

**YEMEN**

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**SUMMARY**

**SOCIO ECONOMIC ASPECTS RELATED TO AGRICULTURAL IRRIGATION DEVELOPMENT**

**INSTITUTIONAL ASPECTS RELATED TO AGRICULTURAL IRRIGATION DEVELOPMENT**

## **YEMEN - SUMMARY**

This section describes the socio-economic context and institutional setting for small scale irrigation development in Yemen. The main parameters and their sources are summarized respectively in the table on socio-economic context and institutional setting. The highlights are:

Socio-economic context:

- Yemen retains a largely rural population (68%)
- Poverty levels are considerable, one third (35%) of the population lives below national poverty line
- On main social services: health expenditures (USD 64/capita), population with access to improved source of drinking water (62%), electric power consumption (223 KWh per capita) and female illiteracy (55%) Yemen scores slightly better than other countries in the same socio-economic bracket
- Agriculture is the main provider of jobs in Yemen (75%)
- In economic value Yemen is a net importer of agricultural products (import to export is 12.94). The total value of agricultural imports is high (USD 2,601 M)
- With respect to food Yemen is also net importer (value of food imports USD 2,378 M)

Agricultural services

- Agricultural road density is low (14 km/100 sq. km land area) – affecting agricultural marketing
- Fertilizer use is modest, but at lower side (14 kg/ ha)
- The use of mechanical equipment is considerable (41 tractors per 100 sq km of arable land)

Irrigation and water use

- Irrigated land is a large fraction of arable land (37%)
- Total water abstraction largely exceeds renewable resources (170%)
- Groundwater usage constitutes 71% of total water abstraction
- Irrigation performance is low with an average irrigation efficiency of respectively 30-40% for Groundwater and Spate Irrigation Schemes

Institutions

- The dominant institutional framework for irrigation and water development at local and district level is vested in the traditional institutions (Shari'a, 'urf and tribal governance). Main modern policies on national level include the National Water Sector Strategy and Investment Program 2005-2009, Water Strategy 2004, Country Water Resources Assistance Strategy 2005 (CWRAS), Water Resources Management Action Plan September 2007 (JICA) and the National Water Law No. (41) of 2006, which is more or less similar to the Water Law 2002
- The institutional mandate for irrigation management at local level is vested at powerful sheikhs and large land owners. The institutional mandate at national level is weak. The mandate is shared between Ministry of Agriculture and Irrigation, which include the National Water Resource Authority; Ministry of Water and Environment; and Ministry of Local Administration. Donors, also exert considerable influence over policy making.
- The water licensing system is based on traditional institutions (Shari'a, 'urf and tribal governance), and the official Water Law 2002/6
- Land ownership is based on principles of Islamic law; the "official" system is highly problematic and subject to widespread fraud and corruption. Annually more than 4,000 deaths are counted over land and water related disputes
- On indicators of government effectiveness (14.4) and rule of law (-1.05) Yemen scores low

## YEMEN - INSTITUTIONAL

Main guiding policies, act and ordinances

### **Traditional institutions:**

- Traditional institutions (Shari'a, 'urf and tribal governance) are still dominant (MoWE and MoAI, 2007, pp. 7) and are able to differ per wadi/basin.
  - The 'urf rule: *Al a'la fa al al a'la (The upper above the upper) is however enforced in the major wadi's (Zabid, Tuban and Al Jawf), it provides primary access to water to the most upstream irrigators.*
  - *Wadi Zabid, knows a water right system of more than 500 years old, and is also referred to as the Ibrahim Al Jiberti, the founder of these rules*
- Although the political power at the local level is vested in the traditional institutions, the governments seeks to influence and control water resources development at national level. The following policies are of main concern:

### **Modern institutions:**

- *National Water Sector Strategy and Investment Programme 2005-2009 (NWSSIP), addresses the problem of low water resource availability, groundwater overdraft, and the vulnerability of irrigated agriculture; it mentions development of basin plans, based on IWRM approach; establishment of basin water committees and WUAs; as well as licensing of well construction and water withdrawal, as strategies to overcome these problems (MoE and MoAI, 2006, pp. 1, 11)*
  - *Basin Plans are prepared for Ta'iz, Sa'ada and Hadramawt; the planning for Sana'a Basin (SBWMP) is still in its design phase (MoE and MAI, 2007, pp. 14)*
- *Other policies guiding Irrigation and Water Resources Development are National Water Strategy 2004, Country Water Resources Assistance Strategy 2005 (CWRAS), Water Resources Management Action Plan September 2007 (JICA) and National Water Law No. (41) of 2006, which is more or less similar to the Water Law 2002*
- *Recent declarations include the National Ten-Point Agenda for Reform, which mentions tackling of land and water disputes, respectively as priority 5 and 9 (Yemen AVA, 2010, pp. 8) and the Yemeni Water Partnership Declaration: Sana'a January 17th 2011, articulating the importance of decentralized cooperation and strengthening of WUA, WUGs and Basin Committees*
- *Large Projects include:*
  - *Irrigation Improvement Project (IIP), a five year program (2001-6), currently being extended. The objective is to improve water management in two major spate schemes and thereby increase productivity and smallholder incomes. (MoE and MAI, 2007, pp. 23)*
  - *Groundwater and Soil Conservation project (GSCP) a six year program [2004-2009] to provide piped conveyance on 27,000 ha and pressurized on-farm irrigation systems (drip, bubbler) for 1,440 ha (MoE and MAI, 2007, pp. 23)*
  - *Sana Basin Water management Project (SBWMP), a five year program (2004-8), supporting the formation of WUAs and investment in modern irrigation on 3,600 ha, within an overall basin management framework & under guidance of the basin committee (MoE and MAI, 2007, pp. 23)*

- *Institutional mandate irrigation development*

### **Traditional institutions:**

- *Despite the impressive array of public agencies, it is the private agricultural sector which exerts almost complete control over water resources (MoE and MAI, 2007, pp. vi). Traditional institutions are dominant (Shari'a, 'urf and tribal governance)(Ibid. pp. 7)*
- *There are continuous tensions between vested powerful sheiks and the relatively new emerging state (Zeitoun, et al. pp. 18) The power is particularly entrenched by sheikhs at the local level, in conjunction with security officials and parliamentarians (Anon, F., 2009 in Zeitoun, et al. pp.19)*
- *Traditional institutions in Wadi's (Tuban/Zabid): Agricultural Council, WUA's, and Irrigation Council.*

	<ul style="list-style-type: none"> <li>○ <i>The agricultural council has to protect customary water proportion and allotment rights (Kuster, S.M., 2009, pp. 92)</i></li> <li>○ <i>Conflicts are either solved using Islamic law (Shari'a) at the Islamic Courts and/or using traditional law (urf and qanun) at the agricultural court (Kuster, S.M., 2009, pp. 92-94)</i></li> <li>○ <i>Shaykh Ash-Shareegh (Water Officer) in control of distribution (Kuster, S.M. 2009, pp. 97)</i></li> </ul> <p><b>Modern institutions:</b></p> <ul style="list-style-type: none"> <li>● <i>Ministry of Water and Environment, established in May 2003 to reorganize the water sector, with the aim of creating an institutional structure for integrated water management and to prepare the necessary institutional and investment conditions to face the exacerbating water problem in Yemen (NWSSIP, pp. 1) The MWE has, however, low implementation capacity and therefore relatively low bargaining power (Zeitoun et al., pp. 19).</i> <ul style="list-style-type: none"> <li>○ <i>National Water Resources Authority: its responsibilities are planning, monitoring and regulation of water resources (MoWE and MAI, 2007, pp. 5). The NWRA is however significantly donor-dependent and also "dogged by a top-heavy and rather inert headquarters and lack of management vision or capability" (Ward, et al. 2007, pp. 34).</i></li> </ul> </li> <li>● <i>Ministry of Agriculture and Irrigation, responsible for planning and investment in irrigation, dams and watershed management. This ministry has also direct managerial responsibility for large spate irrigation schemes in the west and south of the country (MoWE and MoAI, 2007, pp. 5; Yemen AVA, 2010, pp. 7). It has more institutional capacity and influence than MoWE, (Zeitoun et al.; pp. 19)</i> <ul style="list-style-type: none"> <li>○ <i>Agricultural Research and Extension Authority (AREA), responsible for research and technology transfer in irrigated agriculture (MoWE and MAI, 2007, pp. 5)</i></li> <li>○ <i>AFPPF (Agriculture and Fisheries Production Promotion Fund), a public off-budget fund financed by a cess on diesel prices. It invests in sustainable pro-poor agricultural projects and fisheries (Couton, 2007, pp. 13; MoWE and MoAI, 2007, pp. 5)</i></li> </ul> </li> <li>● <i>Ministry of Local Administration, responsible for decentralization and for oversight of local authorities, it supports implementation of the Water law on local level (MoWE and MAI, 2007, pp. 6)</i></li> <li>● <i>Donors, who contribute largely to capital investment in the sector, exert considerable influence over policy making (MoE and MAI, 2007, pp. vi). The donors in the water sector in Yemen however compete amongst themselves, even as they promote cooperation. As a group, they are thus susceptible to being 'divided and conquered' by local leaders or authorities.</i></li> <li>● <i>Yemini Water Partnership (Establishing)</i></li> </ul>
Water Permit System – Drillers	<ul style="list-style-type: none"> <li>● <i>The official law (Article 35 in the revised Water Law 2006) articulates: no person, group of persons, governmental or national agency, natural or body corporate entity may drill any water well, deepen it or erect a water facility for capturing flood water or running springs in valleys or above valleys and water basins, or divert them from their natural courses without first obtaining the approval in advance of the Authority</i></li> <li>● <i>The permits and licenses are to obtained at NWRA, but there is very low institutional capacity to monitor and enforce rules at NWRA (Zeitoun et al.; pp. 24)</i></li> <li>● <i>Improved licensing and regulation of wells, according the NWSSIP 2005-2009, has led however that random drilling hardly occurs anymore in Ta'iz and Lahej (MoE and MAI, 2007, pp. 18)</i></li> <li>● <i>However, about 800 water well drilling rigs are in use that are owned by individuals or companies, which generally do not have any permits despite government legislation limiting the drilling of wells (FAOSTAT, 2008)</i></li> </ul>
Water Permit System – Users	<ul style="list-style-type: none"> <li>● <i>Traditional water rights are based on a combination of Islamic principles, customary practice and state interventions and employ the following principles: (i) water is an ownerless resource but usufruct can be appropriated to those who develop it; (ii) upstream riparians have priority; (iii) water may not be alienated from land; (iv) wells must be spaced a certain distance apart; (v) no one may deny a person's</i></li> </ul>

	<p><i>rights to drinking water (World bank, 2006, pp. 16,17)</i></p> <ul style="list-style-type: none"> <li>• <i>The modern water law 2002 is supposed to regulate water extraction from wells (Yemen AVA, 2010, pp. 7)</i></li> </ul>
Other institutions involved in irrigation development	<p><i>Main international donors involved are in water and irrigation development are the World Bank, FAO, UNDP, the German implementing agencies GTZ and KfW, JICA and the Government of The Netherlands and UK (MoA and MAI, 2007, pp. 2; AREA, 2009, pp. 119; Caton, 2007, pp. 10)</i></p>
Local organizations	<ul style="list-style-type: none"> <li>• <i>Basin Committees (formally established in Sana'a and Sa'ada), the traditional committee of Wadi Tuban has been revived (MoE and MAI, 2007, pp. 14).</i></li> <li>• <i>WUAs of which are four types: Water Management WUAs, Irrigation WUAs, Full service WUAs and Rural Water Supply WUAs (MoE and MAI, 2007, pp. 16)</i></li> <li>• <i>Local councils, responsible to supervise water law implementation (MoE and MAI, 2007, pp. 19)</i></li> </ul>
Private sector	
Support to small scale irrigation development (vocational sector, land planning) <sup>1</sup>	<ul style="list-style-type: none"> <li>• <i>The Water and Environment Centre (WEC), semi-independent institution within Sana'a University, trains especially water managers in Yemeni government (MWE and MAI)(Couton, 2007, pp. 20)</i></li> <li>• <i>A vast number of officials go abroad for training</i></li> </ul>
Land tenure	<ul style="list-style-type: none"> <li>• <i>Land ownership is based on principles of Islamic law and has four categories: privately owned (mulk), state-owned (referred to as miri historically), communal property, and land endowed to a religious trust (waqf)(World Bank, 2006, pp. 15).</i></li> <li>• <i>There is a trend towards inequitable distribution of land in Yemen, especially in the Southern governorates, with ownership increasingly concentrated in the hands of a few influential families. This trend is due to significant changes in the system of land management – prompted by incentives in the market economy for privatizing ownership (World Bank, 2006, pp. 15)</i></li> <li>• <i>The official land transfer (legal registration and transfer of ownership) system itself is highly problematic... further land transfers are subject to widespread fraud and corruption, including document fraud (e.g. asserting a false claim to a piece of land) and the sale of the same property to multiple buyers (Yemen AVA, 2010, pp. 2).</i></li> <li>• <i>Inheritance, as well s the symbolic and financial significance of land, can further complicated land and water disputes (Yemen AVA, 2010, pp. 2, 3)</i></li> <li>• <i>As a result of land and water conflicts over 4,000 deaths per year are reported, probably more than the secessionist violence in the south, the armed rebellion in the north, and Yemeni al-Qaeda terrorism combined (Yemen AVA, 2010, pp. 2).</i></li> </ul>
Government Effectiveness (percentile rank 0-100)(World Bank, 2010)	14.4
Rule of Law (-2.5 – 2.5, in which high values represent effective enforcement of law (World Bank, 2010)	-1.05

<b>YEMEN SOCIO-ECONOMIC</b>	
Food exports 2008 (current US\$M) (FAO Statistical Yearbook 2010)	140
Food imports 2008, (current US\$M) (FAO Statistical Yearbook 2010)	2,387
Imports/exports (calculated)	17.05
Health expenditure per capita 2009 (current US\$) (World Bank)	64
Improved water source 2008 (% of population with access) (World Bank)	62
Improved water source, rural (% of rural population with access)	57
Improved water source, urban (% of urban population with access)	72
Poverty (% below national poverty line) (2005)(UNSTAT)	34.8
Illiteracy rate –Male (15+) (2009)(World Bank)	20
Illiteracy rate --Female (15+)(2009)(World Bank)	55
Primary completion rate, total (% of relevant age group) (2008)(World Bank)	61
Road density (road km/100 sq. km of land area)(2005)(IRF)	14
Road to arable land density (road km/1000 sq. km arable land)	n.a.
Roads, paved (% of total roads)(MoPBH, GoY, 2009)	24
Electric power consumption (kWh per capita)(2008)(World Bank)	223
Country area (km2) (2009)(FAOSTAT)	527,970
Land area (km2) (2009)(FAOSTAT)	527,970
Population, Projected/Estimated (2010)(FAOSTAT)	24,053,000
Urban population (% of total population)(2010) (World Bank)	32
Rural population (% of total population)(2010)(World Bank)	68
Population density (pp/km <sup>2</sup> ) (2010)((World Bank, 2010)	46
<b>AGRICULTURAL</b>	
Agricultural exports (US\$M) (FAOSTAT, 2008)	201
Agricultural Import (Current US\$M) (FAOSTAT, 2008)	2,601
Import/export (calculated)	12,94
Value added in agriculture, growth (%) (2003)(World Bank)	-5
Value added, agriculture (% of GDP)(2003)(World Bank)	14
Employment agriculture (% of population)(2008)(CES, 2008, pp. 77) <sup>2</sup>	75
Agricultural machinery (tractors /100 sq. km arable) (World bank, 2000)	41
Agriculture value added per worker (Constant 2000 US\$) (2003)(WB)	470
Fertilizer consumption (kg per hectare of arable land) (2008)(WB)	14.2
Cereal cropland (% of land area) (of which irrigated, %)	n.a.
Agricultural area (km <sup>2</sup> )(2009) (FAO Resource Stat)	234,520
Arable land (km <sup>2</sup> )(2009)(FAO Resource Stat)	11,710

<sup>2</sup> In: Yemen AVA (2010), pp. 2

<b>IRRIGATED AGRICULTURE</b>	
Irrigated land (% of crop land) (World Bank, 2006, pp. 18)(2003)	37
Irrigated land entire country (ha)(USAID, 2004, pp. 3)	429,000
Actually irrigated (ha) (USAID, 2004, pp. 3)	429,000
Spate irrigation (ha)(IFAD) <sup>3</sup>	115,000
Groundwater irrigated (ha) (Saleh)	314,000
Irrigation potential (entire country)	
Small spate irrigation schemes (<300ha): Made by farmer in upper part of wadi catchments (Saleh)	
Medium spate irrigation schemes (300-1000ha): Made by farmers, local authorities and private entrepreneurs in the middle part of the wadi catchment )(Saleh)	
Large schemes (over 1000 ha): Made by the government in the western and southern Coastal Plains )(Saleh)	
Water Sources	Flashfloods & groundwater
<b>SUSTAINABLE WATER ABSTRACTION RATES (AQUASTAT, 2000)</b>	
Renewable resources (km <sup>3</sup> /year)	2.1
Overlap	1.4
Surface water <sup>4</sup>	2
ground water	1.5
Dependency ratio	0
<b>ACTUAL WATER ABSTRACTION RATES</b>	
Groundwater (km <sup>3</sup> /year) (Aquastat, 2000)	2.397
Surface (km <sup>3</sup> /year)(Aquastat, 2000)	0.987
Total water withdrawal (km <sup>3</sup> /year) (AQUASTAT, 2005)	3.57 <sup>5</sup>
% of renewable water resources (AQUASTAT, 2002)	170%

<sup>3</sup> Major wadis for irrigated agriculture are found in the South and Eastern Escarpment, including Bana (25,722 ha, Tuban (11,000 ha) and Hadramaut (8,000 ha), and in the Western Escarpment, including Wadi Mwar (17,000ha), zabid (15,215ha) and Siham (10,929 ha) (Saleh)

<sup>4</sup> Yemen has no internal rivers and so relies entirely on surface, water run-off to collect in reservoirs with a high evaporation rate (Caton, S.C., 2007, pp. 9)

<sup>5</sup> In the late nineties qat consumed 30% of total water withdrawal in Yemen, within Sana'a basin even 40% of the groundwater extracted for agricultural purposes (Ward, C.; pp. 4, 12)

<b>Water abstraction points National</b> (AREA, 2009, pp. 118)	Over 60,000 <sup>6</sup>
<b>IRRIGATION PERFORMANCE</b>	
Overall Irrigation Efficiency Spate schemes (FAO Aquastat, 2008 and Atroosh, K.B. 2007)	35-45%
Overall irrigation Efficiency Groundwater System (Glass, N. 2010)	30-40
<b>Detailed Spate Irrigation Efficiency (Atroosh, K. B. 2007)</b>	
Conveyance efficiency	80-85
Distribution Efficiency	70-75
Field Application Efficiency	65-70
<b>Detailed Modern Irrigation Efficiency (Atroosh, K. B. 2007)</b>	
Irrigation efficiency Green House	93
<b>AGROPHYSICAL</b>	
Irrigated crops (ha) ((Aquastat, 2004)	527,038
Cash crops (157,878 ha)	Qat <sup>7</sup> (99,504ha), Coffee, Cotton and Sesame
Cereals (123,195 ha)	Mainly sorghum and wheat, to lesser extent maize, barley and millet
Fruit Trees (75,997 ha)	Banana constitutes for 11% and citrus for 15%
Vegetables (72,364 ha)	16,870 ha potatoes in Dhamar and Amran governates
Fodder crops	70.772 ha
Pulses	26, 832ha

Yields irrigated crops in wadi systems (Saleh)	
Cotton (t/ha)	1.2-2
Sesame (t/ha)	0.5-1
Groundnut (t/ha)	0.53-0.78
Sorghum (t/ha)	0.77-1.9
Grapes modern system (t/ha)	27.3-49.7
Potatoes traditional and modern systems (t/ha)	19.6-26.1

<sup>6</sup> Severe over-exploitation of groundwater aquifers, average decline of 2 till 8 meters per year are common (AREA, 2009, pp. 18)

<sup>7</sup> Qat represents only 10 percent of cultivated land, but generates around a third of agricultural GDP.

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