

Republic of Yemen

Comprehensive Development Review

Agriculture, Livestock, and Fisheries

Rural Development, Water and Environment Group (MNSRE)

Middle East & North Africa Region

The World Bank

Draft: January 20th, 2000

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CURRENCY EQUIVALENT

(As of April 30, 1999)

Currency Unit: Yemeni Rials (YR)

Exchange Rate: US\$1 = YR 151

WEIGHTS AND MEASURES

The metric system is used throughout this report.

ABBREVIATIONS AND ACRONYMS

MAI	Ministry of Agriculture and Irrigation
AFPPF	Agricultural and Fisheries Production Promotion Fund
GDP	Gross Domestic Product
PDRY	People's Democratic Republic of Yemen (formerly southern Yemen)
YAR	Yemen Arab Republic (formerly northern Yemen)
YR	Yemeni Rial
MENA	Middle East and North Africa region

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Preface

Coverage of this paper

This paper covers (1) agriculture in the broad sense, including crop production forestry, rangeland, watershed management and livestock; and (2) fisheries. The paper also touches on broader issues of rural development such as rural infrastructure and rural social services development, but does not treat these topics in any detail. It is hoped that these themes can be integrated in a fuller and more comprehensive treatment of rural development at a later stage of the CDR exercise.

Major conclusions and recommendations regarding agriculture

The major conclusions of the paper regarding agriculture are that this will remain a key productive sector for the foreseeable future and will have to absorb labor and provide incomes on a fast-increasing scale due to the demographic explosion. The economic potential exists for further agricultural growth but there are major problems of sustainability affecting horizontal expansion and of productivity affecting vertical expansion. Adverse movements in the terms of trade and the virtual collapse of public services to the sector have also affected growth.

The paper organizes its analysis around the two key problems of poor productivity and sustainability of irrigated agriculture, and low incomes in rainfed and livestock systems. The policy recommendations made in the paper are directed at these two problems and comprise: macroeconomic solutions to remove incentives to water mining and inefficient water use; technical solutions to develop and disseminate the technology needed for improving value added, particularly returns to the scarcest resource, water; and management solutions to give more responsibility and ownership for both resource management and service provision to farmers and farmer institutions, and to improve the quality and cost effectiveness of remaining public services. The paper also proposes implementation steps for Government and a focused line of project and sector work interventions for Government and donors in support of the strategy.

Links to World Bank strategy in the sector worldwide

In 1997, the World Bank published its manifesto on agriculture and rural development, and the current paper picks up many of the broad themes of that manifesto, particularly those highlighted for the MENA region: a return to an emphasis on agriculture (both rainfed and irrigated) as the locomotive of growth and employment in rural areas; the need to set agriculture in the broader context of integrated water resources management; the emphasis on participation and community capacity building; and the priority given to sustainable management of the natural resource base. The broader fit of agriculture within an integrated rural development strategy, which is also a key theme of the World Bank's global strategy, is a priority for Yemen, and should be tackled in a second phase of analysis.

Chapter I Introduction

A. Introducing the “Rural Block” and Coverage of the Paper

1. As mentioned above, this “Rural Building Block covers (1) agriculture in the broad sense, including crop production, forestry, rangeland, watershed management and livestock; and (2) fisheries. The paper also touches on broader issues of rural development such as rural infrastructure and rural social services development, but does not treat these topics in any detail. It is hoped that these themes can be integrated in a fuller and more comprehensive treatment of rural development at a later stage of the CDR exercise.
2. The paper is based on the review of existing information and consultant reports available within the MNSRE group. New research has not been carried out. Core documents for the compilation of the information contained herein are studies which have resulted from the intensive and recent sector work carried out by the Bank with Government and other donors. These documents include the Agricultural Strategy Note (1999), the Fisheries Sector Strategy Note (1999), the Fisheries Sector Review (1999), the Water Strategy (1997), the Sector Note on Animal Resources (1999), the National Environmental Action Plan (1993), the Irrigation Note (1999), the Agriculture Policy Working Papers (1998) etc. Work conducted by other donors has also been incorporated (e.g. the EU Food Security Strategy 1998).

B. Brief Overview of Key Indicators and Trends

3. **The rural sector is important to the economy and to poverty alleviation**
 - Yemen is a predominantly rural country, and within MENA, it is the country with the largest rural sector of its economy.
 - Despite a continuously declining share in GDP, agriculture remains the most important sector - 61 percent of employment, 18 percent of GDP.
 - Over the last three decades, agriculture has shown strong growth, even though terms of trade have shifted against the sector.
 - The sector grew particularly rapidly in the 1970s and 1980s, driven by considerable investment, market expansion and protectionist policy.
 - Today Yemeni agriculture is characterized by market orientation, by a reliance on irrigation that has brought self-sufficiency in fruit and vegetables, and by an explosion in qat cultivation
 - There has been a parallel marginalization of the traditional cereals and livestock economy, with consequent deterioration in watersheds and terraces.
 - Further development of the agriculture sector is important to the economy because of the scope for employment creation and poverty alleviation. In the context of a fast growing rural population and increasing rural poverty.

- In MENA, Yemen is, with the exception of West Bank/Gaza, the country with the scarcest water resources. As agriculture and the rural sector use over 90% of the water, this focuses the water conservation agenda squarely on the rural sector.
- As rural areas are home for the majority of the poor, rural development will have to play a key role in poverty alleviation in Yemen, which is the poorest country in MENA.

The sector grew rapidly - and changed structurally - in the 1970s and 1980s

4. Until the 1960s, Yemeni agriculture remained overwhelmingly traditional. Change came slowly, until the 1973 oil boom. The ensuing large scale migration and flow of remittances created strong influences on the rural economy:

- rapid growth in the 1970s and 1980s, with GDP rising at 12 percent a year and per capita incomes shooting up from \$62 in 1964 to \$528 in 1982
- remittances pouring in to previously poor rural households
- a fast pace of rural development and of investment in agriculture
- a rapid change in the size and nature of the market for agricultural produce, as incomes rose and new tastes were acquired
- a shift in the terms of trade against cereals
- deterioration of traditional rainwater harvesting and livestock systems
- widespread adoption of the tubewell and the tractor
- a protectionist policy encouraging the development of production of fruit, vegetables and qat.

There have been gains - but problems of sustainability, low productivity and poverty emerged in the 1990s

5. Although the recession after the Gulf War has reduced the rate of growth, the agriculture sector is permanently changed (see Table 1). The sector today is characterized by:

- a generally market oriented agriculture
- widespread groundwater irrigation that has brought self-sufficiency in fruit and vegetables but which is subject to growing water constraints
- the explosion of qat cultivation to cover one tenth of prime farm land
- heavy dependence on imported cereals paralleled by marginalization of the cereals economy, reduction in the cereals area and deterioration of watersheds and terraces

- stagnation in the traditional livestock economy
- absence of any recent productivity breakthrough and generally not very advanced levels of husbandry and productivity
- weak linkages to industry
- an inward looking orientation, with very small exports (less than 2 percent of total exports).

6. Demographic pressure has contributed to the problem of rural poverty; in 1995, 20 percent of the rural population (2.4 million people) were poor.

Table 1: Change in Yemeni Agriculture 1970 - 1996

	1970	1996	
(1) shares of agriculture in the economy			
Share in the labor force	75%	58%	
Share in GDP	45%	15%	
Share in exports		2%	
Shares of land cultivated to:			
- cereals	85%	61%	
- cash crops	3%	14%	
- of which qat	<1%	9%	
- tubewell irrigated	0%	32%	
(2) values			
people employed in agriculture	1,232,000	1,615,320	
self sufficiency in cereals		c.25%	
self sufficiency in food		c.50%	
value added of production	\$240 mn	\$1,053 mn	(1995)
(3) farmed areas			
total cropped area	1,266,000ha	1,155,000ha	
cereals area	1,082,000ha	704,000ha	
qat area	8,000ha	91,000ha	
fodder area	40,000ha	94,000ha	
fruit and vegetables area	39,000ha	136,000ha	
rainfed area	1,056,000ha	579,000ha	
irrigated area	210,000ha	488,000ha	
- spate	120,000ha	100,000ha	
- spring	73,000ha	20,000ha	
- wells	37,000ha	368,000ha	
population per ha	4	13	
number of farms		1,092,830	
(4) livestock			
small stock		7.2 million	
cattle		1.1 million	
% of ag. Gdp		20%	
(5) production			
cereals	845,000t	664,000t	
vegetables	25,000t	703,000t	
fruit	14,000t	79,000t	
qat	35 million bundles	592 million bundles	

Source: Agricultural Statistics Yearbook

Fisheries has strong and direct links to Yemen's broader development and especially to poverty reduction.

7. Yemen is endowed with considerable and valuable fish resources comprising rock lobster, cuttlefish, shrimp, and demersal species, and abundant less valuable species of small (sardines, anchovies), medium (Indian mackerels, Spanish mackerels, jacks, yellow fin tuna) and large pelagics (sharks, marlins). These can potentially yield close to US\$95 million worth of fish annually, of which about 50% could be exported. The fisheries sector is of critical importance to the country, with the potential to contribute up to 5% of GDP, and to maintain and expand employment for some 3% of the population in especially Yemen's coastal areas.

8. Fisheries can contribute to growth through three avenues:

- (i) Expansion in production and export earnings (with corresponding improvements in fish quality).
- (ii) Increase in government revenues from industrial license fees, royalties, infringement penalties, export marketing fees, and profits from fisheries public enterprises, all of which can be redeployed to fight poverty in coastal communities.
- (iii) Stimulation of profitable activities in fisheries input supply, fish processing/meal and related value-added activities.

But these contributions can be realized only if safeguards are put in place to protect this natural resource base from overfishing.

Chapter II Basic Data and Trends in Agriculture, Livestock, and Fisheries

A. The Natural Resource Base

Topography

9. Yemen is situated in the south-western corner of the Arabian Peninsula, bordering Saudi Arabia to the north, the Red Sea to the west, Oman to the east and the Arabian Sea to the south. It has a coastline of about 650 km. The principal agro-ecological regions are as follows:

- The **coastal plains** along the west and south coasts, averaging about 50 km. in width, are semi-desert, but are intersected by wadis carrying substantial periodic storm flows from the mountains.
- The **highlands** are an extension of the vast mountain range of the southern Arabian Peninsula that runs through Yemen, with its highest peak, Hadur Shu'ayb at 3,760 meters. Topographical variation in this region gives rise to a wide range of climatic conditions, and its fertile highland plateaus are ideal for growing a wide variety of both tropical and temperate zone crops.
- The eastern part of the country are largely deserts, with a wide **desert margin** where some agriculture is possible.

Climate

10. In the **coastal** area, the climate is primarily dry and hot with high humidity and an annual rainfall of about 229mm (9in). This region is prone to severe sandstorms and maximum daytime temperatures range from 32°C in winter to over 40°C in summer. The **highland** areas boast a mild, temperate climate with pleasantly cool winters. Temperatures range from 21.7°C in June to 13.9°C in January. Highland rainfall varies from 300-1100 mm, declining from peaks around Ibb in the southern highlands towards the drier northern highlands. Two periods of increased rainfall are linked with the eastern and western monsoons; the first of these arrives in April/May and the second in July to September. Most of the rain falls on the western mountains. Rainfall gradually diminishes towards the **desert margins** in the east, and in the Rub' al-Khali desert (Empty Quarter) no rain ever falls.

Water

11. Yemen has little water. The country's total annually renewed water resources are estimated at 2.1 billion m³ (BCM). With a population of around 14 million, available resources thus amount to little more than 150 m³ per person each year. This compares with the MENA average of 1,250 m³, and the worldwide average of 7,500 m³. According to worldwide norms, domestic uses alone require up to 100 m³ per person per year, and food self-sufficiency requires 1000 m³. Thus, Yemen is a water-scarce country and food self-sufficiency is an illusory goal. Resources are unevenly distributed, too;

90% of the population has under 90 m³ annually. Notable is the prevalence of groundwater in water resources - 60 percent of renewed resources (1.3 BCM) is groundwater recharge.

Table 2: Renewable water resources and use in Yemen (1994) (in millions of cubic metres)

<i>Area</i>	<i>Renewable resource</i>	<i>Use</i>	<i>Balance (minus number = overdraft)</i>
Intermontane plains	100	500	-400
Tehama coastal plain	741	1000	-259
Eastern escarpment	315	540	-225
Hadramawt	161	281	-120
Other areas	783	466	317
Total Yemen	2,100	2,787	-687

Source: Yemen: Towards a Water Strategy. Report No. 15718-YEM, IBRD, August 1997.

12. Most water is already fully exploited - and often overexploited. In 1994, water use was estimated at about 2.8 BCM. The country thus overdrew its resources of 2.1 BCM by 0.7 BCM. In general, all surface water sources in Yemen are harnessed and exploited, and in most areas groundwater is already being exploited beyond the level of recharge. It is estimated that there are about 45,000 private wells in the country (although some estimates are considerably higher) and about 200 drilling rigs. Government's sporadic attempts to license and control wells and drilling rigs have not been successful.

13. The overdraft of groundwater is worst in the western half of the country - the mountains, escarpments and coastal plains which contain more than 90% of the population. In this western half of the country in 1994, groundwater use was 1.8 BCM, recharge was 1.1 BCM, a 70% overdraft. Usable storage in the western half is about 35 BCM, so at present rates of extraction the area will be dry within 50 years.

14. The situation is particularly bad in the highlands. In the Sana'a basin, where 10 % of the population live (1.5 million people), use in 1994 was 224 million m³ (MCM), recharge was 42 MCM, a 400 % overdraft. The water is literally running out. Groundwater is expected to be pumped dry in the Sana'a basin in about ten years time. In Qa' Al Boun near Amran water levels have dropped 60m in the last twenty years - and 30m in the last five years.

15. Only in the south-east may there be any significant untapped reserves. In Hadramawt in the sparsely populated south-eastern area of the country, 500 km from the capital, recent resource assessments have revealed a water resource that could be as much as 280 MCM of annual recharge, together with vast storage, equivalent to several thousand years of supply at current rates of use in the area.

Natural vegetation and potential for agricultural land use

16. The **highlands** are comparatively rich and fertile, with regular rainfall provided by the effect of the mountains on the Indian Ocean monsoons. Crops include coffee,

sorghum, wheat, barley, dates, almonds, grapes, and qat. Farming activities also include the breeding of livestock, such as cattle, sheep and goats. Alluvial deposits and seasonal wadi flows in the **coastal** area make “spate” irrigated farming possible. Principal crops are grains and cotton, and livestock is important. In the **desert margins**, the mountains gradually merge with the Rub al-Khali desert. Marib, al Jawf and Hadramawt have some agricultural activity, but further into the desert little agricultural activity beyond herding is possible. The Yemen was once rich in unique flora and fauna, but little remains of either, as a result of intense cultivation and hunting of wildlife. Indeed, many types of local flora are now endangered and most of the larger wild animals are facing total extinction.

B. Human Resources

Population and population growth

17. Compared to other countries in the peninsular, Yemen is a populous nation. In 1997, Yemen's population amounted to 16.3 million. Three quarters of all Yemenis live in rural areas. In 1997 the rural population was estimated at 11.7 million, 77% of the total Yemeni population. Yemen has the highest population growth rate in the Middle East and even one of the largest in the world. Between 1991 and 1997, the population grew by 3.3 percent annually. The estimated rate for 1999 is 3.34% p.a. and the estimated total fertility rate for the same year is 7.06 children born per woman. Due to the shape of the age pyramid and to the return of migrant workers, the labor force grew even faster 1991-7 - by a very high 4.9 percent annually.

18. With continued high growth rates, the Yemeni population is expected to double again to over 30 million by the year 2016. Over the same period to 2016, the rural population is expected to increase by 8 million to over 20 million souls. This will increase the supply of rural labor but, unless ways to absorb this labor into the rural economy can be found, rural poverty will continue to increase, and pressures on land and water resources will continue to degrade the environmental and productive capital of the rural economy.

Social Welfare Indicators

19. Among the countries in the Middle East and North Africa region, Yemen has the lowest life expectancy of 51 years, the lowest adult literacy rate of 38 percent, the highest fertility rate of 7.5 and the highest infant mortality rate of 11.7 percent of all live births. Secondary school enrollment is low for both boys and girls. In 1992 only 41 percent of all children between the ages 6 and 18 were enrolled in school.

Gender

20. In Yemen, as throughout the Middle East, female illiteracy is exceptionally high, and women are largely outside power structures. Compared to other developing countries, Yemen's gender gap in education is particularly large. Female enrollment rates in primary education are far below those of male children in the same age groups. The gender gap is particularly large in rural areas where in some governorates (Shabwa,

Hajjah, Dhamar, Saadah) rural female enrollment rates are less than 10 percent. The low school attendance of girls mirrors the governments under-investment in girls' education and its inability to meet parental, primarily religious-based preferences, such as separate schools for boys and girls.

Rural Employment

21. Most rural employment is provided by agriculture and herding. The principle alternative is to migrate to the city or overseas as a laborer. The national unemployment rate was estimated in 1995 at 30%. In rural areas, there is widespread underemployment, particularly of a seasonal nature.

C. Social organization

22. **Political Structure.** The political system of the north before the emergence of the republic in the 1960s was a matter of contract between the Imam and the tribes - the Imam giving autonomy, the tribes returning fealty and military support. After the creation of the republic in the north, the republican system opened power to both the old and a new elite - a small but changing group of tribal leaders, military officers, rich traders and other high status people. The reciprocity inherent in this contract has limited the freedom of maneuver of Government. Governance has remained weak, always subordinated to the need to keep control. Democracy is in its infancy and politics generally is conducted outside the democratic institutions. After unification, the integration of the southern establishment, with its centralized planning approach and its sometimes violent political culture, proved problematic. Overall, in the united republic, politics remain largely oligarchic in character, and the vision of government is limited to short term reaction based on the imperative of control.

23. Within this limiting framework, recent years have seen the re-emergence of a movement towards a modern civil society that had been eclipsed since the early days of the republic in the north. Decentralization, democracy and the fostering of associations and the right to associate are meeting a parallel growth in transparency and a withdrawal from monopolizing positions on the part of the Government. Although these movements remain tentative and the institutional structure very weak and hostage to the broader requirements of control and patronage, they are clearly movements in the right direction to which development efforts may increasingly be harnessed.

24. **Society.** Tribalism with its pronounced "noble" values was for long the predominant element in the society of the rural highlands and desert margins. The towns and coastal areas enjoyed a more mixed, evolved culture in which status was largely determined by birth. The basic element of society was the household, and society and politics were knit together from a hierarchy of alliances based on the household and local groupings. Since the creation of the modern state in the north, economic changes have induced social change: new wealth has come through urbanization, and through the rapid development of the market economy and foreign trade. As a result, individualism is replacing collective values, and social mobility is replacing the old stratification with a new one in which wealth has become a more important determinant of status than birth. Old "oppositions" - between upper and lower Yemen, Zaidi and Shafi'i, free tribesman

and tenant farmer, protector and protected - and old hierarchies - tribesman, sayyid, qadi, low status people - still survive, but their power as active principles is being steadily eroded.

D. Policy Environment

25. Several significant sets of policies have influenced the sector strongly and continue to do so. The present section looks at some of the most important of these policies and at how they are changing.

1. Policies of subsidy and open access on groundwater irrigation

26. Over two decades, Government policy actively promoted groundwater irrigation through credit and diesel price subsidies and a ban on fruit, vegetable and qat imports. The absence of any regulation on development or extraction of groundwater was also a powerful motor. Effectively, anybody with the financial resources to drill could appropriate groundwater.

27. Awareness about the threat of declining water tables has increased sharply in recent years. In 1996, government created the National Water Resources Authority (NWRA) to develop the regulatory and planning framework for improved water resources management. In addition, government has begun to adjust the distorted incentive framework that has driven the mining of groundwater. Diesel prices have already increased from RIs 3/lit to RIs 10/lit since 1995, and are presently at about 65% of export parity price. Government intends to complete the move to export parity over the next two years, and to lift the fruit and vegetable import ban.

28. These changes, precisely because they reduce incentives to water use, are likely to affect the profitability of using groundwater. Assuming subsidies were removed in one step without any change in farmer behavior, a static model developed in 1998/9 during joint IDA/Government work on the agriculture strategy showed a reduction in income of 13 percent for three principal fruit and vegetable products. This is equivalent to a drop in agricultural GDP of 3 percent. Thus, once the adjustments are complete, incentives to overuse of groundwater will have dropped – but so would incomes, unless efficiency improvements were made.

29. Thus the structural adjustment program that would improve sustainability by putting up the price of groundwater could also lead to significant reduction in farm incomes during a transition period to a more sustainable agriculture. This is a key challenge for policy and programs over the next decade.

2. Policy on cereals subsidy and the parallel neglect of rainfed farming systems

30. In contrast to the support given to irrigated agriculture, Government has both neglected and discouraged rainfed agriculture. Rainfed systems were almost entirely ignored - until very recently - by research and extension. Domestic production of cereals, far from being protected, has had to compete with massive cereals imports retailed at prices as low as 19 percent of border parity. Support to traditional livestock systems was maintained through nationwide veterinary services, but these have now largely stopped

working. There has been a rhetoric of change in recent years. The subsidy on cereals (imports) is being progressively eliminated and agricultural research is shifting gradually to a farming systems approach. However, little impact has yet been felt by farmers in rainfed areas.

3. Policy on public investment in services and infrastructure.

31. Over the last thirty years, since the emergence of the modern state, government has pursued a vigorous investment policy in both agricultural services and in production and rural infrastructure. This has created a broad network of services and service institutions, a large surface irrigation network managed and financed by the state, and a substantial rural development infrastructure, notably roads. In recent years, the crisis in the public sector has undermined Government's inability to undertake so much.

E. The Arable Farming Sector

Land use

32. Only 4% of Yemen's total land area is suitable for crop production, and 75% of this arable land requires irrigation of some kind to make farming possible (Villwock, G., 1991. Contributions to the physical geography and land classification of southern Yemen..). Since the 1970s, the overall farmed area has changed little (about 1.2 million ha). There has been, however, a substantial change in land use as a result of agricultural intensification. An expansion in the irrigated area, driven by the tubewell, has been compensated by a decline in the rainfed area as the economics of poor dryland farming have deteriorated. Between 1970 and 1996, the rainfed cropped area declined from 1,056,000 to 579,000 ha. Numbers for traditional livestock herds also have declined.

33. At the same time, areas that had access to water, especially irrigation water, and to urban markets, rapidly developed market agriculture, and the area under cash crops – fruit, vegetables and qat - went up fivefold, from 47,000 ha to 227,000 ha. between 1970 and 1996.

Table 3: Trends in crop area (1000 ha), Yemen, 1970-1997

	<i>1970</i>	<i>1990</i>	<i>1997</i>
Cereals	1082	845	722
Of which wheat	42	98	105
Cash Crops	40	145	179
Of which qat	8	80	93
Fodder	40	61	101
Fruit	14	57	81
Vegetables	25	52	59
Pulses	65	49	57
TOTAL	1266	1209	1200

Water use and irrigation

34. Yemen is characterized by very dry climatic conditions and the absence of permanent rivers. Hence irrigation has always been an important issue in crop production and long been practiced. Irrigated production now contributes two thirds of the value added of overall crop production. In consequence, agriculture is far and away the main water user, consuming more than 90% of all available water.

35. Traditional techniques are irrigation from spate diversion, from springs and from rainwater harvesting. **Spate irrigation** is a very important system, with over 100,000 ha of modern spate schemes developed by Government since the 1950s. The Tihama spate schemes are now looked on as the “breadbasket of Yemen”. Major problems with spate irrigation are:

1. no recovery of capital or recurrent costs is practiced for the public spate schemes; Government has shouldered the whole burden of developing and running these schemes down to secondary canal level. Now, with the dwindling of public resources and erosion of management capability and incentives, the operation and maintenance of these public spate schemes has deteriorated.
2. the water is delivered without cost to farmers, so that incentives for efficient use are reduced.

36. Modern **groundwater irrigation** developed even more rapidly over the last thirty years and now covers 368,000 ha (32 percent of the total farmed area), up from 37,000 ha. in 1970. This expansion supported a very rapid increase in the production of fruit, vegetables and qat, and made a tremendous contribution to the viability of the rural economy (Table 5). The major problem with groundwater irrigation is that it is very rapidly depleting the resource and in some areas town and country are competing for the same underground water. Groundwater is an open access resource at present, and no individual has any interest in conservation. There is little institutional structure for cooperation in groundwater management, and Government policy has until recently actively promoted further development rather than conservation.

37. Overall, the medium term prospects for irrigated agriculture to create more value added and help absorb labor are thus poor, unless change occurs.

Trends in Agricultural Output

38. Over the last three decades, aggregate production has more than doubled, with particularly strong growth in the 1970s when early technological improvements were made and capital was freely available from remittances.

Table 4: Crop production index (1989-91 = 100)

	1961	1970	1980	1990	1997
Index	53.7	50.6	82.0	105.6	115.2

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

39. Substantial variations by crop are evident, with a progressive movement towards higher value crops.

Table 5: Trends in crop production, Yemen, 1970-1997

	<i>1970</i>	<i>1990</i>	<i>1997</i>
Cereals, total	845	767	646
Sorghum and Millet	610	491	417
Wheat	39	155	129
Maize	13	66	53
Barley	126	52	47
Pulses	50	76	66
Vegetable		696	717
Fruits		313	469
Cash Crops (excluding qat)		31	145
Fodder		536	1090

Source: Government of Yemen, In: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

40. Yemen's area under cereals and production of cereals have declined considerably, as higher value irrigated crops have come in. Yemen's farmers have followed economic comparative advantage by growing high value fruits, vegetables and qat, rather than low value cereals. Government pricing policy (favoring cereals consumers, largely through a policy of importing cheap cereals and distributing them with subsidy) has had an impact on reducing producer incentives. Yemen has little comparative advantage in cereal production, and under the influence of both water scarcity, high wage rates and better economic alternative crops, the cereals area and production has declined.

Table 6: Cereal production areas and quantities

	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1998</i>
Cereals area, 1000 ha	1199	1083	851	845	720
Cereals production, 1000 tons	938	845	865	767	646

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Crop yields

41. Crop yields are low compared to agronomic potential and low compared to similar environments in the region and worldwide

Table 7: Average yields (t/ha) of major crops

<i>Crop</i>	<i>Yemen</i>	<i>Lebanon</i>	<i>Typical Areas</i>
Potato	13.0	25.5	20 - 25
Tomato	16.0	33.5	25 - 50
Banana	7.4	18.9	15 - 25
Oranges	1.8	13.5	10 - 25

Source: Irrigation Strategy Note

42. Cereals remain the most cultivated crop in Yemen, and even farmers who grow profitable cash crops may often still cultivate cereals for domestic consumption. The traditional cereals of sorghum and millet are almost entirely rainfed and yields are low. Wheat has become important in recent years, and much of it is irrigated.

Table 8: Cereal yields (kg/ha) in Yemen, 1961 - 1998

	<i>1961</i>	<i>1980</i>	<i>1990</i>	<i>1998</i>
kg / ha	782.5	1016.5	907.7	897.1

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Productivity

43. Overall productivity in terms of return to land remains low (in fact the lowest in the region, see Chapter III). There has been a slight increase in returns to land over the last decade, probably reflecting farmers switch to higher value crops, but there is still an enormous potential.

Table 9: Agriculture value added per hectare of agricultural land (constant 1995 US\$)

	<i>1965</i>	<i>1975</i>	<i>1985</i>	<i>1990</i>	<i>1994</i>
US\$	n.a.	n.a.	n.a.	35.6	41.4

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

44. The numbers on fertilizer consumption reveal the undeveloped state of much of Yemeni agriculture. Usage is very low (15% of the regional average, see Chapter III) and very much less than levels of usage in countries with comparable physical endowments.

Table 10: Fertilizer consumption (kg / ha arable land)

	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1996</i>
Yemen, Rep.	0.0	0.1	8.3	16.3	8.3

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

F. The Livestock Sector

Animal Numbers

45. The domestic animal population consists of approximately 7 million small ruminants, 1 million cattle, 170,000 camels, domestic poultry, and a fairly concentrated intensive poultry industry. The split between different production systems is as shown in the table below.

Table 11: Livestock systems in Yemen – animal numbers

	<i>No. of farms</i>	<i>Sheep / goats</i>	<i>Cattle</i>	<i>Camels</i>
Nomadic Livestock Farmers	15,000	100,000	60,000	
Transhumant Livestock Farmers	20,000	800,000	100,000	
Highland Mixed Farmers	300,000	2,700,000	550,000	
Lowland Mixed Farmers	350,000	2,500,000	450,000	115,000

Source: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

46. At present Yemen is facing “second generation” problems of high cost of imported feed, dwindling water resources and poor performance on animal health. Due to the limited fodder and water resources, productivity is constrained. Water will continue to be the main limiting factor, and any production increase has to derive from greater efficiency and not from expanding the livestock inventory.

Production Systems

47. Most animals are raised in mixed arable/animal systems where the linkages between crop production, feed, traction and manure are strong. Only 21% of Yemen’s farmers are classed as purely arable, and 20% as livestock farmers. The majority – 59% - are mixed arable/livestock farmers. The animal management systems vary. The principal ones are described in the Box:

Principal Livestock Production Systems in Yemen

1. Smallholder Systems

- **confined livestock systems** mainly found in the highlands. Almost all cattle and 20% of sheep in the highlands are raised in this system
- **guarded grazing in agricultural areas.** This applies mainly to small ruminants that are grazing (often a combined village flocks) under supervision in daytime and confined at night.
- **animal traction use of livestock (mainly oxen and camels)** for tilling (especially in the highlands where animal traction is the only method, apart from manual labor, to till the small terraces) or for transport (mainly donkeys and camels);

2. Transhumant systems

- These are mainly found in the drier areas where "Bedu" producers migrate their sizeable flocks (mainly sheep, goats and camels).

3. Intensive "modern" production system.

- These are mainly poultry farms, 3 large sheep farms (>3000 head), 6 large intensive dairy farms (>100 cows), as well as some 60 urban dairies (each with approx. 20-50 cows) in, mainly, Hodeidah and Aden city.

Economic Role and Markets

48. The overall output of the animal resources sector is estimated at about 20% of agricultural GDP, i.e. about \$300 million. The contribution to employment is considerably higher, with close to 80% percent of the rural population being involved in some form of animal production. Output has grown strongly over the last decade, after two decades in which rapid expansion also took place, particularly in the poultry and dairy industries.

Table 12: Livestock production index (1989-91 = 100)

	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1997</i>
Index	52.3	43.8	70.4	94.5	129.5

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

49. Livestock products are an important component of the overall diet of the Yemeni population. Milk and meat are both in high demand. Preliminary data from monthly expenditure reviews indicate that about 25-30% of the monthly budget is spent on food of animal origin. Since the Gulf crisis, and the subsequent decline of the economy, the consumption of animal products has declined somewhat. However, demand remains strong, despite the declining economy and increasing prices. The income elasticity of demand for food of animal origin appears to be relatively high, more or less similar to cereal consumption.

50. Local production did not increase significantly, however; as any response to market forces is tempered by the overall limitations on the production and use of fodder resources. The latter is closely linked to the availability of water. In a rugged country like Yemen with a poorly developed road infrastructure, preservation (cooling etc.) and transportation of the perishable rural goods such as meat and dairy products, is a major constraint to expansion of the sector. Government still has substantial holdings in large scale dairy production and marketing. There is scope for privatization.

Imports and export

51. Importation of livestock products (mainly dairy products) and live animals continues to provide for a significant part of the food basket. Import of livestock for slaughter declined from the mid nineties. Imports of milk in powder form started in the 1970s and have rapidly grown

Feed and fodder supply

52. Rangeland contributes approximately 50% of the total fodder in the country. The main constraint on animal production is the lack of water, and consequently of quality fodder. Although the overall feed resources are adequate, the distribution, access and seasonal variation in availability cause regional and seasonal shortage, and a risk of overgrazing. Intensification and increased output are perfectly possible, but only through greater efficiency of production, water use and marketing.

53. Two major production systems are dependent on external feed supplies; the **poultry industry** on imported feed (grain and concentrate) and the **dairy industry** on regionally imported fodder sorghum (mainly from the Tihama). Producers are well aware of the feed and labor constraints and are reluctant to keep excess stock. This is resulting in the selling of young stock, and the subsequent large contribution of veal and lambs to the local meat supply. Fodder use and cultivation appears under developed and under researched. Issues include lack of sufficient protein, phosphorus deficiency, poor productivity of rangeland and inadequate use of by-products.

54. Water is a dominant constraint to the sector. Considering Yemen's precarious water resources, the availability of water for livestock production will decrease. Further expansion of production then can only be achieved through **water conserving production methods** (rangeland grazing, crop residue use) or through **increased use of imported feed and fodder**. Current import levels represent over 200 million m³ water each year, one tenth of the national availability.

Livestock products

55. Prices are sustained above world market levels by the premium Yemeni consumers place on fresh products, whether poultry, meat or milk, and varying somewhere between 10 and 20%.

56. **Milk.** The milk market is segmented. Most milk is produced by small holder farms for home consumption. The rural market is supplied by excess of home production. The urban market supplied by a limited number of large producers. Milk powder imports increased during the nineties from 13,343 tons in 1991 to close to 20,000 tons in 1997; it is transformed into liquid milk, yoghurts and cheese.

57. **Meat.** Most meat sold in urban areas comes either from imported live animals (small ruminants and cattle), or from under-aged local stock, producing high quality veal. Most of the urban meat market is supplied by small-scale private butchers. Overall, meat marketing appears to operate well under prevailing conditions, but issues such as food quality and food safety are not addressed. They could become a problem in the future.

58. **Poultry and eggs.** Backyard poultry production is important in rural areas, but has been neglected by the public producer services and no data are available. The economics of broiler, and to a lesser extent egg production fluctuate with the macro-economic conditions as production is to a large extent dependent on imported feed. Many of the smaller commercial producers have disappeared in the last decade, as the price of imported feed has shot up. Water resources are a major constraint both for production and for processing.

59. Most of the services provided to poultry farmers such as feed, veterinary services etc. are through the private sector. There are major productivity improvements possible if current wasteful practice could be corrected –especially poultry diseases and incorrect feed balancing (leading to a poor feed conversion). In particular, the timely identification of disease and deficiency has been hampered by the lack of good diagnostic services. The technical capability for such service was provided by bilateral aid, but the reluctance of Government to practice cost recovery, either for services or for supplies has undermined the services.

60. **Wool** The total wool production of about 2,000 tons is used for local spinning and carpet making. Further development of this subsector is constrained by the high cost and poor skills of labor, and by the generally mediocre quality of the wool.

61. **Hides, skin and leather.** Hides and skins are mainly sold and exported dry. Some local tanning is done. Total value of exports sales is approximately \$ 10 million annually, making it Yemen's third agricultural export. However the export trade is performing well below potential as, overall, the quality of hides and skins is poor.

62. **Honey.** Bee-keeping and honey production is an important rural occupation. Honey is among the few exportable agricultural products, with close to \$ 1 million in export sale.

63. **Traction.** Transport (donkeys, camels, horses) and traction (oxen, camels) are important reasons for keeping livestock. Draft animals are essential in the highlands, where terraced agriculture prohibits the use of wheeled equipment. Studies on the economics of animal traction indicate that in most cases the use of animals is more cost effective than the use of motorized equipment.

G. Fisheries

Fisheries Resources, production and growth

64. Yemen has considerable demersal and pelagic species, with perhaps some of the richest fishing grounds in the region. Annual fish catches vary between 80,000-100,000 tons, of which 90 percent is being caught by the small scale artisanal fleet. The contribution of fisheries production to national economic growth is quite significant. According to official statistics, fish production in 1996 by artisanal (small-scale) and industrial methods in both the Gulf of Aden and the Red Sea is as follows:

Table 13: Fish production in Yemen, 1996

<i>Area</i>	<i>Fisheries Type</i>	<i>Production (tons)</i>	<i>Value (millions YR)</i>
Gulf of Aden	Artisanal	70,150	5,348
	Industrial	7,989	846
Red Sea	Artisanal	29,993	3,223
	Industrial	n.a.	n.a.
Total		108,132	9,417

Source: Fisheries Sector Review, 1998.

65. With output on industrial fisheries difficult to track and evaluate, especially when there is substantial illegal fishing and significant under-reporting by licensed trawlers (not to mention the lack of accurate reporting of catch statistics from the artisanal fisheries), it can be safely concluded that annual fish production in 1996 was no less than about 108,000 tons, which was valued at about YR9,400 million (equivalent to US\$71 million at prevailing exchange rates then) and about 1.4% of 1996 GDP. Between 1980-84, according to official statistics, average total fish production was 90,000 tons and rose to 104,000 tons from 1985-1989. It appears fisheries contribution to economic growth is significantly under-reported. Through strengthening the system of collecting village level catch statistics and monitoring and surveillance of industrial trawlers, the Government can get a better handle at capturing the contribution of fisheries to the national economic growth.

66. Over the past two decades, several resource surveys were conducted along Yemen's Gulf of Aden and Red Sea Coasts, providing valuable information on demersal and pelagic stocks. Up to the period of Unification in 1990, routine data collection from the industrial vessels was well monitored and recorded with reliable and consistent catch and effort data being recorded. Since 1991, no dependable fish landing statistics have been collected, and no reliable catch statistics are available.

67. **Trends in Fisheries Resources.** Despite present data limitations, inferences from past trends and observations on growth in the level of fishing effort suggest the following:

- The most valuable species of rock/spiny lobster, cuttlefish and shrimp appear to be fully exploited or even overfished. The lobster resource used to be effectively managed by Coastal Fisheries Corporation (CFC); but now it is "free for all," contributing to the rapidly declining stocks. The lobster resource could contribute up to some US\$5-9 million annually if well managed. Similarly, the cuttlefish resource is being overfished by the foreign industrial fleet; it could contribute between US\$20-30 million, if well managed.
- The less valuable species of small pelagics (sardines, anchovies) and large- and medium-size pelagics (Indian mackerels, Spanish mackerels, sharks, jacks, yellow fin tuna and marlins) are still abundant and face limited fishing efforts, in large part because of their low value and the limited local market for them. The abundance of pelagics, however, may fluctuate substantially through a seven-year cycle. There is potentially a high value market for fresh (iced) tunas, marlins and shellfish in Japan and Europe; such products would need to be flown out of Yemen. The potential value of these during a high production year could be some US\$25 million.
- The valuable species of demersal fish (bream, snapper, emperor, etc.) appear to be also overfished. Demersal fish are concentrated on the Continental Shelf, of which the largest area is off the coasts of Hadramawt and Al-Mahara governorates, although there are some significant areas with demersal fish resources in the Red Sea and in the Aden vicinity. Heavy fishing activity during the seventies and eighties severely reduced the catch rates available to trawling along the southern coastline. Most of these species have been heavily fished by foreign industrial fishing vessels. However,

their potential value, if well managed, could be up to US\$ 20-25 million per annum.

68. **Location of resources.** The two fishing areas of Yemen, the Red Sea Coast and the Gulf of Aden (including the areas in the Arabian Sea and Indian Ocean), have both nutrient rich waters which make them into valuable fishing grounds.

69. The Red Sea Coast is rich particularly in demersal fishes and shrimps. The Coast extends over a distance of 650 km, and has trawlable grounds of 6,200 km², of which 550 km² is for shrimping areas. The main shrimp species caught in the Red Sea are *Penaeus semisulcatus* and *Penaeus Indicus*. The Red Sea shrimp resources is capable of sustaining annual catches between 500-1,400 tons valued at US\$6-12 million annually if effectively managed. But, at present, shrimp stocks are under heavy pressure from the activities of industrial and artisanal fishermen, and there is significant unlicensed activity by Egyptian and Saudi fishing vessels operating in the Yemen Exclusive Economic Zone (EEZ).

70. The other area, the Gulf of Aden Coast, is rich in small and large pelagics (sardines, tunas, sharks), cephalopods (cuttlefish) and demersal fishes (including spiny lobsters). The Gulf of Aden coastline extends over 1,550 km, with a southern continental shelf of 22,225 km². The bulk of the catch in the Gulf of Aden Coast is composed of migratory large pelagic species of predominantly yellowfin tuna, which is seasonally abundant. During peak season, March-April, concentrations can be so high that a single boat can catch up to one ton a day in two fishing trips. The seasonal glut often depresses local prices. There are also sardines and anchovies which are mostly dried, and used to be exported to Southeast Asian countries during the 1960s and 1970s. There were brief unsuccessful attempts at a fishmeal plant, which was closed in 1980. In general, the catch of small pelagics is mostly sun-dried on the beach and sold as fertilizer or fed to camels in Al-Mahra governorates or across the border to Oman.

Fisheries Institutions

71. The key public institutions operating in the fisheries sector are the Ministry of Fish Wealth (MFW) which is responsible for planning and implementing national fisheries policies, regulations and projects, and for supervising the fisheries cooperatives. MFW has a branch in Aden, Hodeidah and Mukalla. MFW oversees three corporations: the near defunct Yemen Fisheries Corporation (YFC) which owns and operates the industrial fleet; the previously well-run but now declining Coastal Fisheries Corporation (CFC), which was in charge of rock lobster collection and marketing and building fiberglass boats; the near defunct National Corporation for Services and Fish Marketing (NCSFM), which oversees local fish marketing and is a merger of the PDRY's National Corporation for Fish Marketing (NCFM) and the YAR's General Corporation for the Development of Fish Resources (GCDFR).

72. The Ministry is in need of reform to enable it to serve the growth and poverty reduction strategy of the sector more effectively. There are the fiscal issues having to do with the state-owned enterprises (public corporations) in the sector which are operating at high levels of inefficiency, which require restructuring or even privatization. Fiscal matters also include the size of the wage/salary bill vis-à-vis expenditures on operations and maintenance within the overall context of the Ministry's limited budget. There is also

the issue of state-owned enterprises undermining private sector competition. These matters could be handled, in the medium term, as part of the ongoing national privatization effort or piecemeal as part of a project. There are also the administrative issues, having to do with overstaffing and poor capacity. The Ministry, at present, is overstaffed (with some 3,000 employees and about one third of these in NCSFM, making it 1 ministry staff for every 7 fishermen) and lacking in competence in some priority areas, e.g., stock assessment. The Ministry also lost many of its best staff after unification. The staffing and administrative issues are longer term concerns and can best be handled as part of the institutional reform agenda.

73. As far as the private sector is concerned, the main institutions in place are the 13 cooperatives and societies in the Gulf of Aden coast and four fishermen societies along the Red Sea Coast. These organizations provide inputs, marketing and social services to their members and receive loans and grants from MFW, while overseeing a wide range of village fisheries infrastructure. Cooperatives reform is needed to federate the loose ensemble of primary societies to enable them to assume quality control, marketing, and export functions and capture profits from the ensuing value-added.

74. In terms of public and private sector roles to support sector objectives, clearly the public sector should focus on regulation, monitoring, research/extension, and certain types of infrastructure provision (roads, ports, central markets, etc.). The private sector, including cooperatives, should focus on production, processing and marketing. Under this, the various structures directly related to these activities (ice plants, cold storage, landing sites, auction centers) should be privatized, and the concerned cooperatives should own and operate these facilities.

Artisanal versus Industrial Fisheries

Artisanal Fisheries.

75. Artisanal fisheries is carried out by local fishermen operating small, open deck fishing boats and using traditional fishing methods without processing facilities fitted on the boats. In some cases, drying and salting of fish is done using old techniques. This subsector has increased employment and income for a substantial number of Yemenis and has the most important impact on reducing poverty. The size of the artisanal fleet has doubled and the number of fishermen have tripled since unification. This rapid growth in the artisanal fleet and number of fishermen may be due to Donor support and the influx of returnees after the Gulf war, who also came with money which fuelled investment in fisheries. In the Gulf of Aden, many artisanal fishermen are organized in cooperatives, which numbered thirteen in 1993. These cooperatives are still operating but after 1994, a few fishermen societies were established.

76. The main drawback the artisanal fishermen are facing is having to compete with the industrial fleet for the same species in the same fishing grounds. This contributes to the overall resource management problem, with declining catch per effort. There is growing complaint against large foreign trawlers (mostly Egyptian and some Saudi Arabian) which are perceived by artisanal fishermen as fishing illegally (even where some may have licenses). Problems reported by artisanal fishermen against industrial fisheries are:

(i) they compete directly for shrimp and demersal fish, causing sharp reductions in catch rates for the artisanal fleet; (ii) they have high rates of discards of juvenile demersal fish, causing subsequently declining stocks; (iii) they damage or induce loss of fishermen nets; (iv) they destroy fish habitats by indiscriminate use of heavy trawling gear; (v) they violate closed season rules by fishing for shrimp under the pretext of fishing for demersal fish; and (vi) they bribe military patrol vessels and observers on board licensed vessels; and (vii) they sometimes use dynamite.

Industrial Fisheries.

77. Industrial fisheries use large scale vessels. In Yemen, the industrial fishery of the Gulf of Aden is about 30 years old and began around 1966 when the USSR and Japan provided trawlers under royalty, licence and/or joint ventures. From 1974-1990, the Government of Yemen (PDRY) expanded its own fleet of industrial fishing vessels, building up to 19 vessels ranging from 220-1,500 gross registered tonnage (GRT), with a fleet of up to 45 foreign-owned vessels during some years. In the past, the Government favored investing in the fleet of large industrial fishing vessels, licensing of foreign industrial trawlers, and massive investment in onshore infrastructure, mostly in Aden.

As a result of this bias towards industrial fisheries, a considerable number of foreign vessels are currently fishing in Yemeni waters: A licensed Egyptian fleet is fishing for shrimp and other fish in the Red Sea; a Chinese fleet is currently licensed to fish in the Gulf of Aden. In addition, vessels from China, Singapore, Taiwan and Somali are fishing in Yemeni waters without formal licenses. More recently, there has been a decline in industrial fishing by the local fleet, mainly caused by vessel maintenance and serviceability problems, which has redirected attention towards the importance and potential of the small-scale artisanal fisheries in contributing to increased employment and incomes.

78. A recent International Food Policy Research Institute (IFPRI) 2020 Vision in Brief paper, summarizing comparative research on the status of world fisheries, warns against the “dark side” to the fish boom in developing countries related to industrial fisheries development. The Brief notes:

Most of the new fish on the market are coming from industrial fisheries in developing countries. These are often capital intensive enterprises, mainly financed by and earning profits for large investors, favored by national governments because of their contributions to markets, exports, and the national economy. Although they provide employment, industrial fisheries are not producing food for the poor. They produce high-value fish for industrialized countries and low-value fish for fish meal that is fed to livestock. Yet they are overtaking the waters of small-scale, artisanal fisherfolk, particularly in Asia, where there are many poor, coastal communities. “Generating income is one thing,” said Aguero. “Who gets the income is another, and it is not the small-scale fishers. With new trends toward a global economy and more foreign investment, outsiders take advantage of the income fish resources can generate. Increasingly, resources from these enterprises are going into very few hands, and the community at large is not benefiting.

79. The lesson learned from the IFPRI vision paper is that formulating fisheries strategies for poor countries like Yemen requires protecting the interests of poor, small-scale artisanal fishermen against the temptation to emphasize industrial fisheries development which benefit only a few hands and run the risk of destroying fish habitats.

Catalyst for Fisheries Input Supply and Value-Added Activities

80. Through backward linkages, the development of fisheries in Yemen has created an industry of suppliers of inputs used in fish production and thereby created employment and income for many poor Yemenis. These inputs fiberglass boats for artisanal fishermen produced in factories in Yemen which hire local labor; outboard engines, fishing gear, gill-nets, etc provided by local suppliers; private iceplants specialized in the production and sale of ice; and fish processing facilities owned and operated by private local entrepreneurs.

Fisheries Contribution to Government Revenues

81. The Government of Yemen collects revenues from industrial license fees, royalties, export marketing fees, and penalties for infringements and also gets net revenues in the form of profits from the public enterprises in the fisheries sector. Information of the magnitude of these collections is hard to obtain; nevertheless the table below on alternative sources of fisheries revenues is indicative:

Table 19: Estimates of 1996 Government Revenues from the Fisheries Sector

<i>Revenue Collector</i>	<i>Revenue Source</i>	<i>Value (US\$)</i>
Ministry of Fish Wealth	Industrial licence fees	
	-foreign vessels	24,000,000
	-domestic vessels	770
	-Egyptian shrimp	n.a.
	Royalties	706,800
	Infringement Penalties	n.a.
	Export Marketing Fee	250,000
Ministry of Finance	CFC	90,000
	NCSFM	n.a.
	Mukalla Fish Cannery	n.a.
	Shuqra Fish Cannery	165,000
	YFC	0
	FICO	0
Total		25,213,800

Source: Fisheries Sector Review, 1998.

82. The above estimates, albeit incomplete and only indicative, demonstrate that fisheries is and could become a significant source of public revenue if a proper system of revenue collection is put in place, and there is adequate transparency and enforcement to ensure payment compliance.

Fisheries Export Earnings and Growth

83. In 1996, officially recorded exports were estimated at 8,607 tons valued at about

US\$13 million, comprising mainly of cuttlefish, lobsters and shrimp.

Table 14: 1996 Fisheries Exports by Species, Volume (t) and Value (US\$)

<i>Species</i>	<i>Volume (t)</i>	<i>Value (US\$)</i>
fish	7,326	4,491,851
shrimp	375	3,075,864
fillets of fish	41	205,000
squid	72	57,600
sharkfin	23	699,000
dried fish	26	26,000
cooked fish	3	3,000
cuttlefish	556	975,430
sea cucumber	10	87,000
octopus	1	1,500
fish meal	30	7,500
live rock lobster	30	364,800
rock lobster	114	2,287,903
Total	8,607	12,282,448

Source: World Bank, 1999. Republic of Yemen, Fisheries Sector Strategy Note.

84. Large quantities of fish catches from Yemeni waters that physically were exported were not recorded. Potential exports may be 5-7 times larger than what was officially recorded in 1996, and this probably holds true for alternative years. Yemen officially exports demersal fish and cuttlefish to Japan, Spain, Italy and the former Soviet Union; frozen rock lobster tails to the USA and France; limited quantities of frozen and canned fish and fresh tuna to Middle Eastern countries (especially Saudi Arabia) and Europe, and dried shark fins and sea cucumbers to Southeast Asia.

85. Currently, Government prohibits the exportation of five species of fish deemed desirable in the local market; namely: king fish, tuna, bream, grouper and trevally. This export restriction is hampering fish exports and creating incentives for smuggling and transshipment of fish. There is an urgent need to encourage Government to repeal the fish export restriction. Also, fish exports from Yemen face acute quality problems; the world is quickly adopting worldwide quality and health standards as reflected by the HACCP and ISO 2000 standards, which are applied by the EU, USA and many other countries. With the exception of some industrially caught and handled fish, most fish currently being produced in Yemen by small-scale fishermen will likely fail current international quality requirements.

Income Distribution and The Poverty Nexus

86. Coastal areas of Yemen, which comprise populations in the coasts of the governorates of Lahej, Aden, Abyan, Shabwa and Hadramout (along the Gulf of Aden) and Taiz, Hodeidah, and Hajjah (along the Red Sea), are among the poorest in Yemen. Many residents of these areas suffer from malnutrition, poor housing, and limited or no access to social services. At present, we have a real knowledge gap on coastal poverty: its magnitude, characteristics and dimensions. We do not have any baseline data base arising from a poverty survey of fishing villages, showing the number of poor below a derived

poverty line, their characteristics in terms of age, sex and ethnic group and the economic stratification of fishing villages by income and wealth cohorts. Although we do not have a good assessment and estimate of the nature and depth of coastal poverty, we know enough from experience. We know from anecdotal evidence that poverty is widespread and dependency rates are high, suggesting high average fertility rates. We also do know from casual observation that a large number of children in these areas are malnourished, and there are other proxies for poverty in these areas in terms of observed general poor housing, minimal number of health centers and primary schools, low density or non-existence of good access roads, and limited mobility. Indeed, it is highly probable that poverty indicators in coastal communities are below the national poverty norms of Yemen. In view of the fact that we have knowledge of the general location of these fishing villages and their widespread poverty, this makes it possible to do broad-based geographical targeting of resources for poverty reduction.

87. It should be noted that fisheries is the specialized natural resource of coastal communities, and labor is often the only factor of production that the poor possess. Fisheries does generate and bring in income but much of the income is captured not by fishing families but by middlemen such as fish traders and fish processors. This is because many fishermen operate as individuals and lack the organization and resources to organize their production, processing and marketing activities to capture the lucrative value-added which could make fisheries into a high return economic activity. In recent years, there has been growing participation of fishermen in local cooperatives and societies. These cooperatives and societies are owned and operated by the fisherfolks themselves. There are some 13 fishermen cooperatives and societies in the Gulf of Aden and about four fishermen societies on the Red Sea Coast. While initially created to replace the monopsonistic and highly exploitative private marketing practices in the 1960s until the 1990s, the cooperatives received loans and grants from the Ministry of Fish Wealth (MFW) and, as such, became entities used to state support rather than operating as member-owned, profit-making entities. Whereas public support has been largely withdrawn since then, technical and institutional support to assist them to become viable, service-oriented institutions have been limited. The cooperatives and societies currently sell inputs (e.g., boats, gears, engines, ice), facilitate marketing (fish storage and auctions) services, enable members to obtain credit (acting as an agent for the successful fisheries credit program of the Cooperative Agriculture Credit Bank (CACB) and provide still a variety of social welfare benefits (credit for education, health, etc.). Cooperatives and societies generate most of their current income from profits on fish sold in local markets and to the National Cooperation for Services and Fish Marketing (NCSFM), auction fees, and gear sales. Their financial and management performance is mixed, linked to actual fish production and the managerial capacities of their leaders.

88. With no existing institutions having effective operations at the village level, cooperatives are the only organizations that are available to support the sound development of artisanal fisheries, management of village based infrastructure and for future co-management of fisheries resources. But to become effective in such broad supportive role requires a long-term development effort. Cooperatives not only require redrafting of legislation to enable them to unite into a federated or union structure, but also long-term support in management and financial staff training, incorporation of

cooperatives in the enforcement of quality control, the necessary restructuring of fish marketing and export activities, the local management of fish resources, and such activities as fisheries extension and credit supply. In short, the fundamental role of cooperatives and societies in small-scale fisheries needs to be redefined, and cooperatives need to be prepared and trained for such a role.

Fisheries Contributes to National Poverty Reduction Through Consumption and Nutrition

89. Fisheries is an important source of protein for many poor families in Yemen because of its affordability. Indeed, fish in Yemen could very well be called the poor person's protein. Fish figures prominently in the Yemeni national diet, especially in coastal areas and southern cities. According to UNDP calculations, per capita daily calorie intake in Yemen in 1992 was 2,203 (compared to 2,874 for other Arab states), and fish accounts for a significant share of this. Yemen per capita intake of fish per annum could be as high as 40 kg in areas like Aden compared with a world average consumption of fish per capita annually of 13.5 kg. Fish production and domestic consumption could also potentially reduce pressures on groundwater overdrafting through reduced domestic demand on crop sources of protein in consumption.

H. Agriculture in the National Economy

The economy in the last decade and future prospects

90. Yemen is a low income country with an estimated GDP of US\$ 331 per capita in 1997. It is the poorest country in MENA – and the only one currently eligible for IDA loans. Some oil reserves, the immense production and consumption levels of qat, and an unraveling centralized economic system in the former governorates of the PDRY distinguish Yemen from other lower income countries. Within the last ten years, the country faced several major shocks:

- the reunification of YAR and PDRY in 1990 which led to an inflation of the civil service, an unstable political situation, and a deterioration in law and order
- the Gulf War in 1991 and the problem of returnees
- the civil war in 1994

91. Development in the non-oil industrial sector is projected to be 5 percent per annum during 1995 - 2000 from a base of 14 percent of GDP. The absorptive capacity of this sector is hence only limited and agriculture as the other remaining tradable goods sector has to play the key role in labor absorption and poverty alleviation. Rural development thus becomes crucial for poverty alleviation and overall national development.

Contribution of the agricultural sector to GDP and employment

92. Yemen is a predominantly rural country where agriculture provides 61 percent of employment and still 18 percent of GDP. These figures exclude qat, which is probably worth over \$1 billion annually at the retail level, representing about another twenty

percentage points on GDP.

Table 15: Agriculture, value added (% of GDP)

	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1995</i>	<i>1998</i>
% of GDP	n.a.	n.a.	30.0	22.9	17.6

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

93. The official statistics, however, take a more modest view of qat's share in the national income.

Table 16: GDP (Mio. YR) at current market prices in Yemen, 1990 - 1998

	<i>1990</i>	<i>1994</i>	<i>1997</i>	<i>1998</i>
GDP, all sectors	123757	268789	740636	701274
Agriculture and Forestry	33785	64003	102875	106712
Agriculture and Forestry without qat	18999	41869	71061	70814
Qat	14786	22134	31814	35898
Qat (proportion to agricultural GDP, %)	43.8	34.6	30.9	33.6
Qat (proportion to national GDP, %)	11.9	8.2	4.3	5.1
Fishing	797	5814	9311	10149

Note: 1997 and 1998 in provisional figures. Source: Government of Yemen, 1999. Statistical Yearbook 1998.

94. The agricultural growth rate has been erratic, dependent on the rains inter alia.

Table 17: Agriculture, value added (annual % growth)

	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>
Annual growth, %	8.8	1.7	2.2	0.7

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

95. Agriculture remains far and away the biggest employer in Yemen, employing 61% of the work force. Although the percentage has dropped from 70% in 1970 to the present 61%, the sector has absorbed a large increase in the workforce – absolute numbers working in agriculture have gone up from 1.2 million in 1970 to 1.6 million in 1996.

Table 18: Labor force in agriculture (% of total)

	1960	1970	1980	1985	1990
Yemen, Rep.	76.2	70.4	72.6	67.0	61.0

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Terms of trade

96. Terms of trade have become increasingly unfavorable for agriculture (see Table 20), due especially to the rapid rise in the price of imported goods. As a result, the value of production, and hence of farm incomes, rose by only 20% 1990-7, whilst production rose 30% in the same period. The rise in farm incomes was roughly in line with population growth over the same period. Thus agricultural per capita incomes stood still, but the sector was able to absorb the increase in the rural population. (The most favorable terms of trade performance in the rural sector over the last decade has been for fisheries.)

Table 20: Terms of Trade for Agriculture in Yemen, 1985 - 1997

	1985	1990	1991	1997
Fish	50	95	100	600
Meat	50	90	100	450
Grapes	100	100	100	425
Potatoes	50	50	100	175
Sorghum	50	100	150	350
Market Forex Rate	25	50	100	500
CPI	20	50	100	590

Source: EU Food Security Strategy. In: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

I. Markets and Marketing

97. Agricultural marketing is largely in private hands, but there are some government and quasi government institutions that are involved as well. There are also a number of agricultural cooperative associations involved in marketing, including a few involved in the export market.

98. Issues include:

- Vegetables and fruits are marketed by farmers without any grading or selection, which considerably reduces the value of the produce. However, the Yemeni market is as yet not very discriminating and premia for graded produce are not general. Plainly, there is scope for both consumer education and for development of better grading practices.
- Market information systems are weak. A market price information system has been set up with donor support but the data are poor and the reports not generally available

or on time. A well functioning market information system is useful not only to farmers and to commercial agents but also to those involved in setting policies, and is often a significant component of a food security early warning system. Specific improvements should include a better data base on both the local and foreign markets; extension activities and training for agricultural producers in post harvest and marketing.

- There is a high rate of post-harvest losses in agricultural products - in developed countries losses range from 5 - 20% of the marketed output, whereas in developing country, the rate of losses ranges from 20 - to 50% of the amount produced. Yemen has a range of losses between 30 - 56% % of the quantities produced.

Table 21: Estimated post-harvest losses - grains and significant fruits & vegetables

<i>Commodity</i>	<i>Post-Harvest Losses</i>
Grains	15 - 30 %
Potatoes	10 - 40 %
Tomatoes	20 - 50 %
Carrots	10 - 30 %
Grapes	30 - 60 %
Bananas	20 - 50%
Citrus Fruits	20 - 30 %
Papaya	56%

Source: World Bank, 1998. Review of Marketing Policies and Analysis of the Strategies. Yemen: Agricultural Policy Review, Working Paper Number 2.

- Improvements are needed in market management and organization, including the establishment of autonomous boards of directors for the wholesale markets and the reorganization, restructuring and the updating of the existing markets.
- There is a need to revise and improve legislation and regulations, including the drafting and enactment of regulations and laws for markets, notably a decree for the regulation of wholesale markets

J. Domestic self-sufficiency in major foodstuff

Self-sufficiency

99. Import dependence for cereals is currently 80 percent, for all food 50%.

Table 22: Cereal balance of Yemen, 1970 - 1996

	1970	1980	1990	1996
Total cereals Availability	1000	1800	2500	3000
Of which Domestic Production	800	600	600	550
Needs	1000	1500	2000	2500
% self-sufficiency	80	33	22	20

Source: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

100. In Yemen, food self sufficiency has never really been an issue as Government has had access to cheap imported cereals which are efficiently distributed internally. The access to imports has allowed the Government to pursue a water pricing and agricultural development strategy that promoted development of higher value added production rather than trying to maximize production of lower value basic commodities.

Prices and incentives

101. In the past, the preponderance of imports and Government's control over these also simplified the management of Government's consumer subsidy on cereals. For two decades. Government pursued a cheap cereals policy based on imports of commercial or donor grain for distribution at subsidized prices. This subsidy reached 81 percent of the import parity price in 1995. Domestic cereals prices have reflected these low prices with consequent disincentive to domestic production. Now the subsidy on imports is being progressively eliminated – in 1997 the domestic price of imported cereals averaged 58% of import parity.

102. The main consequence of this price disincentive on cereals producers was a decline in production. The area farmed in cereals has diminished from over one million ha in 1970 to 704,000 ha in 1996. This has had an equity impact, as the systems affected are the predominant farming systems of the poor. However, those domestic producers who sold grain had a substantial cushion from the domestic quality premium that the market was prepared to pay. The premium that the market pays for local cereals has always been high and remains so – in 1997, the domestic price of domestically produced cereals was 196% of import parity. This the locally produced grains were selling at more than three times the price of imported grains.

Table 23: Comparison of Import Parity and Official Wheat prices and Local Wheat Prices (1991 - 1997)

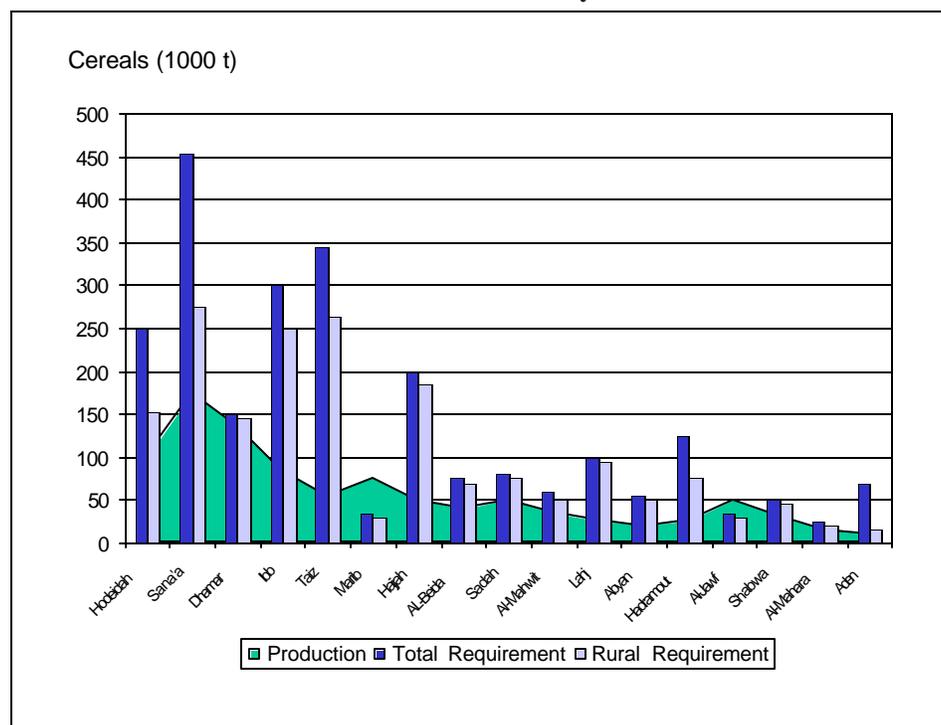
	Unit	1991	1992	1993	1994	1995	1996	1997
Import price (C&F)	US\$/t	125	162.02	167.15	154.61	209.87	260.55	171
Import parity price, Sana'a	YR/kg	3.74	6.07	9.11	13.94	27.89	37.37	25.57
Official wholesale price Sana'a	YR/kg	3.2	3.02	3.02	3.02	5.2	12.8	14.8
in % of import parity price	%	86	50	33	22	19	34	58
Local wheat price, Sana'a	YR/kg	11.88	10.87	13.00	19.53	35.81	47.66	50
in % of import parity price	%	317	178	143	140	128	128	196

Source: MST (prices and costs), Central Bank of Yemen (exchange rate). In: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

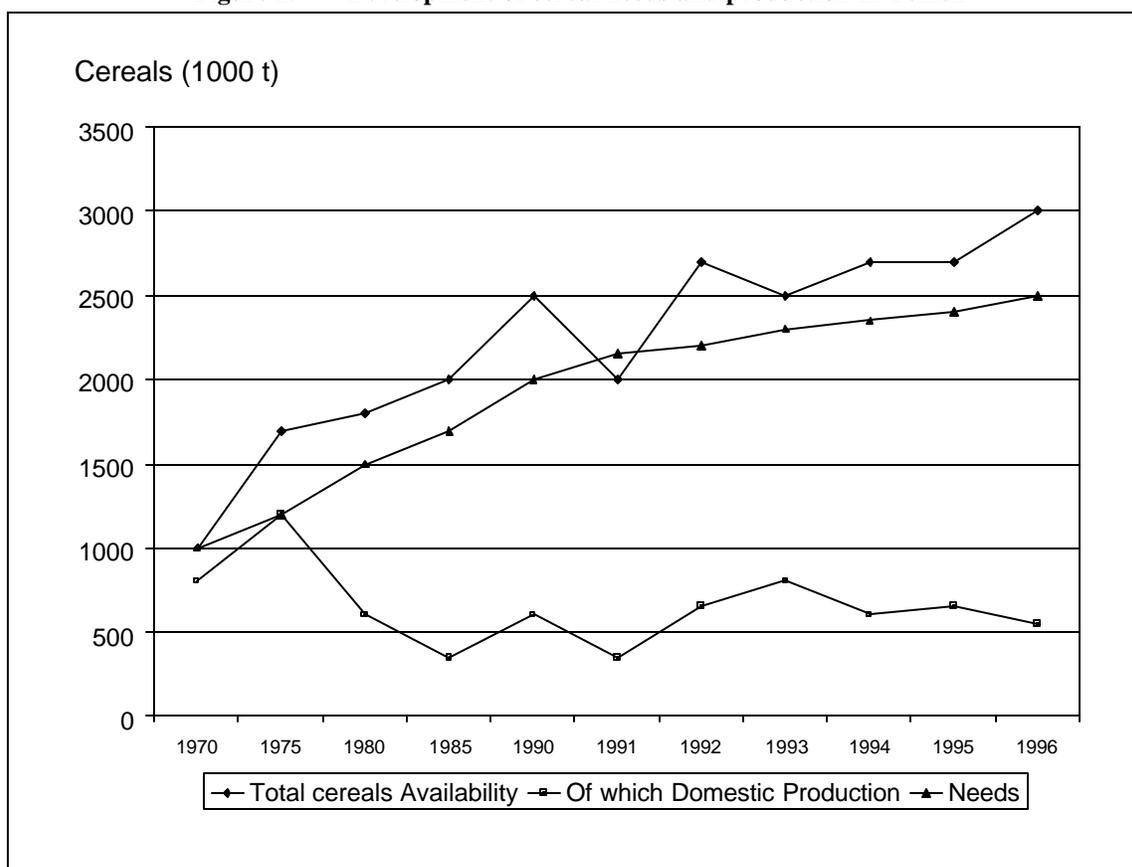
103. For this reason, further reduction in the subsidy of imports will have only a limited effect on domestic producer incentives, but is expected to have a greater impact on the majority of rural dwellers, including farmers who are cereals deficit and who buy from the market. There may be an increase in production for subsistence.

Regional Variations

104. There are large regional differences in the cereals balance between governorates. All governorates except al Jawf and Marib are "cereal deficit".

Figure 1: Regional differences between governorates in respect to cereal production and self-sufficiency

Source: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

Figure 2: Development of cereal needs and production in Yemen

Source: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

K. Rural Poverty

National Situation

105. In 1992, 2.6 million people did not have sufficient resources to meet their basic food and nonfood requirements, equaling about 19 percent of the entire Yemeni population (Panel 1). Nine percent even lived in absolute poverty with too little expenditures to meet basic food needs.

Table 24: Incidence of poverty in Yemen, poverty head count¹ 1992 & 1998

<i>Data source</i>	<i>Urban (%)</i>	<i>Rural (%)</i>	<i>Total (%)</i>
Panel 1: WB Poverty Report (1996)			
Yemen HBS (1992)	18.6	19.2	19.1
Panel 2: Yemen HBS (1998)			
a) CPI Updated Line 1992	21.8	23.2	22.4
b) Poverty Information Monitoring Project	20.3	26.9	25.4
Food + clothes + housing + health + education + transport		*(24.7)	*(23.8)
Panel 3: Social Protection Study 1998			
Social norm poverty line	21.3	25.1	24.8
Change over time (head count)			
1. 1992 HBS data	18.6	19.2	19.1
2. 1998 (mean)	21.0	25.0	23.0
Increase over 1992 (%)	12.9	30.2	20.4

Source: Mitchell, D., 1999. Poverty and social protection in Yemen: Summary report. Draft.

106. With a Gini coefficient of 0.39, inequality of incomes is rather average for a low income country and for the Middle East region.

Rural Poverty

107. Most (81 percent of all and 83 percent of the absolute) poor families live in rural areas. In some governorates, the incidence of poverty as measured by the headcount index is as high as one third of the population. This is the case for Al-Beida, Dhamar, and Al-Mahwit. Poverty appears to be concentrated in governorates with the highest concentration of small farms. Governorates closer to the border of Saudi-Arabia typically have the lowest concentration of poverty.

¹ A first World Bank poverty assessment for the Republic of Yemen was completed in 1996, using the 1992 Household Budget Survey data collected by the Yemen Central Statistical Office (CSO) (Panel 1). These estimates were updated in 1998 when a subsequent Household Budget Survey was conducted by the Yemen CSO (Panel 2). A social protection field survey of some 500 people in very poor communities whose average income locates them in the bottom decile of the income distribution asked participants to estimate the level of expenditure their family needed 'to get by'. The responses to this question generated a poverty line referred to as a 'social norm'. Using this social norm poverty line, a third set of poverty estimates were generated from the 1998 HBS (Panel 3) (Mitchell, D., 1999. Poverty and social protection in Yemen: Summary report. Draft.).

Note: Average upper poverty line (1999): YR 9,134 per year and capita, corresponding to US\$ 203; average lower poverty line (1999): YR 6,371 per year and capita, corresponding to US\$ 142 (World Bank, 1996. Republic of Yemen: Poverty Assessment.).

Outlook

108. Government's structural adjustment program has created a situation of deteriorating terms of trade for agricultural produce. In a transition period to an economically more justifiable and possibly more sustainable agriculture, many families will have to face reduced prices for some agricultural produce and thus lower incomes. In addition, as the majority of the rural population buys cereals, higher cereal prices will increase the cost of living and improve the economic situation only for those comparatively few families who produce surplus cereals.

Chapter III International Comparisons

109. This chapter provides a view of key indicators of Yemen and its rural sector set against other countries in the region and the world which have a similar resource endowment or structure. The purpose is to compare similarities and contrast the differences and so learn something about Yemen's possible growth path. The principal comparators are, within the MENA region, Jordan, Egypt, Morocco and Saudi Arabia together with the MENA average. Outside MENA, Portugal has been selected as the principal comparator.

A. Rural Development

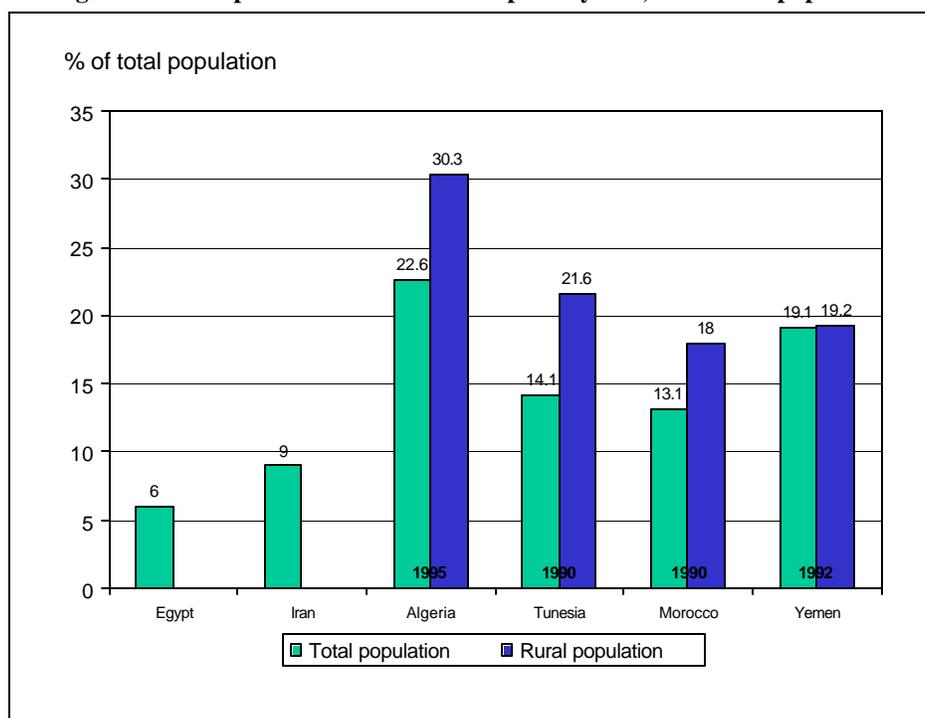
Rural Population below national poverty line (%)

110. Yemen shares with other MENA countries a fairly high proportion of its rural population below the poverty line. However, although Yemen's GDP per capita is the lowest in the region, the distribution of income is not markedly worse than in other countries, nor is the incidence of rural poverty any worse.

Table 25: Rural population below national poverty line, proportion (%) of total population, in Yemen and comparator countries, 1990 - 1996

	<i>Algeria</i>	<i>Tunisia</i>	<i>Morocco</i>	<i>Yemen</i>
Total population	22.6	14.1	13.1	19.1
Rural population	30.3	21.6	18.0	19.2
Year	1995	1990	1990	1992

Source: World Bank, 1999, Statistical Information Management and Analysis System (SIMA) and WB poverty reports on Morocco, Algeria, Tunisia.

Figure 3: Population below national poverty line, % of total population

Source: World Bank, 1999, Statistical Information Management and Analysis System (SIMA) and WB poverty reports on Morocco, Algeria, Tunisia.

Rural population density

111. Yemen has one of the densest concentrations of rural people of any MENA country. Only Egypt has a more densely concentrated rural population. The countryside has proved extraordinarily adaptive over the last three decades. Incomes have increased, even though labor employed in agriculture has increased threefold. Yemenis express a marked preference for rural life, and even those who migrate to cities often maintain strong connections with their village of origin, and frequently return to it to retire.

Table 26: Rural population density (people/km²) in Yemen and comparator countries

	1961	1980	1990	1996
Egypt, Arab Rep.	652.7	1004.2	1287.2	1167.2
Jordan	186.7	292.2	327.4	378.0
Morocco	126.9	154.2	146.7	144.8
Portugal	276.5	284.4	277.4	294.8
Saudi Arabia	253.7	169.1	100.2	87.2
Yemen, Rep.	385.4	498.8	612.8	713.7
Middle East & North Africa	329.3	439.1	518.2	501.3

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

B. Farm land resources

Resource availability and resource use efficiency

112. Despite a large land area, Yemen's arable surface is very limited – about 1.44 million ha, less than three per cent of the total land area. As with other MENA countries, the constraints are topographical – rugged mountains and deserts – and climatological – very low rainfall over much of the territory and no permanent rivers.

113. Irrigation development and improvement has increased the farmed area by about 10% since 1961, but this has placed an unsustainable strain on groundwater resources. Future expansion will have to be “vertical”, getting more crop per drop on the same or even a reduced land area.

Table 27: Arable land (1000 ha)

	<i>1961</i>	<i>1996</i>
Egypt, Arab Rep.	2499	2800
Jordan	270	320
Morocco	6590	8806
Portugal	2507	2153
Saudi Arabia	1140	3700
Yemen, Rep.	1262	1440
MENA	n.a.	n.a.

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

114. As in other dry countries in the region – notably Morocco – the predominant “horizontal” use of land is by livestock, notably the small ruminants that efficiently graze the steep slopes and crannies of the rugged terrain and convert the scanty vegetation to meat. About 30% of the national territory is exploited in this way. However, the carrying capacity is constrained by the water shortage, by the poor health status of the animals and by the lack of means of producing supplementary feed.

Table 28: Land use, permanent pasture (% of land area)

	<i>1961</i>	<i>1994</i>
Egypt, Arab Rep.	n.a.	n.a.
Jordan	8.9	8.9
Morocco	36.7	47.1
Portugal	9.2	10.9
Saudi Arabia	39.5	55.8
Yemen, Rep.	30.4	30.4
MENA	20.7	24.0

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

115. The combination of scant expansion of the horizontal area of arable land and the rapid increase of the population, has led to a very marked decrease in land availability per person in the country, from 0.23 ha in 1961 to under 0.10 ha in 1996. Only the productivity increases made possible by tubewell irrigation have allowed the agricultural sector to absorb more labor and to produce higher incomes from a land area per person that has more than halved over the last three decades. The challenge for the future is to wring more product out of the same resource base, whilst absorbing yet more labor.

Table 29: Arable land (ha / person)

	<i>1961</i>	<i>1980</i>	<i>1990</i>	<i>1996</i>
Egypt, Arab Rep.	0.09	0.06	0.04	0.05
Jordan	0.30	0.14	0.10	0.07
Morocco	0.55	0.38	0.35	0.33
Portugal	0.28	0.25	0.24	0.22
Saudi Arabia	0.27	0.20	0.21	0.19
Yemen, Rep.	0.23	0.16	0.12	0.09
MENA	0.48	0.28	0.23	0.21

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Irrigated land (% of crop land)

116. The MENA region is dry, and irrigation has traditionally been important. Since 1961 Yemen has expanded its irrigation networks faster than any other country in the region, thanks to the untrammled development of tubewell irrigation.

Table 30: Irrigated land as proportion (%) of total crop land in Yemen and comparator countries

	<i>1961</i>	<i>1980</i>	<i>1990</i>	<i>1996</i>
Egypt, Arab Rep.	100.0	100.0	100.0	100.0
Jordan	10.5	11.0	15.8	18.3
Morocco	12.6	15.4	13.6	13.0
Portugal	20.4	20.1	19.9	21.8
Saudi Arabia	29.3	30.6	25.9	38.6
Yemen, Rep.	15.5	19.8	23.5	31.3
MENA	22.6	26.0	32.9	35.1

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

C. Agricultural Production and Productivity

Productivity

117. Productivity remains very low in Yemen, with value added per hectare one fifth of that of comparable countries like Jordan and Morocco. Data are poor, but there appears to have been an increase in value added per hectare of about 10% during the first part of the 1990s. This rate of increase is comparable to that experienced by Jordan and Morocco on their own development path twenty to thirty years ago. Many of the productivity improvements and market developments practiced in those countries might be emulated in Yemen, and there is thus some hope that Yemen may ultimately achieve similar levels of per ha value added.

Table 31: Agriculture value added per hectare of agricultural land (constant 1995 US\$)

	<i>1965</i>	<i>1975</i>	<i>1985</i>	<i>1990</i>	<i>1994</i>
Egypt, Arab Rep.	1640.1	1990.2	2896.4	3120.6	2813.2
Jordan	n.a.	57.1	152.7	243.3	207.9
Morocco	131.2	139.9	182.7	241.7	280.0
Portugal	n.a.	n.a.	n.a.	1045.7	1035.4
Saudi Arabia	16.0	21.6	50.2	67.4	68.2
Yemen, Rep.	n.a.	n.a.	n.a.	35.6	41.4
MENA	n.a.	n.a.	n.a.	n.a.	n.a.

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Cereals Production

118. Yemen's area under cereals has declined considerably, as in Jordan, as higher value irrigated crops have come in. Yemen's farmers have followed economic comparative advantage by growing high value fruits, vegetables and qat, rather than low value cereals. In Yemen, Government pricing policy (favoring cereals consumers, largely through a policy of importing cheap cereals and distributing them with subsidy) has had an impact on reducing producer incentives. By contrast, Jordan, until recently, promoted cereals through subsidies. Unlike Morocco, Yemen has little comparative advantage in cereal production, and under the influence of both water scarcity, high wage rates and better economic alternative crops, the cereals area and production has declined.

Table 32: Area under cereal production (1000 ha)

	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1998</i>
Egypt, Arab Rep.	1724	1912	1978	2283	2643
Jordan	378	264	185	106	100
Morocco	3773	4513	4429	5603	5939
Portugal	1890	1615	1104	760	479
Saudi Arabia	274	339	453	975	595
Yemen, Rep.	1199	1083	851	845	720
MENA	20981	24925	26005	30916	30252

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Table 33: Cereal production (1000 t)

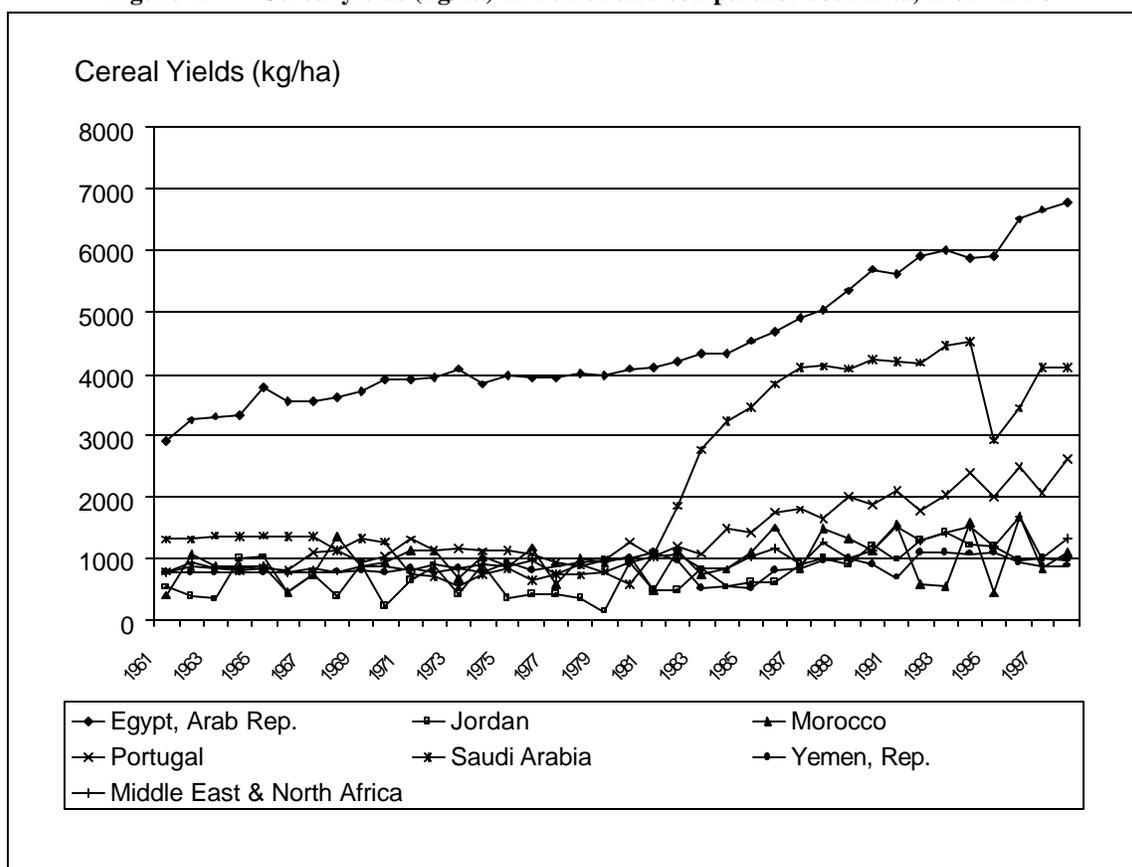
	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1998</i>
Egypt, Arab Rep.	5009	7478	8100	13022	17929
Jordan	208	60	172	129	99
Morocco	1538	4252	4515	6276	6610
Portugal	1483	1677	1408	1427	1256
Saudi Arabia	361	433	266	4137	2440
Yemen, Rep.	938	845	865	767	646
MENA	n.a.	n.a.	n.a.	n.a.	n.a.

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Cereal yields

119. Cereals remain the most cultivated crop in Yemen, and even farmers who grow profitable cash crops may often still cultivate cereals for domestic consumption. The traditional cereals of sorghum and millet are almost entirely rainfed and yields are low. Wheat has become important in recent years, and much of it is irrigated.

120. Overall, cereals yields are low, even by regional standards, and there has been little sustained increase in yields over the last three decades. In the dry conditions of Jordan, yields are still higher than those in Yemen. Irrigated cereals yields in comparable countries are far higher. This points to the need to pursue a vigorous research and extension program for both rainfed and irrigated cereals.

Figure 4: Cereal yields (kg/ha) in Yemen and comparator countries, 1961 - 1998

Source: World Bank, 1999a.

Table 34: Cereal yield (kg / ha)

	1961	1970	1980	1990	1998
Egypt, Arab Rep.	2906	3912	4094	5703	6784
Jordan	551	226	933	1220	989
Morocco	408	942	1019	1120	1113
Portugal	785	1038	1275	1878	2622
Saudi Arabia	1319	1277	588	4245	4099
Yemen, Rep.	782	781	1016	908	897
MENA	782	885	933	1147	1341

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Overall Crop Production

121. Overall crop production in Yemen has shown modest but steady growth over the last decade, following two decades 1970-90 when productivity increased very rapidly with the introduction of the tubewell and the development of new high value fruit and

vegetable crops, and of qat. Yemen's increase in output has lagged behind that of Egypt and Jordan over the last decade, as those countries have successfully developed profitable export markets for their high value produce, something that Yemen has not yet succeeded in doing.

Table 35: Crop production index (1989-91 = 100)

	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1997</i>
Egypt, Arab Rep.	42.5	62.3	76.7	102.3	133.1
Jordan	89.4	29.0	61.5	111.9	155.2
Morocco	27.1	49.8	58.8	90.8 *	87.2 *
Portugal	97.2	105.4	84.0	100.2	93.4
Saudi Arabia	12.4	18.0	26.1	101.7	94.2
Yemen, Rep.	53.7	50.6	82.0	105.6	115.2
MENA	n.a.	n.a.	68.1	102.2	119.7

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA). (Note: * = unrealistic figures.)

Other crop yields

122. The same story is repeated for other crops also. The agronomic potential exists, and the research and extension agenda is crucial.

Table 36: Average yields (t/ha) of major crops

<i>Crop</i>	<i>Yemen (1)</i>	<i>Lebanon (2)</i>	<i>Typical Areas (3)</i>
Potato	13.0	25.5	20 - 25
Tomato	16.0	33.5	25 - 50
Banana	7.4	18.9	15 - 25
Oranges	1.8	13.5	10 - 25

Source: (1) Source: Statistical Yearbooks, Official Government Statistics. (2) Source: Rapid Rural Appraisal and Farmers' Surveys conducted during the preparation of the Lebanon Irrigation Improvement Project – average of five sites (see SAR, Annex 11, pages 7-9). (3) Memento de l'Agromonie, Third Edition, Collection "Techniques Rurales en Afrique", 1980. In: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

Livestock Production

123. Yemeni livestock production has similarly grown slowly over the last decade, after two decades in which rapid expansion took place, particularly in the poultry and dairy industries. Now Yemen is facing "second generation" problems of high cost of imported feed, dwindling water resources and poor performance on animal health.

Table 37: Livestock production index (1989-91 = 100)

	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1997</i>
Egypt, Arab Rep.	42.2	57.2	66.8	98.4	123.4
Jordan	20.9	31.1	51.7	93.9	163.5
Morocco	39.4	47.2	57.7	99.6	109.4
Portugal	37.4	52.8	71.7	101.0	114.6
Saudi Arabia	13.5	14.5	34.0	100.9	130.4
Yemen, Rep.	52.3	43.8	70.4	94.5	129.5
MENA	n.a.	n.a.	63.4	100.7	126.7

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Fertilizer Consumption

124. The numbers on fertilizer consumption reveal the undeveloped state of much of Yemeni agriculture – with fertilizer use only 15% of the regional average and very much less than levels of usage in countries with comparable physical endowments such as Jordan and Morocco. The corollary is the potential for increase in fertilizer use, particularly under controlled irrigation use.

Table 38: Fertilizer consumption (kg / ha arable land)

	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1996</i>
Egypt, Arab Rep.	97.0	136.8	290.2	422.4	426.4
Jordan	5.8	9.6	48.2	51.6	62.5
Morocco	4.4	12.4	27.9	38.4	33.8
Portugal	55.1	52.2	106.9	117.3	127.7
Saudi Arabia	3.5	3.5	21.7	144.2	87.3
Yemen, Rep.	0.0	0.1	8.3	16.3	8.3
MENA	8.0	16.5	44.1	70.9	68.6

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Mechanization

125. The mechanization of Yemeni agriculture is well behind the average for the region, and comparable to that of Morocco. Yemen experienced fairly rapid tractorization in the 1970s and 1980s, as migrants remitted capital funds. However, a lot of this was “trophy tractorization” – much of Yemen’s farming area is in hillside terraces and micro-parcels that can only be exploited by hand or by animal traction. The scope for further tractorization is limited.

Table 39: Agricultural machinery (tractors) per hectare of arable land

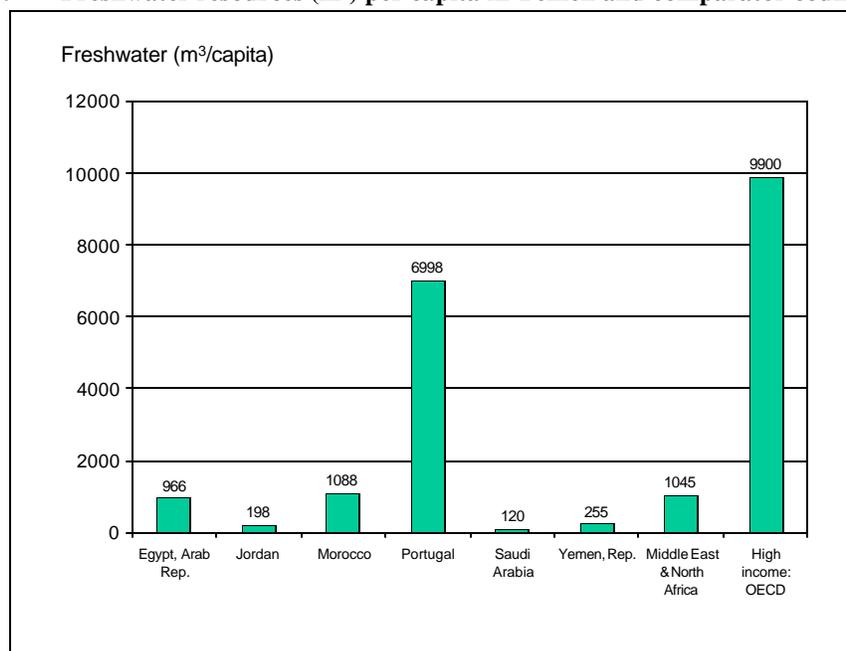
	1961	1970	1980	1990	1996
Egypt, Arab Rep.	0.51	0.63	1.57	2.50	3.21
Jordan	0.33	0.97	1.53	1.97	1.88
Morocco	0.12	0.15	0.33	0.46	0.48
Portugal	0.43	1.30	3.51	5.56	6.97
Saudi Arabia	0.01	0.05	0.10	0.19	0.26
Yemen, Rep.	0.03	0.13	0.33	0.43	0.41
MENA	0.16	0.29	0.62	1.08	1.19

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

D. Water Resources

Freshwater resources (m³ / capita)

126. Yemen is amongst the driest countries in the world. Per capita water availability is little more than one fifth of the regional average, and only 2% of the world wide average. Yemen's per capita availability of 150 m³ is well below the 1000 m³ usually assumed to be necessary for food self sufficiency. In order to feed Yemen in cereals alone, an annual water availability of 16 BCM would be necessary. This compares to the 2.1 BCM actually available. Plainly food self sufficiency is not an attainable goal. Yemeni agriculture does well to concentrate on higher value cash crops, particularly for the irrigated areas where the opportunity cost of water is highest.

Figure 5: Freshwater resources (m³) per capita in Yemen and comparator countries, 1997

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

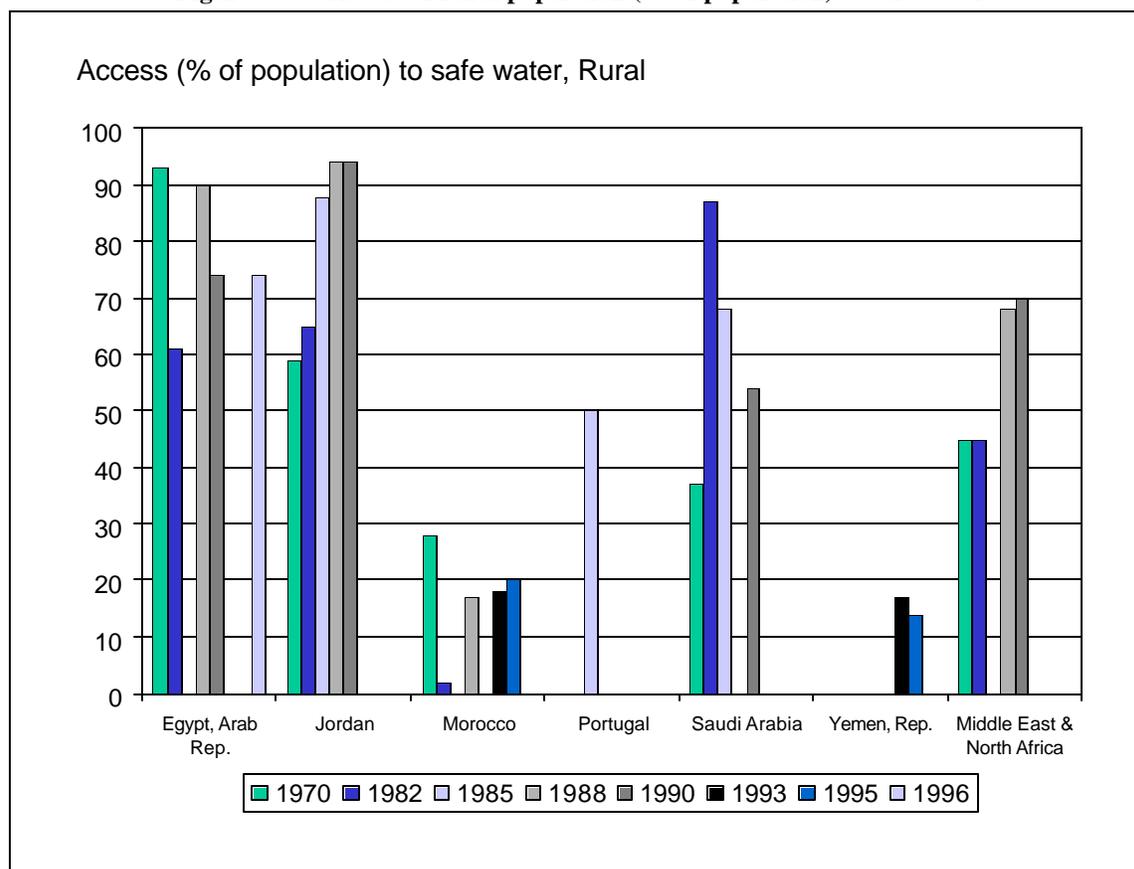
Table 40: Freshwater resources (m³) per capita in Yemen and comparator countries, 1997

	<i>m3</i>
Egypt, Arab Rep.	966
Jordan	198
Morocco	1088
Portugal	6998
Saudi Arabia	120
Yemen, Rep.	150
MENA	1045
High income: OECD	9900

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Access of rural population to safe water and sanitation

127. Yemen's rural population have very low access to safe water and sanitation, well below regional and international averages.

Figure 6: Access of rural population (% of population) to safe water

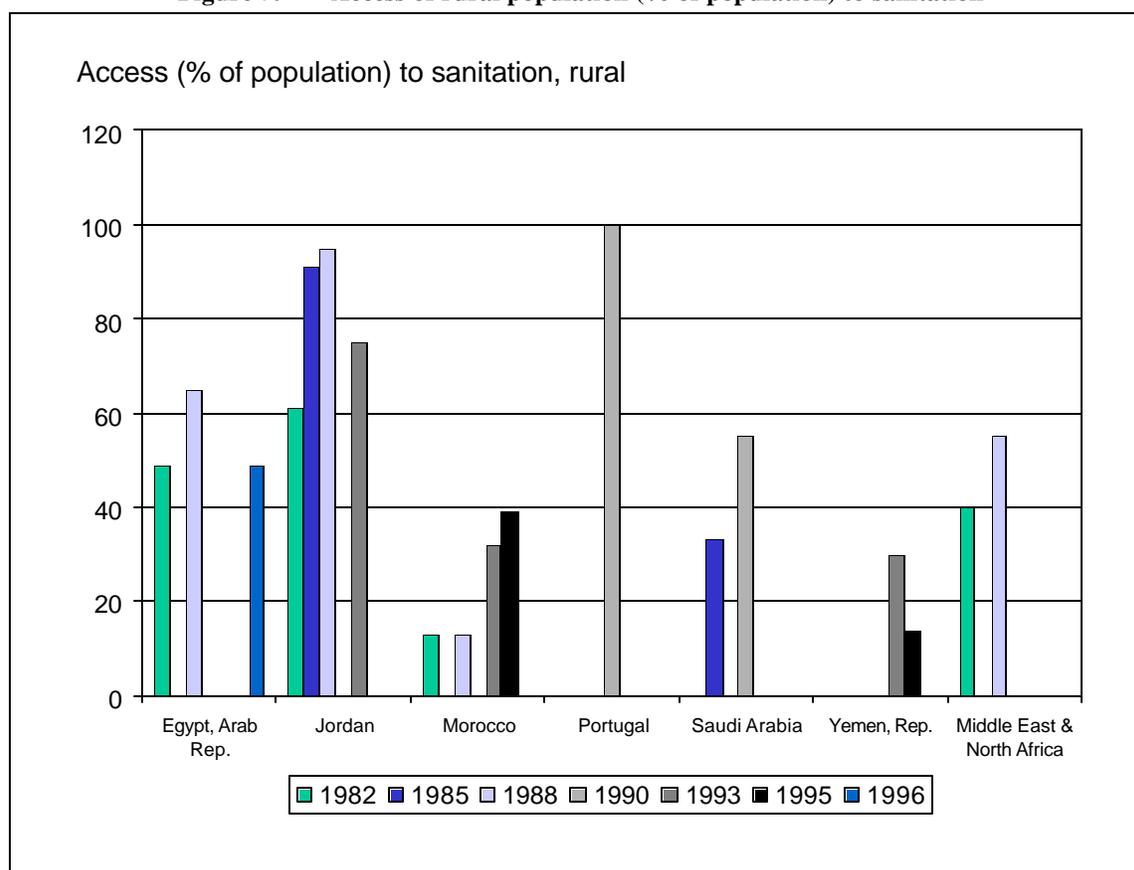
Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Table 41: Access of rural population (% of population) to safe water

	%	Year
Egypt, Arab Rep.	74	1996
Jordan	94	1990
Morocco	20	1995
Portugal	50	1985
Saudi Arabia	54	1990
Yemen, Rep.	14	1995
Middle East & North Africa	70	1995

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Access to sanitation (% of population) in rural areas

Figure 7: Access of rural population (% of population) to sanitation

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Table 42: Access of rural population (% of population) to sanitation

Country Name	%	Year
Egypt, Arab Rep.	49	1996
Jordan	75	1993
Morocco	39	1995
Portugal	100	1990
Saudi Arabia	55	1990
Yemen, Rep.	14	1995
MENA	55	1990

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

E. Environment

128. Forests are a negligible resource in Yemen. Unlike other countries in the region, there are no large forested areas, and most woodland is sparse and scrubby.

Table 43: Forest area (km²)

	<i>1990</i>	<i>1995</i>
Egypt, Arab Rep.	340	340
Jordan	510	450
Morocco	38940	38350
Portugal	27550	28750
Saudi Arabia	2310	2220
Yemen, Rep.	90	90
MENA	92590	88590

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

F. Population

129. By regional standards, Yemen does not appear densely populated. However, 90% of the population is crammed in to the western 10% of the land area. The highlands, where rainfall is greater, have high population densities. The densities have tripled over the last four decades and this “densification” of the rural population is still continuing apace. The absorptive capacity of the rural economy is being challenged. The continuing high population growth rate confirms this challenge.

Table 44: Population density (people / km²)

<i>Country Name</i>	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1996</i>
Egypt, Arab Rep.	26.6	33.2	41.1	52.7	59.5
Jordan	10.0	17.0	24.5	35.6	48.5
Morocco	26.7	34.3	43.4	53.9	60.2
Portugal	97.7	98.8	106.7	108.2	108.5
Saudi Arabia	2.0	2.7	4.4	7.4	9.0
Yemen, Rep.	10.2	12.0	16.2	22.5	29.7
MENA	9.3	11.9	15.8	21.6	24.9

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

Table 45: Population growth (annual %)

	<i>1961</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1998</i>
Egypt, Arab Rep.	2.16	2.09	2.53	2.29	1.73
Jordan	5.47	4.86	3.82	3.66	2.80
Morocco	2.47	2.66	2.24	2.04	1.82
Portugal	-0.06	-0.58	1.08	-0.41	0.06
Saudi Arabia	3.59	4.05	5.51	4.45	3.30
Yemen, Rep.	2.38	1.53	3.88	3.71	2.55 *
MENA	2.46	2.75	3.19	3.45	2.10

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA). (Note: * = does not match with Yemeni national statistics.)

130. Yemen remains an intensely rural country, with over two thirds of the population (64%) still living in the countryside, well above the MENA average of 42%.

Table 46: Rural population (% of total)

	<i>1960</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>1998</i>
Egypt, Arab Rep.	62.1	57.8	56.2	56.1	54.6
Jordan	57.3	49.5	40.1	32.0	26.9
Morocco	70.7	65.5	58.9	51.8	46.1
Portugal	77.9	74.1	70.6	66.5	63.0
Saudi Arabia	70.3	51.3	34.1	21.5	15.5
Yemen, Rep.	90.9	86.7	79.8	71.1	63.8
MENA	66.6	58.6	52.0	46.0	41.6

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

G. Agriculture in the National Economy

131. Agriculture continues to occupy the leading role in the Yemeni economy, with a share of about 18%, above the regional average of 13-14%, and more than that of other strong agricultural economies in the region such as Egypt and Morocco.

Table 47: Agriculture, value added (% of GDP)

	1970	1980	1990	1995	1998
Egypt, Arab Rep.	29.4	18.3	19.4	17.2	16.7
Jordan	11.6	7.9	8.1	4.4	2.8
Morocco	19.9	18.4	17.7	14.6	16.0
Portugal	n.a.	n.a.	6.4	3.9	n.a.
Saudi Arabia	4.4	1.1	6.4	6.7	n.a.
Yemen, Rep.	n.a.	n.a.	30.0	22.9	17.6
MENA	12.8	10.5	14.9	13.9	n.a.

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

132. As for other agricultural economies in the region, Yemen's growth rate has been erratic, dependent on the rains inter alia. The swings have been less marked – and therefore the incomes less erratic – than in countries such as Morocco and Jordan where the agricultural economy is vulnerable not only to the weather but also to changes in international market access and prices.

Table 48: Agriculture, value added (annual % growth)

	1995	1996	1997	1998
Egypt, Arab Rep.	2.9	3.1	3.4	1.7
Jordan	-1.4	6.4	3.6	-7.8
Morocco	-43.9	78.2	-25.6	26.0
Portugal	0.5 n.a.	n.a.	n.a.	n.a.
Saudi Arabia	0.0	1.8	0.0 n.a.	n.a.
Yemen, Rep.	8.8	1.7	2.2	0.7
MENA	-4.0 n.a.	n.a.	n.a.	n.a.

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

133. Agriculture remains far and away the biggest employer in Yemen, employing 61% of the work force, against a regional average of 35%. Although the percentage has dropped from 70% in 1970 to the present 61%, the sector has absorbed a large increase in the workforce – absolute numbers working in agriculture have gone up from 1.2 million in 1970 to 1.6 million in 1996.

Table 49: Labor force in agriculture (% of total)

	<i>1960</i>	<i>1970</i>	<i>1980</i>	<i>1985</i>	<i>1990</i>
Egypt, Arab Rep.	58.1	51.8	57.1	48.7	40.3
Jordan	45.4	27.8	17.8	16.5	15.3
Morocco	65.7	57.6	56.0	50.3	44.7
Portugal	44.0	31.7	26.0	21.7	17.8
Saudi Arabia	71.2	64.2	43.5	30.0	19.2
Yemen, Rep.	76.2	70.4	72.6	67.0	61.0
MENA	59.4	50.0	47.4	41.0	34.9

Source: World Bank, 1999. Statistical Information Management and Analysis System (SIMA).

H. Gender

134. Agriculture employs about half of the male work force, but nearly nine tenths (87%) of women in the labor force are employed in agriculture. The sector is the predominant mechanism by which women can participate in the productive economy.

Chapter IV Key Sectoral Issues, Development Goals and Prospects

A. Key sectoral issues

135. The broad challenge for agricultural strategy is to create sustainable growth in productivity when natural resources are overstrained and public services are weak. This chapter analyzes the challenge through discussion of problems for the two major farming systems: irrigated agriculture, and traditional mixed rainfed and livestock systems. The analysis leads into discussion of current policies; to identification of further policy and investment solutions; and to proposals for implementation.

1. Poor Productivity and Sustainability of Irrigated Agriculture

Summary: Yemen is a dry country and irrigation contributes most value added in agriculture. However, irrigation is under threat from shrinking margins, from vulnerable natural resources and from deteriorating public services. In recent years, there has been no improvement in factor productivity for most crops. The medium term prospects for irrigated agriculture to create more value added and help absorb labor are thus poor, unless change occurs. Groundwater irrigation expanded quickly since the 1970s, boosting incomes but also producing the dramatic groundwater overdraft in some areas. In addition the low cost of water extraction has given farmers little incentive to use water efficiently. Qat has emerged as a major water user. Now Government policy is changing and the cost of groundwater is going up. Once adjustments are complete, incentives to overuse of groundwater will have dropped - but so would incomes and the labor absorptive capacity of irrigated agriculture, unless efficiency improvements are made. Government has actively promoted spate irrigation too, shouldering both investment and operating costs for spate development. Now the fiscal crisis is threatening these spate schemes and productivity has dropped.

Productivity prospects

136. Yemen is a dry country and irrigation has long been practiced, from spate diversion, from springs and from rainwater harvesting. Tubewell irrigation has flourished over the last thirty years, and irrigated production contributes most value added in the sector. However, irrigation is under threat from shrinking margins, from vulnerable natural resources and from deteriorating public services. The medium term prospects for irrigated agriculture to create more value added and help absorb labor are thus poor, unless change occurs. In recent years, there has been no improvement in factor productivity for most crops. Yields are well below technical potential and below actual farmer yields in comparable environments in other countries.

Sustainability of Groundwater Irrigation

Groundwater irrigation expanded quickly

137. In 1970, the area irrigated by wells was 37,000 ha. By 1996, this had increased by

ten times, to 368,000 ha. representing 32 percent of the farmed area and two thirds of the value of output. This expansion supported a very rapid increase in the production of fruit, vegetables and qat, and made a tremendous contribution to the viability of the rural economy (Table 50).

Table 50: Irrigated crop production, 1970 and 1996

	1970	1996
Vegetables	25,000 t	703,000 t
Fruit	14,000 t	79,000 t
Qat	35 mn. Bundles	592 mn. bundles

Source: Agricultural Statistics Yearbook. In: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

Government supported this expansion...

138. Over two decades, Government policy actively promoted groundwater irrigation through credit and diesel price subsidies and a ban on fruit, vegetable and qat imports. The absence of any regulation on development or extraction of groundwater was also a powerful motor. Effectively, anybody with the financial resources to drill could appropriate groundwater.

... but this has encouraged groundwater mining and wastage

139. These policies of subsidy and open access have led to a rapid overdraft of groundwater in many parts of the country. In Qa' Al Boun near Amran water levels have dropped 60m in the last twenty years - and 30m in the last five years. In Wadi Bani Khawlan near Ta'iz uncontrolled groundwater extraction for agriculture and water sales by upstream riparians have drained the aquifer and led to drying up and abandonment of agriculture further down the wadi.² As groundwater in Yemen is an open access resource, individual users have little incentive to conserve it. In addition, the low cost of extraction has given farmers little incentive to use water efficiently within the farm. For example, many farmers currently send water to their fields by rough earthen canals. In a survey in Qa' Jahran, losses between the well and the field ranged from 9% up to 78%. Thus, up to three quarters of water was lost before it reached the field, and in more than two thirds of the cases, losses exceeded 30%.

... and qat has emerged as a major water user.

140. *Qat* is a very popular crop with farmers because it earns consistently good prices, production and market risks are minimal, and farmers can choose when to sell.³ It is sufficiently profitable to justify the construction of new terraces. In addition, *qat* provides:

² See Yemen: Towards a Water Strategy, Report No. 15718-YEM, August 1997.

³ In many *qat* areas, the crop can be harvested in any month except two or three winter months. All that is required is a dose of water to bring on new growth.

- transfers of cash from town to country on a daily basis of perhaps \$2-3 million
- full time employment for perhaps 150,000 people ⁴
- incomes for perhaps 100,000 farm families of \$3-5,000 each annually ⁵
- returns per m³ of water of at least Rls. 30, as good as any other crop and still above the average urban consumer tariff for potable water
- an economic and environmentally sympathetic crop to occupy rainfed mountain terraces.

Now policy is changing to favor groundwater conservation.

141. Awareness about the threat of declining water tables has increased sharply in recent years. In 1996, government created the National Water Resources Authority (NWRA) to develop the regulatory and planning framework for improved water resources management. In addition, government has begun to adjust the distorted incentive framework that has driven the mining of groundwater. Diesel prices have already increased from Rls 3/lit to Rls 10/lit since 1995, and are presently at about 65% of export parity price. Government intends to complete the move to export parity over the next two years, and to lift the fruit and vegetable import ban.

... but this will have an impact on incomes

142. These changes, precisely because they reduce incentives to water use, are likely to affect the profitability of using groundwater. During the background studies for this Note, a static model was created to assess the impact of these policy changes on principal fruit and vegetable products. Assuming subsidies were removed in one step without any change in farmer behavior, the model showed a reduction in income of 13 percent for three products. This is equivalent to a drop in agricultural GDP of 3 percent. Thus, once the adjustments are complete, incentives to overuse of groundwater will have dropped – but so would incomes, unless efficiency improvements were made.

Sustainability of Spate Irrigation

Government has actively promoted spate irrigation too.....

143. Since the 1950s, Yemen has invested very heavily in developing modern spate irrigation schemes in the southern governorates and in Tihama. This investment has enormously increased the productivity of these systems, which cover about 100,000 ha. The Tihama schemes are now looked on as the “breadbasket of Yemen”.

.....but the crisis in public sector management is threatening these schemes

⁴ Based on the average labor requirement of 250-320 days per ha, and half that for transport and marketing.

⁵ Assuming average *qat* holding of about a hectare.

144. No recovery of capital or recurrent costs is practiced for the public spate schemes; Government has shouldered the whole burden of developing and running these schemes down to secondary canal level. Now, with the dwindling of public resources and erosion of management capability and incentives, the operation and maintenance of these public spate schemes has deteriorated. An extreme case is that of the Lahej Irrigation Department where there are 420 staff to manage 20,000 ha - but an operating budget of only RIs 160,000 (\$1,300) in 1998. In addition, the water is delivered without cost to farmers, so that incentives for efficient use are reduced.

2. Low Incomes in Rainfed and Livestock Systems

Summary: The counterpart to the rapid growth of the irrigated sector has been the decline of traditional rainfed and livestock systems. Yet, these systems support the poorest rural people and are in the long run the most sustainable production systems. Government policy is partly responsible. The consequences are felt not just in the incomes of poorer people but in the accompanying decline of traditional systems of natural resource management and conservation.

Traditional rainfed and livestock systems have declined

145. The counterpart to the rapid growth of the irrigated sector has been the decline of traditional rainfed⁶ and livestock systems. The rainfed cropped area declined from 1,056,000 ha in 1970 to 579,000 ha in 1996. Traditional livestock herds appear also to have declined, although the numbers are very unreliable. Yet, it is the traditional rainfed and livestock systems that support the poorest rural people and which are in the long run the most sustainable production systems.

Government policy is partly responsible

146. In contrast to the support given to irrigated agriculture, Government has both neglected and discouraged rainfed agriculture. Rainfed systems were almost entirely ignored - until very recently - by research and extension. Domestic production of cereals, far from being protected, has had to compete with massive cereals imports retailed at prices as low as 19 percent of border parity. Support to traditional livestock systems was maintained through nationwide veterinary services, but these have now largely stopped working.

Deteriorating upper catchments threaten the sustainability of rainfed and livestock systems

147. Government-led development has focused quite largely on land and water development in the plains and lower catchments. The poorer rainfed environments in the upper catchments have been largely overlooked by official development programs. As a result, there is degradation in the age-old systems of terracing and water harvesting, and

⁶ The term "traditional rainfed systems" is used here to include various kinds of controlled water systems, such as terrace agriculture, water harvesting and watershed management systems.

there are related problems of range management and deforestation⁷.

Smallholder livestock systems have untapped potential for increasing incomes

148. Livestock rearing is the principal sustainable production system of poor and marginal farms, and it is the predominant economic activity of rural women, who account for 80 percent of livestock production. Yet smallholder livestock suffers from very significant constraints: high losses due to poor nutrition, husbandry and health; poor quality inputs (medicine, feed, etc.) and inefficient use of resources, with consequent risk to the rangeland. Public interventions focus on animal health, but vaccination campaigns do not achieve full coverage and therefore miss the objective, and public clinical services have declined to very low levels. Incomes from smallholder livestock could increase significantly through the adoption of a number of known technologies for production, processing and range management.

Off farm alternatives are few

149. Despite high levels of rural unemployment and underemployment, off farm activities in rural areas are limited, and official development support has been confined to some “women in development” activities and, more recently, microfinance.

3. Key Constraints to Fisheries Development for Local Consumption and Export

150. Yemen has good potential for production of high value fish both for local consumption and exports. Between 1980-94, average total fish production was 90,000 tons and rose to 104,000 tons from 1985-1989. However, production had decreased to 77,100 tons by 1990 due to overfishing. In 1996, exports were estimated at 8,607 tons valued at about US\$13 million, and comprising mainly of cuttlefish, lobsters and shrimp. There is scope for improving exports, provided efforts are made to address some priority constraints facing the sector.

151. The most pressing constraints to fisheries development in Yemen are: (i) lack of an effective management of the resources, resulting in a declining fisheries resource base; (ii) poor marketing arrangements without due attention to quality control and health certification, and (iii) inadequate infrastructure.

(i) Declining Fisheries Resource Base and Resource Management:

152. The lack of active management of the fisheries resource is demonstrated by the fact that overfishing is depleting the fishing grounds of three of the most valuable species: rock lobster, cuttlefish, and shrimps. Studies of the rock lobster fishery, for example, show strong evidence of a steep decline in catch per unit effort (CPUE) that could lead to the imminent collapse of the rock lobster fishery. Similar risks are predicted for the cuttlefish and shrimp fishery. Length frequency studies show that the large majority of lobsters, cuttlefish and shrimp landed are increasingly getting smaller than the minimum spawning size. The industrial fisheries is largely responsible for much of the overfishing.

⁷ See Annex 8 for a discussion of natural resource degradation issues.

A significant number of the industrial vessels fish without licenses in Yemeni waters, and the Department of Marine Inspection and Control is unable to effectively monitor the waters due to lack of equipment, recurrent funds and suitably trained personnel.

(ii) Poor Marketing Arrangements

153. Whereas fish harvesting by industrial and artisanal fishermen is fairly well-established in Yemen, marketing is a major constraint.

154. **Domestic Fish Marketing.** Marketing at premium prices is hampered by lack of attention to quality, hygiene, and the indiscriminating behavior of domestic consumers. Most of the artisanal fishermen in Yemen do not use ice at sea. They return their catch to landing centers gutted. No chilling is done until after sale by auction. Auctions are run by traditional private auctioneers in some places and by fishermen cooperatives of the NCSFM in other places. Shrimps are sold by weight, whereas fish are auctioned by the bundle or by size in the case of the larger fishes. The buyers then transport the fish in ice to urban areas where the fish is sold to retailers. The domestic consumer is not very discerning about quality at present, although this is beginning to change. As a result, the quality of fish handling and processing is generally poor. Quality control of fish sold at local markets is not controlled effectively as inspectors are only based in Aden and Sana'a. The majority of the fish is eaten fresh and often soon after capture. Fish is landed and auctioned in unhygienic conditions, and are then transported in open vehicles with no protection from the sun and without ice, and public retail markets are generally of a very poor standard of hygiene.

155. **International Fish Marketing.** Traders/companies who are exporting to international markets are beginning to demand high quality and are paying premium prices. Yemen exports demersal fish and cuttlefish to mainly Japan, Spain, Italy and the former Soviet Union. It also exports frozen rock lobster tails to the USA and France. Limited quantities of frozen and canned fish and fresh tuna are exported to Middle Eastern countries and Europe. Dried shark fins and sea cucumbers are exported to Southeast Asia. In view of the fact that Yemen in 1996 exported only about US\$13 million, which is far below its potential, there is scope to increase exports provided priority is given to investments in improving facilities for handling, processing, freezing and transporting fish and also that marketing information is obtained and disseminated to fishermen and traders on the high quality requirements of foreign markets. In 1996, 83 percent of the volume of all exports depart from Yemen from Aden. The Quality Control Department Director General is based in Sana'a whilst a branch and the only Quality Control Laboratory is in Aden. This makes coordination and communication difficult. About 17 percent of recorded export volume is issued with health certificates based on organoleptic (i.e., sensory) evaluation only. Aside from Aden and Sana'a, exports also leave Yemen from Hodeidah, Mukalla, at sea in the Red Sea and by the land border with Saudi Arabia. The quantity of unrecorded and illegal exports is thought to be significant.

(iii) Inadequate or Inappropriate Infrastructure

156. **Production Infrastructure.** The number and/or management of fish landing centers, ice plants, cold storage, and auction sites are inadequate, and there is

considerable scope for improvement. On the Red Sea Coast, there are about 40 landing centers and there are numerous landing centers along the Gulf of Aden Coast. Many of the landing sites in the Gulf of Aden are owned and managed by cooperatives which is the right way to go. Although small production infrastructure is badly needed in some areas, in other areas they have been built without due consideration to local needs and capacities, and, as a result they are being underutilized.

157. **Transport.** Improving Yemen's transport infrastructure would assist private sector development in fisheries. At present road connections to the majority of fishing villages are poor, which makes access to these villages difficult. Air services within Yemen (depending on Yemenia or Yemen Airways) are not reliable and priority is not given to perishable freight. There is great scope for improving air transport services and for building coastal roads, and in general improving the efficiency and functioning of transport services (air and also insulated/refrigerated vehicles) which directly affects fisheries exports.

158. **Ports/Harbors/Shore Facilities.** A lack of harbors and shore facilities presents both a problem for the existing industrial fleet and also constraints the development of industrial fisheries in general. Artisanal fisheries could also benefit from these facilities. Along the Gulf of Aden, there are three main harbors/port facilities: (i) Aden fishing port; (ii) Nishtun port, and (iii) Khalf port. Aden port was built in 1988 and designed to accommodate a fleet of 77 vessels but it is substantially underutilized (indeed far too large for the industrial fishery and probably for Aden's future development needs). The port comprises a 2,000 ton cold storage complex, engineering repair workshops, and a management and administration building. Nishtun port, located in Al-Gheida, Al-Mahara governorate, was built in 1984 partly with Bank financing but has hardly been utilized (except for accommodating a small fleet of artisanal boats) because of problems with the power plant and inadequate maintenance. It has a wharf, engineering workshops, desalination plant and power station, and a fisheries complex (with iceplant, cold storage, etc.), but it is in need of major repairs. The Khalf port located in Mukalla, Hadramaut governorate, was built in the 1980s with facilities for refueling and provision of water. It is a fisheries and general cargo port. Both the Nishtun and the Khalf ports are administered by the Yemen Ports Authority of the Ministry of Transport. Along the Red Sea, there are no port facilities for industrial fishing vessels but the landing centers are limited to harbors in Hodeidah, Salif, and Mokha. Further investment in port facilities is, at present, not deemed wise because of the experience of underutilization of existing facilities and the prohibitive capital costs. However, there is scope for rehabilitation of existing ports/harbors/shore facilities. Some harbors, such as Hodeidah, for example, are in urgent need of dredging.

159. **Coastal Roads.** The scope for constructing access roads (rural roads) to fishing villages is enormous, and MFW has identified, under the ongoing Fourth Fisheries Development Project, a number of priority roads for public investment.

Links of the Fisheries Sector with Infrastructure, Marketing, the Financial Sector, Public Enterprise Management, Governance and Public Finance

160. One of the key challenges for small-scale fisheries development lies in addressing

the constraints of infrastructure, finance, marketing and sector governance that the sector faces.

Linkage with Infrastructure

161. Much of Yemenis fisheries infrastructure (ports, cold storages, ship repair) were designed for industrial fisheries, geared largely towards handling frozen product. With most high value fish increasingly being traded in fresh/iced form, Yemen still lacks sufficient shore-based facilities to handle iced fish for local consumption and export from small scale fisheries. Notably the number of fish landing centers, jetties, ice plants, chillrooms and auction sites is inadequate, and there is also considerable scope for improvement of fish markets in Sanaa, Hodeidah, Ibb, Taiz, Aden, and Mukalla.

162. On the Red Sea Coast, there are about 40 places where fishermen land fish; only four have some basic infrastructure, which are in a bad state of repair. There are numerous places along the Gulf of Aden Coast, but only 11 have basic facilities, of which 9 are well maintained. Most fish landing facilities along the Gulf of Aden are owned and managed by cooperatives; three are managed by NCSFM and CFC under a pilot program to test alternative management arrangements, which so far has not resulted in better performance compared with cooperative management. Shore-based infrastructure is badly needed in some areas with considerable fish landings; in other areas infrastructure has been built in the 1970s for frozen fish, without due consideration for future local needs and capacities. These infrastructure are underutilized, and should be sold to the private sector.

163. **Transport.** Improving Yemen's transport infrastructure would assist private sector development in fisheries. At present, road connections to the majority of fishing villages are poor, which makes access to these villages difficult and more costly. Air services within Yemen are not reliable and priority is not being given to perishable freight. There is considerable scope to improving air transport services and for building coastal access roads.

164. **Shore-based Facilities, and Operations & Maintenance.** These (including landing sites, ice facilities, auction centers, etc.) are needed to support small scale fishermen. There is a need to do a detailed inventory of areas with significant fish landings and identify priority infrastructure needs. There is also a need to learn from and transfer experiences from existing best practices by cooperatives and societies (e.g., Mukalla and Shihr cooperatives and societies in Hadramout) in the operations and maintenance of shore facilities to other fish landing areas.

Linkage with the Financial Sector

165. Fisheries linkage with the financial sector is in the area of access to credit by particularly poor fisherfolk and the potential savings by fisherfolk arising from profitable fishing. In Yemen, fishermen and traders responded effectively when the market was liberalized. Whereas many credit schemes for small-scale fishermen around the world have performed poorly, this was perhaps because they were designed mainly for the convenience of banks. In Yemen, credit programs designed to fit fishermen's needs have been successful. A decentralized organization, with procedures that made it easy for

clients to apply and repay for loans, succeeded, fuelled by strong demand for credit. The OED precis of October 1994 notes: "The fisheries loan program in Yemen may be easier to replicate. This program finances fishing boat construction and repairs, engines, and nets. After initial problems, the program became very successful. Between 1985 and 1990, US\$1.8 million of new loans were made, and the recovery rate for the whole portfolio, including pre-1985 "problem" accounts, rose to 83 percent."

166. It should be noted that prior to the introduction of this program, prospective borrowers made repeated visits to the CACB head office in Hodeidah before consideration was given to their applications, and had to make repeat visits to make their repayments. Fishermen from distant places often lost at least day's work per visit. These disincentives made traditional sources of informal credit more attractive to fishermen, despite the usurious rates of interest charged. The OED precis further notes: "The Cooperative and Agricultural Credit Bank (CACB), which runs the fisheries loan program, accommodates to fishermen's lifestyle. Its staff receive specialist training on fisheries matters, and visit fishing villages at regular intervals to explain their services to prospective borrowers, help borrowers complete documentation, and collect repayment installments. Fishermen have developed an affinity with the staff as people with whom they can discuss their financial problems." In subsequent fisheries credit schemes, as for example, under the Fourth Fisheries Development Project, credit to small-scale fishermen through CACB has similarly been successful. The reason for success on banking on poor fisherfolk has been regular follow-up, reliance on group guarantees provided by existing cooperatives/societies, simplification of credit administration, and the liberalization of fish marketing.

Linkage with Public Enterprise Management

167. The key public enterprises in the fisheries sector are the near defunct Yemen Fisheries Corporation (YFC) which owns Yemen's industrial fleet (no longer operational); the declining Coastal Fisheries Corporation (CFC), in charge of rock lobster collection and marketing and of building fiberglass boats; and the National Corporation for Services and Fish Marketing (NCSFM), which operates about 12 large and smaller cold storages along the coast, two tuna canning plants (in Shuqra, Abyan governorate, and Mukalla, Hadramout governorate, and is also responsible for management of most fisheries harbor facilities in Yemen. All these enterprises operate sub-optimally in terms of efficiency and effectiveness and their roles affect the fortunes of small-scale fishermen.

- The Yemen Fisheries Corporation's (YFC) assets are largely defunct and should be sold forthwith (assuming there are takers), and the company should be folded.
- The Coastal Fisheries Corporation, which has been involved in collecting rock lobster from small-scale fishermen, using annual contracts with individual fishermen and cooperatives, which included sizable incentive payments for delivery of raw material, has historically performed a useful role in its monopsony over the purchase of lobster, thereby contributing to resource management by refusing to buy undersized lobster or egg-carrying females. By controlling the quality and volume of exports, CFC was able to manage fishing efforts and type of fishing on lobster, reducing the pressures

resulting in overfishing. Although its role has been declining, CFC's critical function in resuming the management of the lobster resource suggests that CFC needs to be restructured rather than immediately privatized, and possibly join forces with a private corporation. Its other activities (boat-building, etc.) should be privatized. Also, CFC has some 842 staff (about 29% of the staff of the MFW); so its possible privatization will have fiscal and employment implications. The future role of CFC in lobster management should be the subject of a feasibility study before its future is being decided upon.

- The National Corporation for Services and Fish Marketing is overstaffed (1,189) and a fiscal drain on MFW's budget; its wage and salary bill consuming about 25% of the MFW's annual budget. NCSFM has tried to maintain the traditional role it played before unification, when it implemented a fixed pricing system and maintained buffer stocks of frozen fish to honor the Government's commitment to make fish readily available at affordable prices. This fixed price arrangement may have served the interest of the average consumer but did not help the situation of the poor small-scale fisherman. NCSFM bought fish at auctions and sold them at domestic retail outlets below free market prices; thereby undercutting the private sector. Currently, NCSFM handles less than 10% of its historical workload. It uniformly collects a marketing fee payable by sellers of privately marketed fish and, at some auctions, by buyers for services which buyers and sellers complain as poor. It manages auctions poorly for a fee, which beneficiaries agree should be privatized. Most of the cold storage and ice making capacity provided by NCSFM can be easily privatized. The two tuna canneries may lack the necessary supply of cheap raw material to make them viable in a competitive environment; on the other hand, their closure may have a major negative impact on rural employment. Linkage to an existing foreign cannery or sale to interested local investors may be the only viable options. No decision has yet been made to address the issue of which agency should manage the fishing ports provided changes can be instituted to ensure effective management and maintenance of port facilities. A review of the implications of using the NCSFM, the Ports Department or a private management contract should precede an early decision on this issue.

Linkage with Governance and Public Finance

168. Fisheries linkage with governance and public finances is more directly in the area of licensing and the potential public revenues from issuing licenses. The license issue is not only for industrial trawlers but also for small-scale fishermen, who purchase and operate boats without any licenses. Of course, by far, the most significant potential source of revenues is industrial licensing, but Government should consider also introducing a system of licensing the boats of small-scale fishermen and using the proceeds collected to provide public services in fishing communities.

169. The current industrial licensing system needs to be reviewed to reduce the fishing pressures on standing stocks and to increase government revenue from licensing. Because the current system of licensing is based on unreliable data about standing stocks, it is dangerously contributing to the current problem of resource exploitation. The indications from all sources suggest there is presently excess licensing taking place; at present, about 69 industrial vessels (bottom trawlers) operate with licenses in the Gulf of Aden and 44

bottom trawlers operate with licenses in the Red Sea. These 113 licensed industrial vessels are largely of Chinese national origin, but also include Spanish, Egyptian, Somali and Russian vessels. The optimal number of industrial vessels recommended by the Marine Science and Resources Research Center (MSRRC) researchers for sustainable fishing is less than half the current number; MSRRC's estimate is based on dated, and probably inflated resource estimates calculated in the late 1980s. Because the current system of licensing is not based on reliable knowledge of standing stocks, it is dangerously contributing to the current problem of resource over-exploitation. There is, therefore, an urgent need to link the issue of licenses to more reliable information on stocks.

Linkage with the Environment

170. Overfishing is a major natural resource problem for Yemen. There is general consensus that heavy exploitation of Yemeni fish stocks is taking place, but there is disagreement about the impact of current fishing levels on resources, and the level of risk of stock collapses.

4. Environmental problems related to human utilization of natural resources

171. Environmental degradation often results from trade-offs between immediate and long-term effects. The fast and large population growth has increased resource use intensity. Resource use has largely become unsustainable with the following major environmental effects:

- rapidly declining groundwater tables and
- watershed and range degradation upstream that provoke erosion and reduce groundwater recharge.

172. Major environmental problems are:

- very limited natural fresh water resources and inadequate supplies of potable water
- overgrazing
- soil erosion
- desertification.

173. Specific attention has to be given to the overexploitation of groundwater resources ("water crisis"), measurable by a fall of the water table and an increase in pumping cost. This is discussed in detail in the next section.

B. Water and agriculture

Yemen's Water Crisis and Agriculture

174. Yemen's water crisis in relation to the agriculture sector is characterized by an intense **mining of groundwater** at such a rate that large parts of the rural economy could disappear within a generation. Agriculture supports 70 percent of the population and

produces 18 percent of GDP. The whole rural economy is thus vulnerable to declining water availability. In addition, as all resources are effectively harnessed and demand is not abating – particularly from the burgeoning cities – there is increasing **conflict over water resources**.

Causes of the Water Problems in the Agriculture Sector

175. Since the 1970s, Yemen has witnessed very rapid changes, often unmatched by development of instruments of governance. The present section analyses how these changes have fuelled a rapid increase in demand for water and in its supply.

Demand for water has risen with population growth.

176. The most obvious change that has driven demand for water is demographic. The population has doubled in the last twenty years, and Yemen currently has one of the highest rates of increase in the world (3.7 percent), which implies a doubling of the population again in twenty. Demographic changes have increased demand for water and for goods whose production requires water, particularly agricultural produce. The same changes have contributed to a large increase in the rural population. Intensified agriculture has employed many of the extra people and provided them with a higher standard of living. But the strain on groundwater has become intense.

Markets for qat and other profitable cash crops have developed.

177. A second and related factor on the demand side is the development of markets for cash crops. Agriculture has developed rapidly with the growth of market opportunities. Profitable cash crops have been adopted - particularly fruit, vegetables and, of course qat, which has exploded in the last twenty years as a social and agricultural phenomenon. The profitability of qat can justify irrigation by tankered water (at a cost of over US\$1/m³). The development of profitable agricultural markets has increased the incentives to use water.

Mining of groundwater has been made possible by new technology.

178. On the supply side, exploitation of groundwater has been stimulated by new technology. The advent of tractors, chemical inputs and -- above all -- tubewell technology has made possible the shift away from age old farming practice based on careful husbandry and family labor. Technological changes have made extracting groundwater easy.

This has been encouraged by economic policy.

179. Government has actively encouraged water use, and is still doing so by a series of direct and indirect subsidies. Principal examples include the following:

- Diesel fuel, used in most water pumps, is currently priced at a half of its equivalent international level. Electricity, used in some pumps, is dearer but is still subsidized.
- The Cooperative and Agricultural Credit Bank (CACB) lends for the purchase of water pumps at nominal interest rates of 9 to 11 percent, compared to market

- interest rates above 20 percent.
- International donors continue to provide concessional funding for water pumps.
 - Urban water supplied through the public system is priced very low compared to the cost of supply and to the opportunity cost, with consequent negative fiscal and equity impacts.
 - Fruit, vegetables and qat, highly water intensive crops, are favored by import bans that raise their profit margins and hence their attractiveness for farmers.

180. It is evident that current policies constitute a powerful engine pushing in the direction of exhaustion of Yemen's aquifers.

Water Resources Management

181. With these powerful forces driving both demand and supply, what has been the capacity for water resources management?

There has been little control from law and tradition.

182. For centuries, traditional society managed common resources like water and pasture in a sustainable way. Social changes and powerful economic incentives have relaxed traditional controls over resource use, and in the case of groundwater law and tradition have favoured exploitation rather than conservation. Government has not stepped in to replace these traditional controls with modern regulation. In the case of qat, the absence of Government policy has allowed the huge growth of consumption.

There has been little capacity in the public sector for water resources management.

183. Government did create a High Water Council in the 1980s, but in a decade of existence it never met. There has been virtually no planning for conservation, and no regulation. In fact, the effect of government policy and practice has been to promote groundwater exploitation and not to regulate it.

Public institutions have not adapted to the crisis.

184. **Agricultural research** got off to a good start in the 1970s and 1980s in both north and south but, since unification of the two Yemens in 1990, the combined Agricultural Research and Extension Authority (AREA) has suffered from lack of strategic focus and a very low budget for actual research. Yet there is a crying need for good technology for improving returns to water in irrigation and for alternative technologies in water harvesting and dryland farming. There is virtually no farmer extension or education on crucial aspects of water management and conservation. **Government interventions in irrigation** have not yet adapted either. With donor support, Government has developed or improved spate irrigation systems throughout the coastal plains. Now, the Ministry of Agriculture and Irrigation (MAI) does not have the resources to operate and maintain these schemes; as a result, the systems are deteriorating, water distribution - and hence farm productivity - are dwindling, and the systems are increasingly vulnerable to damage from the flash flood flows in the wadis.

Public expenditure patterns have not helped.

185. The recent review of the public expenditure program for water shows a program skewed towards capital expenditures, with not enough attention to user participation in design, financing and management, and inadequate operating budgets for key services like research, extension, and water resources management. There is too much emphasis on water resource development, including dams, and too little on conservation.

Public policy in water has not favored the poor.

186. Public programs have tended to confirm an inequitable distribution of water. One example is targeted and subsidized agricultural credit through CACB. In effect, it is the better off who generally succeed in getting hold of this cheap money, and then often failing to repay. Another example is spate irrigation, where development tended to favor upstream users. A third area is in groundwater drilling. Here, public policy hitherto has been "hands off", and the absence of any administrative or traditional controls on drilling has concentrated a valuable resource in the hands of the locally powerful. In addition, public policy has given the landowners access to the cheap credit and equipment that enable them to drill. The poor who lack the means to develop their own water resource then have to pay for irrigation or rely on rainfed cultivation.

Environmental degradation has added to water problems.

187. Deforestation, the abandonment of terraces and of traditional water harvesting systems and the consequent degradation have provoked widespread soil erosion, increasing risks of floods - witness the severe floods of 1996 - and reduced recharge of aquifers.

Results of Increased Groundwater Use

188. This section examines the striking costs - and some equally striking benefits - for Yemen of the pattern of increased groundwater use that has emerged. It emerges that the costs are now beginning to outweigh the benefits as the resource is depleted. The section also looks at how the benefits have tended to be somewhat unequally shared, and at how the opportunity for groundwater use to contribute to rural poverty alleviation has been largely missed. The first and most striking result of increased groundwater use has been the extent of the **groundwater depletion**.

189. What have been the **economic benefits and costs** of this rapid groundwater exploitation? First and most remarkable amongst the benefits has been the **resilience of the agriculture sector**, which still accounts for 18 percent of GDP. More importantly, the sector provides a livelihood for about 70 percent of the population. Over the last thirty years the sector has absorbed a vast increase in the population at a higher level of income than previously and, as a result, Yemen has largely avoided the rural urban drift that has plagued other developing countries. This viability of the rural economy has been sustained in large measure by increased use of water. The sector uses 95 per cent of Yemen's water in an increasingly market-oriented agriculture. The leading example of this change towards water intensive cash crop production is the explosion in the cultivation of qat, now far and away the most important crop in Yemen and the country's

greatest consumer of water.

190. The counterbalance to this resilience of the agricultural economy is the **lack of sustainability**. In areas where groundwater is being overused for agriculture - that is, where use exceeds recharge and the resource is being mined like a mineral - the economic outlook is bleak. In the Al-Irra area north of Sana'a, a typical farmer has deepened his well 50 m over the last twelve years - increasing his costs - but he has still seen the amount of water he can extract drop by two thirds. With higher costs and only one third of the water, this farmer can no longer make a living from farming. As this pattern of resource depletion is repeated in groundwater areas, the existence of the rural economy will be threatened.

191. The overexploitation of groundwater in rural areas is likely to have severe economic consequences for Yemen's towns too. As all groundwater around cities is effectively harnessed and overexploited for agricultural uses, the cost of new supplies of water for cities is likely to rise sharply as water has to be brought from further and deeper.

192. **The benefits of groundwater development have been spread** through all agricultural areas where groundwater is to be found. A visit to a prosperous village south of Amran where nothing but qat is grown these days reveals that thirty years back the population was only a third of what it is today and the living then was from a poor sort of rainfed sorghum. The Sa'ada orange farmer will display with pride the massive fruits hanging from his *trees of blessing*.

193. **But there have been losers, too.** The proliferation of tubewells has certainly increased inequity in many rural areas. This has occurred because access to groundwater requires ownership of the land where the well is drilled and sufficient capital to drill and equip the well. Once a well is drilled the groundwater is appropriated and the well owner owns the water he pumps. The result has been an "enclosure" of what had hitherto been the property of nobody (*mubah*), and the vesting in a comparatively small number of well owners of extraction rights in perpetuity. In many areas, well owners now sell water to those not lucky enough to have their own well.

194. **Public policy has tended to confirm this inequitable distribution of water** through its "hands off" approach to groundwater development. The absence of any administrative or traditional controls on drilling has concentrated a valuable resource in the hands of those with land and capital, the locally powerful. In addition, public policy has given the landowners access to the cheap credit and equipment that enable them to drill. The poor who lack the means to develop their own water resource then have to pay for irrigation or rely on rainfed cultivation. In some cases, like that of Wadi Bani Khawlan mentioned above, some users in an aquifer have been able to appropriate the resource at the expense of others.

195. Regarding the contribution of groundwater development to **poverty alleviation**, there has been a first rate opportunity to solve one of the problems that has contributed most to poor poverty and health status in rural areas - access to safe water and sanitation. Many communities have benefited, often through self-help programmes financed with the assistance of emigrant workers' remittances. However, the overall picture is surprisingly

sombre. It is estimated that, after thirty years of intensive groundwater development, only a fifth of rural households have access to safe water. Government programs for rural water supply have concentrated on the area around the capital to the neglect of the poorer, further-flung areas. Sanitation has been largely neglected, with consequent environmental and health problems. As a result, Yemen still has quite poor rural health indicators, with the region's lowest life expectancy (51 years) and the highest infant mortality (11.7 percent of live births). A leading cause of death in infants and children remains diarrhea, partly caused by unsafe water and poor sanitation. Children living in rural areas experience on average seven cases of diarrhea a year. Rural under-five mortality rates deteriorate markedly in households that do not have access to safe water or sanitation. Lack of access to drinking water also has an important impact on the lives of women. In rural areas unserved by piped water, women and girls typically spend up to seven hours a day fetching water.

C. Sources of growth in the agriculture sector

There are many potential sources of future growth in agriculture in Yemen...

196. Although productivity has not improved much in recent years, there are significant sources of growth available:

- many crops have good economic and technical potential for further growth including cotton, grapes, papaya, coffee and market garden crops. These crops have low “domestic resource costs” and high potential for productivity improvements.⁸
- there is plenty of scope for improving the efficiency of water use and of crop husbandry
- potential genetic improvements exist
- post-harvest and marketing efficiencies can be improved to increase value added.

⁸ See Annex 3 for detailed analysis and explanation of the “domestic resource cost” concept.

197. Thus, investment in agriculture would be in line with Yemen's comparative advantage.

Table 51: Domestic Resource Costs

A. Selected Crops with Domestic Resource Costs of Less than 0.5 (i.e. highly efficient users of domestic resources)		
Coastal Area	Highlands	Eastern Plateau
Cotton (irrigated)	Coffee (rainfed)	Tomato (irrigated)
Oranges (irrigated)	Grapes (irrigated)	
Dates (irrigated)		
Papaya (irrigated)		
B. Crops with Domestic Resource Costs of 0.5 - 1.00 (i.e. relatively efficient users of domestic resources)		
Coastal Area	Highlands	Eastern Plateau
Tomato (irrigated)	Alfalfa (irrigated)	Alfalfa (irrigated)
Onions (irrigated)	Tomatoes (irrigated)	Tomatoes (irrigated)
Sesame (supplemental irrigation)	Potatoes (irrigated)	Potatoes (irrigated)
Sorghum (supplemental irrigation)	Onions (irrigated)	Onions (irrigated)
Millet (rainfed)	Qat (irrigated)	
	Some cereals (rainfed and irrigated)	

Source: World Bank, 1999. Republic of Yemen, Agricultural Strategy Note.

D. Development goals (explicit or implicit government goals)

198. The purpose of this section is to identify what are Government's goals in the agriculture sector, and to assess them. Over the last two years Government has worked with IDA and other donors (notably FAO and GTZ) on a broad exercise to analyze the prospects and constraints of agricultural development and to prepare an agricultural strategy. This section: (1) presents the results of that work; and (2) comments on the extent to which Government nominally and practically adheres to those results.

1. The Recent Statement on Agriculture Strategy

199. After two years of joint work, and the production of a very large number of joint working papers, IDA summarized the "joint" view of Government and donors on agricultural development as follows:

"There are many potential sources of future growth in agriculture in Yemen and markets are still expanding. However, natural resources are already fully utilized, so productivity improvements are the key, and growth has to be matched by conservation of the resource base. In addition, the terms of trade are moving against agriculture.

Within twenty years, the rural population will increase by 8 million. This will sustain the supply of rural labor but, unless ways to absorb this labor into the rural economy can be found, rural poverty will continue to increase, and pressures on land and water resources will continue to degrade the environmental and productive capital of the rural economy. Under these circumstances, creating sustainable and equitable growth in output and incomes from agriculture, particularly for the poor, is an appropriate - and very important - goal of Government policy. The means to reach this goal will include policies that promote efficiency, equity and sustainability, and interventions that give maximum scope for the energies of communities, individuals and private enterprise.

*A new way of doing business is required. This comprises, first, **getting the framework right**: - a major change in the economic policy framework that would result in a more or less “undistorted” set of incentives, encouraging efficiency and better natural resource management. Second, **doing less**: a reduced, more focused effort from the public sector with minimal but more efficient Government services, fewer donor projects but higher impact, and more synergy with other institutions across sectors (notably the Social Fund and the Public Works Project). Third, **doing it better**: less but more focused public interventions would build on recent improvements in implementation methodology. As importantly, private and community roles would be greatly increased, bringing gains in ownership, efficiency and sustainability.*

Expected Long Term Outcomes

That agriculture in Yemen does respond to incentives, new technology and availability of financing is beyond doubt. The outcome of implementing the above strategy should be, in the medium term, the development of an irrigated sector of increasing water use efficiency, greater sustainability of both groundwater and spate systems, and higher value added and employment. Jordanian agriculture, with its drip irrigation and greenhouses and its high value, labor-intensive cropping pattern, provides an example of where Yemen’s irrigated sector might be in twenty years time.

In the traditional rainfed and livestock systems, revived profitability and technological innovations can increase incomes and employment, and so have an impact on poverty. The revival of traditional systems would also help improve the sustainability of land and water management, particularly in the rangelands and fragile upper catchments.

The paramount objective is to ensure that the 20 million people expected to live in rural areas in the year 2020 can enjoy a decent standard of life.”

200. The above statement was reproduced in the IDA Agricultural Strategy Note of May 1999, and a version of it has been incorporated in a draft paper on agricultural strategy that the Ministry of Agriculture is intending to present to the Cabinet for approval in the coming months. To what extent is it Government policy? And to what extent does Government policy make any difference to what happens?

The following points are almost certainly agreed by all:

- The natural resource “holiday” is over – water resource mining has given the sector a huge boost, but is out of hand, and major changes are needed to rein it in
- Government has overstretched itself, and needs to withdraw from some services and to focus on a limited provision of services and investments
- Participation, decentralization and community self-management are essential for future development
- The private sector has to be given its head to develop both more productive agriculture and more efficient and profitable markets
- Something should be done about qat.
- Public policy should concentrate on the poor and on the poorer production systems.

On the other hand, there are various points of view:

- There is no unanimity on how to deal with the mining issue. IDA is keen on demand management measures – particularly macroeconomic solutions like diesel pricing and on irrigation improvement programs like that piloted under the Land and water Conservation Project. Government is keen on supply side solutions like the small dams program. Both parties are interested in improving planning and the legal and regulatory framework, but there is widespread mistrust of implementation capability, with weak government institutions and strongly centrifugal tendencies.
- The Aden Agenda is the forum of dialogue on this issue, and there is broad agreement on the goals and the means. However, implementation is slow, and the recent public expenditure review revealed a budget that is expanding in favor of new investment rather than retrenchment on tactical priorities.
- In the meantime, the public service remains very inefficient and low yielding, and both Government and donors are probably overoptimistic in their expectations of what can come from reform.
- Government talks the right rhetoric, but in practice the “farmers association” movement risks being politicized, and public institutions in general are very reluctant to “let go”
- Government often reverts to controls, and the framework for private sector development remains weak.
- There is widespread ambivalence within Government and society about the issue, and the chances of a coherent policy emerging are very limited.
- Government has (see above) consistently said this, but has rarely done much for the poor in rural areas. Much of the development effort over the last three decades have gone in the other direction. It is not clear that there is real political will on this. There is also doubt about the availability of technical, economically viable solutions to the problems of poor rainfed and livestock systems.

2. A Strategic Vision for Fisheries Development

201. Government's policy and strategy in the past encouraged direct public sector involvement in production and marketing of fish. Government emphasis in the past has been on industrial fisheries through support of its own industrial fleet and support for joint ventures for industrial fishing, and Government has been directly involved in fish processing, and marketing through the NCSFM. Government policy in the past also put temporary restrictions on certain kinds of fish exports. The Bank, together with other Donor partners active in supporting the fisheries sector in Yemen (EU, IFAD, FAO), have over the years encouraged Government to reduce its direct involvement in production and marketing activities. This has resulted in the phenomenal growth of private artisanal fisheries and the decline of industrial fisheries. With liberalization of domestic marketing, private traders have also stepped in and grown in numbers.

202. The reorientation of Government towards supporting artisanal fisheries development has been essentially correct. The boom in the small scale fishing sector, which requires increasing management of the resource base, has been fuelled by increases in the demand for fish following unification, the rapid privatization of fish marketing, and the provision of support by development partners such as IDA, EU, and IFAD. There is scope now to do more in the area of resource management, and market development for local consumption and exports, with emphasis on quality. Two key constraints in the sector have been lack of ice and bureaucratic hurdles limiting exports. Some of the ice-availability constraint is being addressed through the construction of ice plants under the ongoing Fisheries IV project, which, among other things, will give boost to the project objective of developing a strong, independent, private, small-scale fishing and marketing sector.

Chapter V Toward Achieving the Development Goals

203. Chapter IV presented as the principal goal of policy and programs in Yemeni agriculture *creating sustainable and equitable growth in output and incomes from agriculture, particularly for the poor*. The key challenge is to create this sustainable growth in productivity in an environment of natural resource degradation and weak public services. For practical purposes, the challenge was analyzed above in Chapter IV under the two main production systems – irrigated farming and mixed rainfed and livestock farming. The same analytic framework will be used in the present chapter analysing policies and solutions. The following section reviews the enabling factors that could contribute to the achievement of the goal, and also the constraints that could inhibit its attainment.

A. Factors Contributing to the Achievement of the Development Goals

Government is intent on doing something and is thinking generally in the right direction

204. The magnitude of the challenge in Yemen's agriculture sector requires a radical rethinking of the agricultural development agenda. The easy first phase of development is over – natural resources are fully developed, easy technology and productivity improvements have been largely adopted, all basic services have been set up. The challenge now is consolidation, retrenchment, rehabilitation, and some tough decisions on pricing – all quite unpalatable politically. Yet senior decisions makers within Government – notably in the Ministry of Planning and the Ministry of Agriculture - show a lively awareness of what needs to be done, and considerable commitment to doing it. This commitment is neither complete nor unanimous – see Chapter IV above – but it is nonetheless a considerable advantage for a nation embarking on a difficult development path.

Markets are expanding

205. Unlike other countries in the peninsula, Yemen has a large population (16 million) and this is likely to double within twenty years. The domestic market for agricultural produce is thus large and fast growing, and demand is likely to move “up-market” to higher value foods as urbanization continues and incomes gradually rise. Domestic demand for local food production will thus remain strong, particularly for higher value produce where Yemen is already quite competitive.

Potential for growth

206. There is undoubted economic and agronomic potential in the sector. It will be evident from the data and discussion in the preceding chapters that not only is there a need for further growth in agriculture but there is very substantial potential. The economic case is made by the DRC analysis. The technical factors like the substantial yield and productivity gaps compared to other similar countries, the low rates of fertilizer use, the abundant supply of cheap labor are all strong factors arguing for the potential of the sector for further and quite rapid growth.

Farmers have begun to help themselves

207. Faced with the absence of Government, rural people are reviving their tradition of self-help. In 1994, Government passed a new law on farmer associations and now one farmer in ten belongs. In support of this movement, Government has set up special institutions like the Agricultural and Fisheries Production Promotion Fund (AFPPF) and the Social Fund for Development to finance local development initiatives.

B. Constraints in Achieving the Development Goals**Natural resources are already fully utilized, so productivity improvements are the key**

208. Yemen's limited natural resource base is already under stress, with rapidly declining groundwater tables, and watershed and range degradation upstream that provoke erosion and reduce groundwater recharge. Therefore, the key to tapping sources of growth in agriculture will be productivity improvements, using technology, capital and Yemen's relatively cheap labor to produce more value added from the existing resource base.

Reversing the trend is difficult

209. Government and the nation have enjoyed thirty years of "easy" development, with simple technology, abundant capital and plenty of scope for patronage. None of these factors obtains now, and the next phase of development will require not only technological innovation on an unprecedented scale and tactical investment, but also the political will to take unpopular decisions on groundwater and on public sector reform. The risk is high that Government and the nation will not be able to mobilize the needed commitment over a sustained period.

Agricultural incentives and incomes could deteriorate under structural adjustment

210. A further constraint to growth will be the deteriorating terms of trade faced by the sector as a result of Government's structural adjustment program. Diesel prices will continue to move to border parity, and fruit and vegetable prices may go down when import restrictions are lifted. The outcome should be a more sustainable agriculture, but the transition period will be difficult as many farm families will be faced with lower product prices. Increases in the price of imported cereals may improve incentives for the minority of farmers who produce a cereals surplus for market, but will increase costs for the majority of rural people who buy cereals.

Government's services to agriculture are in very poor shape

211. In the past the dense network of services to farmers that Yemen created under the management of what is now the Ministry of Agriculture and Irrigation (MAI) gave a strong impetus to the development and adoption of new technology and productivity improvements. Now they are producing very little. During the 1990s, problems of overstaffing and underfunding dogged the Yemeni public service, and this severely affected the performance of producer services. This has become a major constraint to growth in the sector. Research has been moribund (although recently there have been

signs of revival). Extension is bringing little to the farmer (although a new strategy and pilot project may help). Government support to livestock is weak, and livestock services have declined. The government's agricultural credit bank, CACB, has a poor record. It is likely to be radically restructured but in the meantime few farmers have access to credit (or savings) facilities. Management of major spate irrigation schemes is deteriorating. Finally, since the Gulf War, there have been fewer donors and fewer projects in the sector.

The industrial and export markets are not very promising

212. Production of industrial crops is limited. For certain products (cotton, fruit for processing) there could be good potential, but this potential is not being realized. In fact, cotton production has actually receded in recent years, despite apparent comparative advantage. By contrast, exports are unlikely to grow fast. The base is very small (in 1996, only coffee and onion exports achieved more than \$1 million in export turnover), and regional markets for Yemen's fresh fruit and vegetables are competitive and politically vulnerable. Yemen's best export opportunities are in niche markets - original Mocha coffee, frankincense, saffron, myrrh, etc.

Transport is a constraint

213. With Yemen's rugged topography and broadly scattered population, transport – and related security – are a major constraint.

Chapter VI Policy and Program Priorities

A. Policy and program options for relieving the constraints

214. The solutions to the above issues are summarized in the following matrix:

Key issue	Policy actions	Implementation Steps		
		Government Steps	Donor and IDA Steps	Expected Results
Poor Productivity and Sustainability of Irrigated Agriculture	1) Eliminate subsidies to groundwater irrigation	Structural adjustment program	ESW, PSMAC	Groundwater overuse declines, efficiency improves
	2) Community management of groundwater resources	Aden Agenda	Sana'a basin project, possible groundwater irrigation project	–idem–
	3) Promote investment in improved irrigation	Financial sector reform, AFPPF	Spate irrigation project, possible groundwater irrigation project	Return per unit of water increases
	4) Research and dissemination on improved irrigation	National agricultural research and dissemination program, public expenditure restructuring	Agricultural technology and productivity project (ATP)	Technology is developed to improve water use efficiently and returns in irrigated agriculture
	5) Participation in spate irrigation	Aden Agenda	Spate irrigation project, EDI	Farmers assume responsibility for scheme management
Low Incomes in Rainfed and Livestock Systems	6) Remove policy disincentives	Structural adjustment program	ESW, PSMAC	Rainfed cereals production increases
	7) Research and dissemination on rainfed and livestock systems	National agricultural research and dissemination program	ATP	Technology is adopted to improve productivity of traditional production
	8) Improved community management of natural resources	Aden Agenda, AFPPF	Spate irrigation project, Sana'a basin project	Sustainable management of natural resources
	9) Livestock and range	Aden Agenda, support to private investment, public expenditure restructuring	ATP	Productivity and incomes from livestock improve
	10) Rural development focus		Possible ESW	Standards of living and income improve
Producer Services	11) Aden Agenda		ATP	
	12) Farmer selfhelp		ATP	

Irrigated Systems

215. The key problems of the groundwater irrigation sector were set out above – unsustainable overdraft, inefficient use, and a likely drop in net farm incomes under structural adjustment. The problems of spate irrigation – deteriorating scheme

management and inefficient water use – were also discussed above. Solutions to these problems are discussed in the following paragraphs.

Action 1 - Eliminate subsidies to groundwater irrigation

Summary: The elimination of price incentives to groundwater overuse (diesel price, credit price, import bans) is essential in order to improve the sustainability of groundwater irrigation. However, the phase out should be balanced - opening up the import of fruit and vegetables but not of qat will increase the distorted incentives to qat production. Also, the phase out should be accompanied by action on resource management (see Action 2) and by promotion of water-conserving production systems (Action 3).

216. It is expected that much of the current distortion in the incentive structure for groundwater irrigation will be phased out over the next two years. These policy changes are part of the broader structural adjustment program and are driven by fiscal and macroeconomic considerations. The resulting elimination of price incentives to groundwater overuse is essential to the sustainability of groundwater irrigation. However, the phase out should be balanced - opening up the import of fruit and vegetables but not of *qat* will increase the distorted incentives to *qat* production. In the short term, there will be costs and dislocation resulting from this adjustment, including a sizable reduction in incomes resulting from the elimination of subsidies, if farmers do not change their production practices. Therefore, during the phase out of subsidies, the following complementary actions should be taken:

- the phase out should be coupled with action on resource management. This could ideally include regulation of groundwater extraction but in the Yemeni context a community-managed, participatory approach is more likely to succeed (see Solution 2 below)
- the phase out should be matched with promotion of water-conserving production systems (see Solutions 3 and 4 below).
- farmers should be informed of planned changes in advance so that they can adjust their production systems.

Action 2 – Community groundwater management

Summary: Regulation of groundwater abstraction is desirable but unlikely to happen. Cooperation between users in partnership with public agencies is the only alternative for management of aquifers. Current pilot experiences in participatory groundwater management should be monitored and built on, and a broader series of pilots or regional programs should be built up progressively.

217. Although NWRA has begun to develop a regulatory framework and to plan in detail for water management in “hot spots” like Taiz, it is clear that in the Yemeni context regulation of groundwater abstraction is not likely to have much impact on the overdraft problem in the near or medium term. In the absence of regulation, cooperation between users is the only alternative for management of aquifers. Up to now

individualism and anarchy have prevailed, and the consequences are dire. Some experiments are taking place - notably in the Taiz Water Supply Pilot Project, which is testing a model under which urban and rural water users cooperate to transfer water to its highest value use and to manage the resource sustainably. The lesson is that cooperation between users is feasible – but that it requires an unambiguous agreement about quantities and “compensation”; sharing in that compensation by clearly defined “stakeholders”; a local level approach that improves both returns to water in agriculture and incomes from non-farming activities; and partnership with agencies that can provide information and technical support. Pilot experiences in participatory groundwater management such as the Taiz example should be monitored and built on, and a broader series of pilots or regional programs should be built up progressively.

Action 3 - Improved irrigation promotion

Summary: Very many improvements in irrigation efficiency are available, and farmers will increasingly seek them as the cost of water goes up. Experience has shown that where credit and technical advice are available, farmers will take up improvements even with relatively low rates of subsidy. This experience should be built upon in a national irrigation efficiency program.

218. Very many improvements in irrigation efficiency are available, for example, in reducing conveyance losses. Solutions like conveying water in pipes or lining canals would usually provide substantial savings. Other improved irrigation technologies like drip irrigation, fertigation, or plastic tunnels and houses are widely used in similar environments throughout the Middle East.

219. A major constraint with the adoption of improved irrigation is high cost. However, the Land and Water Conservation Project has demonstrated that where credit and technical advice are available, farmers will take up improvements even with relatively low rates of subsidy. This experience should be built upon by improvements in access to credit through financial sector reform, through refocusing AFPPF onto water use efficiency, and through a project approach to irrigation efficiency improvement in spate, and possibly also in groundwater.

Action 4 - Research and dissemination on water use efficiency and agronomic potential

Summary: Economic analysis done for the Agricultural Strategy demonstrated good economic returns for many irrigated crops. Research is essential to improve the productivity and profitability of irrigated production further, particularly to improve returns to the limited and dwindling water resource. Efficient and low cost means to provide information to farmers on these innovations is also essential.

220. DRC analysis has demonstrated good economic returns for current irrigated crops - particularly fruit, vegetables, cotton and qat. All of these crops generate high value added; typically they are an important source of income for small farmers, they are labor-intensive in their production and provide a high return per m³ of irrigation water. All these crops have demonstrated potential for further growth, either by increasing

productivity through yield increases or through efficiency improvements, or by reducing risk through husbandry and marketing improvements, or by increasing prices through improved management, both on-farm and post-harvest. Research is essential to improve the productivity and profitability of irrigated production further, particularly to improve returns to the limited and dwindling water resource. Efficient and low cost means to provide information to farmers on these innovations is also essential.

Action 5 - Participation in irrigation management (PIM) and public sector restructuring

Summary: One Government service that can be handed over under the “Aden Agenda” is operation and maintenance of at least parts of spate irrigation schemes. This should be complemented by rehabilitation so that the handed-over schemes are in good shape.

221. The “Aden Agenda” (compare Action 11) is identifying services that can be better done by farmers themselves. One such service is operation and maintenance of spate irrigation schemes, at least up to and including secondary canal level. Government is already exploring, with IDA and WBI assistance, the scope for supporting “water user associations” leading to ultimate handover of public spate schemes. This should be complemented by rehabilitation and some modification and simplification so that the handed-over schemes are in good shape.

Rainfed and Livestock Systems

222. The main problems faced by traditional production systems were reviewed above – an incentive system that favors cereals imports over domestic production, neglect of traditional systems in public development programs, decline in the quality of public services for livestock production, and lack of growth in rural off-farm employment. Solutions to these problems are discussed in the following paragraphs.

Action 6 - Remove policy disincentives to traditional production systems

Summary: The bias against domestic cereals production should be eliminated. Higher consumer prices for imported cereals are likely to lead to an increase in local production for subsistence, and this could provide a much-needed boost to the rainfed economy and an incentive to terrace maintenance.

223. The bias against domestic cereals production is being reduced and it is expected that the subsidy will be eliminated within two years. Paradoxically, this change will not have a wholly beneficial impact on rainfed farming communities. First, the impact of these rises in cereal prices on producer prices for local cereals will be muted as locally grown cereals already trade at a large premium due to strong consumer strong preference for local (‘balady’) cereals. Second, although some upward movement of producer prices can be expected, this is unlikely to stimulate a large increase in cereals production for market as 90 percent of local grain production is consumed on-farm, and the profitability of market-oriented production lies as much in the straw for fodder as it does in the grain. Third, the price rises - and the further rises that are planned over the next two years to bring wheat prices to import parity - will substantially increase the cost of food in rural

areas, most of which are cereals-deficit areas. However, the higher consumer prices for imported cereals are likely at least to lead to an increase in local production for subsistence, and this could provide a much-needed boost to the rainfed economy and an incentive to terrace maintenance.

Action 7 - Research and dissemination on rainfed and livestock systems

Summary: Research on rainfed and livestock farming systems is only just beginning in Yemen. Ways to improve traditional sustainable production systems in the poor dry areas should be a major focus of research. Research results need to be disseminated through efficient and low cost information systems. This should include attempts to revive the moribund extension service and a focus on mass media, agricultural education and approaches through community groups and the private sector.

224. Research on rainfed and livestock farming systems is only just beginning in Yemen. There is untapped genetic potential within and outside Yemen. Most of Yemen's crop varieties are local "land races", highly adapted to local climates, soils etc. and able to produce under unpredictable and low water availability. Typically yields of such land races are low. The challenge for research is to come with low risk but higher yielding varieties. There is considerable scope also for early and late varieties that would allow farmers to achieve better prices. The potential for such genetic improvements, based on simple introduction and adaptation of varieties already existing, is considerable. New varieties may be introduced not only for yield but also for drought resistance, pest resistance and storability. There is also scope for research in such areas as water harvesting, supplementary irrigation, cultivation practices, post-harvest handling, off-farm diversification etc, and for research on a "holistic" approach to natural resource management of watersheds.

225. In the livestock sector, current traditional husbandry systems have scope for efficiency improvements. The research agenda would include genetic, husbandry and animal health components, together with processing and range management. Support to the livestock sector is further discussed below.

226. As for research on irrigation, an essential complement to research on rainfed and livestock systems is the existence of efficient and low cost information systems, so that farmers can learn how to farm better. Existing experience with conventional low-g geared extension has not yet demonstrated the value of this approach. Further support to a two year trial program (1999 - 2000) in extension in Yemen is being provided by the Netherlands Government. If field extension can be made to work during this trial period, it would be worth investing further in it, particularly if civil service reform allows pragmatic changes to staffing, incentives, etc. If these conditions are absent, future support should focus only on mass media, agricultural education and approaches through community groups and the private sector.

227. In both research and dissemination a gender focus is essential, given the leading role women play in agriculture, particularly in the poorer rainfed/livestock systems. And throughout, the focus for both research and dissemination should be on raising incomes through productivity improvements.

Action 8 – Improved management of natural resources

Summary: In addition to water management there is a major agenda for land resource management, particularly soil erosion, terrace degradation, deforestation, range management and sand dune encroachment. Action is needed at both the policy and the field level. At the policy level, the incentive structure has to favor sustainable management – elimination of the subsidy imposed on cereals, wide availability of low cost cooking gas, policies favorable to communal range management. At the field level, there is a need for a new paradigm of cooperation between the public sector and communities. The public sector can provide technical inputs and models to natural resource management - and perhaps some matching funds grants, but implementation and maintenance require ownership by the community. This is an area where “partnership” between communities and other agencies would pay the highest dividends. The rural self-help movement in general should be promoted.

228. The challenge of water management is discussed above. In addition to water management there is a major agenda for land resource management, particularly soil erosion, terrace degradation, deforestation, range management and sand dune encroachment. Action is needed at both the policy and the field level. At the policy level, the incentive structure has to favor sustainable management – elimination of the subsidy imposed on cereals, wide availability of low cost cooking gas, availability of investment resources to support investment in sustainable management, policies favorable to communal range management.

229. At the field level, there is a need for a new paradigm of cooperation between the public sector and communities. Experience (e.g. under the Land and Water Conservation Project) is that the public sector can provide technical inputs and models, but that implementation and maintenance require ownership by the community. This is an area where “partnership” between communities and other agencies would pay the highest dividends. The Social Fund is testing community/NGO partnerships and the AFPPF is testing community/public agency partnerships. Government’s role should certainly reduce; direct investment in nurseries or infrastructure is not going to solve the problem. Instead, government should provide an “enabling environment” for NGOs and community groups, and finance through the Social Fund, the Public Works Project and the AFPPF.

Action 9 - Improve services to livestock and range.

Summary: The efficiency of smallholder livestock production can significantly increase through adoption of a number of known technologies and with the improvement of animal health services. Government should restructure its interventions in the livestock sector to give a larger role to private service providers, to improve its own interventions in oversight and quality control, and to focus future support on smallholder production systems, with a special focus on women’s role.

230. The efficiency of smallholder livestock production can significantly increase through adoption of a number of known technologies such as mineral supplements (especially of phosphorus), control of production diseases, improved animal housing, and introduction of better fodder plants. Improvement of small scale processing (of dairy

products, wool, honey) would add value and increase rural incomes. Better management of rangeland could certainly improve range conditions and sustainability and increase the security of rangeland users.

231. These improvements can be achieved through revival of services to livestock and range. During 1998/9, Government held a series of policy discussions on livestock, from which an agenda for change is beginning to emerge. This agenda would require Government to restructure its interventions in the livestock sector in order to benefit from the greater role that the private sector can play, to improve its own interventions in oversight and quality control, and to focus future support on smallholder production systems, with a special focus on women's role. Specific steps would include:

- formalizing and encouraging the private delivery of clinical veterinary services and revising the governance framework of animal health services through a new veterinary law.
- within this framework, carrying through a budget-neutral stratification of animal health services that will include private veterinarians, village level animal health assistants (financially self-sustaining but integrated in the overall system), and self-supporting public services such as diagnostic laboratories.
- privatizing livestock farms.
- developing special partnerships and programs for support to smallholder production, that: support herders and farmers associations; train women leaders and paravets; and disseminate low cost and labor saving technology in husbandry and processing.

Action 10 – Rural development focus

232. Given the rapid growth - and pauperization - of the rural community, a new focus is needed on improving the standard of living of rural people, particularly in poorer areas. Government has already set up the three funds – Social Fund, Public Works Project, AFPPF – and is about to embark on restructuring of CACB, the rural finance institution. There are also some tentative initiatives on rural income diversification, rural roads etc. However, much more is needed. Key areas, include: decentralized and community rural institutions, rural energy and electrification, rural access, rural business creation, rural telecommunications, and rural financial market development

Producer Services

Action 11 - Improve services by implementing the Aden Agenda

233. After a period in which services and structures have deteriorated, Government has set up a process of strategic thinking and decision making about agricultural services. This process, known as the “Aden Agenda”, is redefining a new, limited role for the public sector, planning for efficiency improvements and downsizing, and supporting the entry of community and private organizations into service provision. The planned public/private division is shown in Table 52.

Table 52: The future of agricultural services under the Aden Agenda

<i>To be retained by MAI and improved</i>	<i>To be shared with or progressively transferred to non-public providers</i>	<i>MAI to withdraw as soon as possible</i>
Research	Extension	Seed production and supply
Quarantine	Plant and animal protection (non public interest aspects)	Nurseries
Plant and animal protection (public interest aspects)	Agricultural education	Input supply
Rural infrastructure	Spate irrigation management	Machinery rental
Oversight of natural resource management	Credit	
Promotion of farmer organizations		

Source: Aden Agenda, March 1997.

234. The process of change has already begun in some services; the seeds sector, for example, is already being restructured. In March, 1999 a draft proposal for a comprehensive restructuring of services was put out⁹, covering restructuring of MAI field services, restructuring of the overall personnel of MAI, and budget restructuring. It is expected that this proposal will be adopted by government in the year 2000, and then implemented.

Action 12 – Promote farmer organizations

235. Promoting the rural self-help movement in general should also be a priority. The farmers association movement offers hope that some of the power of traditional cooperation in the country that was harnessed in popular initiatives in the first years of the republic may again be captured. The movement has political support but uneven adhesion at grass roots level. FAO is considering providing support to the movement with planning, management and outreach, and this is to be encouraged.

Fisheries

236. Achieving the sector's real potential and creating the most benefit for Yemen and its fishing population requires a sector strategy and specific short- and long-term action to address the following five key issues:

Improve Fisheries Resource Management and Determine the Future Role of Industrial and Small-Scale Fisheries

237. The need to improve the management of key fish stocks is a matter of prime urgency. The current fishing pressures on selected stocks (notably cuttle fish, demersal species, lobster and shrimp) due to rapid expansion of industrial fishing combined with the fishing pressures coming from the efforts of the growing small-scale fishing is not

⁹ Aden Agenda – MAI Restructuring Proposal: Exposure Draft, March 4, 1999.

sustainable. Reducing such excessive fishing effort to sustainable levels should have priority over all other action in the sector. The current crisis is linked to a single policy question: The future role of industrial and small-scale fisheries. Past policies and related donor support have increasingly favored development of small-scale fisheries, reflecting considerations of equity, employment, food security (local fish consumption) and regional development. Such a development was to be combined with the limited presence of industrial vessels, which would focus mostly on catching cuttlefish. Continuation of such policies can no longer be combined with the current, more expansive industrial fisheries policies. Fish resources cannot support the rapid expansion of both. Hence, the Government will need to determine whether: (a) to maintain and expand small-scale fisheries, while substantially reducing the role of industrial fisheries; or (b) maintain a major industrial fishery -- be it smaller than the current fleet -- which would force the benefits and fish production from small-scale fisheries to substantially decline, and which may increase the risks of over exploitation of key fish stocks. Both options are technically feasible, but will have vastly different risks, outcomes, economic and social impacts and political implications. This policy decision is fundamental and urgent. To develop a successful sector development strategy, Government needs to make a clear decision soon. This report recommends that the Government should follow option (a).

238. To address these resource management issues, this report further specifically recommends that Yemen:

- Carry out an immediate assessment of standing stocks (of demersal, cuttlefish and shrimp resources, with international donor/FAO support) to determine their current status, and estimate the risk of immediate collapse;
- Introduce an immediate moratorium on industrial fishing for cuttlefish and demersal fish, and extend closed season rules for shrimp catching;
- Review the role of Coastal Fisheries Corporation (CFC) and determine in what way: a) its formerly highly effective role in managing lobster stocks exploited by small scale fishermen could be reestablished, or b) alternative management approaches can be pursued;
- Develop and adopt a long-term strategy to maintain growth of small scale fisheries and limit the role of industrial fisheries to: a) catching only those species and amounts that can not be caught by the small-scale sector, and b) those species that can not yet be exported by the small-scale sector, because of lack of adequate quality control measures;
- Develop a tactical program to promote small-scale fisheries and reduce industrial fishing on especially shrimp by reducing the number of industrial licenses and increasing the price of each license in relation to catch value; and
- Include in the sector strategy a program to design and implement actions to gradually transfer the responsibility for coastal fish resources to local communities, and to prepare and assist those communities to responsibly execute such role.

Enhance Institutional Performance

239. The function of the Ministry of Fish Wealth (MFW), currently employing over 3,000 people in linked public corporations, has insufficiently changed from its traditional, production-oriented role. Its traditional role of controlling public corporations is no longer appropriate in the current political and economic environment, and its structure and functions constrain rather than assist the sustainable development of the sector. If the sector is to achieve its potential, the objectives, institutional structure, capacities and performance of the MFW require substantial change. The Ministry needs to perform better the roles it should perform (defining sector policy and strategy; management of fish resources— including such related items as monitoring catches and fish-stocks, controlling and surveillance of the fishing fleet, and administering a vessel licensing scheme; managing fisheries research and extension; ensuring the existence of proper quality control systems; and effective management and development of essential public infrastructure) and discontinue the roles it should not perform (public fish production; processing and marketing; maintaining public corporations; and managing some types of infrastructure) .

240. To effectively carry out the roles it should perform, the Ministry should:

- Develop a long-term reorganization program to become an effective regulatory agency, and implement a systematic human resource development policy remedying key staffing weaknesses;
- Actively participate in current efforts of the Government of Yemen to privatize all public fish marketing and processing infrastructure. Such privatization program should include, but should by no means be limited to: cold storages/freezers in several locations along the coast, the Nishtun complex, the two tuna canneries in Shuqra and Mukalla, and the boat-building activities of the Coastal Fisheries Corporation;
- Review management alternatives for the larger fishing ports in Hodeidah, Aden and Mukalla, and either: a) have these ports managed under management contracts, and abolish the National Corporation for Services and Fish Marketing (NCSFM) entirely; or b) adjust NCSFM's objectives and structure to one of efficiently managing these ports;
- Implement a program to improve management, funding, staffing and research planning of the Marine Science and Resources Research Center, and initiate steps to develop closer cooperation, like a twinning arrangement, with another fisheries research institute in the world; and
- Carry out a study and develop a program for the federation of fisheries cooperatives, and strengthen their performance, including their future role in co-managing coastal fish resources.

Improve Fish Marketing and Quality Control

241. Yemen's official exports of fish (8,600 tons valued at \$13 million in 1996) are less than 25% of its potential; local consumption is growing rapidly, but from a low base.

Ineffective fleet licensing and monitoring, legal and illegal unrecorded direct exports, overfishing, lack of critical infrastructure, legal constraints on export of certain species, weak quality control, and an uncertain and partisan implementation of the legal investment framework for foreign investors all contribute to this unfortunate situation. In this area, several actions are urgently needed. Of critical importance to Yemen will be the introduction of a fish quality control strategy. In today's world, all countries are unable to export fish without having passed universally applied quality requirements usually referred to as Hazard Analysis and Critical Control Path (HACCP) procedures. Hence, Yemen should as early as possible develop capabilities to apply HACCP procedures to all its industrial fishing operations. To apply HACCP to small-scale fisheries will require structural adjustments in the small-scale sector, which will take time and resources to implement. Hence, the role of the small-scale fisheries sector will initially have to focus on local marketing; it will be unable to assume a major role in exports (except possibly in lobster exports) until this fundamental issue has been addressed. Removal of limitations on fish exports, a measure that has outlived its initial objectives, is equally essential.

242. To boost exports, it is recommended that MFW:

- Develop and implement a quality control strategy soon, possibly with the assistance from large fish importing countries with the most stringent quality requirements (Japan, EU). While the initial focus of such strategy should be on export-bound fish, it should equally address the issue of how to enable the small-scale sector to participate in fish exports in the future;
- Review and develop the capacity and quality of local laboratories to perform under the new quality control strategy; and
- Lift the current fish export restrictions on the five species of king fish, tuna, bream, grouper and trevally; instead, introduce a system of licensing exporters, with fees related to quality and volume.

Develop and improve Management of Selective Infrastructure

243. Yemen's fishing sector has been the beneficiary of considerable donor-funded infrastructure. Unfortunately, much of that infrastructure was designed for a planned economy, in which industrial fisheries dominated. While existing industrial port and related infrastructure capacity are probably adequate, or even excessive, insufficient facilities exist along the coast to land, auction, preserve and transport fish landed by small-scale fishermen. Local fish markets in Yemen are extremely unhygienic and inadequate, and their rehabilitation or replacement should receive the utmost priority. In addition, Yemen urgently needs more access roads for selected fishing villages, some rehabilitation of the only specialized small-scale fishing port in Hodeidah, and improvement of basic infrastructure for export by air and sea of high value fish. While the private sector and cooperatives should augment ice supply in critical areas along the coast, such investment is unlikely as long as there is no price premium for high quality fish. A Program to enforcing higher (export) quality requirements, as discussed above, and education of consumers should encourage higher prices for quality fish.

244. It is recommended that MFW:

- Give high priority to rehabilitation and replacement of local fish markets;
- Plan and construct access roads for selected fishing villages;
- Rehabilitate the only small-scale fishing port in Hodeidah, and develop a long-term agreed maintenance program; and
- Support increased ice production in coastal areas by a combination of quality control enforcement, consumer education and private sector/cooperative access to credit.

Improve Fish Culture Prospects

245. While prospects for fish culture exist in Yemen, few fish culture operations currently exist. Coastal areas offer prospects for shrimp culture and rearing of other marine species like scallops and bream. In fresh water reservoirs, stocking of tilapia and cage culture of various species appear to have potential. While some of these technologies have been applied in neighboring countries, the specific technical parameters for these activities still need to be developed. In addition, investment in fish culture in Yemen involves considerable commercial and human resource risks. Therefore, it appears unlikely that this sub-sector will develop without any initial public support and guidance. Further, applied research and pilot operations are necessary. Private sector pilot activities may initially be supported by direct public inputs, or by applied research executed jointly by private and public interests in the Fish Culture Research Institute near Aden. In addition, the Government should take immediate steps to prepare a legal and institutional enabling framework to support future private investment, and to regulate potential risks related to disease and quality control.

B. Implementation Steps

Government Steps

246. This agenda, although large, is feasible over the next three years; in fact **government is already acting on many of these things** and should continue in a phased and prioritized way. The criteria for “ranking” actions should be feasibility; economic importance; equity impact; and chances of succeeding within likely resources and constraints. Government has prepared an agricultural strategy document for presentation to the Council of Ministers in the next few months. The following implementation steps for Government could help implement this strategy:

- (a) removing subsidies and protection from unsustainable systems (by implementing the structural adjustment program);
- (b) restructuring public services with an emphasis on reviving essentially public services of economic importance, particularly for the production systems of the poor and, in parallel, empowering community and private organizations (by implementing the Aden Agenda);

- (c) providing efficient public research and information services (by implementing the Aden Agenda and by implementing a national agricultural research and dissemination program);
- (d) promoting efficient public/donor investment in line with the adopted strategy and in support of the ten solutions (by restructuring public expenditures); and
- (e) promoting efficient community/private investment in the sector (by implementing the structural adjustment program, by implementing the Aden Agenda, by restructuring the Agricultural Fund, and by supporting private investment).

Donor/IDA Role

247. Donors in the agriculture sector are scant, but cooperation with those there are is good. In developing new ideas on strategy, Government has worked closely with IFAD, FAO and GTZ, and is now working with the Netherlands Government on similar approaches. The prospects are therefore good that donors will support Government in implementation.

248. Regarding IDA, a new Country Assistance Strategy (CAS) has been approved for the period July 1999 – June 2002 (IDA's fiscal years FY 2000-02), concentrating on four objectives: public sector reform, increased private investment, water resources management, and poverty alleviation. Continuation of IDA support in the agriculture sector will therefore be oriented around support to:

- (a) public sector reform, especially sector policy and restructuring, including policy change, public expenditure reform and administrative reform (through sector work, public expenditure review, and support to implementation of the Aden Agenda);
- (b) sustainability and productivity of water use (through new project support comprising a Spate Irrigation Improvement Project, an Agriculture Technology and Productivity Project, and a Sana'a Basin Integrated Water Management Project. Support to the implementation of national water strategy and water resources management is proposed through an IDF grant to NWRA. In addition, a possible Groundwater Irrigation Improvement Project is under consideration; and
- (c) improving incomes in poorer production systems, with special emphasis on rural women (through the Agriculture Technology and Productivity Project which will have a component of technology development and dissemination for rainfed and livestock systems in the drylands, and a component for restructuring livestock and veterinary services).

249. In addition, IDA should work with Government on preparation of a broad rural development strategy as a way in to more effective rural poverty alleviation.

C. Conclusion

250. The strategy discussed in this paper contains three significant changes from “business as usual”: an emphasis on getting the overall economic policy framework right; a reduced, more focused effort from the public sector; and priority to the quality and efficiency of interventions. If the strategy can be implemented as proposed, the irrigation sector should move towards the kind of high value labor intensive cropping pattern currently seen in countries like Jordan. The revival of traditional and rainfed and livestock systems should raise the incomes of the poor and improve natural resource management. The paramount objective is to ensure that the 20 million people expected to live in rural areas in the year 2020 can enjoy a decent standard of life. The strategy proposals in this Note should materially contribute to that goal.

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