

Republic of Yemen
Ministry of Agriculture and Irrigation



A Promising sector for Diversified Economy in Yemen:

National Agriculture Sector Strategy 2012-2016

March 2012

This National Agriculture Sector Strategy and Investment Plan 2012-216 Approved by the Cabinet on 13/3/2012 by the Cabinet Decree No. (37 – 2012).



This strategy is prepared in cooperation with the United Nations Development Programme , Economic Diversification Support Programme (Agriculture Sector)



Speech of The Minister of Agriculture and Irrigation

All we are aware that agriculture and irrigation in Yemen faces many challenges. Although some of these challenges are outside human control, such as climate change, the limited water and land resources, but still we can develop agriculture and irrigation in spite of these limitations and constraints. Despite all the difficulties faced by the agricultural sector, Yemen still has some important strength. Nature of diversified climate that would help in the diversity of agricultural production which would provide various agricultural products throughout the year, a feature not available in many countries, and the long history of Yemen in the field of agricultural production under difficult natural conditions, and the infrastructure of terraced agricultural etc., all of which are positive elements contribute to the agricultural sector and rural economy. Despite the negative effects of scarcity of resources is still possible to achieve significant gains in improving the rate of agricultural productivity. Through more investment in the sector, these goals can be achieved at economic and social levels while achieving sustainability of scarce natural resources. It is also worth to notice the perseverance and hard work of Yemeni farms in agriculture in spite of limited resources.

When talking about agriculture in Yemen, the attention quickly turn to the issue of rural development in Yemen, which is an essential part of the elements which constitute this sector and vitality. The successive governments of Yemen with the help funders and donors has focused in supporting this sector, either at the level of targeted people or the various institutional levels, which aims to help increase agricultural production and exploitation of natural resources while preserving them and ensuring their sustainability.

With a focus on the importance of sustainable development, it has imposed new directions which have been taken seriously by MAI. Involving the beneficiaries in the decision-making at all levels is a basic guarantee for the efficient exploitation of natural resources available. Also enabling the private sector and cooperative in playing an important role in the production and delivery of services allows the agricultural institutions of the state to focus on the technical aspects associated with the beneficiaries needs, it enable ministry to play its planning, legal and regulatory role better.

It should be noted, that there are many ways and means by which to improve the efficiency of agriculture and irrigation through the development of policies and appropriate environment that will provide the means and tools for large and small farmers, e.g. improved agricultural inputs such as seeds, fertilizers, agricultural mechanization, irrigation systems, and also through the transfer of knowledge on agricultural techniques, marketing opportunities, business practices, management of crop and yield, and animal health improvement. It is through the provision of improved inputs to farmers and develop their knowledge, can improve the livelihoods of rural communities, both those directly working in agriculture or those being engaged in auxiliary services.

Yemen has a long history of developing strategies in the agriculture sector, with the three most current strategies dating from the Aden Agenda, which was started in 1996, but made official in 2000, and followed by Ministry of Agriculture and Irrigation (MAI) agriculture policies and strategies in 2005, and

2009. All of these do a good job in identifying the constraints to agriculture, but remain mute on actual solutions, and lack clear paths on how to achieve the objectives. As we can see, MAI give great importance to re-evaluate policies and strategies for the agricultural sector, and then the developing and updating of these policies, strategies to cope with the economic and political changes at regional and international levels. This strategy is also designed to complement the MAI's current draft strategy as part of the DPPR process, as well as its five-year plan for 2011-2015.

NASS has been developed through a participatory approach either during the comprehensive review and analysis of agriculture sector, review of related strategies, field visits, or the consultative workshops for key participants in the agriculture sector. In each workshop more than 160 participants of experts, stakeholders of different operational and planning levels as well as private and cooperative sectors and donors participated in workshops. Based on the results & recommendations, draft agriculture sector strategy was developed and then a technical committee of multidisciplinary national experts in agriculture and irrigation was established to finalize the strategy. UNPD, in partnership with the MAI, has contributed to this strategy development through the Economic Diversification Support Programme (EDSP) in accordance with Yemen's Strategic Vision 2025, and its central concern namely, national economic diversification through promotion of pro-poor growth in four promising sectors: agriculture, fisheries, industry and trade, and tourism. And also in accord with national priorities reflected in the UNDAF and UNDP Country Programme Action Plan (2011-2015), with reference to promoting pro-poor economic growth in the country and diversifying its economy.

This strategy includes a comprehensive analysis of the current situation reflecting the challenges and problems of small and commercial farmers in different agricultural subsectors. It also includes, vision and goals, as well as the priorities of the strategic solutions in different sub-sectors (*Cereals and fodders, Fruits and Vegetables, and Livestock*) as well as the priorities of the strategic solutions related to cross cutting issues within the sector or extended to other related sectors.

NASS also includes Implementation Plan for five years 2012-2016 contains a list of programs that are necessary to realize the goals of the strategy, as well as the required funding. A significant commitment to provide adequate resources is needed to move the implementation plan from concept to reality, and it is hoped that the commitment and resources will become available from local, private and international sources to carry out this ambitious agenda.

More importantly, it requires the activation, enforcement and working with legislation, laws and regulations and the imposition of system of the state for implementation of development plans and programs in general and for the achievement of development goals, whether those related to this strategy or any other sectors. This strategy must also operate in full coordination with the development policies and strategies of other sectors so that all working as an integrated system in accordance with the policy of the State to meet and achieve the objectives of integrated development in all sectors.

Eng. Farid Ahmed Mujawar, The Minister of Ministry of Agriculture & Irrigation

Executive Summary

Yemen faces many challenges including high levels of poverty, rapidly expanding population, severe resource constraints, and security concerns. The development of the agriculture sector will have a key role in addressing all of these challenges. Expanding productivity in the agriculture sector can assist greatly in reducing rural poverty, while improving food security, and contributing to reducing a key driver of security concerns. Sustainable agricultural development can conserve dwindling natural resources if appropriate policies are developed and enforced. Only rapid population growth cannot be fully addressed by development of the agriculture sector, as arable land resources are not sufficient to accommodate a significant expansion of the agriculture base.

The National Agriculture Sector Strategy (NASS) seeks to provide a comprehensive guide to the development of the agriculture sector. The NASS follows on a wealth of studies and strategies formulated in the last decade to address food security, climate change, water resources, and the role of government in developing the agriculture sector. The NASS also provides a current picture of the sector and challenges that are relevant in 2011. The NASS, and the accompanying Implementation Plan (NASS-IP) will cover a period of five years, as implementation of policies, and developments in resource availability should have a major impact on the outlook of the sector. As with all strategies, constant monitoring and adjustments will be necessary during the course of strategy implementation and it should not be viewed as a static document.

Throughout the development of the NASS, there was a focus on the farmer, and what is needed to improve productivity and increase economic returns. The needs are not the same for small scale farmers and larger commercial farmers, but improvements for both were analyzed. The focus on commercial farmers was included due to the impact on rural poverty, and the presence of many landless poor in rural Yemen. In addition, a focus on the subsectors of agriculture of livestock, horticulture, and field crops and forage were addressed, again, because the necessary inputs and policies for each subsector vary tremendously. Sector-wide issues are also analyzed due to their impact on all agricultural subsectors, and include limited water and land resources, role of women in agriculture, importance of extension, cooperative development and development of export sector, and the critical role of government in facilitating agricultural development.

The NASS is also intended to support multi-sectoral initiatives in the areas of food security, climate change, and poverty reduction. The NASS is focused only on development of the agriculture sector from technical, economic, and policy perspectives, which can be easily integrated into the multi-sectoral strategies. Also, the success of the NASS is closely linked to the implementation of the National Water Sector Strategy Program's Implementation Plan (NWSSP-IP), because agriculture as currently practiced in Yemen is wholly dependent on the continued availability of water. With strong support from the Government of Yemen and the international community, the NASS will be able to meet its objectives of raising domestic agricultural production, lead efforts to fight poverty in rural communities, and preservation of the environment and natural resources.

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Acronym List

ACU	Agricultural Cooperative Union
AFPPF	Agriculture and Fisheries Production Promotion Fund
AHS	African Horse Sickness
CAC Bank	Cooperative and Agricultural Credit Bank
CCPP	Contagious Caprine Pleuropneumonia
CPD	Continuing Professional Development
DGAH& VQ	Directorate General of Animal Health & Veterinary Quarantine
DG of ARD	Directorate General of Animal Resources Development
DPPR	Development Plan for Poverty Reduction
EC	European Commission
EDSP	Economic Diversification Support Program
FMD	Foot and Mouth Disease
GCC	General Climate Change
GDAM	General Directorate of Agriculture Marketing
GDP	Gross Domestic Product
GDPM	General Directorate for Planning and Monitoring
GIS	Geographical Information System
HACCP	Hazard Analysis Critical Control Point
HPAI	Highly-Pathogenic Avian Influenza
HR	Human Resources
ICARDA	International Center for Agricultural Research in Dry Areas
ID	Identification
MAI	Ministry of Agriculture and Irrigation
MIS	Market Information System
NASS	National Agriculture Sector Strategy
ND	Newcastle Disease
NFSS	National Food Security Strategy
NWSSIP	National Water Sector Strategy Implementation Plan
OIE	World Organization for Animal Health
PADZEY	Project to support rural development in livestock production areas in Yemen
PPR	Peste des Petits Ruminants (Pest of small ruminants)
RRT	Rapid Reaction Team
RVF	Rift Valley Fever
RWD	Rural Women Department in MAI Offices in Governorates
RWDGD	Rural Women Development General Directorate
SMS	Short Message Service
SPS	Sanitary and Phytosanitary
SQL	Structured Query Language
TDA	Tehama Development Authority
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Program
WTO	World Trade Organization

I. Introduction

Agriculture is a key sector in the Yemeni economy, and provides a main source of employment for 54% of the population. Agriculture produced 17.5% of Yemen's GDP in 2010¹, according to the Central Statistics Office. Agriculture also plays an important role in food security, in improving the trade balance, and in efforts towards integrated rural development. In addition, the agriculture sector helps to stabilize the population by reducing internal migration and its related social and economic problems. The agriculture sector is also key factor in natural resource management, and may consume up to 90% of available water in Yemen.

The problems in agriculture are well known in Yemen, and have been analyzed in great detail in the last two decades. Low productivity, resource constraints, inadequate marketing systems, low human resources capacity, lack of infrastructure facilities, lack of production technologies, and insufficient availability of inputs are all serious constraints that prevent the agriculture sector from making a larger contribution to rural incomes, national GDP, and addressing the trade imbalance in food items. The role of government in the agriculture sector has also been declining due to lack of resources over time, and many common functions of a Ministry of Agriculture are absent. External factors such as climate change, social conflicts, and lack of security are also having a significant impact on the agriculture sector. Thus, it is important to plan, develop and implement a long term agriculture sector strategy to achieve desired goals of food security and reduced rural poverty.

Despite all of the difficulties faced by the agriculture sector, Yemen also has some considerable strength. An excellent climate that produces a wide variety of agricultural products, a strong history of farming in difficult environments, and a solid infrastructure all contribute to the agriculture sector and the rural economy. Significant gains in agricultural productivity are possible, even if resource constraints will limit those gains. With additional investments in the sector, these gains can be realized not only economically, but in social benefits, and in sustainable usage of Yemen's scarce natural resources. To realize these benefits, there needs to be a new and strengthened partnership between the farmers, private sector, government, and donors.

Current Strategy Development: Yemen has a long history of developing strategies in the agriculture sector, with the three most current strategies dating from the Aden Agenda, which was started in 1996, but made official in 2000, and followed by Ministry of Agriculture and Irrigation (MAI) agriculture policies and strategies in 2005, and 2009. All of these do a good job in identifying the constraints to agriculture, but remain mute on actual solutions, and lack clear paths on how to achieve the objectives. This strategy is also designed to complement the MAI's current draft strategy as part of the DPPR process, as well as their five-year plan for 2011-2015. MAI has also been instrumental in assisting with

¹ Source: Central Statistics Organization, Statistic book, 2010

the assessment of agriculture, and in the conduct of the consultative workshops that have taken place to assist in the preparation of the current strategy.

The UNPD, in partnership with the MAI, has contributed to this strategy development through the Economic Diversification Support Programme (EDSP). EDSP is addressing a central concern in Yemen's Strategic Vision 2025, namely, its call for national economic diversification through promotion of pro-poor growth in four promising sectors: agriculture, fisheries, industry and trade, and tourism. The EDSP is also in accord with national priorities reflected in the UNDAF and UNDP Country Programme Action Plan (2007-2011), with reference to promoting pro-poor economic growth in the country and diversifying its economy.

Methodology: The National Agriculture Sector Strategy (NASS) has been developed through a review of recent agriculture strategies, review of related strategies, field visits, and workshops for key participants in the agriculture sector. The Aden Agenda from 2000, and MAI Policies and Strategies from 2005 and 2009 were the key documents reviewed to understand the process of strategy development that had been followed in the past. In addition, other key related strategies were reviewed, in particular the National Food Security Strategy, which has just been approved by the cabinet, National Water Sector Strategy and Investment Program (NWSSIP), MAI irrigation strategy, Climate Change Impact Assessment on Agriculture and Water Sectors, and the Agriculture Sector Strategy included in the recently developed Fourth DPPR. Field visits were made to 10 governorates, including Hajja, Hodeida, Taiz, Aden, Lahej, Abyan, Ibb, Dhamar, Hadramout, and Sanaa, where we visited small holders, large commercial farms, export centers, concentrate producers, a variety of cooperatives, poultry producers, and large water projects. In addition a separate strategy was prepared by UNDP for Sa'adah, which contains most of the same recommendations that are developed in this National Agriculture Sector Strategy. We also visited with local officials, donor funded programs, and a wide range of officials at MAI headquarters. Finally, we held two consultative workshops in December 2010 and January 2011 with over 160 participants each time to gather input on the problems and solutions in agriculture today. In addition, a multidisciplinary national team established to work with the project staff to finalize this strategy. Appendix (B).

An inclusive definition of agriculture sector was utilized to develop the strategy, and particular attention was paid to the needs of both small scale and commercial farmers. The underlying approach was to utilize a value chain approach to ensure that every level above and below the production level was considered. For instance, all aspects to increase a farmer's success are analyzed, including inputs, on farm equipment and techniques, marketing, processing, storage, and transport. In addition to following a value chain approach, the needs of small scale, poor farmers was considered separately from the different needs for the medium and large enterprises. Altogether, every avenue to increase small scale farmer income, and increased employment opportunities for landless rural dwellers from commercial agriculture ventures was investigated. Validation workshop for formal approval by MAI of this strategy was held on 11/2/2012 with over 130 participants from agriculture and other related sectors.

Moving Forward: The National Agriculture Sector Strategy is accompanied by a 5-year implementation plan. A comprehensive range of programs and interventions are identified that could assist small-scale and commercial farmers directly, or assist in developing the capacity of the government to provide services, knowledge, and inputs to farmers. In addition, there are recommendations on new functions that should be done by the government, such as setting grades and standards, revitalization of extension services, and active involvement in developing guidelines and principles for associations and cooperatives. The strategy is also looking at sector-wide issues that have a serious impact on all subsectors in agriculture, such as water scarcity, land issues, strengthening the role of government, women in agriculture, revitalizing the extension service, plant protection, and supporting the expansion of the export sector.

The National Agriculture Sector Strategy is also intended to work with existing strategies in the areas of water, food security and climate change. In addition, there are other sector strategies in fisheries, tourism, and trade and industry that are being developed concurrently that will also complement the agriculture strategy. The Implementation plan included to the extent possible the current and planned donor programs in the agriculture and water sectors, and strategy and planning activities need to utilize donor lead programs as a resource.

This strategy is intended to be a living document that will be adjusted over time to adapt to new challenges that may be posed by climate change, changes in resource availability, shifting security situation, or new opportunities in the market for Yemeni agricultural products in domestic and overseas markets. It is also anticipated that this strategy will provide a guide for both the Yemen government, and donor agencies, that want to work in a concerted effort to improve the lives and livelihoods of the Yemen farming community.

II. Situational Analysis

a) Role of Agriculture in the National Economy of Yemen

Agriculture accounts for 17.5% of the national GDP. About 74% of the population of Yemen lives in the rural areas. Direct employment is estimated at 33.1% of the workforce. In addition, the agriculture sector also accounts for significant employment in the transport, processing, and trading sectors that may raise the percent employed to 54%. Therefore, the agriculture sector is the most important sector for Yemen's development for generating employment in rural areas, supporting the economy in farming communities, and providing food and nutritional security, despite a modest contribution to the national GDP.

Despite severe resource constraints, the agriculture sector has been growing. From 2006 to 2009, average growth in production of value added agriculture was 7.5% annually. All types of crops showed positive growth from 2005 to 2010, with largest increases in grain, coffee and honey. This increase shows the importance of agriculture to rural farmers, as they realize gains with their outmoded technologies. It also highlights the potential in the agriculture sector to continue to provide growth and income to rural people.

The agriculture sector is also a key element in terms of food security. The total grains production in Yemen in 2009, 674,000MT, which covers only 15.2% of local demand of the Year (2009)². Currently, Yemen only meets 7.8% of its demand for wheat in 2010, which is down from 8.9% in 2005, and 89% in 1970. Yemen relies on imports of wheat, which opens it up to severe price swings, such as in 2008, and quite possibly in 2011. In addition, the World Food Program recently conducted a rapid assessment and identified 24% of households are food insecure. The agriculture sector can address both food sovereignty and food security through higher production of grains, and increased incomes from expanded production of cash crops. In the meantime, Yemen may need to consider either a national or regional grain reserve program to help alleviate issues from global price shocks due to their dependency on imports.

b) Subsistence Agriculture – Status of Poor Farmers

Subsistence farmers usually have small holdings, or are landless tenant farmers, and utilize the majority of their food production for their own use. In mountainous areas, the agricultural plots consist of small terraces, and seemingly impossible slopes are farmed. Knowledge of their land and how to farm it are generally high, but there does not appear to be a system in place to provide them with the best crop production knowledge, advice on improved techniques, market opportunities, or improved high yielding and resistant varieties. Water appears to be a limitation, and most areas are rainfed. In the highland and coastal plains, the land tends to be owned by large land holders, and small farmers are interspersed

² Source: Central Statistics Organization, Statistic book, 2010

among large farms. Many of the landless poor find work on large commercial farms. Small scale animal raising is also practiced by the landless, and many households have their own milk cow for household milk consumption. Tenant farmers face some particular difficulties, in that they cannot improve their perennial horticultural production (fruit trees, coffee) without approval of the land owner, which limits their ability to invest in better production techniques or varieties. In general, subsistence farmers in Yemen all suffer from the lack of association formation, poor access to improved inputs and knowledge, and have limited marketing channels for their saleable produce, i.e. often there is only one trader that serves a particular community.

c) Commercial Agriculture – Impact on increasing rural employment

Yemen has a vibrant commercial agriculture community. Commercial farmers easily adopt new techniques that will improve production and productivity, and tend to have access to credit, equipment, improved inputs, and water mining equipment. A particular success is the poultry area, where there are some large farms in close proximity to the major cities that produce 100% of the demand for eggs in Yemen, and 56.4% percent of the chicken meat. Coastal fruit farms produce large amounts of mango, banana, citrus, and other exportable items, as well as fodder for dairy and livestock operations. Many farms and facilities have a combination of public and private shareholders, with the line between public and private hard to distinguish at times. Many commercial horticulture farms only grow the produce, and depend on traders for harvesting and transportation, which provides for a significant number of employment opportunities for landless rural dweller. Commercial farms also appear to be able to access subsidized inputs through various government programs, which gives them an advantage. Despite earlier statements about the readiness to adopt modern technologies, the commercial sector could still benefit from improved inputs, techniques, and effective marketing associations.

d) Government Role in Agricultural Development

The Government of Yemen (GoY) plays a large role in the agriculture sector. It is an owner or major shareholder in many large commercial agriculture facilities around the country, controls the production of key inputs such as wheat and potato seed, provides subsidies through the Agriculture and Fisheries Production Promotion Fund (AFPPF) programs, and is involved in supervising the establishment of agricultural associations and cooperatives. On the other hand, many typical functions of a ministry of agriculture have been neglected, and funding levels are not adequate to function effectively. Food safety, quarantine, plant protect, animal health, policy and regulatory functions, research, extension, marketing information, women's issues, natural resource protection, and statistics are all underfunded and underperforming. The Ministry of Agriculture and Irrigation only receives 1% of the national budget, which is tiny in comparison to the role of agriculture in the economy. There is a lot of room for improvement in the delivery of government services, in particular to small farmers. The government needs to review the balance of funds it spends on agriculture, including the balance between funding

AFPPF which benefits primarily medium to large farmers, and funding basic ministry functions that could have a wider impact on small farmers. The people of Yemen could also benefit from improved government functions to provide improved food safety and better protection of natural resources.

e) Donor Role in Agricultural Development

The donor community has supported a wide range of programs from constructing major dams, to training women paravets in impoverished villages. Due to Yemen's large size and diverse culture and geography, and security concerns, most programs have been limited to a specific area. There have been few, if any, national programs in the past several years. Also, ideas that are proven to work in one area by one donor program have no mechanism to spread this experience to other areas. There appears to be a new and welcome commitment by the donor community to support agricultural development in Yemen, and in particular in the areas of fisheries and agriculture. It is hoped that these upcoming programs will coordinate with the government of Yemen, and address the long standing needs of the agriculture sector.

f) Supporting industries to the Agriculture Sector

Yemen has a well developed trading and transport industry. Markets remain private sector and relatively informal. Through traditional means, agricultural products find their way from farms to final markets. The market for inputs is also free and open, with most products available from feed concentrate to veterinary medicine, but at a cost that may not be affordable to most farmers. Some of the seed producing industries for wheat and potatoes do not produce sufficient seed to meet the demand in Yemen, and force farmers to purchase expensive imports. The processing industry is also an important factor, but does not seem to meet demand for processed products in Yemen, nor the needs of farmers with surplus produce to sell. For instance, juice factories in Hodeida import mango concentrate while they are surrounded by mango plantations that complain of insufficient markets for their produce. One supporting industry that is not meeting demand is the packaging industry. Produce exporters import boxes from Saudi Arabia, and small scale processed food enterprises (pickles, honey) have no suitable local containers to purchase, which limits their capacity to grow and produce retail ready products for domestic and export markets. In general, the supporting industries to agriculture are all functioning to some extent, but could all use additional investment and technical assistance.

III. Challenges in the Agriculture Sector

a) Limited Water Resources

Availability of water is the most often mentioned constraint to the development of the agriculture sector in all parts of Yemen. Yemen relies on two main sources of water: rainwater and groundwater, where Yemen is one of the countries with water scarcity and classified within the arid and semi-arid areas. The average annual rainfall ranging between 200-800mm, while the rainfall in the three governorates of Ibb, Al-Mahweet and Hajjah is about 1200mm. Amount of rainfall in all parts of the country ranging between 67.11 billion MC and 93 billion MC per year.

Statistics show that the total cultivated land in Yemen in 1970 was about 1.29 million hectares, of which about 37,000 ha were irrigated with groundwater, 120,000 hectares by floods, while about 73,000 hectares were irrigated by springs and water streams and the rainfed area reached 1.06 million hectares. In 2010, the total cultivated area has marginally increased to \$ 1.37 million ha, with increase in groundwater irrigated area to 420,000 ha (almost 11 times), floods irrigated area also increased to 136,335 ha, while the rainfed cultivated area decreased to 695,388 hectares.³

Highland basins that rely on groundwater are experiencing rapid declines in the water table, and competition for this dwindling resource is fierce, where the rate of pumping from the groundwater more than recharge where the water level in that basins decline 1-4 meters per year (and up in some basins to about 7 meters per year). Once this resource is depleted, there is no equivalent replacement source and the continuation of farming, and even possibly habitation, may be in doubt. Coastal areas are also utilizing ground water at an unsustainable rate, and salinity is becoming a serious problem there.

This prompted the Ministry of Agriculture and Irrigation to implement several investment projects aimed at improvement of water resources utilization and management and increasing irrigation efficiency including, inter alia, introducing modern irrigation and water saving technologies. In 2010, the area covered by water-saving technologies has reached 76,500 hectares. This represents 17% of the total area irrigated by groundwater, estimated at 420,000 ha. To achieve this, MAI provided support to encourage farmers to adopt these technologies, the amount of subsidy reaching 70% of the cost of these technologies. This also accompanied by irrigation extension services, organizing farmers in water users associations and groups including, technical and institutional support. However, these interventions were carried out through investment projects in limited areas. There is still a great need for expansion in these services and technologies, especially in critical water basins.

The main problems facing the irrigation structures are operation and maintenance, as farmers cannot afford the high maintenance costs and the government does not allocate enough budget for operation and maintenance of these facilities, accordingly some of these facilities are not working properly or

³ MAI paper to national conference on management and development of water resources in Yemen, held in January 2011

damaged. There is also a problem with the contribution of the beneficiaries in the construction of spate irrigation facilities of up to 15% of the cost of small and medium-sized water structures, ranging from 50,000 to \$ 200,000 due to low income of farmers, leading to limited implementation of these facilities.

For areas that are dependent on groundwater for agriculture, an urgent strategy that looks at water demands of various crops, competing uses, and estimates water availability is needed to preserve the resource to prevent or ameliorate the impact of groundwater depletion. Areas that rely on surface water or spate irrigation are dependent on rainfall levels that can vary from year to year. However, long term planning for agriculture is possible in these areas, and expansion of surface water resources through dam construction should be considered. Finally, rainfed agriculture that takes place in most parts of Yemen needs to be supported more strongly, as low levels of production are better than allowing desertification. Many crops produce well with Yemen's rainfall resources, such as coffee, qat, and cereal crops including wheat, barley, millet and sorghum, and should be given the same support as high production, high value irrigated agriculture. Again, water availability is the key to the future of all types of agriculture in Yemen.

Regarding surface water, the Ministry of Agriculture and Irrigation has given a great attention to water harvesting systems through the construction of about 2967 water structures and there are other 413 structures under construction, including dams, levees, diversion canals and spate irrigation facilities. In addition to many other activities in wadi training, wadi banks protection, maintenance of entrances of irrigation channels and maintenance and rehabilitation of agricultural terraces. There is an urgent need to take advantage of the stock of existing dams and water structures, through the structure and development of irrigation canals and modern irrigation networks to reduce the pressure on groundwater and for optimal use of surface water resources.⁴

b) Land Resources Impact on Agriculture

Land is a limited resource in Yemen. The total area of Yemen is 45.55 million hectares, with an estimated area of arable land of 1.61 million hectares, while the cultivated area in 2009 amounted to 1.31 million hectares, of which 695 thousand hectares of rain-fed farms, and an area of irrigated land of 693 thousand hectares. The estimated area of bush and forest land 1.5 million hectares while the total area of grazing land 22.6 million hectares, (*Statistical Yearbook issued by the Central Organization of Statistics, 2010*). Mountain agricultural is an amazing sight in Yemen, with terraced agriculture going back hundreds, if not thousands of years. However, the population density is very high in these areas, and every square centimeter is farmed. In this environment, agriculture can only increase through improvements in productivity, and a challenge for the future is posed by inheritance rules that will see small plots divided amongst large groups of siblings. In the coastal and plains areas, land is also limited due to water resources, and high populations. The key result of limited land is the need to focus on

⁴ Joined Annual Review Report for Irrigation Sector 2010

productivity improvements to reach agricultural goals. Land resources also need to have better registration and legislative procedures to ensure that conflicts over limited land are minimized, and to ensure that appropriate activities are undertaken on the land that will preserve it as a resource. Land degradation and desertification are also significant issues that need both study and policies to prevent land from being taken out of cultivation.

c) Increasing Qat Production

Qat production is increasing in Yemen. It is displacing food crops, and also utilizing limited groundwater. Qat cultivated area estimated at 154,000 ha in 2009 this represents about 22.3% of irrigated area⁵ and qat production consume 30% of agriculture water uses, while qat mainly cultivated in the highland where water scarcity is critical. Qat consumption is also considered to have a negative impact on society as whole, as lower income families spend too high a percentage of their financial resources on qat consumption. There are also health concerns from chewing qat. However, it is also a significant source of income for farmers, and accounts for a large percentage of agriculture production in Yemen.

It should be noted that many attempts to address the qat issue have come up with simplistic solutions that do not fully take into consideration rural incomes. The role of the agriculture strategy is to only take into consideration the needs of the farmer and the environment, and to defend this role in the preparation of a national qat strategy.

Several recent studies have called for reduction of qat production and consumption. However, that discussion, and set of proposed actions, focus primarily on the negative aspects of qat production. What is needed is a national, multi-sectoral qat strategy that will address social, economic, health and cultural issues in a comprehensive manner. The agriculture sector plays a key role in any qat strategy, and should focus on the following to protect the farmer: Realistic assessment of qat's impact on the rural economy regarding returns to the farmer from alternative crops, and impact on rural employment; Assessment of alternative crops for farmers, and alternative livelihoods for qat marketers; Long term strategy that plans for a switch to alternative agriculture; More efficient methods of producing and marketing qat that reduce demand on groundwater and other resources including the safe use of pesticides.

d) Marketing Deficiencies

Marketing of agricultural products in Yemen has many challenges at all levels. Small scale farmers have little access to extension that will provide them with advice on markets for their products, and an effective Market Information System (MIS) is not operating in Yemen. Small farmers are also disadvantaged by limited marketing opportunities provided by traditional retail and wholesale markets, and the lack of associations and organization, Inefficiency of markets for agricultural products, and

⁵ Source: Central Statistics Organization, Statistic book, 2010

failure to provide any services to producers, most of which are not in consistency with the specifications of international markets of vegetables and fruit. In addition to the absence of legislations and laws regulating markets and preparation centers, including, lack of oversight and control. The value chain is also not well developed for many producers, as the processing, packaging, and storage industries are at a low stage of development. Commercial farmers also face the same marketing constraints as small farmers, but can overcome some of the obstacle due to their size and financial resources. In particular, commercial farmers need to have a better understanding of planning, strategies, and business practices, especially if they intend to expand into export markets for agricultural products. While markets operate freely with little government intervention, additional support is needed in the areas of extension to small scale farmers to increase productivity and profits; rules to strengthen farmer cooperatives and associations; setting and enforcement of grades and standards to improve quality; and provision of credit to support the growth of the processing, packaging and storage industries.

e) Weak Export Sector

The agriculture sector is not meeting its potential in exports. Despite having some excellent quality produce, they are selling on a low cost basis, and in an opportunistic fashion. While there are some knowledgeable exporters, many new companies are entering the export business, and are building export centers and buying equipment before they have adequate knowledge of exporting. The export sector is also limited by inadequate packaging from local suppliers. Supplies of local produce are often of mixed quality, size, and appearance, and less experienced exporters are shipping these potentially high quality and high priced produce for low prices due to lack of sorting and no official grading. Although the high quality product is produced, the result is low prices, and a poor image by importers of Yemeni produce. In addition, markets information particularly those related to prices in export markets. In addition to the weakness of export-oriented horticultural crops; the traditional methods are still practiced in harvesting, packaging, handling, and transportation. In addition, the means of rapid cooling, pre-cooling, cold transportation and cold storage, and packaging facilities. All are not sufficient, and not meet the required standards. As well as, the high costs of cold road, sea and air transportation, reduce the competitiveness of the products in foreign export markets. To improve the export sector, there needs to be stronger associations; improved knowledge of exporters; stronger exporter-importer relationships; better knowledge of shipping alternatives; training on customs procedures; basic business skills training and knowledge of sanitary and phytosanitary requirements (SFS). The potential is there to grow significantly, but the exporting subsector needs to mature to take full advantage of the opportunities.

f) Absence of effective government role and lack of funding

Throughout the assessment process of agriculture in Yemen, it became clear that there is limited support coming from the government of Yemen to Yemeni farmers. The reason is always the same, with budgets cut to the point where much of the Ministry of Agriculture and Irrigation (MAI), and the governorate offices, cannot function. However, there is a sizeable Agriculture and Fisheries Program Promotion Fund (AFPPF), which goes to subsidize inputs for cooperatives and farmers. Nevertheless,

the policy, regulatory, research, enforcement, and extension functions of the government do not have adequate resources, and many offices cannot function due to lack of funds. Some offices report this lack of minimal funding going back 15 years or more, and some laboratories have been looted in various civil wars and never restored. Therefore, a critical challenge is to find a way to adequately fund the MAI, or to develop alternative private sector or donor lead programs that can take up some of the Ministry's functions.

g) Insufficient availability of credit

Yemen provides credit, grants, and interest free loans through the Agriculture and Fisheries Production Promotion Fund (AFPPF) to many farmers that are members of agricultural cooperatives that are registered with the Agricultural Cooperative Union (ACU). However, many of these cooperatives are required to have a minimum number of members, individual members may be required to have a minimum amount of land, and the cooperative will need to demonstrate significant capital resources to be registered with the ACU. Therefore this source of loans and grants may only be available to medium to large farmers, and not to farmers that do not meet the minimum requirements to join, or to community based cooperatives that are not registered with the ACU. The Cooperative & Agricultural Credit Bank (CAC Bank) has recently made a successful transition into a full service commercial bank. CAC Bank still provides a variety of products for the agriculture sector, with interest rates set by the government of Yemen. However, all of their loan products are only available to land owners, and therefore leave the landless and tenant farmers, who tend to be the poorest, out of consideration for their loan products. Microfinance banks are just starting in Yemen, and hold a lot of promise to provide low cost loans to many small agricultural producers. In general, availability of credit appears to be a significant constraint for poor and/or landless farmers, while larger commercial ventures appear to be able to access credit and grants for production facilities.

h) Limited knowledge and technology transfer to farmer

Agriculture extension acquire a great importance and represents a fundamental pillar in agricultural and rural development, food security, improving living standards, farmer and rural economics and in facing future challenges in light of and free market system including the agreements of WTO. Accordingly it is of great importance to activate the role of agricultural extension and its national institutions on a country level. In addition to rehabilitate, strengthen and develop its capabilities in various aspects so that it could play its role efficiently and effectively during the next phase in achieving the Millennium development objectives and meet the requirements of agricultural development and future challenges.

This challenge is closely related to the previous challenge of government funding. In assessing the public extension system in Yemen, it became clear that it is simply not functioning due to lack of resources. This lack of support goes back for 15 years, and has resulted in a function in name only. What is left of

the extension service also does not have the benefit of current extension techniques, nor any updated technical knowledge regarding current agronomic, business, or management techniques. Business training is also not a part of the extension service. This presents a tremendous challenge, but also a tremendous opportunity, to start over by creating a new extension service that could be public, private, or a combination of the two. At this point, cash infusions, and a few training courses for underpaid and unmotivated extension staff, will not contribute towards the development of the agriculture sector. Therefore, bold action is needed to revitalize the extension service, which will be key to improving the productivity of Yemeni agriculture, and raising rural incomes.

i) No enforceable quality and safety standards

Yemen has excellent potential to export some of its high quality fruits and vegetables, and is currently doing so in some regional markets that accept imports with minimal standards. A system of grades and standards that is developed either by the government or private sector can elevate the image of Yemeni produce in foreign markets, and bring higher prices and stronger demand. In addition, Yemen's consumers would also be able to benefit by having grades of produce available, with quality conscious consumers paying more, and value conscious consumers (and often poor) paying less. A system of grades and standards is a prerequisite to encouraging farmers to use better harvest and handling practices, and should also be rewarded with higher prices for producing better quality produce. Therefore a public or public/private system should be set up to develop these standards, and a communication strategy needs to be developed to inform the trade and public about these standards. This will encourage the farmer to produce better quality produce to receive higher prices per kilo for the export and urban markets.

j) Neglected role of women in agriculture

Women have always played an important role in agriculture, undertaking a wide range of activities relating to food production, processing and marketing. The key role played by women in agriculture is largely unacknowledged in government statistics and decision-making. Hence there are lots of important challenges faced by rural women in agriculture in Yemen today. Some of the important challenges are as follows:

- Water scarcity for household use, and instances of denial of access to water for irrigation
- Agriculture extension and other services are not provided to rural women. In addition to limited training for rural women and related staff.
- Insufficient financial and other resources are provided by the government and international donors for both the Rural Women's Development offices and rural women extension agents.
- Low levels of official land ownership by women and limited access to credit

- Poverty reduction strategy from 2002 acknowledges need to improve women's access to land, but no legislation has been proposed to address this.
- Some stereotypical views of women, social norms, and tribal traditions all limit women's participation in development projects, associations, cooperatives, and selling their products directly in the market.
- Lack of studies, researches and data for rural women's role in agriculture.

k) Food security problem

Food security remains a critical issue in Yemen, and the agriculture sector can provide a large portion of the solution. The definition of food security is "when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life." According to the Global Hunger Index in 2009, Yemen still has an alarming rate of food insecurity ranking 74th in the world. Self sufficiency in wheat has also declined from 8.9% in 2005 to 7.8% in 2010, which means Yemen is heavily dependent on food imports, and therefore subject to global price shocks. Recent price shocks have raised the price of food, which has pushed the number of people living below the poverty line to 27.2 percent as of 2007. Therefore, to improve the food security situation in Yemen, the country must decrease food imports, and increase domestic production; raise rural incomes for non-farming families; and develop policies in the agriculture sector that target the development of poor and landless farmers.

In recognition of the critical nature of the food security issue, the government of Yemen has just approved a National Food Security Strategy (NFSS). The vision of the NFSS is for "All Yemeni people to have access to sufficient and nutritious food at all times to live an active and healthy life – i.e. all people are food secure." The key objectives are 1) to cut food insecurity by one-third in 2015; 2) to make 90 percent of the population food secure by 2020; and 3) to reduce child malnutrition by at least one percentage point per annum. The agriculture sector will contribute to achieving the key objectives by working in 8 out of 18 priority areas, including: 1) accelerating job creation and pro-food secure growth in promising sectors; 2) improving market access and infrastructure; 3) improve technology in food/fish processing using the private sector; 4) strategize the optimal level of physical storage for cereals; 5) increase productivity in rain-fed and irrigated agriculture; 6) limit cultivation of qat and promote alternatives; 7) increase rural and urban access to water; and 8) promote sustainable water management. In addition, the NFSS contains a seven point action plan, and the agriculture sector will play a key role in realizing 3 or them, including: 1) Use qat reduction policies for fostering agricultural development; 2) Improve food security risk management; and 3) Implement the water sector strategy decisively.

This National Agriculture Sector Strategy will at all times seek to contribute to reducing food insecurity, and may have a larger contributing role that envisioned in the NFSS. Recent increases in national food

production, along with observed opportunities to enhance productivity, indicate that the agriculture sector has much greater potential. The resource constraint of water remains critical, but a key element of the national agriculture sector strategy is to expand production in non-irrigated agriculture.

1) Climate Change

Climate change is a critical issue and the impact on water and agriculture has been well documented in a report from 2009 from the World Bank entitled “Climate Change Impact Assessment on the Agriculture and Water Sectors, Republic of Yemen.” The report indicates a change in rainfall in the year 2100 in Yemen could vary from a reduction of 46 percent to an increase of 45 percent over current levels. However, the report also is very concerned about the over extraction of ground water resources, and predicts a rapid collapse within 15 years. Scenarios for long term climate change are dependent on the over extraction of ground water to be solved by regulation in the near term. The report recommends that water saving strategies should be implemented immediately to protect the ground water, and to protect against a scenario that could see a reduction of rainfall. In general, the current status of Global Climate Change (GCC) models still cannot provide any probability of which scenario will occur (less rainfall vs. more rainfall) due to lack of data in this part of the world. In any case, the Government of Yemen must continue to record temperature and rainfall throughout Yemen to provide a longer time series of data for future climate change modeling activities, and continue to work on strategies that utilize less groundwater to take into account the current over use of water resources.

IV. Agriculture Sector Strategy

A. Vision Statement

The agriculture sector in Yemen will play the primary role in raising rural incomes and creating jobs, and increasing food security, while protecting the environment and natural resources.

B. Objectives

The overall objective of the agriculture sector is to increase growth, sustainability, and equity by raising agricultural output, and to increase rural incomes, particularly for the poor. More specifically, the objectives in the agriculture sector are to:

1. Raise domestic food production through improvement in input supply, increased farmer awareness, and greater availability of agricultural credit;
2. Lead efforts to fight poverty in the rural community through higher income to farmers and increased rural employment;
3. Preservation of the environment and natural resources, and activating the role of community participation to ensure sustainability.
4. Improve marketing efficiency and decrease post harvest losses and development of exporting capacities

To achieve these overall objectives, it is important that development of the agriculture sector include the following strategic elements:

1. Given the scarcity of arable land, the emphasis will be on raising productivity in both crop and livestock production;
2. More efficient use of water in irrigated agriculture through adoption of modern irrigation techniques, and increase efforts to expand rain-fed agriculture;
3. An increased role for rural women in meeting food needs and protecting the environment
4. Watershed management, terraces rehabilitation and wadi banks protection

V. Subsector Development Strategies

1. Horticulture Subsector

a. General Situation

Yemen produces a fantastic assortment of high quality fruits and vegetables due to the hard work of its farmers, and a very conducive climate. World class citrus, coffee, melons, mangos, bananas, potatoes, and a wide assortment of vegetables are grown in Yemen. Therefore, the fruit and vegetable subsector plays a critical role in the national economy, and is also source of significant national pride. Small scale production is important for household food and nutrition needs, and often provides a surplus for cash or trade. Commercial production supports the export sector, and could also support a domestic processing sector. The fruits and vegetable sub-sector in Yemen is a key income and employment generator in the rural economy.

The fruit and vegetable subsector is a significant contributor to Yemen's exports, with 89,000 MT exported in 2010. Exports have been increasing an average of 12% in 2010, and account for 40% of all agricultural exports. Yemen enjoys a seasonal advantage in the production of some fruits and vegetables, which provides a good market when crops are at maximum production.

Fruits and vegetable support organizations are not very strong in Yemen. Export cooperatives and other farmer's organizations are vital in agricultural production and marketing, particularly in countries like Yemen where the sector consists of many small holders. Commercial producers are also not well organized, and could benefit from national marketing schemes. Government support has also been weak in providing appropriate research, technology, and extension to small scale and commercial farmers that could improve productivity.

b. Inputs for the Horticulture sub-sector

Inputs to improve productivity in the fruit and vegetable subsector are not adequate. Improved seed, fertilizer, pesticide and cultivation techniques are all needed to improve productivity, which lags productivity rates in similar countries in the region. Developing private sector seed companies in different locations in Yemen, plus improving agriculture research, extension and tissue culture techniques are needed to boost productivity. In addition, credit is a significant constraint to increasing production and additional assistance from the commercial banking and microfinance industries is needed. However, the Agriculture and Fisheries Production Promotion Fund (AFPPF), through CAC Bank provides low interest loans to cooperatives to establish marketing and export preparation facilities, but similar programs are not available to smaller farmers, in particular if they do not own their land. Therefore, improving the availability of inputs at affordable cost could have a significant impact on the production and income generated in the fruit and vegetable subsector.

Table 1: Production and Potential for Fruits, Vegetables, and Cash Crops⁶

PRODUCTS / MT	2005		2009		DOMESTIC PRODUCTION SATISFIES PERCENT OF DEMAND
	AREA/ HA	PROD/ MT	AREA/ HA	PROD/ MT	
FRUITS	82,796	764,790	92,888	988,679	100%
GRAPE	12,424	107,753	13,488	129,385	50%
DATES	13,773	29,990	14,764	56,760	71%
BANANA	9,075	89,905	10,264	132,418	100%
PAPAYA	1,340	20,588	1,512	25,117	100%
MANGO	23,240	341,838	25,818	404,573	100%
ORANGE	6,579	83,979	8,268	112,502	65%
LEMON	1,799	14,082	2,154	23,039	82%
MANDARIN	1,063	13,258	1,486	22,216	100%
PEACH	2,366	11,049	2,568	12,838	100%
POMEGRANATE	2,438	22,191	2,699	26,200	100%
APPLE	1,940	11,275	2,306	20,074	45%
ALMONDS	4,746	8,547	5,285	9,986	25%
OTHER	2,022	10,335	2,276	14,541	100%
VEGETABLE	73,480	877,820	88990	1,090,479	
POTATOES	17,155	217,759	21,497	278,022	100%
TOMATOES	15,059	204,446	18,071	251,269	100%
WATERMELN	11,468	144,212	13,364	172,148	100%
ONION	12,284	173,112	14,072	215,500	100%
SWEETMELON	2,763	27,502	3,102	31,598	100%
OKRA	3,067	17,904	3,718	22,579	100%
CAPSICUM	2,997	16,810	3,577	20,777	100%
OTHERS	744	7,194	1,059	9,443	100%
CASH CROPS	197,270	190,360	240,455	264,537	
COFFEE	28,821	11,331	34,497	18,924	99.7%
SESAME	18,794	19,363	22,613	24,285	95%
COTTON	17,609	20,573	19,664	24,895	32%
TOBACCO	8,116	17,694	10,169	22,577	54.6%
QAT	123,933	121,399	153,512	173,856	100%

⁶ Source: Agricultural Statistics Yearbook 2009, Ministry of Agriculture and Irrigation, March 2010

c. Marketing System for Horticulture sub-sector

The marketing system for fruits and vegetables is a traditional one, with farmers selling their produce to a local buyer for sale in local markets, or sale to traders for urban or export markets. However, most fruit and vegetable products are consumed at the household level in Yemen. The marketing system has poorly developed packing, packaging, storing, and processing sectors. Marketing information system, marketing extension and market research are also poorly developed, which leads to inefficiencies in the market, and a lower return to the farmer. Retail and wholesale market centers are also not well developed has not organized to promote marketing and market system in Yemen. Grades and standards are also undeveloped, which lowers the value of all produce in domestic and export markets. Post harvest losses are also significant. Altogether, there is a lot of value that is lost in the marketing system for fruits and vegetables, and relatively small investments can yield large returns to small and large scale producers.

d. Government support for Horticulture sub-sector

As has been mentioned, productivity and the marketing system are not sufficient to allow Yemeni farmers to gain the most from their efforts. Government support is critical in the areas of research, extension, cooperative formation, credit availability, and providing grades and standards to raise the quality of fruit for urban centers and export markets. In addition to providing credit for producers of fruits and vegetables, credit needs to be made available to the packaging, processing, storage, and export center industries to expand the number of available markets for producers of fruit and vegetables. Research and extension also needs to focus on the use of better varieties, and proper use of inputs. Yemen has one of the lowest rates of fertilizer use in the world, and it is critical to increase the productivity of each fruit tree and vegetable field. Water management is also a key government responsibility, as water availability is often cited as the key limitation to productivity in both small scale and commercial producers. Policy support from the government is also necessary in business contract enforcement, food safety, trade laws, food safety, and establishing and enforcing grades and standards to maximize the potential of the fruit and vegetable subsector. In addition, government support is needed for crops of comparative advantage and economic and social importance, such as palm dates, mango, pomegranate, grapes, almonds, citrus fruits, tomatoes, onion and other vegetables and fruits.

e. Area of Potential growth in the horticulture sub-sector

The domestic market for virtually all fruits and vegetables remains strong. Export markets for mangoes, bananas, melons, coffee, and citrus also present opportunities for expansion, as well as for some highly prized vegetables, such as okra. The nursery industry also presents opportunities for growth to provide farmers with improved varieties of potato seed, vegetable seed, and fruit tree seedlings. There are also many opportunities to explore in the area of specialty crops, such as spices, ornamental plants, jasmine, chili peppers green beans, soybeans, tobacco, sesame and cotton, which are high value crops that can be grown on small plots of land. Altogether, the fruit and vegetable sub-sector will support employment generation, private and cooperative sectors development which will promote Yemen's national economic development in a sustainable manner.

f. Priority programs to enhance growth in fruits and vegetables

- **Improved Seeds and Other Inputs:** Establish and support private sector industry development for seed and nursery material quality improvement; develop program to allow low income farmers to have access to these improved inputs.
- **Grades and Standards:** Establish national grades and standards for major fruits and vegetables, including also enforcement and inspection protocol, especially for exported products, and a communications strategy to disseminate the information. .
- **Marketing Organizations:** Establish product-specific trade associations that are lead by producers to support producers in marketing, technology, and providing a unified voice to influence government decisions. Establish marketing cooperatives for small scale growers by product.
- **Water Usage of Horticultural Crops:** Conduct comparative study on water usage of major horticultural crops, and utilize study to develop policies to encourage or discourage production of various crops based on local water availability.
- **Modern and Improved Technologies:** support and encouraging use of modern and improved production technologies.

2. Grains and Fodder Subsector

a. General Situation

Grain and fodder production accounts for 58% of agricultural land in Yemen, and is integral to the livelihoods of small scale farmers. The most important grain is sorghum, with the grain being used for human consumption, and the vegetative part of the plant used as either green or dry forage. Sorghum can produce in rain fed areas, but has much higher productivity when irrigated. It is also the perfect plant for subsistence farmers, by providing food for household consumption and producing much larger amounts of fodder to support their livestock than other grains. Millet has a similar dual usage, with grain production for household consumption, and forage production. Wheat and barley are grown in upland areas, and are primarily for human consumption. They are generally rain fed, and can produce two harvests a year depending on the micro-climate. Farmers indicated a desire to produce more wheat due to strong prices, but indicated the limited availability of improved seed.

The table below shows the rates of production of grain, fodder, and legumes. The most striking information is the low level of wheat production in Yemen, considering that bread is the staple food for the country. The other interesting feature is the near absence of oilseed production, with only sesame providing some of the countries needs. Yemen remains almost entirely dependent on imports of wheat and cooking oil, which puts the country at risk for global price shocks in the future, as occurred in 2008. Another key feature is the large production of sorghum that supports the livestock industry. Sorghum fodder is more important as a cash crop than the grain, and the relationship between livestock and fodder production needs to be better analyzed.

b. Inputs for the grain and fodder subsector

Across the subsector, there is a lack of improved seed to increase the productivity of grains. Wheat and barley farmers ideally need to have improved seed every five years. Improved seed alone can increase productivity by 30%. Yemen has a seed multiplication facility owned by the government, but it is not producing sufficient quantities of seed. Furthermore, additional research needs to be conducted for all types of grain to find the better varieties for rain-fed agriculture that are both drought and salinity resistant. Establishing private sector seed companies throughout Yemen, and supporting them with applied research could help to strengthen the sector.

Fertilizer is generally not used in grain production, with the exception of some manure. Irrigation is generally not used, but is usually flood irrigation when it is used, which is the only practical alternative for grain production. Some pivot irrigation is used, but this is only for the most highly capitalized and large farming operations. Availability of plowing and harvesting equipment varies across the country, and is even in oversupply in some areas. Small and medium scale farmers usually rent the services of

farm equipment, and the rental rates are closely tied to the price of diesel. Grain production in terraced areas relies on draft animals, as mechanized plowing and harvesting is not feasible.

Table 2: Production and Potential for Cereals, Legumes and Fodder⁷

PRODUCTS / MT	2005		2009		DOMESTIC PRODUCTION SATISFIES PERCENT OF DEMAND
	AREA/ HA	PROD./MT	AREA/ HA	PROD./MT	
CEREALS	688,752	495,590	677,725	674,488	
SORGHUM	429,986	263,691	392,780	311,504	99.9%
MAIZE	38,504	31,108	37,402	56,087	10%
MILLET	99,737	66,640	97,688	61,527	100%
WHEAT	86,010	112,962	117,525	222,129	7.3%
BARLEY	34,515	21,189	32,330	23,241	97.5%
LEGUMES	36,627	58,616	43,716	81,822	
COW PEA	18,010	37,479	18,758	50,567	100%
LENTIL	7,966	5,582	10,031	8,047	15%
BROAD BEAN	2,310	4,432	4,131	7,264	17%
FENUGREEK	4,108	5,765	5,396	7,910	62%
OTHERS LEGUMES	4,233	5,389	5,400	8034	25.5%
FODDER	122,803	1,541,288	163,002	2,119,908	
GRASSES	4,312	50,670	5,687	68,680	100%
SORGHUM FODDER	97,790	1,267,580	130,743	1,750,219	100%
ALFALFA	20,701	223,038	26,572	300,909	100%

c. Marketing system for grain and fodder

Marketing of grain products is not organized in Yemen. Most grain and forage products are consumed locally or at the household level. Surplus production goes into informal markets, with traders moving the grain or fodder from a surplus market to a deficit market, such as the movement of sorghum fodder from coastal lowlands to mountainous areas in winter. There are few industrial scale consumers of grain products, since commercial bakers utilize imported wheat, and animal feed producers for poultry and concentrate are also largely dependent on imported soy and maize supplies. Any cooking oil produced from sesame is consumed locally. In general, these informal markets with traders buying and selling are functional, and without any increases in production, are adequate to move what surplus the farmers have. Exports are not a factor, considering the huge amounts of imports, and associations are not a major factor.

⁷ Source: Agricultural Statistics Yearbook 2009, Ministry of Agriculture and Irrigation, March 2010

d. Government support for the grain and fodder subsector

The government has a major role to play in obtaining and disseminating improved seed varieties for all types of grains and oilseeds. At this point, there is some research being conducted, but not at the level that is needed to strengthen the sector. There also is no seed certification system in place that will ensure that improved seed is identified and protected. Information on improved farming techniques, such as no till agriculture, should also be studied and disseminated through an extension system. The government may also want to consider the need for a strategic grain reserve. Such a reserve will rely primarily on imported grain, but its operations can have an important role in the domestic grain market, and could even be used to affect market prices. In general, there is much the government can, and should, do in the grain subsector, and needs to plan on how to strengthen the subsector.

e. Areas of potential growth in the grain and fodder subsector

Increased production of grain crops, and introduction of oilseed production, could assist Yemen in the areas of food security, reduction of imports, and expanding the role of rain fed agriculture. Processing of fodder products, i.e. baling, could improve the efficiency of fodder transport and sales. Development of a seed multiplication industry will provide another important cash crop for participating farmers, and also provide improved seed to enhance grain production nationally.

f. Priority programs to enhance growth in grain and fodder subsector

- **Rain-fed Research:** Utilize foreign research, and supplement domestic research to identify new varieties of highly productive grain and fodder crops that utilize less water, are more drought resistant, have increased production, and have greater tolerance for salinity. Conduct research in different agro-ecological zones in Yemen to determine which species produces the best, and what agronomic techniques need to be used (soil preparation, planting strategy, crop timing).
- **Extension for Rain-fed Agriculture:** Develop an aggressive extension program to disseminate information on seed varieties and agronomic techniques to expand production of rain fed grains and forages.
- **Expand Seed Industry and Other Inputs:** Develop and expand in improved seeds and encourage and establishment of specialized associations in improved seeds. Establish and expand private sector seed multiplication industry. Expand fertilizers and other improved inputs, techniques and technologies. Activating the role of quality control and National Seed Certification system to approve new varieties, and certify production of seed multiplication industry.
- **Food Security:** Study the need for a Strategic Grain Reserve in Yemen, and its functions and impacts on market prices for wheat, and develop policies for utilization of the grain reserve.
- **Agriculture Machinery:** Expand appropriate agriculture machinery and new irrigation systems

3. Livestock Subsector

a. General Situation

Livestock is a critical part of the agriculture sector in Yemen. Yemen does not produce sufficient livestock and livestock products and imports a tremendous amount of live animals, meat, and dairy products. For instance, Yemen's milk production only meets 42.6% of domestic demand, domestic poultry production satisfies 56.4% of demand, and beef, lamb and goat meat supplies 63.7% of demand. Yemen is fully self sufficient in eggs and honey.

The vast majority of small farmers and the rural poor have some livestock resources, and many rely on livestock as a savings account, as animals are sold as money is needed. Households also consume livestock products, such as eggs and milk, which accounts for an important food source. Small scale livestock production also has an impact on the crops grown on a small holder's limited land, and fodder may be a significant part of what is produced, and competes with other crops that could be consumed directly or sold. Improvements in livestock production for small farmers could play a significant role in the food security of rural households, through increased consumption of livestock products and increased income through sale of animals and dairy products. There are good opportunities to provide additional rural income if markets are developed for underutilized resources, such as skins and wool, and expanded production of by-products, such as cheese, and new sources of income, such as honey production, all can contribute to improving incomes of farmers and rural dwellers.

Commercial livestock production is significant in Yemen, and has potential to grow. The poultry sector is very advanced, and meets all domestic demand for eggs. Poultry for food consumption does not satisfy domestic demand, but produces a tremendous amount of live chicken that receives a higher price than imported frozen chickens. For cattle, there are significant dairy operations, and some grow out (fattening) facilities. In general, the facilities for cattle are good, but could use additional inputs and techniques to increase productivity, and also could benefit from more highly trained technicians. With the exception of eggs, there appears to be plenty of room for growth in the livestock sector, with the key limitation of feed. Currently, most protein meal (soy based) is imported, and the cost of relying on imports could impact the viability of the sector.

Despite the spread of modern dairy farming and some fattening farms in the last decade of this century, but the small-scale producers in the villages are responsible for the majority of livestock except poultry sector which is dominated by mostly private and public sector companies. According to statistics, total value of domestic production of red and white meat and other animal products, for the year 2006, about (144) billion riyals while, total value of imported animals, meats and other animal products about (89.9) billion riyals.

Yemen was largely dependent on local food products to the beginning of the seventies. At present agricultural production is less than 20% of GDP, while in the past was more than 30%, of which animal production is approximately 25%. Also, 50% of meat and meat products imported from abroad, especially from Brazil, and frozen chicken and livestock from Africa.

To develop the livestock sector and control the health of local livestock and the provision of healthy food that is suitable for people and to minimize the import of those products, the Veterinary Services should involve researches and studies on the economic impact of disease and control considering the feasibility of diseases control, to be keep up with the modern economic trends of state especially in the field of investment and development, in addition to studies on the effects of animal nutrition, animal care and genetic resources.

The importance of developing animal resources and the veterinary services of the importance of livestock in food security, the Yemeni, in addition, the social significance of livestock is more important than its contribution to economic development, where approximately 73% of Yemenis live in rural communities and the majority of rural households own livestock that make up a large part of agricultural production and a major source of income for families with small holdings or which do not possess the land.

The total value of livestock is estimated at more than 360 billion Riyals, or more than U.S. \$ 1.8 billion. The annual production of animal (meat, milk, eggs, leather, honey, compost ...) estimated in the current 150 billion Riyals, or 0.8 billion U.S. dollars. This value could be doubled that in case farmers have access to reasonably good veterinary services and provision of advices in the field of animal production including animal feeding, care, training and animal extension programs.

Yemen is in a critical situation, particularly with respect to the possible entry of animal pests and diseases, due to its geographical location at the crossroads of Africa (which provide most of the imported animals) and the Arabian Peninsula, as well as with the wild birds migrating from north to south and back. Many of these diseases have the ability to influence and affect, in fact, human beings, whether in the form of epidemics of acute (Rift Valley Fever and bird flu), or repeated attacks of chronic (brucellosis, tuberculosis ...), in addition to diseases transmitted through food and through the consumption contaminated animal products, all of this cause many human deaths and high rates of morbidity in different regions of the country. The critical situation also is related to the deterioration of genetic resources and poor animal care, nutrition, breeding and genetic improvement programs,

Most of animals import from Africa, where Africa is home to most of the animal epidemics that constitute a major threat to domestic livestock and public health in the event of leakage to Yemen. Also, Rift Valley Fever considered a high risk, although the disease controlled after its attach for the first time in Yemen in 2000/2001. However, the re-emergence and spread of disease remains a risk. Foot and mouth disease attacks the regular familiar in Yemen. After the onset of SAT - 2 in the neighboring countries in the Arabian Peninsula, foot and mouth disease has become one of the big business

problems in the region, and the PPR is widely widespread in Yemen, although the virus is isolated only in 2000. Sheep and goats count for more than 17 million and is considered an essential source of income for local trade and also export to neighboring countries. Develop a national strategy to combat the plague of small ruminants and epidemics of economic importance and to public health and to protect local animals and trading is one of the key national tasks.

Annual losses that affect directly farmers through animal mortality is estimated at 20 billion Riyals, or \$ 100 million, while direct losses associated with diseases (morbidity) of up to 25% of productivity, and thus estimated annual losses of production at about 40 billion Riyals, or \$ 200 million . To reduce these losses to an acceptable level (50% at least in the short and medium term) and the protection of the country of import or the appearance of disease more deadly, for sustainability, Veterinary Services, should have the necessary resources to determine the geographical spread of existing diseases, and identification of strains and species of pathogens, and take decisions on the basis of strategic interventions with regard to veterinary and determine the location and timing of these interventions and to take appropriate health measures, as well as to the nature of vaccines and treatments that can be used. In addition, activities related to animal care and feeding should be improved in order to reduce the imports and thus reduce the entrance of infectious diseases.

Improving livestock nutrition and animal care including the strengthening the partnership among the related departments, concerned with livestock development, as well as combating epidemics and animal diseases of heavily economic impact on livestock are not of the effectiveness and feasibility only if adopted on the principle of early warning and early interaction or rapid control. This requires veterinary surveillance (the survey and investigation of animal diseases with epidemiology, diagnosis, laboratory), which consequent rapid action to reduce or eradicate the disease. The strengthening of the monitoring, oversight and control role of veterinary services on animal health inputs and services plays an important role in the effectiveness and quality of veterinary services provided to farmers, as well as the oversight monitoring role on animal products so that they are healthy and fit for human consumption, in addition, the role of veterinary services in preserving the environment and public health. This will necessitate rebuilding restructuring the veterinary services, and development of policies, strategies and activities to enhance capacity building and infrastructure development that is tailored to meet the new tasks and new trends of the Ministry of Agriculture and Irrigation

Table 3: Production and Potential for Livestock and Livestock Products⁸

ANIMALS AND ANIMALS PRODUCTS	Unit	2005 PRODUCTS	2009 PRODUCTS	IMPORTED 2009'
Animals				
CATTLE	Head	1,447,240	1,567,295	164,025
SHEEP	Head	7,723,973	9,087,216	1,493,046
GOAT	Head	7,695,661	8,883,315	
CAMEL	Head	357,010	383,533	
BEE HIVES	Head	1,197,281	1,230,692	
LIVESTOCK PRODUCTS/MT				
SHEEP MILK	MT	30,334	42,122	
GOAT MILK	MT	39,425	52,278	
COW MILK	MT	144,680	194,016	51,002* ⁹
CAMEL MILK	MT	2,169	2,671	
SHEEP MEAT	MT	23,670	30,648	1,646
GOAT MEAT	MT	22,675	31,649	
BEEF	MT	23,985	31,957	4,805
CAMEL MEAT	MT	2,297	2,482	
WHITE MEAT	MT	113,195	139,635	108,089
EGGS(MILLION)	Million Egg	930	1,128	
HONEY (Kg.)	Kg.	1,960,611	2,485,688	927
SKINS/ LEATHER	MT	9,715	12,102	
WOOL	MT	3.573	4,176	

b. Inputs for the livestock subsector

As mentioned, feed for livestock production is a significant limitation to growth in the sector. Poultry production relies on grain and oilseed based feed, and currently all soy, and most maize, resources are imported. The feed concentrate industry is just beginning in Yemen, and products often lack animal protein, and other key ingredients, leaving local production deficient. In addition, a tremendous amount of cropland is dedicated to fodder production, and the balance of fodder vs. food production should be studied. Other inputs, such as veterinary medicines and vaccines, appear to be available in private markets, but these are often not obtainable to small scale famers due to high prices or not available in remote rural areas. Quality of these inputs is also uneven, since there are no effective quality control mechanisms in the government. Breeding stock is also a significant problem for cattle, sheep and goats, as there has been insufficient investment to improve the stock over the years.

⁸ Source: Agricultural Statistics Yearbook 2009, Ministry of Agriculture and Irrigation, March 2010

⁹ *MILK POWDER

c. Marketing System for Livestock

Livestock markets are all traditional and informal in Yemen, but appear to function well. Small farmers bring their livestock to local livestock markets, and sell them to traders who transport them to population centers. Slaughtering is not a significant industry here, as most is done by individual butchers in villages and cities. Live poultry markets are found all over the country. This reflects the cultural preference for fresh meat and poultry products, and modern supermarkets that sell frozen or fresh meat are only utilized by the middle and upper classes in urban centers. A significant amount of chicken meat is imported. However, cattle, sheep and goats are imported and exported on the hoof. Again, while not efficient, this reflects the traditional marketing of animals in Yemen, and fits with consumer preferences to purchase live animals (poultry), or freshly butchered meat. Milk and milk products are sold in urban areas in consumer packs, while small holder milk production is consumed in the household or traded within the village. However, there are shortcomings in the legislation and regulations governing the marketing of livestock that should be developed.

d. Government support for livestock subsector

Government support for the livestock sector is minimal. As mentioned under inputs, the certification of quality of veterinary inputs, feed and other animal production inputs, is limited if not performed by the government due to lack of resources and capacity. Developing active extension programs to assist small scale livestock producers could greatly increase productivity of small producers. There are some donor programs working with small scale livestock producers on animal health issues, but this is only in a limited number of communities, and its activities do not cover aspects related to the animal breeding, care, feeding and productivity improvement. Government support could also be useful in expanding the breed stock for cattle, sheep and goats, and also in introducing an artificial insemination industry, including enhancing the technical aspects related to animal production.

e. Areas of potential growth in the Livestock subsector

Areas of growth include expanding the fattening industry, animal breeding, poultry, dairy production, feed and integrated concentrates production, and the honey industry. Both cattle and sheep fattening should be expanded to increase the supply of locally available meat supplies. In addition, fattening facilities may provide an additional market for young animals, and reduce the amount of animals that are slaughtered at an immature stage. The dairy industry could benefit from the expansion of commercial level dairy farms, increase in milk processing facilities, and the introduction of milk collection programs to meet domestic demand for dairy products. The concentrate industry is in its infancy, and utilization of concentrate by small farmers should be encouraged to increase the weight and value of their animal production. Finally, the honey industry could grow at all levels, including increasing small scale production, introducing better processing techniques, and expanding the

availability of packaging products for small scale producers. It should be noted here the importance of activating the role of technical staff in all animal production activities.

f. Priority programs to enhance growth in the Livestock subsector

- **Breed Improvement:** Genetic improvement and cross breeding research to improve the local breeds, which will increase the output of dairy and meat products, and introduction of artificial insemination techniques.
- **Fodders:** development of fodder crops and introduction of integrated animal feed concentrates production through the use of local available resources and promoting researches in the field of cultivation of fodders crops of low water requirements and resistant to drought & high salinity.
- **Input Quality Control:** Strengthen, promote and encourage government quality control inspection and enforcement of procedures for livestock subsector inputs – including feed concentrate, vaccines, and veterinary medicines.
- **Combating animal diseases and veterinary services:** developing and promoting early emergency/warning network for animal diseases (epidemiological and laboratory surveillance) and possibility of interaction through a rapid implementation of package of health actions to control endemic and epidemic animal diseases, as well as protecting the country from foreign diseases. In addition to make veterinary services available for farmer when needed in remote rural areas and areas of extensive livestock production.
- **Expand Extension Services and Veterinary Communication:** Extension program should be expanded to include training of male and female paravets and related labors; implementation of animal health and animal production extension programs; introduce technologies and the usage of balanced feed concentrates to small scale producers; introduce techniques to help in reducing losses of animal feeds and water; and establishment of livestock demonstration centers and programs to demonstrate better breeds and other related techniques, including livestock development programs related to animal nutrition requirements, productivity improvement, and introduction of drought-resistant fodders.

4. Development Policy for Animal Production

1. Policy: Increase Production in Yemen

The Policy in this area is to activate the role of the General Department of Animal Resources Development including technical and institutional capacity building. In order to conserve public finances with regard to animal production, it is important for Government to create an enabling environment for private investors in animal production, rather than undertaking directly activities to increase animal production. It is proposed that a public/private liaison or “partnerships” office is established within the General Directorate of Animal Resources Development to foster public/private partnerships in animal production.

2. Partnership Office

The office would promote public/ private partnerships with the objective of generating investment in strategic areas and points of the livestock value chains to provide new opportunities, alleviate constraints, create employment and increase the value added. To maximize benefits of the potential investments and ensure best use of staff time it will be important to have a clear view of the types of investment required and how they fit within and enhance the value chain. The Partnership Office should provide a variety of services for investors including the provision of a brokerage service, offering facilitation, orientation, and assistance to investors, and assisting the private sector and livestock organizations to establish their own representation and develop sub sector plans. The Partnership Office should evaluate successful animal production enterprises in Yemen and the region and apply the lessons learnt to new investment proposals. A clear and complete proposal for the partnership office has been developed by the General Directorate of Animal Resources Development.

3. Key areas for Animal Resources Development Plan which form part of a portfolio of potential partnership / joint venture projects include:

i. Pastures and fodders

- ✓ Study, characterize and improve indigenous pastures;
- ✓ Establish/maintain facilities to introduce suitable exotic fodders for feeding livestock, poultry and support bees;
- ✓ Pay particular attention to introduction and selection of fodders that combine high productivity and nutritional value with low water requirement;
- ✓ Study methods of increasing the nutritional value of fodders with low nutritional value;
- ✓ Study and introduce modern methods and technology for improving the palatability of fodders;
- ✓ Support seeds producers and cooperatives to produce improved grasses for grazing and fodders production;
- ✓ Establish units for chopping fodders and crops by-products, mixing additives, compressing and packaging for sale to livestock producers;
- ✓ Work with farmers to improve natural pastures and rehabilitate rangelands, introduction of ensiling techniques, use of fodder additives and assistance through introduction of appropriate agri-machinery for harvesting of fodder and appropriate irrigation technologies;
- ✓ Introduce technology for reduction of wastage in green and dry fodders;
- ✓ Utilization of waste products such as prickly pear (Atina ashoki), banana leaves and fish byproducts;
- ✓ Development of different extension projects;
- ✓ Support the establishment of private laboratories for measurement of fodder quality and nutritional value.

ii. Within the dairy sector

- ✓ Establishment of milk industry and production facilities, including dairy farms, milk collection and storage, milk processing, distribution and sale centers; develop procedures for inspection and control at each level of the dairy chain and standards for the inspection procedures;

- ✓ Specific support and developing legal and business skills in addition to assistance for cooperatives and small farmers / producers;
- ✓ Promoting the use of artificial insemination for both small farmers and large scale producers;
- ✓ Small scale dairy association opportunities and costs of developing added value products either as small associations or through a larger union(s) of associations;
- ✓ Support small dairy associations and provide the necessary funding for the development of value-added products either as small associations or through larger associations unions.
- ✓ Support the establishment of private laboratories for measurement of technical standards of milk;
- ✓ Establishment of camel milk farms.

iii. **Poultry**

- ✓ Development of more stable local markets for the local eggs as well as market for export from poultry farms;
- ✓ Development of broiler chicken farms, a poultry abattoir and possible domestic processing facilities, refrigeration /freezing facilities, , chilled/refrigerated distribution, and marketing infrastructure, with frozen storage capacity and capability to allow absorption of fluctuations in demand, and application of HACCP procedures for inspection and control at every level of production.

iv. **Small ruminants and cattle**

- ✓ Development of breeding and fattening enterprise(s) in order to improve productivity and promote availability of pastoralists' livestock linked to more profitable marketing, including exports;
- ✓ Establishment of a meat industry, including producers, traders, abattoirs, meat preparation and processing plants, butchers, wholesalers and retailers, distribution and sale to the consumer with application of HACCP procedures for inspection and control at every level of production chain of meat and by-product;
- ✓ Development of the hides and skins trade and processing an preparation of leather and wool products;
- ✓ Development of animal feed companies for manufacture of animal feed concentrates.

v. **Apiculture**

- ✓ Promotion and regulation (control and inspection) of bee-keeping and honey production activities and projects: Support honey production to improve livelihoods in rural areas through introduction of modern bee keeping and honey production technologies without compromising the product's properties that is known for it.
- ✓ It is proposed that available knowledge on bee keeping in Yemen is reviewed, and where there are gaps, studies are conducted to provide the necessary information on:
 - Characteristics and distribution of pastures most suitable for supporting bee keeping activities;
 - Local expertise;
 - Species of bees;
 - Presence and spread of diseases, pests and predators of bees;
 - Marketing of honey.
- ✓ A feasibility study should then be undertaken regarding the need and location of joint training and bees breeding centers, taking into account those already in existence, followed by

establishment of such centers where required. These centers would train rural people in best and most appropriate bee keeping practices under conditions in Yemen and provide those who have been trained with bees and hives to start their own projects in the field of bee keeping and honey production.

- ✓ Private laboratories should be encouraged and supported to undertake measurement of technical standards (quality control and detection of adulteration) of honey.
- ✓ Encourage and support associations/cooperatives of small producers of honey to improve their products and marketing.
- ✓ Help those starting or expanding their honey production business to access affordable finance (Credits).
- ✓ Support and encourage the private sector to market the necessary materials for modern honey production (hives, cells, wax etc.).

vi. Sericulture

- ✓ Promotion and regulation (control and inspection) of silk production.
- ✓ Capacity and institutional building to General Department of Animal Resources Development
- ✓ Encourage and support associations/cooperatives of small producers of silk to improve their products and marketing.

vii. Support for rural farmers, including women

- ✓ Introduce training courses for rural farmers, including women, working in animal husbandry, develop their awareness regarding animal and honey production opportunities and involve them in small business development through provision of affordable (low interest) loans;
- ✓ Promote the establishment of small farmers' cooperatives and associations to help them get food and services at competitive prices, and assist them in marketing of livestock and animal products, including honey.

viii. Development and improvement of community based capacities

- ✓ Training of selected livestock/cattle breeders to give them the necessary skills to work in field of animal health, production, nutrition and extension services in their communities;
- ✓ Expansion in the distribution of animals for the poor people;
- ✓ Promote micro-finance projects in order to improve the productivity of domestic livestock;
- ✓ Participation of DG of ARD in preparation of training materials and extension messages, including those related to honey production.

ix. Wildlife

- ✓ Classification of types of wild animals and birds in Yemen and determine their locations & lifecycles;
- ✓ Identify and seek business partners for commercial ventures involving wildlife (such as public parks and natural protected areas).

x. Research and development

- a. Development of programs for animal husbandry :
- b. Establishment of farms for increasing productivity through improved breeding techniques including selection, developing artificial insemination, centers of genetic resource, testing of sires, and embryo transfer;
- c. Improvement of breeding techniques and methods based on scientific research;

- d. Improvement of local stock by identification and characterization of local breeds in all categories of livestock, including poultry and bees;
- e. Import the appropriate semen, in particular to improve milk production;
- f. Assessing the production of milk and meat from local breeds of ruminants that are raised locally, and after identification of suitable breeds/cross breeds, select the best and then propagation and distribution of offspring;
- g. Establish a database of genetic resources in Yemen, (Gene bank) to support and protect local breeds such as Shaubi goats (Bajil) and Al Bown sheep (Amran);
- h. Improvement of traditional methods for animal production;
- i. Provision and improvement of production tools and means.
- j. Involvement of private sector in the field of animal production researches and development

4. Human resources development in the DG of ARD

Assess the capacity of DG of ARD and identification of areas, disciplines and expertise compared to their tasks, and then review of its technical staff in order to identifying areas where there is a lack of expertise and availability of staff who could be utilized better elsewhere or dispensed with. Where required, the relevant expertise should be acquired through employing new staff or training existing staff. The DG of ARD should develop training and capacity building programmes in order to implement the assigned activities and tasks to DG of ARD and to and to meet the needs of livestock development.

5. Production and marketing database

Support DG of ARD to create a database of production and marketing information that are collected from districts with a support of a team of analysts who have expertise in marketing and economics to analyze the data collected for preparation of policies on production and marketing and to seek out opportunities for production and marketing to be undertaken together with the private sector. The database should be linked with the databases proposed for DAH&VQ to allow exchange of information.

6. Animal Resources Policy Unit

The Animal Resources Policy Unit will assume responsibility for formulating the Animal Resources Development Plans. Tasks of this unit include identification of areas for livestock development and funding proposals based on the results of researches and collected data from various sources and in different related areas. In addition, the development of standards for producers to meet the needs of the local and export markets for livestock and livestock products.

5. General Policies for Animal Health and Veterinary Quarantine

Policies and strategies of animal health and quarantine presented in this document were drawn and developed based on livestock policy document prepared by the international expert funded by Rain-fed agriculture and livestock project, funded by the World Bank., Which was the results of long discussions with the participation of relevant livestock (governmental sectors: agriculture, health, environmental health, financial, research and other various government agencies) and education institutions: universities, institutes, private and cooperative sectors during two workshops . The first workshop

allocated for gathering ideas and discussions, according to which the first draft developed. During the second workshop comments on the first draft and opinions were discussed and the second draft was developed which absorbed all the comments and remarks that serve the development of the livestock.

a) The overall objective of the policies and strategies for livestock:

Increase the productivity of livestock and livestock production in all parts of the country to provide a better level of animal protein for citizens and increase economic returns and welfare of the livestock farmers. This can be achieved through the protection of livestock from animal diseases, improve animal husbandry practices in line with the three pillars of the national development framework (development of human resources, development of resources and management of uses, and development of the private sector).

b) Goals:

- ✓ To achieve a better safety on health and nutrition of animals to maintain food security, commercial agricultural production, and generating capital;
- ✓ Access to healthy food suitable for human consumption.
- ✓ Contribute to the national economy through production efficiency and quality in rural areas and intensive production for the national and export markets;
- ✓ Improvement of living and income level

c) Institutional building and restructuring

Policy: rebuilding and restructuring of governmental veterinary services organizations to increase their capacity to carry out its basic functions on the basis of a clear definition of the modern structural components and jobs classification (tasks) at the central and the provinces levels so that the redrafted tasks commensurate with the modern trends of the state and the new tasks of the Ministry of Agriculture and Irrigation: policies and regulations, monitoring and evaluation, and provision of selected inputs and services, and encourage the establishment of partnerships between different sectors.

Strategies:

- ✓ Find a clear and appropriate coordination mechanism.
- ✓ Re-building of government services
- ✓ Design and implementation of good management system.
- ✓ Rehabilitation of the necessary government services with needed infrastructure and services.
- ✓ Development, organize and implement a coordinating mechanism that allows the partnership with the private sector and avoid duplication of the same work and competition between the existing forces of development.
- ✓ Review the expected types of activities of government services.

d) Delegate certain veterinary health powers to the private sector:

"The mandate health" gives the General Directorate of Animal Health and Veterinary Quarantine authority to introduce the contracting policy for the surveillance and control of animal diseases with qualified and appropriate personnel, as well as those authorized by (the Medical Board of Veterinary / other entity with the same functions) in the private sector, as follows:

1. Create a partnership between the public and private sectors for the purpose of the transfer of specific services relating to animal health from the state to the private sector.
2. Secure management of contracts for the health authorization
3. Overseeing the procedural aspects of the implementation of the health authorization, including:
 - Procedures for reporting the occurrence of disease.
 - Procedures for the initial investigation in the outbreak of the disease in case of suspected occurrence of any disease requires reporting.
 - Procedures for the application of health measures by authorized specialists and veterinarians.
 - Procedures for the implementation of vaccination campaigns against specific diseases.
 - Setting a formal accredited training curriculum in the field of the health authorization and supervision of health training courses for veterinary professionals or counterpart (veterinary health workers) with respect to the mandate of health.
 - Setting conditions for the transfer of powers of health (health authority) to veterinary professionals or professional's counterparts.

Although the health authority is an effective and economic mean to provide animal health care services in place in many countries, but there are some restrictions that hinder the implementation of that in Yemen, namely:

1. There are some doubts about the availability of qualified veterinarians and veterinary assistants in the private sector that can take over the contracted veterinary activities. And where the majority of veterinarians in the private sector living in urban areas and most of them are employed by institutions such as the pharmaceutical companies and poultry farms.
2. Although there are now many veterinarians graduate every year from the College of Veterinary Medicine Dhamar, but there are questions about the quality of training and consequently about their abilities
3. Difficult for veterinarians in the private sector to prove themselves in Yemen since the veterinary specialists working for the government engaged in business, especially after the official working hours of government. Easy to make a recommendation to enact legislation prohibiting the veterinarians employed by the government to exercise a special work, but this may not work to solve the problem due to the following:
 - a. Low government salaries and it may not be possible to ask of veterinarians and veterinary assistants with the government to stay in rural areas unless they have the incentive to earn additional income through private activities.
 - b. There may not be suitable veterinarians or veterinary assistants working as a private sector in rural areas to provide animal health care services or available to implement contracts for the work of the government's veterinary.

Currently, it is difficult to adopt any policy to be applied term of mandate health in Yemen as the situation requires further investigation as to whether the private sector can play a special role to provide the public veterinary services through contracts with the government, as the situation requires further discussion with stakeholders. However, what should be done now is to review the current legislation, setting health authorization policy, so that it can be displayed quickly and easily when needed. For example, if not to be used for the recruitment of veterinarians and veterinary assistants in the private sector to provide the field work, it may be better to engage them in contracts for the implementation of other activities, such as meat inspection and control of livestock markets.

e) Policies for Disease and Disease Control

The overall objective: Reduce mortality and reduce the spread of livestock diseases through preventive programs and to provide quality veterinary services for the treatment of animal diseases to protect the human being from common diseases and to ensure the quality and safety of animal products

To achieve this overall objective of the Veterinary Services, the following strategies are required:

- Development of prevention and control programs to reduce the impact of transboundary diseases and emerging diseases based on networks and modern information systems, and through better coordination with all concerned parties.
- Create an enabling environment to the promotion and dissemination of veterinary services and distribution of medicines provided by the private sector.
- Intensification of control measures to combat common diseases.
- Implementation of health measures and regular inspection of products of animal origin at the country level as a whole.

a) Prevention and control of epidemics:

Politics: Reducing the impact of animal epidemics on national livestock to the acceptable limit in the medium term and to prevent entry of any new animal disease and epidemics.

The epidemiological surveillance strategy includes the following:

- Passive surveillance based on farmers' and other members of the public reporting suspicion of disease, organized by district veterinary staff.
- Active surveillance by district veterinary staff.
- Training and use community animal health workers in the community.
- Public information campaigns and hotlines services.
- Dedicated surveillance teams to undertake purposive surveillance based on the results of risk analysis (as done for Rift Valley fever- RVF), including use of random sample surveys and participatory rural appraisal

Probably the best policy is flexibility to suit different production systems using combinations of the above methods. Whatever surveillance system is used it will not be sustainable without the

expectation of the reporter that reporting will be followed up by further investigation and control activities. This requires:

- A reporting network from village, through provincial to central level;
- A well staffed and supported Epidemiology Unit for processing surveillance information, undertaking risk analysis and response planning and forwarding the information generated to policy makers and giving feedback to regional and district animal health staff and to livestock keepers;
- A well staffed and mobile veterinary investigation unit supported by the veterinary laboratory which is fully mobile and able to respond quickly to make field investigations to follow up surveillance reports;
- A field service plus response teams at provincial and central level that can undertake treatment and control activities at farm/village level.

b) Field and laboratory surveillance:

- Creating a field surveillance network equipped with all means on country level.
- Capacity building for the existing staff to be able to carry out the new tasks in the field of surveillance and data collection.
- Employment of veterinarian staff, particularly in areas that lack this specialization in those provinces where there is no enough veterinarian staff.
- Ensure that the veterinary services, in the field of control of epidemics, have the ability to mobilize cooperation between all stakeholders and collecting epidemiological information and clarification on major diseases and in particular:
 - Develop and expand the veterinary communication for the training of technicians assistants in the field of diseases identification and clinical diagnosis.
 - Increase farmers' awareness through participatory epidemiology that will be implemented by field teams through guidance during data collection.
 - Organization of merchants and increase their awareness.
 - Determine the impact and incidence of the disease through the science of participatory epidemiology.
 - Create a list of diseases to be reported and a mechanism for reporting, which requires service providers in the private sector to inform governmental veterinary services.
 - Work to ensure the clinical diagnosis and laboratory confirmation.
 - Organization of laboratory support for the field surveillance activities.
- Rehabilitation and strengthening of the Central Veterinary Laboratory and regional laboratories and the development of its infrastructure, particularly in the following areas: -
 - Rehabilitation and strengthening of the central veterinary laboratory as a national and as the first reference laboratory in the country and develop its infrastructure in order to provide the following: -
 - Rapid and approved diagnosis for the livestock disease.
 - Quality control tests on production and animal health inputs.
 - Contribute to the studies and applied researches in the field of animal health and production.
 - Contribute in providing the diagnostic reference services to the private sector.

- To maintain the continuity of the provision of diagnostic and reference services it will be important for classification of services provided by the Central Veterinary Laboratory, according to categories of beneficiaries as follows:
 - diagnostic services pertaining the control of epidemics, field surveys and studies undertaken by the State with regard to disease or other studies related to the improvement of production and animal health and risk assessment should offered by the state veterinary services free of cost.
 - Diagnostic services to small farmers for individual cases and non-epidemic, should be offered on the bases of recovery part of the cost.
 - Diagnostic services to Intensive animal husbandry farms and poultry farms produced for commercial purposes and testing of imported and locally produced production and animal health inputs. In these cases, lab tests costs imposed should cover the operation costs and should be competitive.
 - Cost sharing fund will be used in providing some reagents, materials and as incentives for the staff that will impact positively on performance improvement and excellence in service delivery.

c) Control Disease from Imported Livestock

Risk analysis shows that the biggest animal disease threat in Yemen is from transboundary diseases entering Yemen across its international boundaries. The biggest danger has been from diseases being carried by imported cattle from Africa.

To protect Yemen against the importation of diseases from other countries, particularly from Africa, the following strategy is proposed:

- ✓ Inspection, identification (ear tags) and registration (including date of entry) in a database at the port of entry;
- ✓ Upgrade quarantine facilities so that imported livestock can be kept in separated batches at improved quarantine facilities;
- ✓ Surveillance and testing at quarantine facilities, reporting results in the database against ear tag number and recording date of release from quarantine;
- ✓ Inspection at markets with access to the database, noting ear tag numbers for updating the database and confiscating imported livestock without ear tags or irregular entries in the database;
- ✓ Inspection at destination (may be an abattoir, fattening unit or, in the case of animals in transit, a border inspection post) noting ear tag number for the database and confiscating imported livestock without ear tags or irregular entries in the database.

To implement the above strategies the following must be undertaken:

- Establish a network of veterinary quarantine facilities with abilities to work as per international standards, and the importance of quarantines and its sensitivity regarding the protection of livestock and local Yemeni consumer, functions must be specified to facilitate the application of control measures and quarantine procedures to be as follow:
 - Al-Mukha Quarantine Facility for live animals on the Red Sea

- Almukalla Quarantine Facility for live animals on the Arabian Sea
- Ports of Aden, Hodeida and airports for animal products and production inputs.
- Sana'a airport for vaccines entry, one-day-old chicks and hatching eggs.
- Harad port of entry for animal products and production inputs, as well as day-old chicks and hatching eggs coming from neighboring countries.
- Shahn port of entry the same for Harad port of entry
- Rehabilitation of existing quarantine facilities especially quarantines in Al-Mukha and AL-Mukalla
- To control the movement of animals between provinces, it requires a study to determine the locations of markets.

d) Disease Control:

For proper animal epidemics and zoonotic disease it is proposed that lists of diseases of particular importance in Yemen (for reasons of high morbidity, mortality and economic damage, as well as those zoonotic diseases that have an important deleterious effect on human health) are made compulsorily notifiable under the Animal Health Act. A list of notifiable diseases should be prepared which should include at least:

Disease Type	Diseases
Transboundary Disease	<ul style="list-style-type: none"> ☞ Foot and mouth disease (FMD); ☞ Peste des petits ruminants (PPR); ☞ Pox diseases (Sheep and goat, camel and avian pox); ☞ Contagious caprine pleuropneumonia (CCPP); ☞ Old world screwworm <i>Chrysomyia bezziana</i>.
Endemic Disease	<ul style="list-style-type: none"> ☞ Pseudotuberculosis (<i>Yersinia pseudotuberculosis</i>); ☞ Bluetongue; ☞ Newcastle disease; ☞ Mange (seen in sheep, goats, camels, donkeys and dogs).
Diseases of Public Health significance	<ul style="list-style-type: none"> ☞ ☒ Rabies; ☞ ☒ Brucellosis (<i>Brucella melitensis</i>; <i>B.abortus</i>); ☞ ☒ Rift Valley Fever.

Strategy:

- Contingency plans and emergency preparedness should be prepared for the diseases listed and disease control programmes planned (e.g. PPR and Newcastle Disease vaccination programmes).
 - With regard to locally produced livestock for export and for imported livestock from Africa that are fattened in the Tihama for export, a strategy is emerging which appears to be getting agreement from international regulators in OIE (though as yet not EC) which is described as a commodity-based approach to livestock trade.
 - Adoption of a system for Hazard Analysis and Control of Critical Points (HACCP), which includes the critical control points for quarantine and vaccination, but not the need for the establishment of disease free zones, which are usually only feasible for large-scale commercial farming.
 - The commodity-based approach to livestock trading is an appropriate option for small scale livestock farmers and pastoralists. An export trade in their livestock products could provide them with the finance and incentive to be more actively involved in disease control, and thereby help to further stimulate livestock trade opportunities in Yemen, both locally and for export.
- For control of zoonoses it has been proposed that a policy of collaboration with the Ministry of Public Health and Surveillance is instituted for combined surveillance activities to assess prevalence

of and control of zoonotic diseases (e.g. brucellosis and RVF). Humans can be sentinels for zoonotic disease in animals (e.g. rabies). An appropriate strategy is the formation and training of joint Animal Health/Human Health Rapid Reaction Teams (RRTs) for surveillance and response in the face of an outbreak of zoonotic disease

To implement diseases control strategies, the following control programs and control of epidemics and field surveys, must be adopted:

- Monitoring and control of animal diseases with economic impact, as well as zoonotic disease of importance to public health by providing all possible support of vaccines and equipment to collect field samples and sent to the Veterinary Laboratory and means for GPS for identifying sites, and means for transferring and analyzing of information.
- Establishment of epidemic information network at the national level that is equipped with all necessary facilities and equipment to cover all governorates of the Republic.
- Strengthening the role of veterinary extension through the communicating the indicative message by different means to the animal breeders to make them aware of health care for the animals to contribute to the protection and development of livestock.
- Pay due attention to local staff and provide capacity building and local and external long and short term training in the field of animal health.

e) Veterinary field services and distribution of medicines:

Policy: to ensure the arrival of the high quality and effective veterinary services and provision of medicines and vaccines with excellent quality for all owners of animals in time of need and wherever they are across the country as a whole.

Strategies: these services to be undertaken by the private sector while the Ministry of Agriculture and Irrigation and the other relevant authorities should facilitate the tasks in terms of training the required staff, financing tools and medications that enable them to start activities in coordination and supervision by the General Administration of Animal Health and Quarantine.

- Improve coordination between public and private services and stakeholders. Development of a partnership system based on regular consultation and participation, and participation in diseases detection activities, surveillance and reporting and participation in the control programs.
- Establishing partnerships and promote coordination of the handling in the provision of veterinary services and the distribution of medicines.
- Encourage the private sector to provide veterinary services, including the partnership between government and private sector and the development of contractual arrangements for the implementation of some public services by the private sector.
- Develop plans, in consultation with relevant stakeholders, for gradual costs recovery of services and inputs, especially laboratory services and immunization programs.
- Regulate and control the quality, safety and efficiency of medicines and vaccines required permission to be imported or manufactured and distributed within the country. This requires regulation of veterinary medicines, vaccines and biological materials in Yemen needs to be investigated to check that it complies with international standards including:
 1. Regulation on the import, manufacture, distribution, sale and final use of veterinary medicines, vaccines and biological materials.

2. Procedures for the registration of veterinary medicines, vaccines and biological materials.
3. Procedures for licensing, inspection and control of premises and operations where registered veterinary medicines, vaccines and biological materials are manufactured or traded.
4. Procedures for licensing and control of imports of registered veterinary medicines, vaccines and biological materials.

To be properly implemented, animal disease control activities need to be undertaken by appropriately trained and regulated professionals. Therefore veterinary statutory board must be established and the following is recommended:

- Preparation and enactment of enabling legislation to support the existence and activities of a Veterinary Statutory Board;
- Standards and authorized levels set for activities of veterinarians, paraveterinarians and other authorized persons, e.g. community animal health workers;
- Preparation and maintenance of registers of the authorized persons described above.

The Board should have powers to:

- Monitor those in its registers and remove those who do not meet the standards set;
- Prosecute any persons who undertake unauthorized animal disease control activities.

Veterinary treatment and extension service to cover all various regions the following composition needed: -

- Services at the village level or a group of villages performed by a health worker under the supervision of licensed veterinarian
- Services at the level of district division (Uzlah) or group of close Uzlah by licensed veterinary technician
- Services at the district level or a group of districts performed by licensed veterinarian assistant.
- Services at group of districts to be performed by licensed veterinarian and oversees the performers of the veterinary services of health workers, technicians and veterinary assistants in his region.

f) Control of common diseases transmitted from animals to humans:

Policy: reduce the spread of common diseases in the country and prevent the population from contamination that is likely to result from livestock and poultry in cooperation with the Ministry of Public Health and other relevant bodies. In General, common diseases are classified as one of the diseases that fall within the basic functions of government services, and the development of strategies to control applies the same principles concerning the control of infectious diseases of priority referred to previously. Epidemiological information to be accurately and organized in coordination and cooperation with the Ministry of Public Health and Population.

Relevant strategies include: -

- Development and achievement of laboratory diagnosis capacity of major animal diseases.
- Implementation of public awareness programs for residents pertaining the risks of existing and potential pollution.

g) Improve the monitoring of animal products (Regulation of Veterinary Public Health):

Policy: regulation, control and implementation of the quality and safety control on local and imported animal facilities, services and products for protection of consumers and promotion of the Yemeni exports.

The Ministry will work on the summarizing regulatory regimes on local animal products (dairy, red meat, white meat, eggs, and honey) and ensure its quality and its rivalry to similar imported products:

- Review the current situation that prevails in both rural and urban areas regarding the marketing and slaughter of animals and processing animal products, particularly meat and dairy products.
- Consult with producers, traders and distributors about the problems they face and the possibility of developing solutions.
- Identifying priorities and needs regarding the required infrastructure, equipment and training, as well as governing legislations.
- Develop a national program for food safety includes Technical trends, cost and schedule for implementation and identification of functional responsibilities of each party in the government, including the veterinary activities pertaining to public health.
- Develop a field mechanism to control the following:
 - Quality control of production and animal health inputs e.g. feeds, medicines and vaccines.
 - Monitor the quality of local animal products to be able to compete.
 - Monitor the quality of the implementation of the field campaigns.
 - Monitor the services provided by the private sector.
 - Strengthening and enhancing the laboratory capacities to enhance the role of field control

There is also concern about the threats to public health due to the limited presence of sanitary facilities for slaughter and the absence of proper and neutral inspection in the provincial cities and commercial centers in Yemen. There is a need to ensure minimum acceptable standards as determined by the purposes and the productivity of existing facilities.

Therefore, by working together with other parties, the extent and impact of animal diseases common in Yemen should be assessed, which may be detected and controlled through the facilities of the healthy slaughter and meat inspection.

An exercise should be undertaken to map towns and villages and conduct needs analysis for slaughter facilities, including poultry slaughter facilities, based on the population and prevalence and distribution of relevant zoonotic diseases. Depending on the results of this exercise and on the financial/business considerations of these facilities, attention should be given to the feasibility, costs and benefits of introducing minimum training requirements and course certification for workers in the meat and meat processing industry, and how different components should be financed by government/private sector/consumer.

Other considerations with regard to abattoirs are:

- Involvement of abattoirs in the epidemiological networks;
- Procedures for control and management of abattoirs;
- Develop procedures for *ante mortem* and *post mortem* inspection;
- Establishment of procedures for animal slaughtering according to animal welfare considerations.

Control the movement of animals and animal products and veterinary inspection are of great importance in controlling animal pests and diseases and their effects on the economy and public health. To promote it, the following must be taken:

- Drawing marketing paths and identifying critical control points so that the inspection and control become more effective.
- Prepare a list of areas of conservation of animals and quarantine stations, shops of traders and butchers, their uses, their current facilities and conditions (fences, water, etc.) and development of a plan for rehabilitation and development of those facilities which are useful as well as new ones, which are necessary in terms of strategy.
- Introduction of licensing system for the movement and the veterinary inspection in the markets and the checkpoints including the appointment of additional staff as necessary to support the system.
- Through the application of traffic control and enforcement systems to prevent illegal movements, the risk of the spread of diseases transmitted across the borders will be reduced and health care for transmitted livestock will be improved. In addition, anti-theft and smuggling of animals will be controlled especially if accompanied by the introduction of the numbering system of animals.

The process for oversight and inspection of the animal markets and animal collections requires the following:

- Setting conditions for the adoption and approval of veterinary inspectors.
- Development of specifications for any type of inspection by the Veterinary Inspector.
- Supervision and inspection on the movement of animals.
- Introduction of a system for recording and registration of livestock to enable better tracking and control disease outbreaks.

h) Human Resources Development and Capacity Building:

Human development is the main pillar for the development of veterinary services in the country, and the lack of adequately trained personnel is the norm and significantly in most areas of veterinary medicine, livestock and related services in the public and private sectors, which is considered as the key issues. Since the ability to implement clearly defined policies for these vital services depend mainly on appropriate human and adequate financial resources, and that is the policy of the Ministry of Agriculture and Irrigation is as follow:

Policy: a comprehensive study of the human resources and needs assessment for veterinary services, and ensure the recruitment, training and extension programs are funded and implemented in the medium term.

Such a policy must be shared with relevant government institutions and donors to ensure the use of national and international resources as soon as possible. For development of strategies all levels of the livestock industry, livestock breeders themselves and specialized on different levels should be involved. To include in particular:

- Re-evaluation, in coordination with the Faculty of Veterinary Medicine and Veterinary Institute and the Ministry of Higher Education the following:
 - Quality of the curriculum and the quality of graduates, commensurate with international standards relating to the intermediate and university veterinary education and sciences.
 - Linking veterinary education with market needs, so that a plan for the next ten years should be prepared to reflect the needed middle and university staff in the field of veterinary medicine.
- Identify the needs of competencies at the level of master's and doctoral degrees and set conditions to be met by individuals applying for the universities and the International Institutes, which provides that kind of studies.
- Develop a specific list and planning on short and medium term for the areas of training outside the country that cover urgent needs in both the public and private sectors.
- Develop a list of specific and short-term planning to bring in international experts to train local staff in the country.
- Review of the existing potential for the training of health workers and identification of veterinary standards of training for these groups.
- Identify issues that need organization and implementation of specific guidance systems.
- Establishment of communication systems to be used development farmer's awareness or other stakeholders through development programs.
- It is important for veterinary institutes and colleges to establish new strategies for the admission of students to ensure that the distribution between the provinces, and to encourage graduates to go to rural areas to practice veterinary activities.

i) Legislation and regulations:

It would be difficult to implement policies without an enabling and appropriate legislative and legal environment, which define the conditions for the continuity of these policies and ensure the rights and obligations of the concerned parties. For this the Ministry's policy will be:

Policy: Review and update existing legislation to create an enabling and conducive environment for the implementation of government policies and to provide and encourage private sector initiatives and investment. Identification of laws and regulations that are necessary to maintain the policies and strategies, including *inter alia* the following:

- Decisions related to animal life, including:
 - Set of regulations on animal diseases and diseases to be reported;
 - Set of regulations on the exercise of Veterinary Medicine.

- Set of regulations on veterinary medicine, pharmacy and biological input, and organizing the control of quality, safety and efficiency of drugs and vaccines that require permission to import or manufacture and distribution within the country.
- A set of regulations on animals and the environment.
- A set of regulations on the prevention of cruelty to animals.
- Decisions regarding human use of animals, including:
 - A set of regulations on the ownership of live animals.
 - A set of regulations on the movement and marketing of animals.
 - A set of regulations on the handling of animal products, marketing, distribution and export.
 - A set of regulations on animal feed, supplements and additives.

VI. Sector-wide Development Strategies in Agriculture

The following are key areas that impact all subsectors in agriculture, as well as both small scale and commercial agriculture. The solutions to these cross cutting issues may also lie outside of the sector, and other assistance is necessary from other areas of the government besides the MAI.

1. Water Resources

The primary factor affecting agriculture is water scarcity and low rainfall. Historically, water has been managed sustainably, but water use far outstripped renewable supply in recent years mainly due to rapid population increase and irrigation expansion. Soil and irrigation water management practices in order to improve the productivity and profitability of agriculture must be improved. With regard to these concerns, the following are some suggested actions to account for water scarcity:

- Continue infrastructure development of irrigation schemes, including the construction of flood barriers and dams, wadi bank protection and the rehabilitation of abused terraces, as well as the rehabilitation and maintenance of existing irrigation structures. In addition, infrastructure investments are needed to: promote the use of rainwater harvesting techniques; increase development of surface water resources; replenish groundwater basins by reducing excessive pumping; prevent and mitigate floods and flood damage; and to reduce as much as possible wasted water that reaches the sea.
- Ensure the sustainability of spate irrigation schemes: most of the spate irrigation infrastructure is deteriorating due to poor maintenance caused by budgetary constraints in the public sector. Irrigation schemes will be maintained by improving the cost effectiveness of their management and involvement of users in irrigation investment and management.
- Integrated water-saving approaches to on-farm management include: combined water and soil fertility management through enhancing the efficiency of water utilization, including rainwater; through introduction of modern irrigation techniques; promotion of better management practices; and programs for integrating soil and water conservation, rainwater harvesting and storage. Promotion of these water saving approaches will require the provision of comprehensive technical advisory services.
- Increasing the productivity of irrigated agriculture through promotion of improved irrigation technologies, comprehensive knowledge transfer, and research on agricultural water use efficiency and conservation
- Improve and maintain soil fertility through increased use of organic fertilizers, which will also assist in the control of soil erosion and other environmental degradation.
- Promotion of water resources sustainability through improvement of watershed management, wadi bank protection, tree planting in watersheds, and rehabilitation of agriculture terraces and existing water structures including construction of subsurface dams.
- Promote the production of rain-fed and drought tolerant crops, and provide support to research to develop new varieties of drought resistant crops or alternative crops.

- Promote usage of treated wastewater including gray and brackish water to support environmental preservation activities,
- Regulatory incentives for water conservation must be developed and integrated within overall agricultural policy, both on the input side (with policies for research, extension, fertilizer, investment, and input support) and on the output side (with policies for transport, market development and trade, agricultural prices, and protection). Including incentives to the staff of irrigation sector.
- Build the institutions and capacities within the agriculture sector to promote water conservation.
- Promote capacity building and expansion of gender-based farmers' organizations and water user associations.
- Update the National Water Strategy, the National Irrigation Strategy(NIS) and watershed management strategy to meet the changes.
- Classification and categorization of agricultural land on a country level through satellite imageries and other modern techniques to produce comprehensive land use, green cover and watersheds maps.
- Develop data base and information system including geographical information systems. Activating water monitoring, data collection and analysis including agro-climatic data. Monitoring climate change related data and its effect on agriculture. Developing early awareness systems in main wadis.
- Study water requirements for different crops (irrigated and rain fed) for developing action plan for cultivating appropriate crops in appropriate areas based on availability of water in these areas.
- Promoting community participation in water management and involvement of farmers, water users associations, cooperative and private sector.
- Efforts to meet the effects of climate change on agriculture sector. Including related studies in different areas required to develop plans for adaptation and resilience at country level.
- Develop policies and strategies for climate changes, drought resistance and combating desertification including investment program related to climate changes according to National Adaptation Program of Action (NAPA) for submission to United Nations Framework Convention on Climate Change (UNFCCC) including development of related strategies.

2. Land Resources

Land resources are extremely limited in Yemen. The quantity of land is limited, quality of agricultural land is threatened with serious degradation of agricultural, grazing and terraced land resources, and land registration policies are not sufficient to protect the interests of agricultural land owners and tenants. Population growth will also lead to a situation of small plots of land being divided between numerous children, rendering the land impractical for agriculture. While it may be too late to reduce

the population pressure on agricultural land, the areas of land registration, and preventing degradation of land resources should be addressed in the near term.

Land Registration Issues: Land ownership and tenancy rights are problematic, as tenant farmers are often not permitted to make improvements to their farming plots, and have other disincentives to make the best use of the land they have rented or been given rights to farm. In addition, illegal land takings have been reported in many parts of the country. While there is no solution to creating more arable and grazing lands, there are a number of legislative and regulatory interventions that could be undertaken to make the best use of the land that is available. Given the importance of access to land, and the complicated nature of laws and compliance, a detailed research study is needed to fully understand and propose improvements to land access for small scale farmers, women, and tenants.

Improving Access to Land: Productive land in Yemen is increasingly concentrated in the hands of a small number of wealthy families, which reduces the rural and urban poor's access to land. Lack of access to land increases farmers' vulnerability to food insecurity, since the farmer is likely to be able to earn more money from farming than from casual labor. In addition, rural women's access to land is an unresolved issue. Although women perform 75% of cultivation activities in Yemen, they rarely have ownership rights to land, and commonly relinquish inherited land rights to male family members in exchange for promises of security. Therefore, it is important to highlight that improving secure and equitable access to land is a key component in developing a strategy for food security.

Land Rights and Registration: The Republican Resolution on Law No. 39 of 1991 requires registration of land rights. However, only urban land appears to be registered pursuant to the formal law. Most private rural land rights are documented under customary law. Traditional leaders, usually the *sheikh* prepare land title documents (*basira*) and issue land inheritance certificates (*fasl*). The documentation usually includes a description of the land, boundaries, and history of ownership. Land may be titled individually or jointly in Yemen, but the vast majority of land is titled in the name of the male head of household or extended family. Women with individual title to land tend to be wealthy or educated urban residents. Only a small percentage of Yemen's land (an estimated 10–20%) is registered. Eighty to ninety percent of land transactions occur by *basira* or informal documentation. Due to the low level of official registration of land, access to credit has been affected, as all of the loan products of the leading agricultural bank require a land deed to receive even the smallest loan.

Land Tenure: It is important to protect tenure security over land, not just in order to preserve property rights and concessions to small-holders and poor people, but also to guarantee that natural resources will be protected, and the productive value of the land is preserved. In 2002, the Government of Yemen adopted a poverty reduction strategy that expressly recognizes the need to support the agricultural sector and improve women's access to agricultural land. However the PSRP does not include any programs or initiatives to address land access and land tenure security for any groups, including women. Insecure land tenure, which reduces the incentive to invest in land improvements and good husbandry, such as tree planting, terracing or investing in permanent crops, and also reduces productivity by denying collateral to receive credit for improved inputs and fertilizer.

Limiting Degradation of Land Resources: Land resources are under threat in Yemen, whether the land is used for agriculture, rangeland, or desert. It is critical that programs are developed to conserve all types of land that have an impact on various agriculture subsectors.

Agricultural land – Yemen’s agricultural soil is not maintained in a way to ensure long term fertility. Fertilizer usage is low, and crop rotation is not widely practiced to rotate legumes and non-legumes. Many of Yemen’s terraces are in disrepair, which could lead to erosion of fertile soil. Programs need to be developed to ensure agronomic techniques conserve the soil quality, and efforts are made to preserve terraced agriculture. Water control measures are also important to prevent erosion of agricultural land located in wadis.

Rangeland – Much of Yemen’s livestock sector is dependent on natural forage in rangelands. These rangelands are over exploited, which could lead to desertification, and reduction in available forage for livestock producers. Programs are urgently needed to rehabilitate rangeland, and to institute proper rangeland management. This is a key activity to help rural livestock owners to maintain, or expand their herds. Rehabilitation of rangeland may also require the establishment of nurseries and seed production for forage plants that will survive in marginal conditions.

Desertification – Desertification is a significant issue for both rangeland and agricultural land. There are a variety of interventions that need to be undertaken to combat desertification, including establishing wind breaks, raising and dispersing desert plants, and water management. These activities should be carried out in conjunction with the Environmental Protection Agency.

3. Improve Productivity Through Extension, Research, and Inputs

Low productivity in agriculture is evident in all subsectors. The solution is the same for all, and that is better quality inputs, and better knowledge of agronomic techniques/livestock production to increase yields. Improvements in productivity in Yemeni agriculture are critical, considering the resource limitations of land and water that all subsectors and locations face in Yemen.

With respect to inputs, the horticulture subsector could benefit from better yielding seed varieties, as well as improved species of fruit trees. In addition, there is little supervision of the quality of pesticide and fertilizer inputs that farmers use, with many complaints of poor quality or ineffective chemicals. Improved irrigation techniques and equipment are not available at an affordable price for many small farmers. For the livestock industry, improved breeding stock is needed in the cattle subsector, and the industry does not utilize artificial insemination to a great degree, which is much more cost effective than importation of live animals. Veterinary medicines are available, but not very affordable to all. Comprehensive, national vaccination programs are not undertaken in a systematic way.

On the knowledge side, much could be done to assist farmers in increasing the productivity of horticultural crops. Pesticide usage rates are excessive in some cash crops, such as qat, and the profitability of the farmers is affected. Improving the productivity of rain fed grain crops has been almost completely ignored over the years, and new and efficient techniques should be promoted. Some important improvements have been made in the area of training women on home gardens, which is beneficial for home consumption, but larger scale production remains at a low level. Also, an inadequate system exists for identifying and treating plant disease outbreaks, which also has a tremendous impact on productivity. The commercial livestock sector does fairly well in terms of

knowledge, as high value poultry and dairy operations can afford to import professional advice. However, medium sized operations often lack fully qualified staff, and have issues leading to lower productivity. Better trained technicians and paraprofessionals are necessary to support the growth of the commercial producers. Small scale farmers of sheep, goats, and poultry could be supported by better information and availability of paraprofessionals for the identification and treatment of diseases, and providing information on better fattening and breeding techniques.

Renovating the government's extension and research capacity is the most important method to increase productivity in the agriculture sector. Analysis of current service provision has found it lacking to non-existent in most parts of Yemen. In addition, research and extension do not work together as they should, where advances in research are to be passed on to the farmer through the extension system. Also, extension services are spread across several Directorates in MAI, and do not work in a coordinated manner. Private sector extension and technical advice is available in Yemen, and is often performed by existing MAI employees of the extension service for a fee. However, this level of extension is not available to small farmers due to lack of funds. Donor programs also contribute to providing extension services, but this is on a localized basis. A complete re-building of the public extension service is needed including restructuring, capacity building, introducing effective extension techniques, strengthening linkages to research, and employing a new male and female extension agents that will have a positive, service oriented attitude to replace the existing, non-performing extension agents. Capacity building is needed for these new recruits to add new skills such as financial management, efficient water usage, water saving agronomic techniques, introduction of new crops and varieties, and association or cooperative development. This will be the best way to increase productivity for Yemen's small farmers, and to provide services and inputs from the central government to the underserved rural communities.

4. Plant Protection

One of the most important agricultural problems in many countries is the problem of plant protection from harmful pests that affect plants starting from cultivation up to harvest, and post-harvest during storage and marketing. International statistics has estimated international losses of crops due to plant pests between 20-30%. This means that every fifth hectare in the world does not produce any yield. According to international estimates, the total value of global losses due to the injury of the pests reached \$ 75 billion of which 13.8% of injury due to insects and 11, 6% of injury due to disease and 9.5% of injury due to weeds.

It is therefore clear that the increase in agricultural production and improving its quality is one of the basic tasks of plant protection. Therefore, world attention and spending on plant protection has been increased in accordance with the expansion and diversification in the production of agricultural crops. Studies show that expenditures in combating agricultural pests can increase production five times the expenditure. It is not the goal of eradication of pests which is impossible in practice, but to reduce harm by reducing their numbers to below the economic limit, or attempt to remove them or prevent their access to the host. This interest is reflected by the support provided in all countries around the world for

studies and research on pests, their behavior and population in order to obtain the guiding results to reduce or minimize the damage caused by these pests.

In spite of these efforts, plant pests are still prevailing on the ground and are still at their disposal all planting or harvesting or storage. In addition, plant pests represents one of the key factors in the incidence of food gaps in the world, especially in many developing countries where the pests, whether exotic or migratory and cross-border or endemic which does not recognize the systems, laws and political or natural boundaries and does not abide by any agreements or laws or regulations, and can eliminate any planting unless necessary actions and the direct monitoring and control are taken.

Yemen, like other countries in the world, suffers from a lot of damage caused by plant pests. The Ministry of Agriculture and Irrigation, represented by the General Directorate of Plant Protection, have tried and is still trying hard, to organize the mechanism with which to address these pests and reduce their impact through the development of successive strategies and policies and enact laws on plant protection and to join many bilateral, regional and international agreements relating to plant protection.

Since the renewal of the previous Plant Protection Strategy during the year 2005, based on which, five-year plan for protection was developed for the years 2006-2010, many variables, in the field of plant protection, have occurred at local, regional and international levels, which are:

Local variables:

- Directions of the Government to shift from central to decentralized system through application of the law of the local governance and the transfer of many of the task and responsibilities to the governorates and districts.
- The issuance of the new structure and internal regulation of Ministry of Agriculture and Irrigation by Presidential Decree No. 160 for the year 2008, which included the new goals and tasks of MAI. In addition, it included the establishment of many new institutional frameworks for implementation of those goals and tasks entrusted to the Ministry including the new 21 functions of the General Department of Plant Protection.

Regional variables:

- Initiating arrangements for joining the Gulf Cooperation Council, and the requirements of the harmonization of legislation on plant protection and inspection procedures with those applicable in the GCC countries at the regional level.
- The convention for establishing the Plant Protection Organization in the Near East come into force on January 8, 2009 .

International variables:

- Yemen negotiations to join the World Trade Organization and the requirements of harmony with the Convention on the organization of the application of Sanitary and Phyto-Sanitary SPS measures.
- The amendment occurred in the International Convention on Plant Protection IPPC
- Adoption of international standards for phytosanitary measures issued by the International Convention for Plant Protection, and the obligations by different countries for its application, which represent the modern and global unified concepts for plant protection.
- Change the behavior of many plant pests due to climate change and global warming witnessed by most of the world in recent times.

These local, regional and international variables as well as the results of current situation analysis of plant protection, considered a periodic review of the previous strategy of plant protection. All these factors, together, call for a new strategy for plant protection through which to clarify the vision of the perceptions and future directions that will achieve the goals and needs for plant protection to reach the desired goals for plant protection, such as:

- Increased plant production and improve the quality through its protection from direct and indirect damage caused by plant pests, both endemic or epidemic or migratory and trans-boundary.
- Support integrated pest management programs IPM as an integrated package for the most important plant pests and their application in practice with farmers through the implementation of farmers' fields school in order to achieve the concept of good agricultural practices, in order to rationalize the use of pesticides to reduce its harm to consumer health and safety of the environment.
- Facilitate trade of plants and plant products, pesticides and other plant protection products traded on the international and regional movement of trade and remove all unjustified obstacles for trade. And the need to rely on scientific evidence based on the process of pest risk analysis or international standards issued by the International Convention for plant protection.
- Fulfill the obligations specified in the regional and international conventions related to plant protection to ensure the accession to the WTO and to engage in the new global system.
- Increase the competitiveness of Yemeni agricultural products and increasing accessibility to foreign markets through fulfillment of the requirements of the SPS for products exported to international markets of being free from plant pests or to abide by the allowable limits of pesticide residues.

Based on this, the new strategy for plant protection was based on many current challenges facing the plant protection work. The main ones are related to addressing the technical, administrative, and financial weaknesses shown by the results of the study on the current status

of plant protection. In addition, the problems caused by the change in the behavior of many plant pests due to climate change and global warming. Furthermore, the requirements for fulfillment the obligations specified in the relevant international conventions related to plant protection, which require serious action at all levels. For implementation of this Strategy, provision of financial support by the government and the donor community is also required during the next five years.

Policies and Strategies for Plant Protection

Vision: Protection of plant resources in Yemen from pests and preservation of the environment from the risk of uncontrolled use of pesticides.

Mission: the protection of cultivated and wild plants, products and biodiversity, from the risk of leakage and the outbreak of quarantine, epidemiological and migratory cross-border pests. and development of technologies and procedures to control the application of programs of integrated pest management in order to rationalize the use of chemical pesticides in order to avoid their negative impact the health of the consumer and for protection of environment.

General objective: to enhance productivity and improve the quality of plant products through protection of plants from direct and indirect effects of endemic, migratory, epidemiological and cross-border plant pests, and development of techniques and methods for control.

First: - The legislative and institutional framework

Policy: Institutional and capacity building and development for Plant Protection Sub-sector to ensure improved performance and plant protection services.

Strategies: -

- 1. Restructuring to ensure the adoption of the principle of empowerment, authority and integration of institutional roles between the various plant protection activities, in such a way that does not conflict with the central policy, planning and implementation and decentralization of management.**

Actions: Restructuring of General Administration of Plant Protection at central and provinces levels, to enable them to carry out the tasks entrusted to them as set out in the new regulations of the Ministry of Agriculture and Irrigation. In addition, to ensure the implementation of the central functions, planning and overseeing the implementation of the tasks of decentralization in coordination with the local authorities.

- 2. Review and updating of various plant protection legislations including modification and development of the necessary legislations as needed.**

Actions: Modify the plant protection legislations to ensure coordination and consistency with international standards, guidelines and recommendations resulted from the International Convention on Plant Protection of the IPPC, and the Convention on the SPS, The Codex Alimentarius Commission, the Convention on the PIC, and the Convention on the POPs,

3. Establishment of a comprehensive database for various Plant Protection activities

Actions: - Adoption of a program to establish a comprehensive database for various Plant Protection activities.

4. Implementation of e-government strategy

Actions: - Establishment of a portal for Plant Protection Service to allows the recipient of services to complete the required transactions using the Internet.

Second: The Technical Framework

Policies: -

1) Support and development of the technical capacity of the Plant Protection

Strategies:

- a) Implementation of survey programs and periodic epidemiological surveillance of plant pests:** - Development and implementation of survey and periodic epidemiological surveillance and monitoring programs of plant pests at the country level, including natural protected areas. In addition, documentation of deployment and all related information and determine the conditions of these pests and their categories based on Hazard Analysis of Pests.
- b) Strengthening Plant Pests Diagnosis Capacities:-** Support the capacity of plant pests diagnosis and classification laboratories to enable them to apply unified scientific standard protocols for the diagnosis of plant pests approved by the International Convention on Plant Protection.

2) Develop the technical capacity of the various activities of the Plant Protection

Strategies

- a) Support capacities in the field of analysis of quality of plants pesticides and the residual effects in accordance with the standards issued by the Food and Agriculture Organization of the United Nations (FAO):-**
 - Update laboratory analysis of pesticides.
 - Run the remaining laboratory impact of pesticides
- b) Support the integrated pest management programs of IPM as integrated package for the most important plant pests :** - To support integrated pest management programs IPM as

a package for the most important plant pests and their application in practice with farmers through the implementation of farmers' fields schools that is to achieve the concept of good agricultural practices (GAP) in order to rationalize the use of pesticides to reduce harmful to consumer health and safety of the environment.

c) Introduction of new technologies for pest control in various control ways and means available e.g. agricultural, natural and biological etc., including the chemical control methods in the context of work on the establishment of programs of integrated pest management for major pests of important agricultural crops : -

- Implementation of national campaigns programs to combat the epidemic plant pests and migratory, according to well designed plans based on the process of risk analysis of the targeted pests.
- Implementation of programs of integrated plant pest management (IPM) as an integrated package on the most important plant pests targeted in the programs of national campaigns.

d) Regulation of pesticides handling and implementation of the registration measures and re-registration as per the law of the regulation of plant pesticides and its implementing regulations including the International Code of Conduct for handling and uses of pesticides and the globally Harmonized System for registration. Focus should be given to the safest pesticides and biocides : -

- Implementation of the Globally Harmonized System for the registration and re-registration of pesticides
- Perfect control on importing and handling of plant pesticides.
- Prevent any accumulation of expired and abandoned pesticides.

e) Activation of plant quarantine measures: -

- Complete the establishment of a plant quarantines network in the customs of the Republic.
- Complete control of plant consignments imported, exported and transit in order to prevent the entry and spread of pests, and fulfill the requirements of phytosanitary of importing countries.
- Activating the role of post entry quarantine procedures.

f) Application of international standards for phytosanitary measures issued by the International Convention for plants protection as modern and globally uniform concepts for plant protection: - the progressive implementation of international standards for phytosanitary measures

g) Preparation and implementation of contingency plans to face the risk of quarantine, epidemiological and cross-border migratory plant pests : -

- Preparation of contingency plans to face the risk of quarantine, epidemiological and cross-border migratory plant pests.

- Technical and financial support for implementation of contingency plans for potential lesions revealed by the results of the survey and surveillance programs for pests.

h) Applying the concept of Pest Risk Analysis (PRA) : - the application of pest risk analysis program as a concept for a modern plant protection

i) Activate the Plant Protection Research and its Utilization : - utilization and benefit from the results of local and external plant protection researches, and coordination with other relevant authorities for delivery to farmers by all theoretical and applied means.

j) Develop a farmer who can protect his crops : - ensure the participation of farmers to protect their farms from the lethal pests through farmer field schools, through which can develop capable farmer for implementation.

Third: Human and Financial Resources.

Policies: -

1. Best use of human resources for plant protection.

Strategies:

A. Human resource planning : -

- Prepare and implement a plan to predict the needs of staff.
- Prepare and implement a plan to bring career

B. Development and training of human resources :- the preparation and implementation of a training plan in various areas of plant protection

C. Functional discipline and code of conduct : -

- Preparation and implementation of a program to assess the functional discipline and the implementation of tasks.
- Preparation and implementation of periodic inspection program for all administrative units at the central and governorate levels.

D. Develop and improve the system of incentives and rewards: - Preparation and implementation of a proposal to give incentives and rewards in accordance with the job description, job evaluation discipline, reward and punishment principle.

E. Development and improvement of knowledge management : -

- Development and updating of the Central Library of plant protection with the latest references, magazines and journals concerning the plant protection issues
- Establishment of electronic information network service "Internet" at high speed in all sections of the General Directorate for Plant Protection

2. Optimal use of financial resources for plant protection

Strategy:

- i. **Financial independence:** - Preparation and implementation of a proposal for financial independence to enable the general directorate for plant protection to implement the entrusted tasks.
- ii. **Improve revenues and management of plant protection:** - Preparation and implementation of a proposal to increase the revenues and regulatory mechanism for the categorization, collection and disbursement in accordance with the applicable financial systems and improve methods of revenue collection.
- iii. **Control the current expenditure:** - Preparation and implementation of a proposal to control the current expenditure in line with flow of revenues.
- iv. **Establishment of Emergency Fund:** - Preparation and implementation of a proposal for establishing an emergency fund to ensure the implementation of contingency plans for exotic pests and migratory

Fourth: the social / economic

Policies: -

1. **Strengthening the partnership with the private sector in the implementation of programs and activities, to encourage investment in the field of plant protection.**

Strategies: -

- a. **Provide information on programs and activities of Plant Protection:** - Implementation of a program to provide the information related to all plant protection activities to the private sector "through the Internet, magazines and the various periodic releases, and official reporting ... etc."
- b. **Communication with the public and private sector : -**
 - Appointment of official focal point for plant protection to communicate with different state institutions and the private sector.
 - Develop and implement a specific mechanism that connection point with the different state institutions and the private sector.
- c. **Formal representation and participation in activities related to plant protection : -**
 - Participation and formal representation in the local, regional and international conference of plant protection.

- d. **Accreditation and authorization for the private sector to provide certain services in the field of plant protection:** - Preparing a program for plant protection services that the private sector can invest in, under the supervision of the GDPP, "such as heat treatment of fruits of orchard trees and vegetables, the application of the standard for wood packaging materials, accredited laboratories, etc.
 - e. **Effective partnership with the private sector in implementation of the new plant protection programs and services:** - Active participation with the private sector in implementation of new programs for plant protection based on the results of related research in plant protection.
- 2. Increasing the competitiveness of Yemeni agricultural products and increase access to Arab and international markets.**

Strategies: -

- a) **Fulfill the requirements of the SPS for the importing countries: -**
 - Implementation of the inspection and test programs exported shipments and verification of compliance with phytosanitary requirements of the importing States.
 - Implementation of the program to ensure that the rates of pesticide residues in agricultural products exported are in the range of allowed ratios in the importing countries.
- b) **Harmonization of legislation relevant to plant protection with the International Standards for Phytosanitary Measures:-** to speed up the amendment of legislations relating to plant protection according to the related international conventions and standards.
- c) **Establishment of phytosanitary certification programs for exports:** - Preparation and implementation of phytosanitary certification programs for exports and the provisions of oversight.
- d) **Arrangements for more bilateral agreements in the field of plant protection with many countries including the application of the concept of equivalence of phytosanitary measures: -**
 - Activating the bilateral agreements in the field of plant protection which have already been signed with many countries.
 - The conclusion of more new bilateral agreements in the field of plant protection with many other countries including the application of the concept of equivalence of phytosanitary measures.
- e) **Follow up the conditions sanitary and phytosanitary of plants and plant products in the places of origin :** - prepare and implement a program to inspect and track the conditions of health and health of plants and plant products for export production in the places of origin
- f) **Transparency :** - inform the States and the Secretaries of international conventions on legislations relevant plant protection and the situations of plant phytosanitary in general.

- g) **Regional** : - Preparation and implementation of programs and establishing sites and areas free from pests. And areas and production sites that have a low spread of pests and conservation of that areas and sites.

5. Marketing System Improvements through Cooperative Development

The marketing system for agricultural products in Yemen has many deficiencies that do not allow the farmer to profit maximally, and do not provide the products in the quality and quantity demanded. To strengthen the marketing system, increased organization through development of various associations and cooperatives will strengthen the system, and make improvements in quality and information possible.

Currently, the marketing system in Yemen is very traditional, with farmers taking their produce or livestock to market, and dealing with the traders as they have for hundreds of years. Farmers lack the information needed to understand the true value of their products in distant markets, and what qualities are demanded. Formation of marketing cooperatives, associations, or community level groups can greatly assist in the expansion of value to the farmer. For instance, a local association of fodder producers can combine their efforts to improve their product through buying a baling machine, and then arrange for lower per unit cost transport to distant markets. The returns increase to the farmers, as they have a better product, and lower their costs to market. In addition, the presence of a local fodder association will make it easier for public or private extension agents to come and provide training on production, business development, and marketing to a group, where individual members may not be able to access this information that can increase their productivity and profitability.

Commercial producers can also benefit from creating effective industry-wide associations that can provide marketing information to all producers. For instance, a national coffee, mango, or onion association could gather information on domestic and international markets, and provide this to the members, as well as acting as an information source on production, legislative, or quality issues. Currently, individual producers do not have access to this information, which could be key to improving their productivity and profitability, which in turn can allow them to grow and hire more rural labor.

Cooperative development is key to getting marketing and production information to a wide range of farmers in an efficient manner. In general, cooperatives are formed for the purpose of obtaining subsidized inputs. This is an important function, but many additional benefits, such as improved information flow to make better marketing decisions are not currently practiced. The power of association of farmers and producers should be fully exploited to improve as many aspects of production and marketing as possible.

Strengthening the role of cooperatives and associations will require extensive training in functions of cooperatives either directly or through intermediary groups such as the Agricultural Cooperative Union or other MAI departments. In addition, laws and regulations regarding should be reviewed to ensure that the Cooperative Law of 1998 is still meeting its objectives. There is also an important role for NGOs and donor organizations to assist in developing community level cooperatives. Finally, the concept of trade associations should be introduced to assist in the marketing and dissemination of technical advice for specific commodity groups.

6. Export Sector Development

Expansion of fruit and vegetable exports offers great promise in Yemen. There are also unofficial exports of livestock, which may also provide another source of foreign exchange. These exports generate foreign exchange, which will contribute to Yemen's food security. Currently, the MAI lacks the capacity to provide exporters with adequate information on export markets, nor can it effectively campaign for improvements in trade conditions with export markets. In addition, there is a lack of understanding of the importance of post harvest handling, and other quality enhancing measures, which are necessary to increase the competitiveness of Yemen's horticultural exports and to bring Yemeni produce up to international standards.

To strengthen the export sector, there are many interventions needed. First, the export sector needs to have better knowledge and training as to the basics of export, which includes the strengthening of business knowledge, transportation and customs issues, and understanding the demands of the export markets. Secondly, the producers need training on post harvest handling, and on standards of produce that are required by the export market. The government of Yemen must also become more effective at representing the needs of Yemeni exporters by strengthening its trade policy capacity. This will allow the GoY to develop bilateral and trilateral trade agreements, satisfy WTO obligations, and ensure that border customs procedures are followed by Yemen's neighboring countries. Finally, the export sector needs to have strong associations to act on behalf of exporters, and to ensure that government regulators act in a way to assist exporters, and not put roadblocks in the way.

7. Women's participation in agriculture

There is a need for rural women to be empowered to the point where they can exert influence and participate in decision-making on issues that affect their lives. In fact, gender equity is impossible without women's empowerment. In the agricultural sector, gender-awareness in decision-making is needed at a number of levels in the agriculture sector and particularly in the MAI.

At the micro-level, for example, through access to credit and better equipment, change is very important and should be put into practices as soon as possible. Thus, in the short-term, making more material resources available to women for land, credit and technology is mostly a question of putting gender equal policies into practice. Advancing gender equality and equity requires for better access to all forms of credit, access to property rights, and technology, and extension services. It should be ensured that there are sufficient budget lines and credit funds available for changes to take place in order to small scale women's farming to flourish equitably.

At the macro-level, however, changes are coming slowly and will depend on a more favorable gender balance at all levels of the power structure, from the Minister of Agriculture to agricultural researchers and extension agents in the field. It is important to highlight here that the MAI should include Rural Women's Development General Directorate (RWDGD) in its decision making bodies, so that the RWDGD will be directly linked to the Minister and be included on the decision making bodies of the Agriculture

Development, Agriculture Service and Irrigation. This would also make it possible to serve on the Council of Ministers. The representation of rural women in three sectors should be increased so that needs of rural women and the barriers to their access to existing resources would be better presented in respect of mainstreaming gender equality issues within the MAI. This will, in the long-term, require an essential change in the decision making body of the MAI as well as in the education and training of women farmers and the girl child, and the creation of opportunities to promote the advancement of women so that they can ensure that gender-equitable policies can be put into practice.

The suggested implementation programmes address both practical needs and strategic needs.

All departments, programmes and projects of the MAI will comply with the policy and strategy for gender mainstreaming. It is the guiding document to be distributed to all department and agencies under MAI as well as other stakeholders who have collaboration with the MAI.

EDSP Gender component, the RWDGD, and the Agriculture Cooperative Union have a pivotal responsibility in facilitating and monitoring the implementation of the policy and strategic plan. It has a 'sentinel/watchdog' role, ensuring that all the MAI activities, irrespective of departments, programmes, projects, or donors, align themselves with the gender policy.

The suggested implementation programmes for gender mainstreaming in regards to rural women development have different intervention reasons which are as follows:

The suggested implementation program on advocacy for reviewing and recommending amendments of land legislation, such as land tenure, land rights, registration, and illegal land looting from a gender perspective, will all provide more equitable access to land for women. The suggested amendments will also ensure that the appropriate activities are undertaken that will preserve the land as a resource, which means there will be more arable and grazing lands to provide food security and income generation for women. The suggested thorough study on land tenure, land rights, registration, and legislation related to illegal land looting will provide clear perspectives on necessary amendments to legislation. As well as the importance of research programs related to finding appropriate technologies for women farmers to suit the capacity capabilities of rural women to ease the burden and reduce the effort that women play in agricultural production activities, both plant and animal.

The other suggested implementation program on advocacy and capacity building for strengthening the role of the Rural Women Development General Directorate (RWDGD) within the MAI will ensure that the gender machinery will actively carry out its pivotal role of implementation of gender mainstreaming programmes within the MAI. That will also facilitate providing equal and better services to rural women.

A number of training programmes are suggested as a result of capacity building needs assessments that have been carried out in the governorates of Hodeida, Hajja, Dhamar, Raima, Aden, Lahej, Abyan, and Seiyun (Hadramout Valley). The suggested training programmes on gender sensitivity aim to train the staff of MAI and its Agriculture Offices in the governorates including extensions services in the respective governorates. These training programmes will provide progressive capacity strengthening in order to ensure that participants are all aware of, and will be able to respond to, gender issues in their work. This capacity strengthening will use different approaches in order to best suit different target groups.

The suggested training programmes on business management skills, leadership, project management, gender and entrepreneurship, access to financial resources, and information all aim to have capacity

building of both the staff of the RWD in each Agriculture Offices and rural women farmers/ producers in all governorates. The provision of agricultural services to women farmers will be enhanced through equipping female extension staff with relevant skills and incentives. In addition to that the capacity building will also ensure and encourage rural women more for income generations activities and market oriented entrepreneurship.

The suggested awareness raising programmes on land rights management for rural women in all governorates aims to create more ownership of land for rural women. It is important to highlight here that in 2004-05, the Agricultural Research Station in the governorate of Abyan conducted a study found that around 62% of families owned agricultural lands and 15% of these were owned by women. Hence it is important to raise awareness of rural women on land ownership issues.

The suggested trainings programmes for the staff of Rural Women Development on horticulture production marketing related activities aims to ensure that they are going to train rural women producers on the mentioned subjects so that they will be able to access to wider marketing environment to sell their products.

The suggested training programme for rural women on livestock rearing is for both income generating activities and food security that is aiming to empower rural women economically.

There are some suggested community based projects in order to empower local communities as well as help them to achieve income generating and food security activities. At this level the rural women will be involved in the identification, planning, implementation and monitoring of the development interventions that are undertaken in their villages. Each community based pilot project will be given priority to widows and single women households. Using different participatory and diagnostic methods, it is possible to bring the rural women closer to local decision-making that impact both on their lives and on a wider geographical and socio-economic area. Village level development committees or similar are advantageous entry points for gender mainstreaming interventions.

8. Capacity Development – Public and Private

A universal theme from all sectors is the lack of resources that the MAI has to carry out its mandate. Currently, most of the funds available in agriculture are directed to the Agricultural and Fishery Production Promotion Fund, which makes grants available for the purchase of equipment by middle and upper income farmers that belong to government run associations. While expanding the amount of agricultural inputs available is a positive thing, it comes at the expense of the core MAI functions of research, extension, planning, and developing an effective regulatory environment. Unfortunately, the MAI in Sana'a, and MAI's governorate offices, have become effectively paralyzed by the lack of funding, and this prevents them from considering ways forward. With only 1 percent of the budget, while supporting 54% of the jobs in the country, the allocation of resources by the government to MAI is not in alignment with its massive mandate in agriculture and irrigation.

This inability to move forward means the MAI is not developing many critical functions that are expected of ministries of agriculture around the world. Additional functions that are currently not being undertaken at an effective level include: setting and enforcing grades and standards for agriculture and livestock products; certification and testing of inputs, including pesticides, fertilizer, and seeds; effective inspection and quarantine services at the borders; providing extension services to small farmers; planning for rangeland management and resource conservation;

Therefore, a commitment must be made to either find a way fund the Ministry adequately, and provide capacity building to many units that have not received adequate resources for many years, or to consider new models of public-private partnerships to conduct key functions that will assist in the long term development of the agriculture sector.

Capacity development of the public sector is at a critical stage, as the long period of lack of investment in the personnel of the MAI has left employees both technically and managerially unable to meet the needs of a renewed mandate in agriculture. A comprehensive Change Management program is needed to address structural issues within the ministry, and to develop a long term strategy to improve the skills and capacity of the ministry staff to contribute effectively to the development of the agriculture sector. A Change Management program would begin with a complete assessment of the ministry's current functions, and assessment of personnel needs to meet expanded functions of the ministry. Also included is a complete assessment and strategy to ensure the support functions of the ministry in finance, procurement, HR, communications, IT, policy, and planning are able to fully support technical functions. An ambitious Change Management program assumes the funding will be available to support expanded ministry functions and mandate in sustainable manner.

Capacity development in the private sector is also needed. Many commercial agriculture projects utilize foreign experts to advise on their facilities instead of utilizing Yemeni experts. Technical training should be provided to these private sector experts to ensure they are current. In addition, an effort should be made to form an association of private sector technical and management advisors so that local governments, commercial producers, NGOs, and donor programs can easily access these scattered professionals. Together, this will expand the capacity of private sector advisors, and will increase their effectiveness in reaching potential clients. Finally, this will provide results sooner than the efforts to rebuild government service providers, and will strengthen overall efforts to develop the agriculture sector.

VII. Conclusion

This National Agriculture Sector Strategy has been developed through the participation of many key members of the agriculture community, field assessment of agriculture, and through analysis of past agriculture sector strategies and policies. It is intended to serve as a guide as of 2011 to the future of agriculture in Yemen, and the role of the public, private, and international sectors. Particular emphasis was put on the needs of Yemen's poorest citizens, and how they can make a better living through the agriculture sector. The result will be to strengthen rural communities, and the nation as a whole.

The Implementation Plan attached to this strategy contains a list of programs that are necessary to realize the goals of the strategy. A significant commitment to provide adequate resources is needed to move the implementation plan from concept to reality, and it is hoped that the commitment and resources will become available from local, private and international sources to carry out this ambitious agenda.

**Appendix A: National Agriculture Sector Strategy - Implementation Plan
(NASS-IP 2012-2016)**

National Agriculture Sector Strategy – Implementation Plan (NASS-IP) 2012-2016

Introductory Notes on Implementation Plan.

The purpose of the Implementation Plan is to identify all actions necessary to improve the contribution of agriculture to rural incomes and food security, while preserving the environment. All levels of the agricultural value chain will be addressed including inputs, infrastructure, production, marketing, and processing. Actions will focus on the needs of poor farmers, but will also include ways to strengthen commercial agriculture due to its impact on rural employment.

The Implementation Plan will be divided into two sections as follows:

I. Proposed Programs 2012-2016

This section includes programs that have been identified through the process of development of the NASS. Potential programs are listed by subsector or sector-wide category as discussed in the NASS. These programs are intended to address gaps identified in Yemen's agriculture sector, and include strengthening both the government and private sector's ability to contribute to the economic growth of the sector. These programs are not funded, and seek assistance from the GoY or international sources. Where possible, rough estimates are given for program costs, and further costing work is needed in the process of program design.

II. Submitted programs

These programs have been submitted to the Government of Yemen (GoY) as part of the Forth Five Year Socio-Economic Development Plan for Poverty Reduction 2011-2015 (DPPR). The programs listed are comprehensive, and represent investments by both the Government of Yemen and/or the donor community. Some of the programs are ongoing; while others are due to begin shortly. Some of the programs are already fully funded, while funding has not been finalized for others. Since these programs will be approved by the GoY, they will take precedence over proposed programs discussed below when there is overlap or conflict of activities.

It should be noted that this implementation plan is flexible, and will change as priorities are developed, and funding arrangements are made.

National Agriculture Sector Strategy – Implementation Plan (NASS-IP) 2012-2016

Section I: NASS Proposed Programs 2012-2016

S.N	OUTPUT	ACTIVITIES	BENEFICIARY/ TARGET	2012	2013	2014	2015	2016	IMPLEMENTING AGENCIES & PARTNERSHIPS	BUDGET ESTIMATE (USD)
A. Horticulture Subsector										
1	Increase productivity through better inputs & GAP	Expand production of high yielding varieties of fruits and vegetables through production of better seed and small trees. MAI should research best varieties for Yemen's climate. Private sector nurseries will also be established to multiply seeds for sale to farmers. Including improved seeds, fertilization and other inputs and modern techniques including good agriculture practices(GAP)	All horticultural producers + cooperatives	x	x	x	x	x	AREA (research), GD for Plant Production, GD for Extension, GD for Plant protection and donors	25,000,000
2	Increase income of small farmers	Develop agency to develop and promote specialty crops for small farmers. Agency would disseminate technology to grow specialty crops, advise on markets for its products, and monitor production. Specialty crops are high value, low volume products, such as spices, ornamental plants, or	Small farmers	x	x	x	x	x	MAI + GD of plant production, GD for Extension	12,000,000

		any other item.									
3	Increase income to farmers for higher quality produce	Develop grades and standards for horticultural products. Create certification program. Disseminate information on standards, and develop pricing structure for different grades. Develop enforcement capacity.	Horticulture farmers, traders, exporters, and consumers	x	x	x	x	x		General Directorate of Marketing + GD for Extension + GD for Plant Protection	6,500,000
4	Increase efficiency and productivity of produce industries	Develop effective associations for major commodity-specific groups, which will serve to improve information distribution and advocacy for specific industries.	Commercial farmers, small farmers, traders	x	x	x				GDAM + GD for Extension+ GDRWD + cooperatives	6,500,000
5	Increase income to horticultural producers by increasing available markets	Study and support food processing industries for horticultural products that will provide additional markets for seasonal surpluses of production. Study should also include packaging availability, and support packaging industry if needed.	All horticultural producers, industrial sector	x	x					Ministry of Industry and Trade, GDAM, GDRWD and CAC Bank	15,000,000
B. Cereals and Fodder Subsector											
1	Increase productivity of grain through expansion of	Develop National Seed Certification Authority under the MAI. This Authority would register, inspect, release, and approve new varieties, and provide independent certification of	Grain farmers	x	x	x	x	x		Quality Control, Research Authority, specialized committee within MAI	6,000,000

	improved seed	seed produced by the private sector seed multiplication industry.								
2	Increase productivity of grain through expanded availability of improved seed and other inputs	Support development of commercial seed multiplication industry to overcome shortage of locally produced improved seed through expansion of activities of general corporation for seeds multiplication, agriculture researches and private sector. Provide training in techniques, grades of seed, and business skills, and a guarantee to purchase at the close of the harvest season. Including support improved products and good agriculture practices (GAP) & techniques	Grain farmers, entrepreneurs	x	x	x	x	x	MAI, GD for Plant Production, GD for Extension and GD for Plant Protection, agriculture research and private sector	20,000,000
3	Improve food security in Yemen	Study the need for a Strategic Grain Reserve in Yemen. Stocks of grain held locally, or regionally, could help to protect against price or supply shocks in the future.	Consumers	x	x				Independent + MAI	1,500,000
4	Improve forage availability	Pilot projects and study of grasses and forage that will grow in rain fed areas, and help to prevent soil degradation, while providing income to land owners. Buffalo grass, and other grasses can be considered.	Environmental sustainability, livestock producers, forage farmers	x	x				GD of Forests, Rangelands and Desertification Control + GD of Livestock Development + Agriculture Research	15,000,000

5	Improve Food Security, and farmers income	Study and pilot programs on oilseed production in Yemen. Production of oilseeds (soybeans, sunflower, cotton, sesame, others) will reduce dependence on imports, and provide new and profitable crops for Yemeni farmers. Include pilot oil processing as appropriate.	Food Security, innovative farmers, consumers	x	x	x				General Department of Plant Production, donor funded program	6,000,000
6	Improve income of fodder producers	Pilot a program to bale forage crops in order to increase marketability and profitability, and to reduce transport costs. Create community associations around baling machines and baled forage markets.	Fodder producers, fodder consumers	x	x					General Department of Plant Production, Donor lead program	6,000,000
C. Livestock Subsector – Proposed Programs											
1	Increasing honey production to improve poor families income	Providing bee hives, other equipment, and training. In different governorates;	Rural poor	x	x	x	x	x		General Department of Animal Resources Development (MAI)	2,500,000

2	Increase productivity of livestock owners	Extension training in the livestock and local poultry rearing and increasing Providing training to the trainers, than to the rural animal keepers in local animal and poultry to improve productivity Training of trainers in the governorates.	Livestock owners	x	x				General Department of Animal Resources Development (MAI)	12,000,000
3	Improve productivity of livestock through improved breeding	Establish artificial insemination (AI) center to improve productivity of national breeds. Program will: 1) Provide technical training to the staff 2) Construct facility 3) Provide equipment, tools, and other materials to produce AI products.	Livestock owners	x	x				General Department of Animal Resources Development (MAI)	3,500,000
4	Improve productivity of livestock through improvement of breeds	Develop research program for improving local breeds, and dissemination program of better breeds either through Artificial Insemination or traditional methods.	Livestock owners	x	x	x	x	x	General Department of Animal Resources Development (MAI) + Agriculture Research	6,000,000
5	Improve livestock health and productivity of livestock	Expand animal health and animal production workers training programs to include more men and women, and support them in establishing their practices in rural communities	Small scale rural livestock owners	x	x	x			Regional development authorities under the supervision and control of DGAHVQ, DG of ARD	2,000,000

6	Improved productivity and animal health due to more and better trained veterinarians and assistants	Training of subject Matter specialists in different specialization including post graduate training, refreshment courses and in job training for the staff of Veterinary services and animal production.	Livestock owners, and veterinarians, and animal production specialists	x	x	x	x	x	MAI	3,500,000
7	Increase healthy livestock production suitable for human consumption	Establishing a national system of quality control on inputs and outputs of livestock production (concentrates, animal feed and feed additives) and animal health products (Medicines, vaccines and other veterinary medications) and animal products (dairy, red meat, white meat, and also the eggs, and honey) and ensure its quality and rival to similar imported products and control of veterinary services provided by the private sector.	Livestock owners and Veterinarians	x	x	x	x	x	General Directorate of Animal Health and Veterinary Quarantine	5,000,000
8	Increase livestock production and productivity through infectious disease control	Expand epidemiological surveillance program to identify introduction and spread of diseases. Conduct national vaccination program to control epidemic diseases for livestock and poultry. Establishment of national network for field surveillance and organizing laboratory support for	Livestock and poultry owners	x	x	x	x	x	General Directorate of Animal Health and Veterinary Quarantine	159,000,000

		<p>surveillance activities. Rehabilitation and support the central and regional veterinary labs. Preparation and implementation contingency plans and emergency preparedness, design and implementation of monitoring and combating animal diseases.</p> <p>Establishment of epidemiological database network on country level.</p> <p>Regulation and monitoring quality, safety and efficiency of veterinary medicines, vaccines and biological materials</p>								
9	Increase livestock production and productivity through control of disease from imported livestock.	<p>Establishment of a strong quarantine facilities network able to comply with international standards. Developing, upgrading and rehabilitation of existing quarantine facilities. Implementation of inspection, monitoring and tests programs at the ports of entry and at destinations</p>	Livestock owners, and veterinarians	x	x	x	x	x	General Directorate of Animal Health	24,000,000

10	Increase livestock production and productivity through capacity building and training	Comprehensive review of human resources for assessing the training needs in animal production and animal health. Implementation of different training programs for all related staff, and training of selected livestock keepers to be community based animal health, production, nutrition and extension workers. Including training courses for rural farmers, including women, working in animal husbandry, develop their awareness regarding animal and honey production opportunities.	Livestock owners, and veterinarians	x	x	x	x	x	General Directorate of Animal Health + General Directorate of Livestock Development	1,500,000
D. Water Resources										
1	Improve water availability and conservation	Support activities in National Water Sector Strategy Investment Program Update	Water users	x	x	x	x	x	General Directorate of Farm Irrigation, General Directorate of Irrigation Facilities, MWE	1,500,000
2	Improve water availability by Irrigation Investment program	Support projects in all areas of Yemen to apply modern irrigation techniques, and introduce water savings technologies.	Agricultural water users	x	x	x	x	x	Irrigation Sector (MAI), local MAI offices, regional development authorities, CAC Bank	29,000,000

3	Improve productivity and water availability for agriculture through Water Harvesting Investment Program	Support projects to improve surface water harvesting through activities to build small and medium dams, construction of irrigation canals from dams, maintenance of existing main, secondary, and tertiary irrigation canals, reforestation, watershed management, wadi bank protection, and low and medium cost water harvesting storage structures including tank/cisterns for complementary irrigation.	Agricultural water users	x	x	x	x	x	Irrigation Sector (MAI) + MWE.	132,000,000
4	Improve impact of irrigation program through water monitoring studies and community participation	Support program on irrigation water monitoring and information systems to develop measurement indicators and participatory assessment. Conduct studies to support irrigation activities, including 1) review of subsidy policy on irrigation inputs and infrastructure; 2) investigate private sector participation in irrigation programs; and 3) evaluate community participation in water user associations; 4) consultancy services for studying new water wadis. In addition to development of community participation in water management.	Water policy makers, water users	x	x	x	x	x	Irrigation Sector (MAI)	6,700,000

5	Improve productivity and expand technical knowledge of irrigation users	Expand impact of Irrigation Advisory Service (IAS) to provide irrigation extension services. The IAS will provide not only technical knowledge of installation and use of water saving technologies, but also on efficient water usage techniques (water use minimization, scheduling) to all types of farmers including rural women. The program will expand the number of trained agents.	Agricultural water users	x	x	x	x	x	Irrigation Sector (MAI) + General Directorate for Extension	8,600,000
6	Improve water availability and protection of environment	Development program for improved reuse of treated wastewater and reuse of gray water including brackish water. In addition to enhancement the role of rural women in gray water reuse.	Agricultural water users	X	X	X	X	X	Irrigation Sector (MAI) + MWE + MoPH	12,000,000
7	Improve productivity through applied researches in irrigation	Conduct applied researches program on modern irrigation systems	Agricultural water users + Staff of irrigation section (MAI)	X	X	X	X	X	Irrigation Sector (MAI) + Agriculture Research Authority.	2,000,000
8	Improve performance of irrigation sector	Implementation of institutional and capacity building program for irrigation sector, related directorates, institutions and MAI branches in governorates	Irrigation sector MAI + Water Users,	X	X	X	X	X	Irrigation Sector (MAI)	5,800,000

9	Awareness Raising on Adaptation to Climate Changes	Promote community-based participatory planning and management of climate change issues at local levels through enhanced public awareness	All Farmers	x	x	x	x	x	MAI + MWE	650,000
10	Strengthening the country capacity to aggregate, analyze, and disseminate climate change information.	Establishment and Maintaining of Climate Change Database.	MAI	x	x	x	x	x	MAI + MWE	350,000
11	protect coastal wetlands	Planting and re-planting of mangroves and palms for adaptation to sea level rise.	MAI	x	x	x	x	x	MAI + MWE	2,450,000

E. Improve Productivity Through Extension, Research, and Inputs

1	Improve productivity of all farmers	Complete renovation of public extension service. Restructure, re-train, expand, and upgrade techniques and philosophy of Extension Service. Determine number and locations of extension agents to deliver training services to rural population. Develop coordination role for all extension specialists in other GDs or ministries (veterinary, water, community development, women's departments, donor programs). Updating Agriculture Research Policy and Develop permanent training institute for continuous upgrading of technical and managerial knowledge of all extension agents.	Small scale and commercial farmers	x	x	x	x	x	General Directorate of Agricultural Extension and Training + GDRWD + Agriculture Research Authority	20,000,000
F. Plant Protection										
1	Agricultural products free of pesticides	Integrated Pest Management program IPM as an integrated package for the most important plant pests and their application in practice with farmers through Farmers Fields Schools (FFS).	Farmers, Consumers and exporters	x	x	x	x	x	General Directorate for Plant Protection + Extension	7,000,000

2	Improve Sanitary & Phyto-Sanitary (SPS)	Strengthen the capacity of diagnosis and classification of plant pests, including the capacity to apply standard scientific protocols for the diagnosis of plant pests	Farmers, Consumers exporters & Plant Protection Staff	X	X	X	X	X	General Directorate for Plant Protection	5,000,000
3	Improve the product and its safety	Upgrade the field analysis and the residual effects of pesticides laboratory.	Farmers, Consumers exporters & Plant Protection Staff	X	X	X	X	X	General Directorate for Plant Protection	6,000,000
4	Protection of plants from destructive pests & meet requirement of international agreements	Complete the network of plant quarantines in entry points, and activating the role of quarantine and post entry quarantine procedures.	Farmers, Consumers and exporters	X	X	X	X	X	General Directorate for Plant Protection	15,000,000
G. Land Resources										
1	Improve productivity of livestock producers	Develop pilot programs to improve natural pasture and reduce desertification in Yemen. Research and identify appropriate ground cover, estimate livestock population that can be supported on improved pasture land, and develop regulations that will conserve the improved pasture land.	Livestock producers, environment	x	x	x	x	x	General Directorate of Forests and Rangelands and Desertification Control + GDRWD + GDPM (MAI)	15,000,000

		Follow on program to scale-up planting of improved pasture and anti-desertification plants.								
2	Improve productivity of landless farmers	Land Tenure - Develop legislature to protect and empower landless farmers to increase their productivity on leased land. A study will be necessary to understand the current regulations and practices, and to identify ways to help the farmer invest in land/crop improvements, while also protecting the rights of the land owners.	Landless farmers, landowners	x	x	x			General Directorate of Inventory and Land Reclamation (MAI), Director General of Legal Affairs (MAI), consultancy	6,000,000
3	Farmers have secure ownership of their land	Land Registration – Review land registration procedures and legislation to ensure small farmers have security in land ownership, and protection from illegal takings. Improved registration procedures will also assist farmers to have access to credit.	Small holders	x	x	x			General Directorate of Inventory and Land Reclamation (MAI), Director General of Legal Affairs (MAI), consultancy	1,500,000
4	Increase production on terraced land	Develop program to assist farmers in reclaiming and maintaining terraced land and renovate terraced agriculture. Produce a study to survey condition of terraced agriculture, and to estimate financial and environmental benefits of reclamation.	Small holders	x	x	x	x		General Directorate of Inventory and Land Reclamation + Related departments within MAI	20,000,000

5	combating desertification in the mountainous areas and lower-lands rangelands through integrated management of natural resources	Sustainable land management to combat desertification and land degradation. combating desertification in the mountainous areas and lower-lands rangelands through integrated management of natural resources with focus on water and vegetative cover including using low quality water in dryer environments	All farmers	x	x	x	x	x	MAI	2,400,000
H. Capacity Development – Public and Private										
1	Improve capacity of MAI to provide services and develop policies to increase production and productivity in the agriculture sector	Change Management – Institute comprehensive change management program in MAI. Evaluate and institute managerial improvements in finance, HR, policy development, ministry structure, and development of a service attitude. In addition, conduct a complete technical assessment of personnel to determine and implement training programs to ensure MAI provides advice on best practices.	Agriculture sector in Yemen	x	x	x	x	x	MAI	15,000,000

2	Improve advisory services to assist farmers in increasing productivity and profitability	Training Institution – Plan, develop and fund a training institution to develop capacity of private sector advisors in areas of business development, marketing, cooperative formation, and technical specialties (agronomy, irrigation, storage, transportation, poultry production, food processing).	Commercial agriculture, Community organizations	x	x	x	x	x	Associate with University, or private enterprise	4,500,000
I. Women's Participation in Agriculture										
1	Improve participation of women in agriculture	Empower and strengthen role of the Rural Women Development General Directorate (RWDGD) within MAI in headquarters and the governorates, and mainstream gender awareness within MAI. Build capacity through training in advocacy, land rights, project and business management, gender sensitive budgeting, access to financial resources, horticultural marketing, and leadership/gender entrepreneurship. Strengthen and support local RWDGD offices, Agricultural Women's Cooperative Union, and rural women's development agencies in all governorates.	Rural women	x	x	x	x	x	GDRWD, UNDP	6,000,000

2	Increase income generation, productivity, and food security for rural women	Develop general training and extension programs for rural women to increase productivity in horticulture, livestock rearing, dairy products, bee keeping, and community and credit organization. Support community based pilot projects for income generation through micro-finance projects in honey, fodder, dairy and savings associations, and also through demonstration pilots for fodder and pasture improvement, honey improvement, and milk collection centers.	Rural women	x	x				GDRWD, UNDP, donors, NGOs and GD of Agriculture Extension	12,000,000
3	Promote role of rural women in implementing small gender based development projects	Preparation and implementation of pilot development project by rural women department in MAI offices and GDRWD	Rural Women	X	X	X	X	X	GDRWD + RWDs + UNDP+ Donors + NGOs	6,000,000
4	Create equitable access to land for women	Develop a study on land tenure, land rights, and registration, and also study the impact on land looting on women's access to farm land. Review necessary legislation for land reform, and advocate for gender inclusiveness.	Rural women	x	x				GDRWD, UNDP, donors	1,500,000

5	Improve inclusion of women's issues in policy development	Create a system to produce gender disaggregated data about women in agriculture in Yemen.	Policy makers	x	x					GDRWD	1,500,000
J. Marketing System Improvements through Cooperative Development											
1	Improve productivity and profitability of farmers through strengthened cooperative services	Strengthen training capacity of Agricultural Cooperative Union (ACU). Also review functions and mandates of the individual cooperatives to ensure that all of the member's needs are met in terms of technical instruction, business management, and marketing strategies.	Members of ACU	x	x	x				ACU, training consultancy	5,000,000
2	Improve productivity of small farmers through expansion of community based cooperatives	Expand community based cooperative movement to include creation of small cooperatives or associations that can be formed to improve access to training, inputs, and credit for small scale farmers in rural communities.	Small scale farmers	x	x	x	x	x		ACU, NGOs, donors	5,000,000
3	Expand cooperative movement	Review cooperative law in effect since the 1970's. Revise law to be more inclusive, and to meet demands of farmer's in the current environment.	Small scale farmers	x	x					ACU, Directorate General of Legal Affairs (MAI), consultancy	2,500,000

4	Increase production and quality of agricultural products.	Support development of industry associations to serve as a voice for farmers in a specific industry, while serving as a source of technical information for farmers. Also serve to disseminate market information to farmers and traders.	Producers, traders	x	x	x				ACU, NGO's, donors	6,000,000
K. Export Sector Development											
1	Increase profitability of farmers through increased exports	Strengthen ability of MAI to create trade agreements and resolve trade disputes to expand agricultural exports. Ensure MAI assists GoY in meeting international treaty obligations, such as the WTO, HACCP standards, PRA and Post harvest processing.	Farmers of exportable products	x	x	x	x	x		General Directorate of Marketing and Trade + GD of Plant Protection (MAI)	6,000,000
2	Increase growth of the export sector	Develop technical, managerial, organizational, and governmental capacity to expand the export sector in Yemen. Activities will focus on introduction of new crop varieties, strengthening agricultural marketing cooperatives, adjust quality standards for international markets including SPS, improving credit availability, introducing contract farming, and reducing post harvest losses. Support will also be	Exporters, farmers	x	x	x	x	x		General Directorate of Marketing and Trade, GD of Plant protection (MAI), UNDP, donors.	15,000,000

		given to strengthen the capacity of MAI and exporter associations, to improve the marketing information system.									
L. Quality Control:											
1	Quality control legislatives in place	Enactment of the remaining quality control legislatives to organize all related activities in quality control	Producers, exporters and importers	x	x					GD of Quality control + GD of Legal Affairs	1,500,000
2	Improve capacity In quality control	Establishment of quality control units in four governorates and provision of necessary equipments for these units. Provision of necessary equipment, instruments and materials for the central laboratory of quality control. And capacity building and training of QC staff in related fields.	Producers, exporters, importers and consumers	X	x	x	x	x		GD of Quality control	6,000,000
3	Increase awareness on quality of agriculture products	Implementation of public awareness campaigns and programs pertaining to quality control. Implementation of inspection and test on quality control activities.	Producers, exporters, importers and consumers	x	x	x	x	x		GD of Quality control + GD of Agriculture Extension	4,500,000
M. Sector wide:											
1	Improve quality and find solution to surplus	Support infrastructures of agricultural related facilities. rehabilitation of tomato paste plant, cotton processing	Producers, exporters	x	x	x	x	x		MAI	5,000,000

		labs and support export preparation centers								
2	Improve productivity	Support tissue culture activities in the field of palm dates, potato and other fruit and vegetables	Producers, exporters	x	x	x	x	x	MAI	3,000,000
3	Improve income of rural farmers	Support program for production of medicinal and ornamental raw materials, oils, etc. for efficient use of medicinal, ornamental plants and vegetative cover.	Rural farmers	x	x	x	x	x	MAI	5,000,000
4	Improve agriculture statistics	Institutional and capacity building for GD of agriculture statistics.	Agriculture Sector	x	x	x	x	x	GD of Agriculture Statistics	2,500,000
		Grand Total								750,950,000

National Agriculture Sector Strategy – Implementation Plan (NASS-IP)

Section 2: Agriculture Sector Programs Submitted for Approval in the Fourth DPPR 2011-2015

(Agriculture sector operational matrix in the fourth plan 2011-2015)

General Objectives/the Indicators	The Policies/ Indicators	Action Plans	Implementation period	Cost million/YR
<ul style="list-style-type: none"> ▪ Increasing the agricultural production to achieve high levels of the food security that rely on domestic agricultural food 	Expansion of wheat and other grains cultivation to improve the agricultural trade balance	Wheat and grains expansion program	2007-2015	6,750
	Improving livestock productivity by selection, health care and feeding.	Supporting the rural development in the livestock areas (livestock, high population areas)	2004-2011	720
		Supporting livestock developing	2011-2015	4,000
		Animal health (care)	2011-2015	31,800
	Greater role to the rural women, greater participation and role in food security and fighting poverty.	Supporting rural women by mean of Economic Empowerment	2011-2015	320
	Promote cash crops cultivation by improving production methods and marketing efficiency.	Mango plantation support	2011-2015	2,400
		Palm dates plantation development	2011-2015	1,800
		Coffee plantation development	2011-2015	2,200
		Honey production developing and support	2011-2015	1,600

		Olive production development and support	2011-2015	1,120
		Sunflower production and processing	2011-2015	1,500
		Agricultural marketing support and development of exports	2011-2015	1,700
		Economic diversification program in promising sectors	2011-2015	530

Support efforts to combat poverty in the rural community	Improve the circumstances and efficiency of the rain fed cultivation production, and increase farmer's income .	Rural Developing Participation Project (Dhamar) in progress	2007 - 2012	3,900
		Community resources management project (Aldala'a) in progress	2007 - 2014	3,849
		Agri. And fisheries development program. Hadramout – coastal area. In progress	2008 - 2014	4,979
		Rainfed agriculture and livestock project. In progress	2007 - 2012	2,659
		Northern regions, rural development project, 2 nd phase- new (feasibility study, financed by Arab fund)	2011 – 2017	8,200
		Agriculture development project – Hodeida(new) , initial study prepared	2011 – 2017	5,000
		Agriculture development – Taiz,(initial study	2011 - 2015	4,000

		prepared)		
		Agriculture development –Shabwa,(new)	2011 – 2015	4,000
		Agriculture development –Ibb,(new)	2011 – 2015	4,000
		Agriculture development –Lahej,(new)	2011 – 2015	3,000
		Agriculture development –Abyan,(project management on process)	2011 – 2016	3,500
		Agriculture development –Albaida’a,(new) (initial study prepared – study financed by Islamic bank)	2011 – 2015	3,230
<p>Preservation of environment and natural resources, and activating the role of community participation to ensure sustainability</p> <ul style="list-style-type: none"> • Increase efficiency rate of water use in irrigation • Increase efficiency rate of land resources use • Decrease use of pesticides in agriculture 	Increasing irrigation water use efficiency by using suitable and efficient techniques and systems	National irrigation program	2010 – 2014	15,578
		Ground water and soil conservation project	2011 – 2012	4,200
		Modern irrigation systems project	2011 – 2015	5,000
	Continue development of valley water barriers and small dams. Establish and promote water harvest techniques	Hassan water dam project	2009 – 2014	14,927
		Small water dams	Continue	4,171
		Water harvesting	2011 – 2015	2,300
	Continue research programs to provide services for agricultural development goals	Support, improve and strengthen the agricultural extension	2011 – 2015	3,700
		Develop and support agricultural research	2011 – 2015	4,000

		Plant protection	2011 – 2015	600
		Infrastructure establishment project to increase ministry capacity in quality control and agricultural production inputs	2011 – 2015	120
	Promote and develop cooperatives and increase public participation	Developing Agricultural cooperatives project	Continued	1,430
	Promote switching to essential cash crops of economic income equivalent to qat Decline qat cultivation area (Land)			

Appendix B: Preparation of the National Agriculture Sector Strategy

List of MAI and EDSP Staff Participated in Preparing Arabic Version of NASS and IP

#	Name	Position
1	Eng. Abdulmalik Al-Thawr	Deputy Minister for Plant Development Production Sector
2	Dr. Mohamed Al-Ghashm	Deputy Minister for Agricultural Services Sector
3	Eng. Ahmed Al-Ashla	Deputy Minister for Irrigation Sector
4	Eng. Sadeq Noman Al-Nabhani	National Project Manager – UNDP – EDSP – Agriculture Project
5	Eng. Ali Junaid Ali	General Manager – General Directorate for Planning & Monitoring
6	Dr. Mansoor M. Al-Aqel	General Manager – General Directorate for Agricultural Extension and Training.
7	Dr. Mansoor M. Al-Qadasi	General Manager – General Directorate for Animal Health & Veterinary
8	Eng. Farooq M. Qasem	General Manager – General Directorate for Agriculture Marketing
9	Eng. Ahmed Saber	General Manager – General Directorate for Projects
10	Abdul Karim Naji Al-Sabri	General Manager – General Directorate for On-Farm Irrigation
11	Eng. Abdo M. Al-Saqaf	General Manager – General Directorate for Control and Review
12	Eng. Afrah Sa'ad Al-Mahfadi	General Manager – General Directorate for Rural Women Development.
13	Ahmed A. Mughales	Manager of External Affairs Department of ACU
14	Mohamed Ma'ajam	General Directorate for Planning & Monitoring
15	Dr. Adnan Al-Aqhali	Animal Health Specialist – EDSP – Agriculture Project
16	Abdulhafith Qarhash	General Manager of Plant Production
17	Abdullah AL-Sayani	General Manger – Plant Protection
18	Adel Ahmed Mutahar	Private Sector
19	Nasr Thabet Mahmood	Secretary - Agriculture Engineers Association
20	Dr. Saher Al-Aqili	General Manager DG of ARD

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Contact List

1. Eng. Farid Mujawar, Minister of Agriculture and Irrigation
2. Dr. Mansour A. Al-Howshabi, Ex Minister of Agriculture and Irrigation
3. Eng. Ahmed Mohsen Al-Eshlah, Deputy Minister Irrigation, MAI
4. Eng. Abdulmalik Althawr, Deputy Minister Production, MAI
5. Dr. Mohammed Al-Ghashm, Deputy Minister Services, MAI
6. Mohammad M. Basher, Chairman, Agricultural Cooperative Union
7. Naji Abu Hatim, Senior Rural Development Specialist, World Bank/Yemen
8. Dr. Abdulmalek Modhish, General Manager, Risabah Dairy Production Farms, Dhamar
9. Eng. Ali Y. Al-Rawdi, General Manager, Potato Seed Company, Dhamar
10. Christopher Ward, Economist: Water and Agriculture, World Bank
11. Mayad S. Yafai, Economic Growth Specialist, USAID/Yemen
12. Nagwa S. Saleh, Economic Growth Specialist, USAID/Yemen
13. Elias Al-Fakhri, Veterinarian, Padzey Program, Taiz
14. Eng. Abdulkarim N. Alsabri, Director General On Farm Irrigation, MAI
15. Eng. Abdul Wahed M Al-Hamdi, General Director of Irrigation Structures, MAI
16. Dr. Henning Baur, Principal Advisor on Food Security, GIZ/Yemen
17. Dr. Fuad Aldomy, FAO Representative in Yemen
18. Taher Ali Saif, Principal, National Animal Feed Co., Zabeed, Hodeida
19. Eng. Ali Gunid Ali, Director of Planning, Monitoring and Evaluation, MAI
20. Eng. Ali M. Taher, Chief of Association, Yemeni Cooperative Association for Agricultural Exporters, Hodeida
21. Amer A. Al-Aghbary, Agricultural Specialist and Advisor to MAI, US Department of Agriculture
22. Eng. Majeda Bakaheil, Head of Women's Department, Agricultural Cooperative Union
23. Al Quaid johar Zahri, Secretary, Project of Uprooting Qat and Agricultural Development, Haraaz
24. Isam Saleh Ali Luqman, Executive Director, AFPPF
25. Khalid A Abdulmoghni, Manager of Rural Agricultural Credit Department, CAC Bank
26. Ahmed A. Al-Modwahi, Vice President Retail Banking, CAC Bank
27. Mohammed Ahmed Taki, Vice President for Operations Support, CAC Bank
28. Eng. Mona Al-Wrafi, Women Rural Development Specialist, Padzey, Taiz
29. Eng. Mohammed Ali Nasheri, Livestock Specialist, Padzey, Hodeida
30. Dr. Rami A. Al-Haj, Livestock Specialist, Padzey, Taiz
31. Mohammed Ali Al-Adroai, Manager Planning Department, Agricultural Cooperative Union
32. Shabbir A. Ezzi, Managing Director, Al-Ezzi Industries, Sana'a
33. Amira Al-Hemyari, Administrative Supervisor, Al-Ezzi Industries, Sana'a
34. Adnan Al-Harazi, Purchasing, Al-Ezzi Industries, Sana'a
35. Najal M. Alshami, Cooperation and Senior Communications Expert, GTZ/Yemen
36. Samra Shaibani, Senior Communications Officer, World Bank/Yemen
37. Dr. Naif M. Abu-Lohom, Senior Water Resources Specialist, World Bank/Yemen

38. Qahtan Yahya Al-Asbahi, Sectoral Water Policy Technical Officer, Responsive Governance Program/USAID
39. Dr. Abdullah Nasher, President, Yemeni Biological Society
40. Dr. Mansoor Al-Qadasi, Director General of Animal Health and Veterinary Quarantine, MAI
41. Dr. Fritz Schulleri, Senior Agricultural Expert, GTZ/Yemen
42. Mohammed S. A. Al-Lai, CEO, Al-Amal Microfinance Bank
43. Simon Chevalking, Meta Research (water)
44. Philip Schwehm, Senior Economic Governance Specialist, RTI International
45. Phil Psilos, Senior Economic Growth Specialist, RTI International
46. Dr. Najib Thabet, General Manager, Agriculture Office (MAI), Abyan
47. Dr. Abdulghani Al-Yaheri, Chairman, Ribat al Qala Cooperative, Ibb
48. Abdulwahab Olaya, Chairman, Dhamar Agricultural Cooperative, Dhamar
49. Abdulsalam Al-Tayib, Chairman, Tihama Development Authority (TDA), Hodeida
50. Mohammed Foutainy, Director Monitoring and Evaluation, TDA, Hodeida
51. Marwan Sabeha, Manager, Sabeha Lime Farm, Hodeida
52. Abdullah Saif, General Manager, Surdod Farm, Hodeida
53. Ahmed Abdulmalik, External Relations, Agricultural Cooperative Union
54. Abdullah Al-Ansi, Chairman, Highland Potato Seed Cooperative, Dhamar
55. Dr. Saher Al-Oqaily, Director General, Animal Production, MAI
56. Ahmed Handel, Owner, Central Fruit Market, Sana'a
57. Ali Al-Mountasel, General Manager, Agriculture Office (MAI), Lahej
58. Mr. Al-Masoadi, Al-Masoadi Export Center, Al Lawiya, Hodeida
59. Abdullah Raimi, Manager, Hodeida Dairy Cooperative, Hodeida
60. Nadia Al-Hindi, Manager of Rural Women Department, TDA, Hodeida.