Flood-Based Livelihoods Network Yemen

Water and Environment Centre

META

World Agroforestry Centre

IFAD

Flood-based livelihoods in Yemen

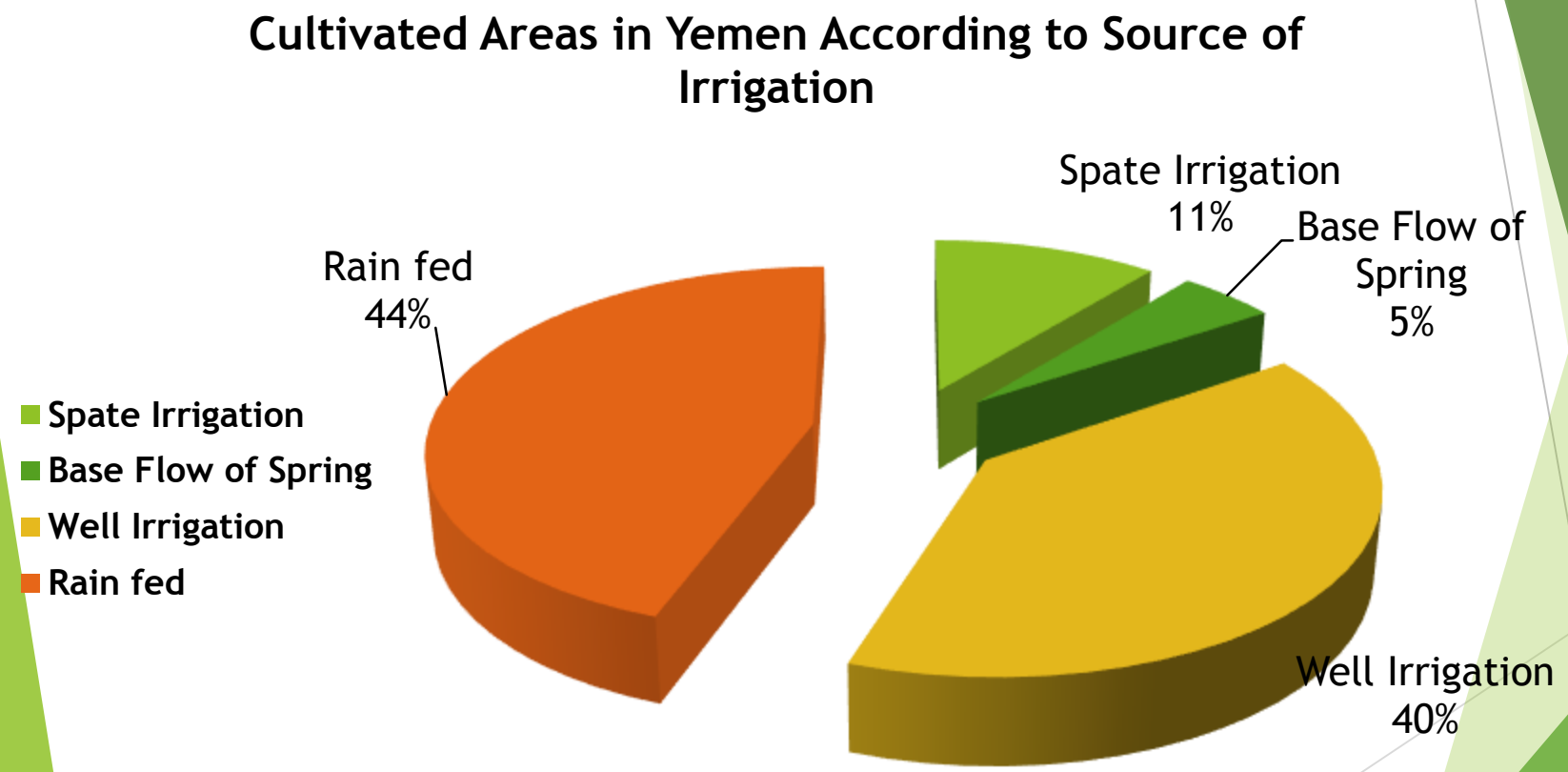
Water and Environment Center

Adel Zolail

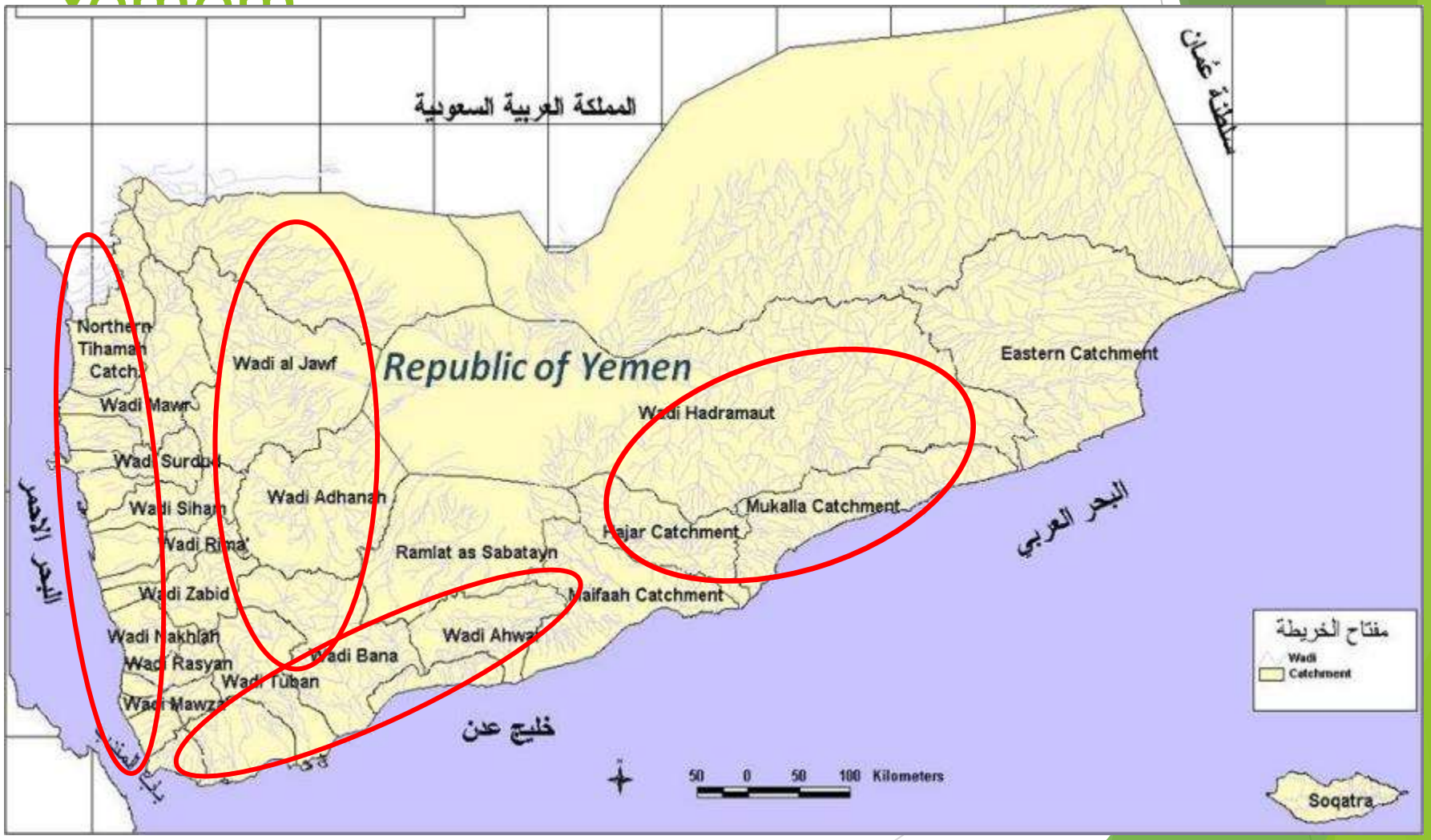
May 2017

Wageningen - Netherlands

Cultivated Ares in Yemen



Flood-based livelihoods in Yemen

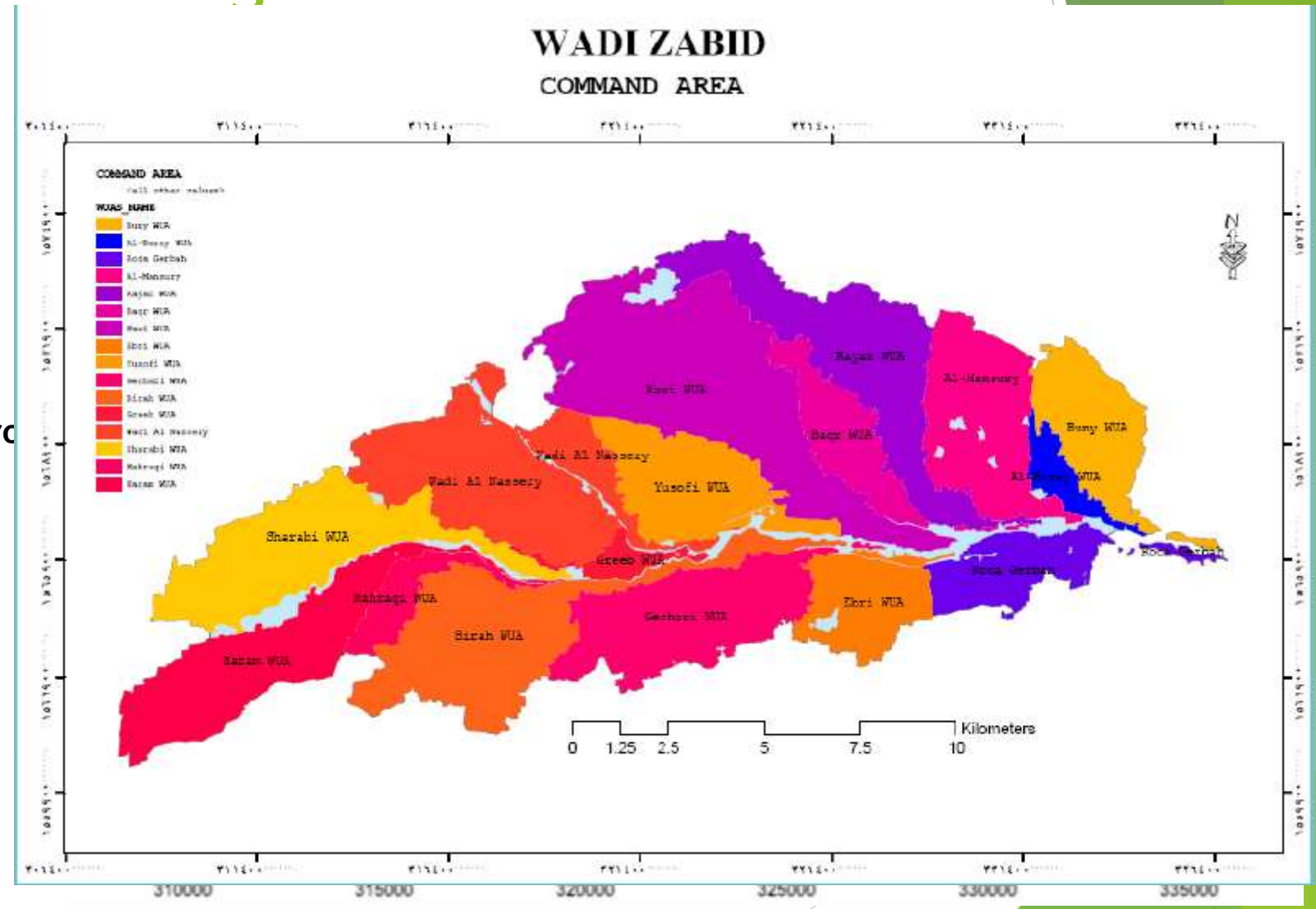


Zone	Wadi	Catchment Area, km^2	Mean Annual Rainfall, mm	Mean Annual Flow, Mm^3
Western escarpment	Wadi Mawr	8000	480	210
	Wadi Surdud	2700	650	121
	Wadi Siham	4900	500	130
	Wadi Rima	2700	570	103
	Wadi Zadid	4700	560	164
	Wadi Rasyan	2000	500	54
	Wadi Mawza	1600	400	38
Southern escarpment	Wadi Bana	7200	359	160
	Wadi Tuban	5060	244	125
	Wadi Hassan	3300	300	30
Central escarpment	Wadi AlJawf	14000	140	35
	Wadi Adanh	12600	-	-
	Wadi Ahwar	7250	100	40
	Wadi Mayfa'a	6000	200	30
	Wadi Beihan	3600	150	54
	Wadi Hajer	9324	80	288
Eastern escarpment	Wadi Hadhramout	113900	63	230
	Wadi Maselah	*	200	27

* Unavailable

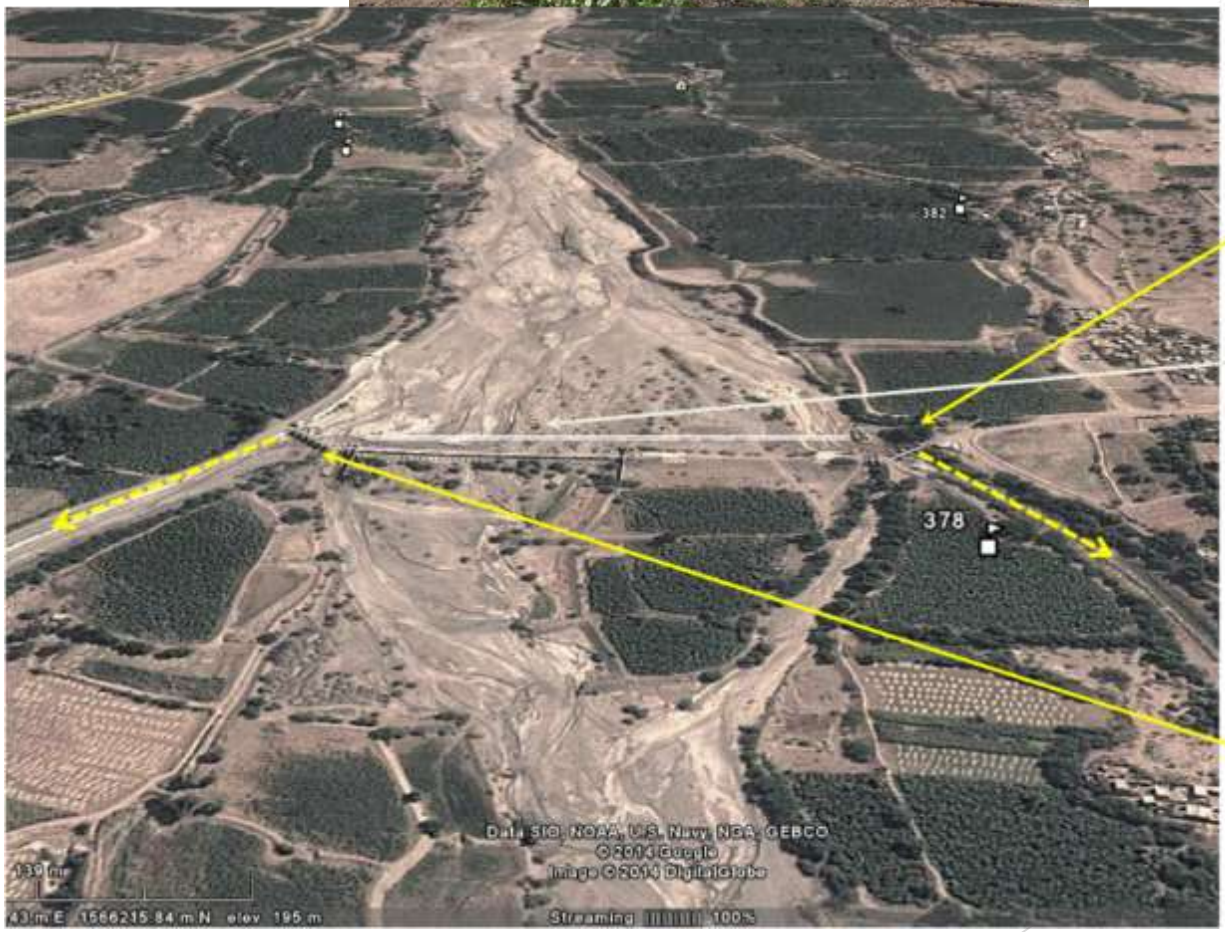
Water Rights in Wadi Zabid

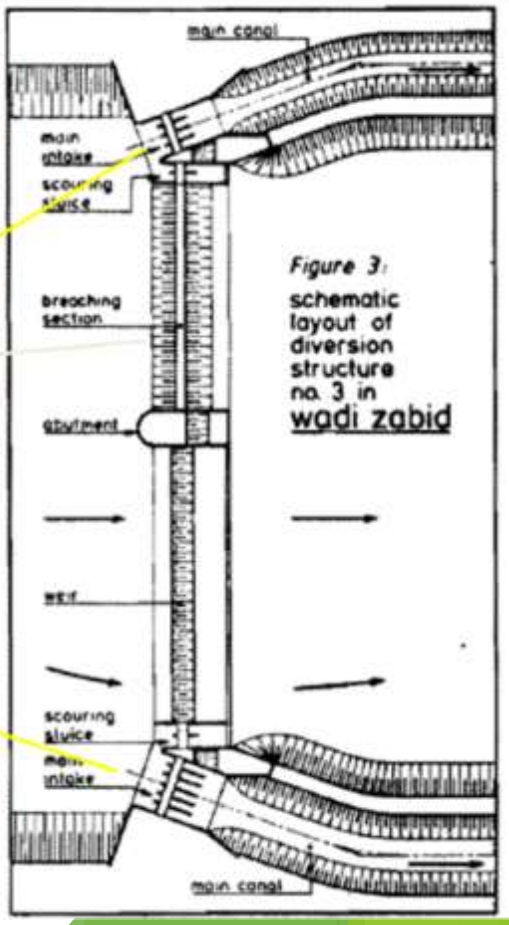
Fro



Irrigation System

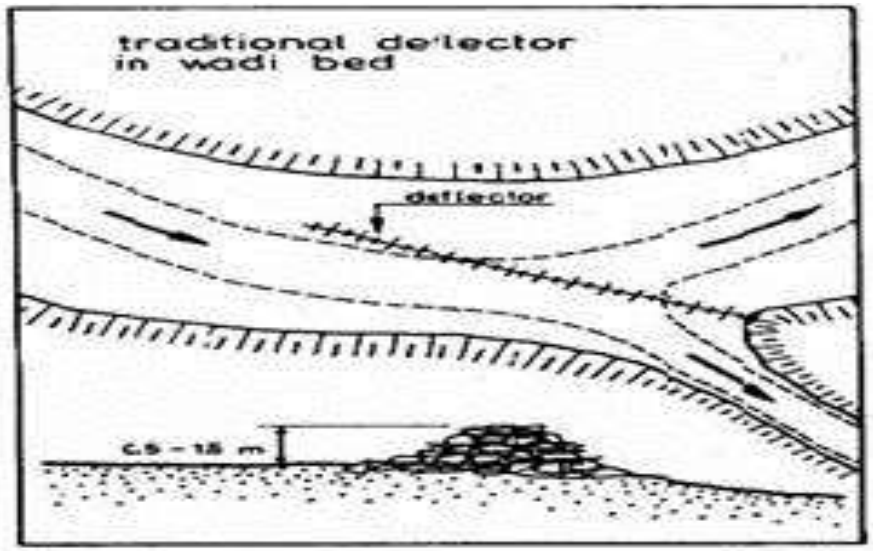
Diversion structures in Wadi Zabid

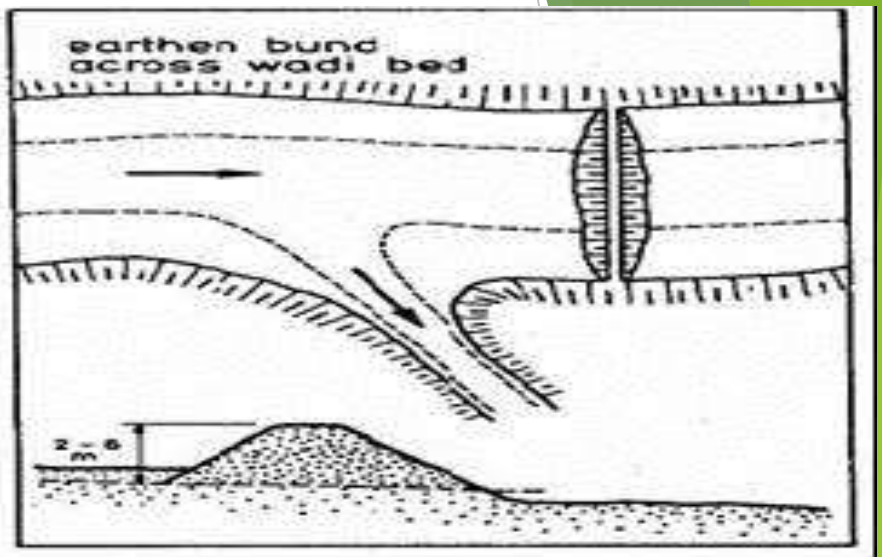

382
378
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2014 GeoEye
Image © 2014 DigitalGlobe
43 m E 1566215 84 m N elev 195 m
Streaming 100%


main canal
main intake
scouring sluice
breaching section
abutment
weir
scouring sluice
main intake
main canal
Figure 3:
schematic layout of diversion structure no. 3 in
wadi zabid

Diversion structures in Wadi Siham

Traditional diversion structures





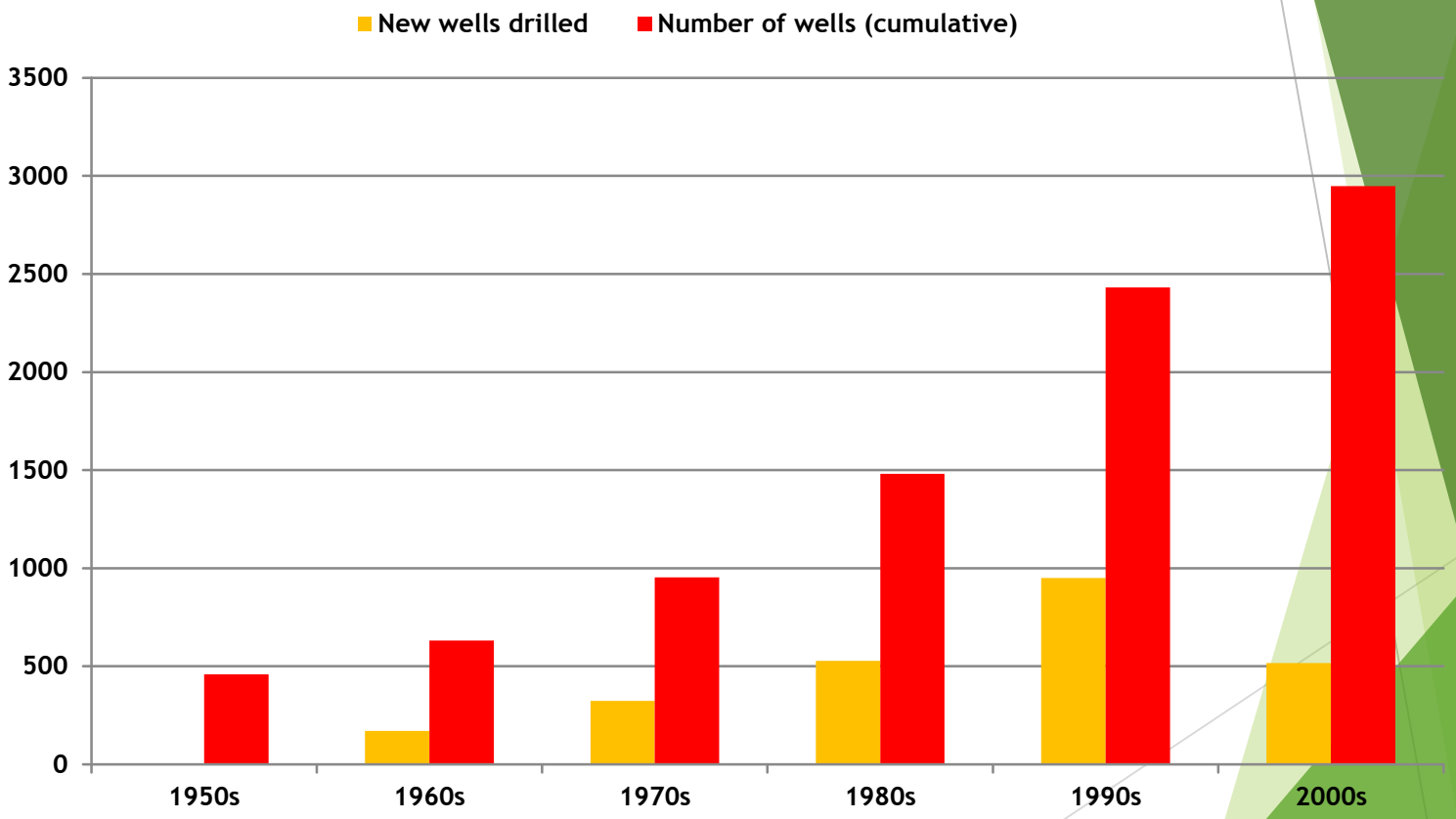
Wadi Zabid

Wadi Baihan

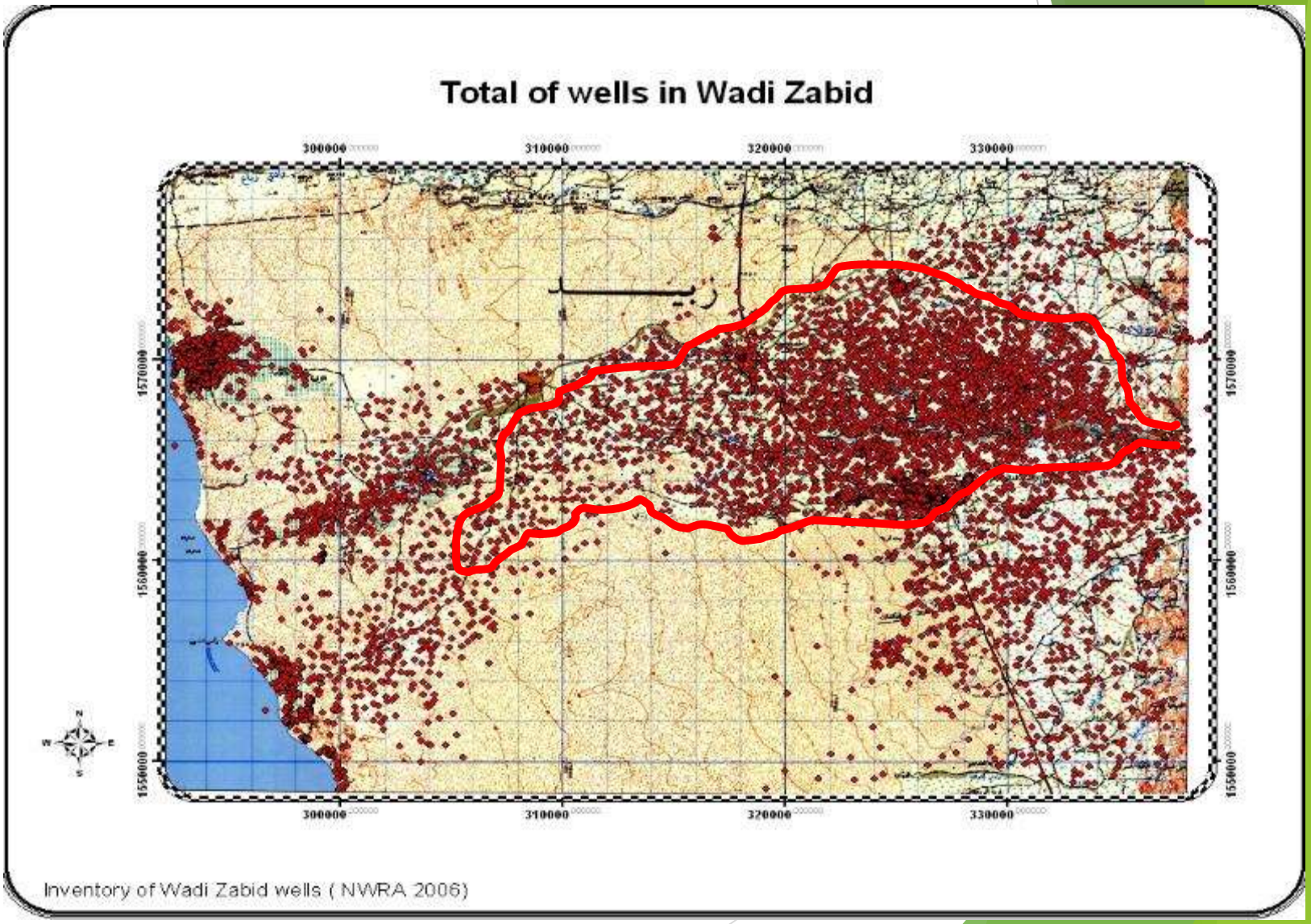
Crop Patterns of FBLS in Yemen

Type of crop	Order	Groundwater irrigation %	Spate water irrigation %
Grains: (Sorghum grains, millet, fodder, maize)	1	20	80
Fruits; (Mango, banana, papaya, melon)	2	80	20
Vegetables; (tomatoes, onion, cucumber, peppers…ect)	3	70	30
Other cash crops; (cotton, tobacco, sesame)	4	90	10

Annual increasing rate of wells number in Wadi Zabid



Total of wells in Wadi Zabid

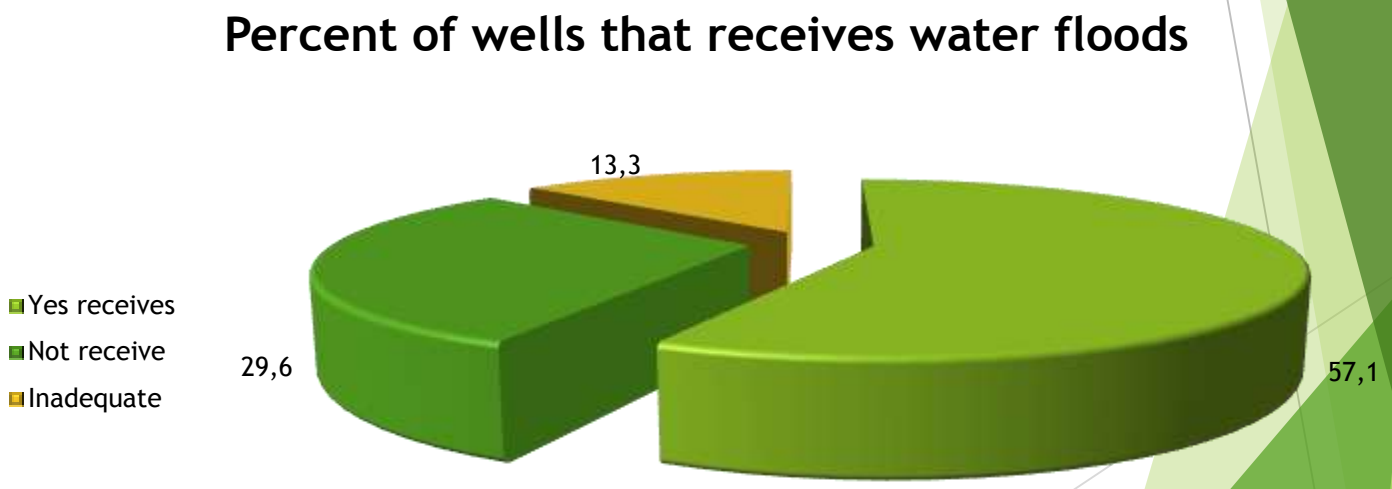


Groundwater Levels (m) in spate irrigated areas - Wadi Zabid

Category of area	Mean	Minimum	Maximum
Upstream	35.78	16.00	61.00
Midstream	32.53	18.00	42.80
Downstream	71.54	43.80	105.00

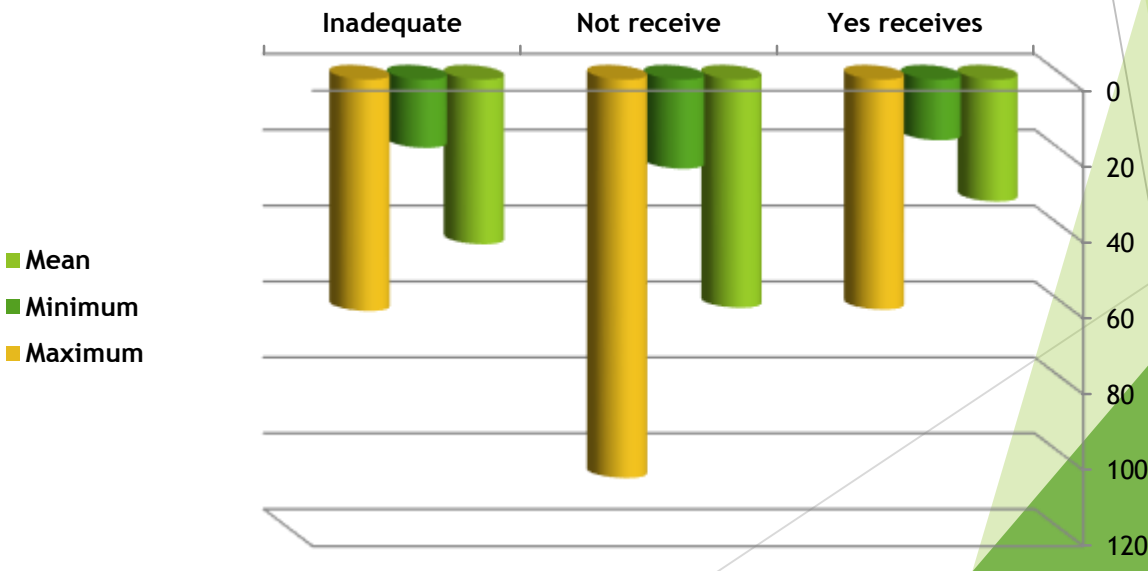
Percent of wells that receives water floods – Wadi Zabid

Water flood	Percent%
Yes receives	57.1
Not receive	29.6
Inadequate	13.3



Water levels in Wells according receiving water floods – Wadi Za

Water level	Mean	Minimum	Maximum
Yes receives	32.12	16	60.6
Not receive	60.13	23.5	105
Inadequate	43.4	18	61



Groundwater abstraction Waid Zabid

Site	Area of banana ha	The amount of water MCM	Area of fodder ha	The amount of water MCM	Area of other crops ha	The amount of water MCM	Total consumption MCM	Ratio of consumption %
Upstream	1,900	109	1,300	15.00	500	6.0	130.0	%45
Midstream	1,700	113	2,600	30.00	1000	11.0	154.0	%53
Downstream	0	0	400	5.00	100	1.0	6.0	%2
Total	3,600	222.0	4,300	50.0	1,600	18.0	290.0	%100

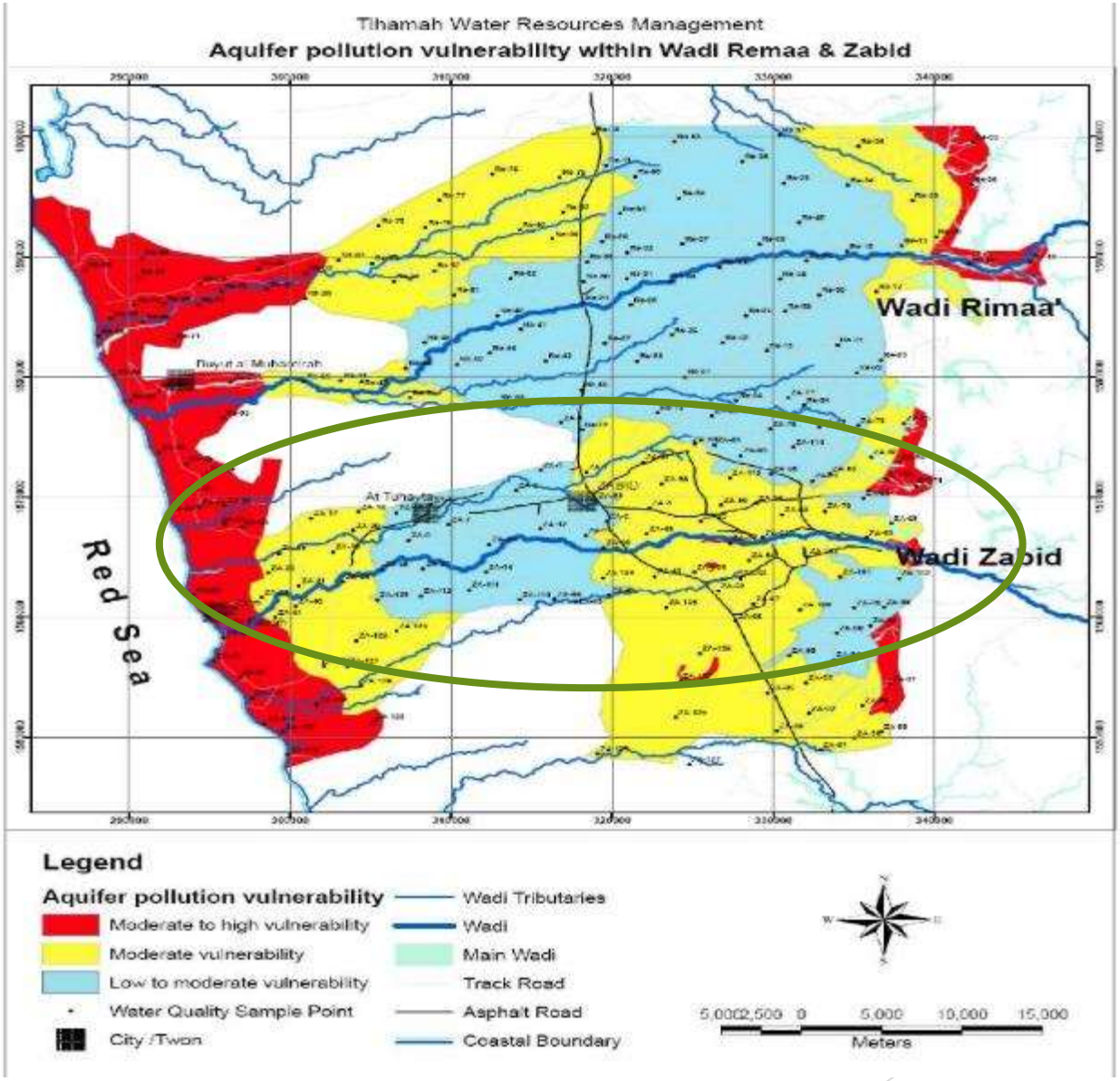
Groundwater consumption for banana crop

- Banana crop consumes about 222 MCM , with 75% of the amount of groundwater extracted.
- Due to the change in the pattern crop (banana) has increased the number of wells drilled in Wadi Zabid of 460 wells at the end of the fifties to about 2950 wells in 2000s, with the annual rate of increase in the number of wells about 0.04.
- There are 2535 wells which are pumped with 86%
- One well covering about 5 ha , which is equivalent to 20 wells per square kilometer

Water balance

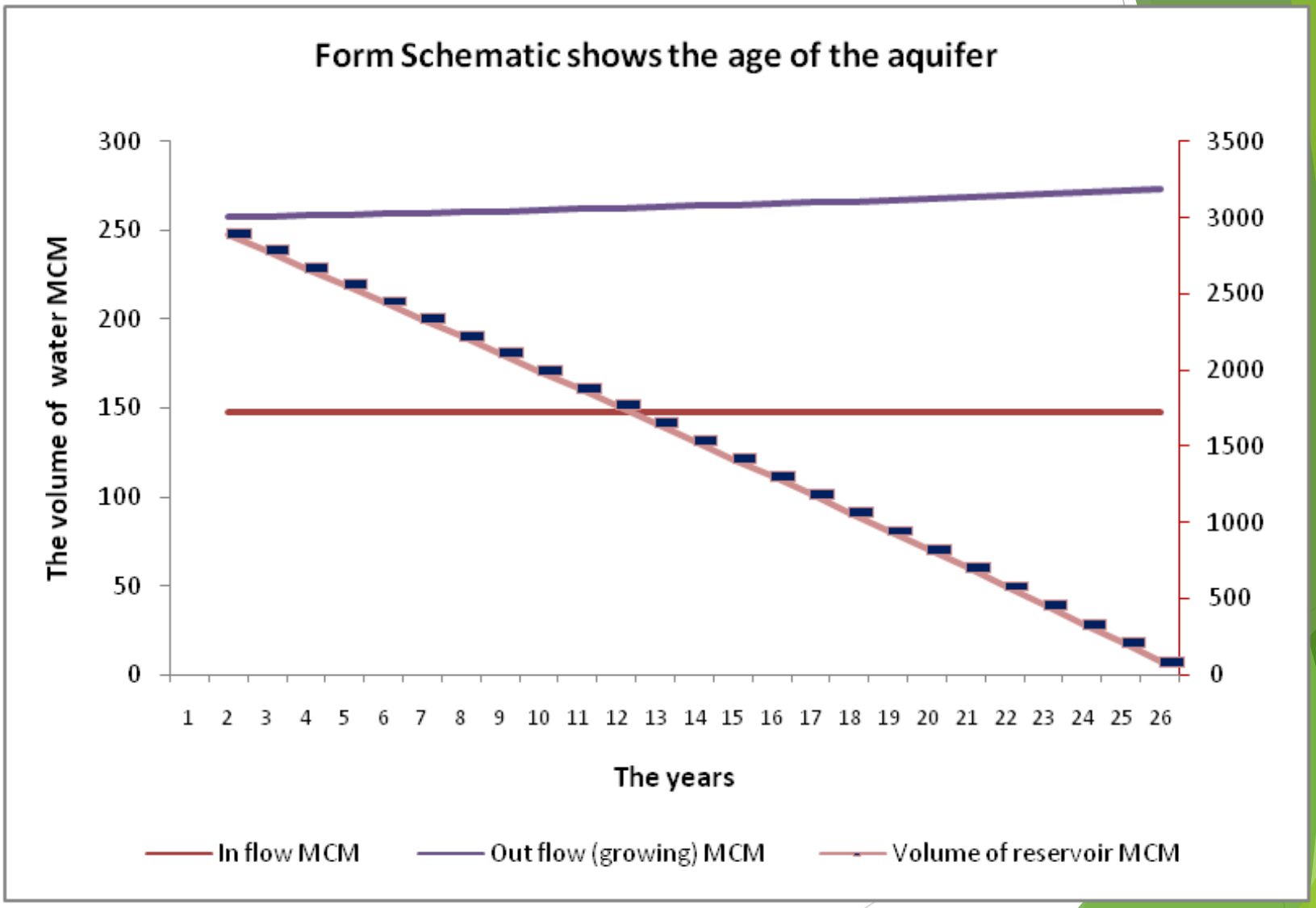
- The total water extracted from the aquifer 290 MCM, and considering that 30% of this extracted water is return to the reservoir in deep leak, the amount of the annual loss from the reservoir is 258 MCM
- Water balance = inflow – outflow
- Water balance = 148 – 258 = -110 MCM
- The annual deficit of the reservoir = -110 MCM

Wadi Zabid Water Quality - NWRA 2009

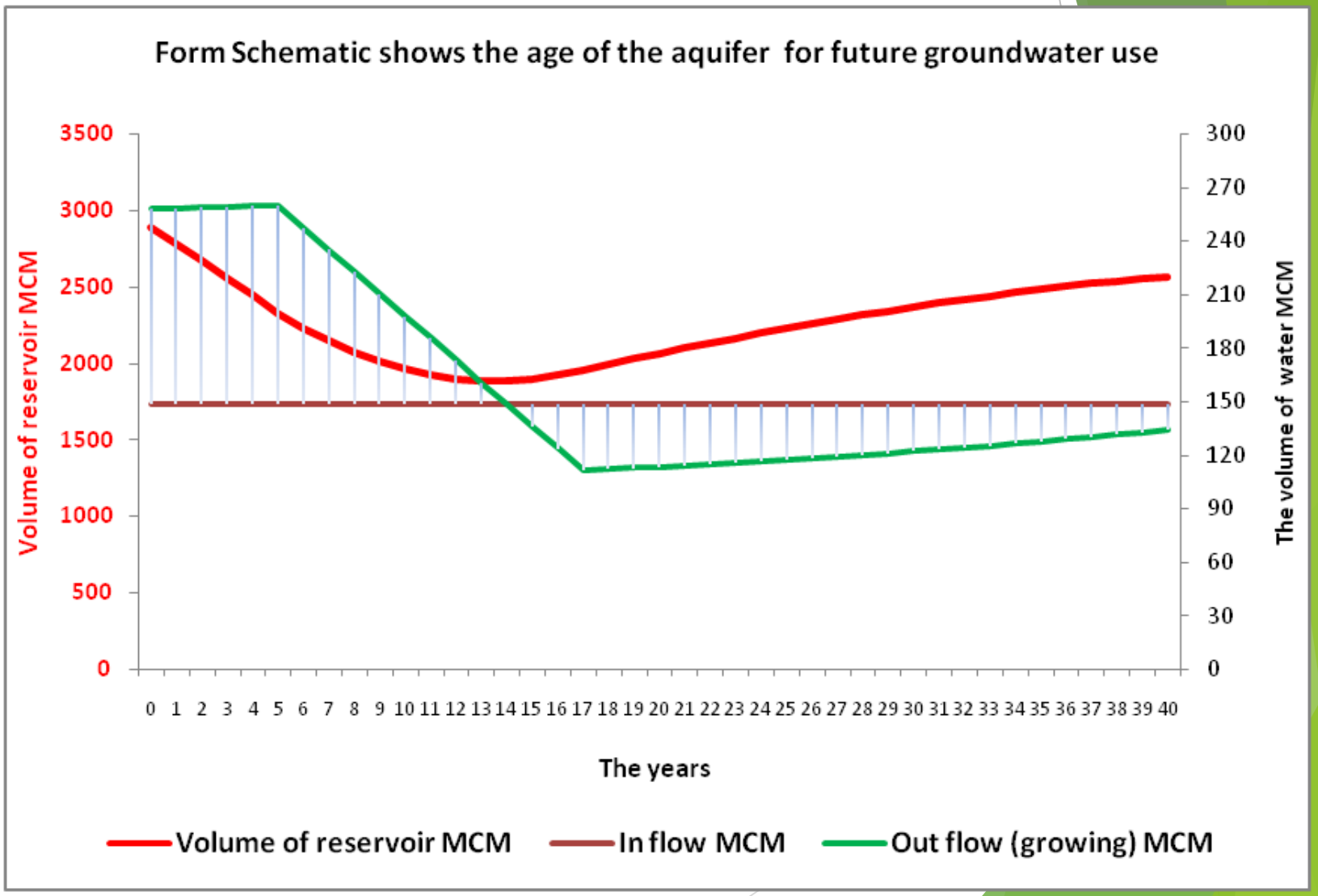


Estimation of groundwater recharge

Study name	Date	Inflow (flood) MCM	Recharge MCM	Recharge (%)
Al-Eryani	1979	230.4	198.2	86%
FAO	1987	140	92	66%
DHV	1988	135	52	37%
IIP	2002	131	96.6	74%
This study	**2013**	**118**	**75.77**	**64%**


Form Schematic shows the age of the aquifer
The volume of water MCM
300
250
200
150
100
50
0
3500
3000
2500
2000
1500
1000
500
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
The years
In flow MCM
Out flow (growing) MCM
Volume of reservoir MCM

Achieve access to water balance - Wadi Zabid



Impact of recharge on supplementary irrigation crops in Wadi Zabid

Downstream

Midstream

Upstream

The present situation

- The most of works carried out by related authorities has been stopped as a result of the war and political conflicts.
- Deterioration of canals because the sedimentations and harmful trees.
- Many beneficiaries of floods have been prevented their share of irrigation due to damaged canals.
- Deterioration of groundwater resources in most of Yemeni's Wadis

War impacts

Destroying the private and governmental buildings and infrastructure by airstrikes of Saudia Arabia

War impacts

Destroying the private and governmental buildings and infrastructure by airstrikes of Saudia Arabia

Headquarters of the Tihama Development Authority, destroyed by aerial strikes

Remains of the building and storage facilities of National Program fpr Irrigation Unite, after aistrike- Hodeidah

The locomotive workshop of the Tihama Development Authority in Hodeida was also destroyed by airstrikes

The damages of canals

FBLN partners in Yemen

Local Councils

WUAs

NWRA


Gender & Development Expert
Sana'a University


WEC Future Trends
In Water Resources Management

Future Version of FBLN in Yemen

- Enabling the farmers to changing the wrong practices in water management
- Increasing the agricultural productivity
- Creating a good communication between the farmers and professionals on local, regional and international level
- Rising the awareness between the farmers about importance of water resources sustainability

Thank you