 15,000 | 315,000 |
| | | 4 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| | | 5 | 25,000 | 60,000 | 70,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 |
| | | 6 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| | 2 | 1 | 15,000 | 36,000 | 42,000 | 7,800 | 6,000 | 13,200 | 120,000 | 6,000 | 126,000 |
| | | 2 | 25,000 | 120,000 | 10,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 |
| Sub total | | | 1,148,750 | 2,907,000 | 3,066,500 | 597,350 | 459,500 | 1,010,900 | 9,190,000 | 459,500 | 9,649,500 |
| 2 | 1 | 1 | 250,000 | 200,000 | 1,100,000 | 130,000 | 100,000 | 220,000 | 2,000,000 | 100,000 | 2,100,000 |
| | | 2 | 37,500 | 30,000 | 165,000 | 19,500 | 15,000 | 33,000 | 300,000 | 15,000 | 315,000 |
| | | 3 | 6250 | 15000 | 17500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| Sub total | | | 293,750 | 235,000 | 1,292,500 | 152,750 | 117,500 | 258,500 | 2,350,000 | 117,500 | 2,467,500 |
| Total | | | 1,442,500 | 3,142,000 | 4,359,000 | 750,100 | 577,000 | 1,269,400 | 11,540,000 | 577,000 | 12,117,000 |

4. Estimated cost for activities of cash crop.

| Subcomponent | Outcome | Activity | Human resources | Equipments and tools | Inputs (Improved seeds, fertilizers, pesticides etc.) | Training and work shops | Internal duty | Operational cost | Total direct cost | Supervision and follow up (5%) | Total | |
|------------------|--------------|------------------|-----------------|----------------------|---|-------------------------|----------------|------------------|-------------------|--------------------------------|------------------|------------------|
| | | 1 | 26906 | 32288 | 107625 | 13991 | 10763 | 23678 | 215250 | 10763 | 226013 | |
| 1 | 1 | 2 | 62,500 | 150,000 | 175,000 | 32,500 | 25,000 | 55,000 | 500,000 | 25,000 | 525,000 | |
| | | 3 | 37,500 | 90,000 | 105,000 | 19,500 | 15,000 | 33,000 | 300,000 | 15,000 | 315,000 | |
| | | 4 | 62,500 | 150,000 | 175,000 | 32,500 | 25,000 | 55,000 | 500,000 | 25,000 | 525,000 | |
| | 2 | 1 | 62,500 | 150,000 | 175,000 | 32,500 | 25,000 | 55,000 | 500,000 | 25,000 | 525,000 | |
| | | 2 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | 3 | 1 | 18,750 | 45,000 | 52,500 | 9,750 | 7,500 | 16,500 | 150,000 | 7,500 | 157,500 | |
| Sub total | | | 256,250 | 615,000 | 717,500 | 133,250 | 102,500 | 225,500 | 2,071,520 | 103,576 | 2,175,096 | |
| | | 1 | 9,188 | 11,025 | 36,750 | 4,778 | 3,675 | 8,085 | 73,500 | 3,675 | 77,175 | |
| 2 | 1 | 2 | 25,000 | 60,000 | 70,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| | | 3 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 4 | 25,000 | 60,000 | 70,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| | | 1 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | 2 | 2 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | Sub total | | | 87,500 | 210,000 | 245,000 | 45,500 | 35,000 | 77,000 | 773,500 | 38,675 |
| | | 1 | 6,234 | 7,481 | 24,938 | 3,242 | 2,494 | 5,486 | 49,875 | 2,494 | 52,369 | |
| 3 | 1 | 2 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 3 | 9,375 | 22,500 | 26,250 | 4,875 | 3,750 | 8,250 | 75,000 | 3,750 | 78,750 | |
| | | 1 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | 2 | 2 | 25,000 | 60,000 | 70,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| | | Sub total | | | 59,375 | 142,500 | 166,250 | 30,875 | 23,750 | 52,250 | 524,875 | 26,244 |
| | | | 1 | 6,234 | 7,481 | 24,938 | 3,242 | 2,494 | 5,486 | 49,875 | 2,494 | 52,369 |
| 4 | 1 | 2 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 3 | 12,500 | 30,000 | 35,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 1 | 9,375 | 22,500 | 26,250 | 4,875 | 3,750 | 8,250 | 75,000 | 3,750 | 78,750 | |
| | 2 | 2 | 25,000 | 60,000 | 70,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| | | Sub Total | | | 59,375 | 142,500 | 166,250 | 30,875 | 23,750 | 52,250 | 524,875 | 26,244 |
| | Total | | | 511,063 | 1,168,275 | 1,489,250 | 265,753 | 204,425 | 449,735 | 4,088,500 | 206,425 | 4,292,925 |

5. Estimated cost for component of Animal Wealth

| Subcomponent | Outcome | Activity | Human resources | Equipments and tools | Different inputs | Training and workshops | Internal duty | Operational cost | Total direct cost | Supervision and follow up(5%) | Total | |
|------------------|------------------|----------|-----------------|----------------------|------------------|------------------------|----------------|------------------|-------------------|-------------------------------|------------------|------------------|
| 1 | 1 | 1 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 2 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 3 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 4 | 25,000 | 30,000 | 100,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| | | 5 | 125,000 | 150,000 | 500,000 | 65,000 | 50,000 | 110,000 | 1,000,000 | 50,000 | 1,050,000 | |
| | 2 | 1 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 2 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 3 | 25,000 | 30,000 | 100,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| | 3 | 1 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 2 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 3 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| | | 4 | 5,000 | 6,000 | 20,000 | 2,600 | 2,000 | 4,400 | 40,000 | 2,000 | 42,000 | |
| | | 5 | 25,000 | 30,000 | 100,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| | | 6 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | Sub total | | | 286,250 | 343,500 | 1,145,000 | 148,850 | 114,500 | 251,900 | 2,290,000 | 114,500 | 2,404,500 |
| | 2 | 1 | 1 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | | | 2 | 15,000 | 18,000 | 60,000 | 7,800 | 6,000 | 13,200 | 120,000 | 6,000 | 126,000 |
| | | | 3 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| 4 | | | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | |
| 5 | | | 1,250 | 1,500 | 5,000 | 650 | 500 | 1,100 | 10,000 | 500 | 10,500 | |
| 2 | | 1 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 2 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 3 | 25,000 | 30,000 | 100,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 | |
| 3 | | 1 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 2 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 3 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| | | 4 | 2,500 | 3,000 | 10,000 | 1,300 | 1,000 | 2,200 | 20,000 | 1,000 | 21,000 | |
| | | 5 | 18,750 | 22,500 | 75,000 | 9,750 | 7,500 | 16,500 | 150,000 | 7,500 | 157,500 | |
| | | 6 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 | |
| Sub total | | | 125,000 | 150,000 | 500,000 | 65,000 | 50,000 | 110,000 | 1,000,000 | 50,000 | 1,050,000 | |

| | | | | | | | | | | | |
|------------------|------------------|--------|----------------|----------------|------------------|----------------|----------------|----------------|------------------|------------------|------------------|
| 3 | 1 | 1 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | | 2 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| | | 3 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | | 4 | 25,000 | 30,000 | 100,000 | 13,000 | 10,000 | 22,000 | 200,000 | 10,000 | 210,000 |
| | 2 | 1 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| | 4 | 1 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | | 2 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | | 3 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| | | 4 | 2,500 | 3,000 | 10,000 | 1,300 | 1,000 | 2,200 | 20,000 | 1,000 | 21,000 |
| | | 5 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| 6 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 | | |
| Sub total | | | 115,000 | 138,000 | 460,000 | 59,800 | 46,000 | 101,200 | 920,000 | 46,000 | 966,000 |
| 4 | 1 | 1 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| | | 2 | 93,750 | 112,500 | 375,000 | 48,750 | 37,500 | 82,500 | 750,000 | 37,500 | 787,500 |
| | | 3 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | | 4 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | 2 | 1 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | | 2 | 12,500 | 15,000 | 50,000 | 6,500 | 5,000 | 11,000 | 100,000 | 5,000 | 105,000 |
| | | 3 | 5,000 | 6,000 | 20,000 | 2,600 | 2,000 | 4,400 | 40,000 | 2,000 | 42,000 |
| | 3 | 1 | 3,750 | 4,500 | 15,000 | 1,950 | 1,500 | 3,300 | 30,000 | 1,500 | 31,500 |
| | | 2 | 6,250 | 7,500 | 25,000 | 3,250 | 2,500 | 5,500 | 50,000 | 2,500 | 52,500 |
| | Sub total | | | 152,500 | 183,000 | 610,000 | 79,300 | 61,000 | 134,200 | 1,220,000 | 61,000 |
| Total | | | 678,750 | 814,500 | 2,715,000 | 352,950 | 271,500 | 597,300 | 5,430,000 | 271,500 | 5,701,500 |

6. Estimated cost for activities of component Fish Wealth

| Subcomponent | Outcome | Activity | Human resources | Equipments and tools | Different inputs | Training and workshops | Internal duty | Operational cost | Total direct cost | Supervision and follow up(5%) | Total |
|------------------|---------|----------|-----------------|----------------------|------------------|------------------------|---------------|------------------|-------------------|-------------------------------|----------------|
| 1 | 1 | 1 | 12500 | 60000 | 15000 | 6500 | 5000 | 11000 | 110000 | 5500 | 115500 |
| | 2 | 1 | 12500 | 60000 | 7500 | 6500 | 5000 | 11000 | 110000 | 5500 | 115500 |
| | | 2 | 25000 | 120000 | 15000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 3 | 12500 | 60000 | 7500 | 6500 | 5000 | 11000 | 110000 | 5500 | 115500 |
| Sub total | | | 62500 | 300000 | 45000 | 32500 | 25000 | 55000 | 550000 | 27500 | 577500 |
| 2 | 1 | 1 | 125000 | 600000 | 150000 | 65000 | 50000 | 110000 | 1100000 | 55000 | 1155000 |
| | | 2 | 5000 | 24000 | 6000 | 2600 | 2000 | 4400 | 44000 | 2200 | 46200 |
| | | 3 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 4 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | 2 | 1 | 50000 | 240000 | 60000 | 26000 | 20000 | 44000 | 440000 | 22000 | 462000 |
| | | 2 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 3 | 50000 | 240000 | 60000 | 26000 | 20000 | 44000 | 440000 | 22000 | 462000 |
| Sub total | | | 305000 | 1464000 | 366000 | 158600 | 122000 | 268400 | 2684000 | 134200 | 2818200 |
| 3 | 1 | 1 | 2500 | 12000 | 3000 | 1300 | 1000 | 2200 | 22000 | 1100 | 23100 |
| | | 2 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 3 | 50000 | 240000 | 60000 | 26000 | 20000 | 44000 | 440000 | 22000 | 462000 |
| | 2 | 1 | 12500 | 60000 | 7500 | 6500 | 5000 | 11000 | 110000 | 5500 | 115500 |
| | | 2 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 3 | 125000 | 600000 | 150000 | 65000 | 50000 | 110000 | 1100000 | 55000 | 1155000 |
| Sub total | | | 240000 | 1152000 | 288000 | 124800 | 96000 | 211200 | 2112000 | 105600 | 2217600 |
| 4 | 1 | 1 | 12500 | 60000 | 7500 | 6500 | 5000 | 11000 | 110000 | 5500 | 115500 |
| | | 2 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 3 | 7500 | 36000 | 9000 | 3900 | 3000 | 6600 | 66000 | 3300 | 69300 |
| | | 4 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 5 | 18750 | 90000 | 22500 | 9750 | 7500 | 16500 | 165000 | 8250 | 173250 |
| | 2 | 1 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 2 | 25000 | 120000 | 30000 | 13000 | 10000 | 22000 | 220000 | 11000 | 231000 |
| | | 3 | 12500 | 60000 | 7500 | 6500 | 5000 | 11000 | 110000 | 5500 | 115500 |
| Sub total | | | 151250 | 726000 | 181500 | 78650 | 60500 | 133100 | 1331000 | 66550 | 1397550 |
| Total | | | 758750 | 3642000 | 910500 | 394550 | 303500 | 667700 | 6677000 | 333850 | 7010850 |

7. Estimated cost for activities of component Institutional Structure

| Subcomponent | Outcome | Activity | Human resources | Equipments and tools | Different inputs | Training and workshops | Internal duty | Operational cost | Total direct cost | Supervision and follow up (5%) | Total |
|------------------|---------|----------|-----------------|----------------------|------------------|------------------------|---------------|------------------|-------------------|--------------------------------|----------------|
| 1 | 1 | 1 | 18750 | 90000 | 7500 | 9750 | 7500 | 16500 | 150000 | 7500 | 157500 |
| | | 2 | 25000 | 120000 | 10000 | 13000 | 10000 | 22000 | 200000 | 10000 | 210000 |
| | | 3 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 4 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 5 | 6250 | 30000 | 2500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 6 | 6250 | 30000 | 2500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 7 | 6250 | 30000 | 2500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 8 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 9 | 9375 | 45000 | 3750 | 4875 | 3750 | 8250 | 75000 | 3750 | 78750 |
| | 2 | 1 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 2 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | 3 | 1 | 6250 | 30000 | 2500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 2 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 3 | 6250 | 30000 | 2500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 4 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | 4 | 1 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 2 | 37500 | 180000 | 15000 | 19500 | 15000 | 33000 | 300000 | 15000 | 315000 |
| | | 3 | 15000 | 72000 | 6000 | 7800 | 6000 | 13200 | 120000 | 6000 | 126000 |
| Sub total | | | 236875 | 1137000 | 94750 | 123175 | 94750 | 208450 | 1895000 | 94750 | 1989750 |
| 2 | 1 | 1 | 25000 | 120000 | 10000 | 13000 | 10000 | 22000 | 200000 | 10000 | 210000 |
| | | 2 | 25000 | 120000 | 10000 | 13000 | 10000 | 22000 | 200000 | 10000 | 210000 |
| | | 3 | 25000 | 120000 | 10000 | 13000 | 10000 | 22000 | 200000 | 10000 | 210000 |
| | | 4 | 25000 | 120000 | 10000 | 13000 | 10000 | 22000 | 200000 | 10000 | 210000 |
| | | 5 | 25000 | 120000 | 10000 | 13000 | 10000 | 22000 | 200000 | 10000 | 210000 |
| | 2 | 1 | 18750 | 90000 | 7500 | 9750 | 7500 | 16500 | 150000 | 7500 | 157500 |
| | | 2 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | 3 | 1 | 50000 | 240000 | 20000 | 26000 | 20000 | 44000 | 400000 | 20000 | 420000 |
| Sub total | | | 206250 | 990000 | 82500 | 107250 | 82500 | 181500 | 1650000 | 82500 | 1732500 |
| 3 | 1 | 1 | 6250 | 30000 | 2500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |

| | | | | | | | | | | | |
|----------------------------|---|---|------------------|-------------------|-------------------|------------------|------------------|------------------|-------------------|------------------|-------------------|
| | | 2 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 3 | 37500 | 180000 | 15000 | 19500 | 15000 | 33000 | 300000 | 15000 | 315000 |
| | | 4 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| Sub total | | | 68750 | 330000 | 27500 | 35750 | 27500 | 60500 | 550000 | 27500 | 577500 |
| 4 | 1 | 1 | 62500 | 300000 | 25000 | 32500 | 25000 | 55000 | 500000 | 25000 | 525000 |
| | | 2 | 37500 | 180000 | 15000 | 19500 | 15000 | 33000 | 300000 | 15000 | 315000 |
| | | 3 | 62500 | 300000 | 25000 | 32500 | 25000 | 55000 | 500000 | 25000 | 525000 |
| | | 4 | 125000 | 600000 | 50000 | 65000 | 50000 | 110000 | 1000000 | 50000 | 1050000 |
| | 2 | 1 | 125000 | 600000 | 50000 | 65000 | 50000 | 110000 | 1000000 | 50000 | 1050000 |
| | | 2 | 6250 | 30000 | 2500 | 3250 | 2500 | 5500 | 50000 | 2500 | 52500 |
| | | 3 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 4 | 31250 | 150000 | 12500 | 16250 | 12500 | 27500 | 250000 | 12500 | 262500 |
| Sub total | | | 462500 | 2220000 | 185000 | 240500 | 185000 | 407000 | 3700000 | 185000 | 3885000 |
| 5 | 1 | 1 | 62500 | 300000 | 25000 | 32500 | 25000 | 55000 | 500000 | 25000 | 525000 |
| | | 2 | 125000 | 600000 | 50000 | 65000 | 50000 | 110000 | 1000000 | 50000 | 1050000 |
| | | 3 | 31250 | 150000 | 12500 | 16250 | 12500 | 27500 | 250000 | 12500 | 262500 |
| | | 4 | 31250 | 150000 | 12500 | 16250 | 12500 | 27500 | 250000 | 12500 | 262500 |
| | | 5 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| | | 6 | 12500 | 1560000 | 5000 | 6500 | 5000 | 11000 | 1,600,000 | 80000 | 1680000 |
| | | 7 | 12500 | 560000 | 5000 | 6500 | 5000 | 11000 | 600,000 | 30000 | 630000 |
| | | 8 | 25000 | 120000 | 10000 | 13000 | 10000 | 22000 | 200000 | 10000 | 210000 |
| | | 9 | 200,000 | 2,600,000 | 200,000 | 200,000 | 300,000 | 500,000 | 4,000,000 | 200000 | 4200000 |
| | 2 | 1 | 25000 | 120000 | 10000 | 13000 | 10000 | 22000 | 200000 | 10000 | 210000 |
| | | 2 | 12500 | 60000 | 5000 | 6500 | 5000 | 11000 | 100000 | 5000 | 105000 |
| Studies and designs | 3 | 1 | 125000 | 600000 | 50000 | 65000 | 50000 | 110000 | 1000000 | 50000 | 1050000 |
| Sub total | | | 675,000 | 6880000 | 390,000 | 447,000 | 490,000 | 918,000 | 9,800,000 | 490,000 | 10,290,000 |
| Total | | | 1649375 | 11557000 | 779750 | 953675 | 879750 | 1775450 | 17595000 | 879750 | 18474750 |
| Grand Total | | | 8,966,188 | 26,571,575 | 24,377,600 | 4,751,218 | 3,782,475 | 8,257,445 | 76,706,500 | 3,835,325 | 80,541,825 |