

Expected Impact of Climate Change on Population and Livelihood in Arid and Semi Arid Areas: Case Studies from Palestine

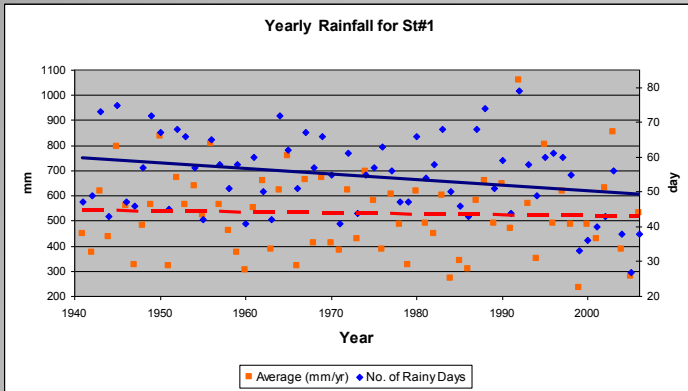
اثر التغير المناخي على سبل العيش المستدام في فلسطين



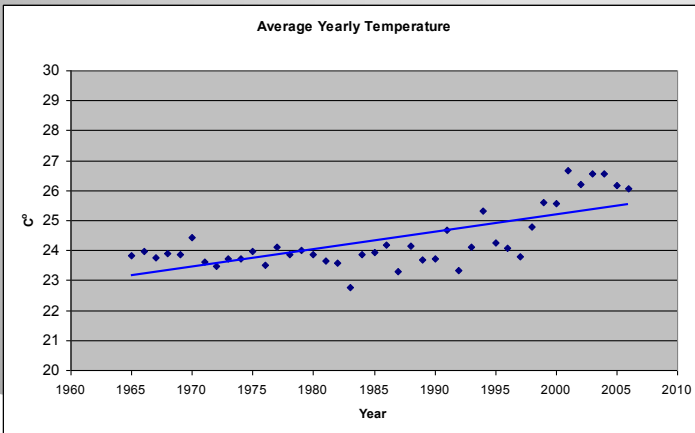
Palestinian Hydrology Group
Palestine
may2016

Water Problem in Palestine

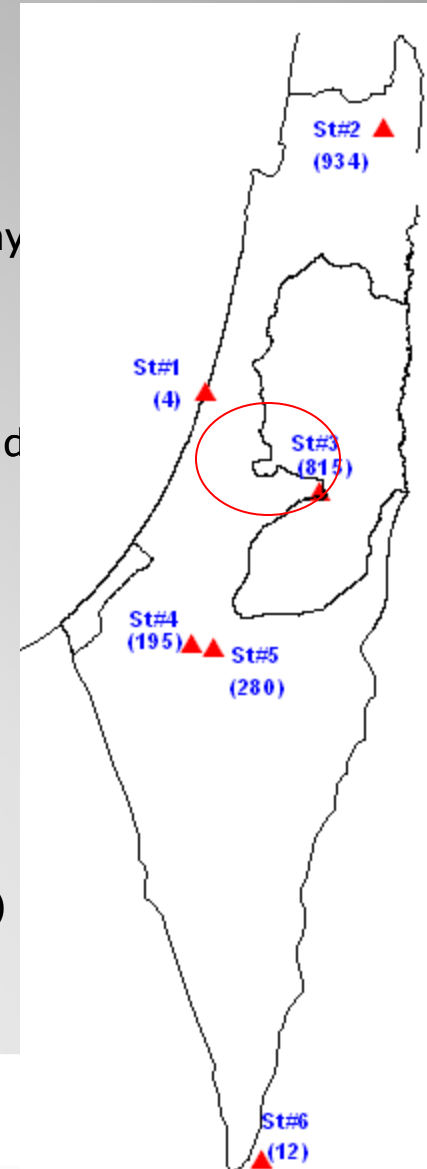
- Palestine is a **semi-arid** area with very limited water resources. مناطق شبه جافة ومصادر مياه محدودة.
- Additional stress on water resources:
 - **Growth rate** is one of the highest worldwide; 3.06% in West Bank and 3.7% in Gaza while world average is 1.14%. نسبة نمو سكاني عالية.
 - **Political conflict**; destruction or pollution of water resources in addition to limited accessibility. وضع سياسي صعب اثر على المصادر وساعد في زيادة التلوث.
 - Potential impact of **climate change** معرضين كباقي العالم للتاثر من التغير المناخي

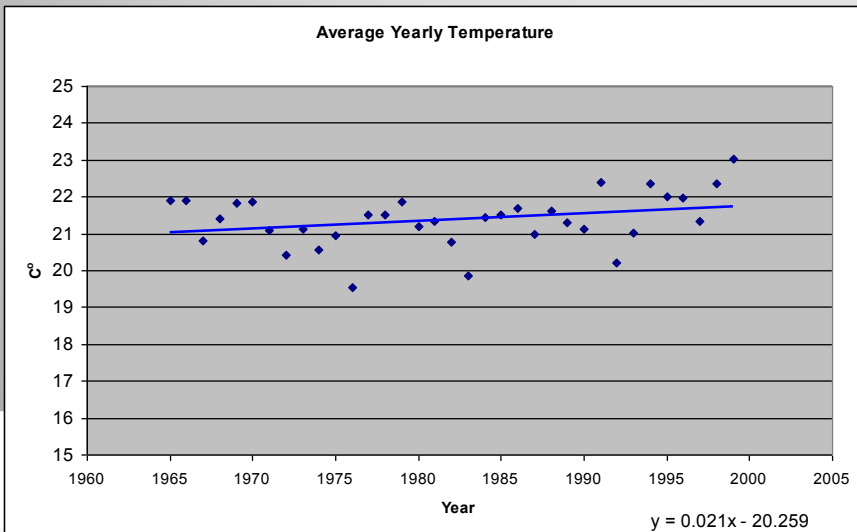
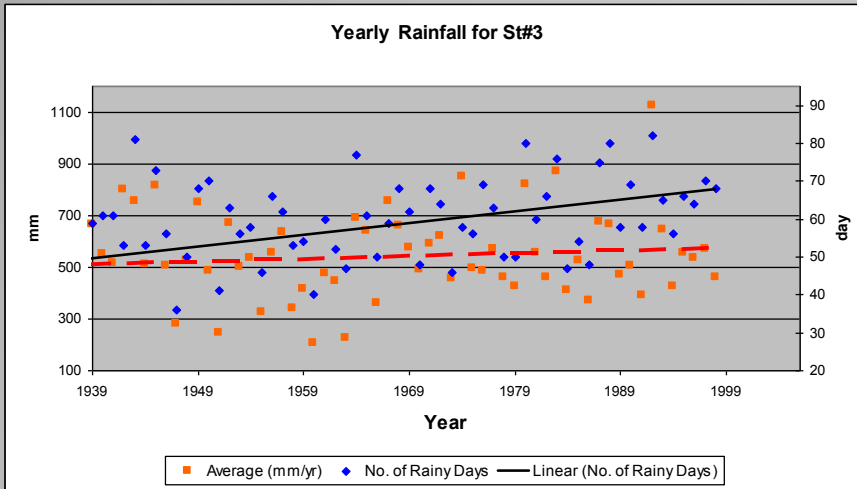


- Period: 65 years
- Mean annual average rainfall= 526 mm/yr
- Mean annual average rainy days= 60 days
- Change in rainfall trend = -22.4 mm (decrease)
- Change in rainy days trend = -10 days (decrease)



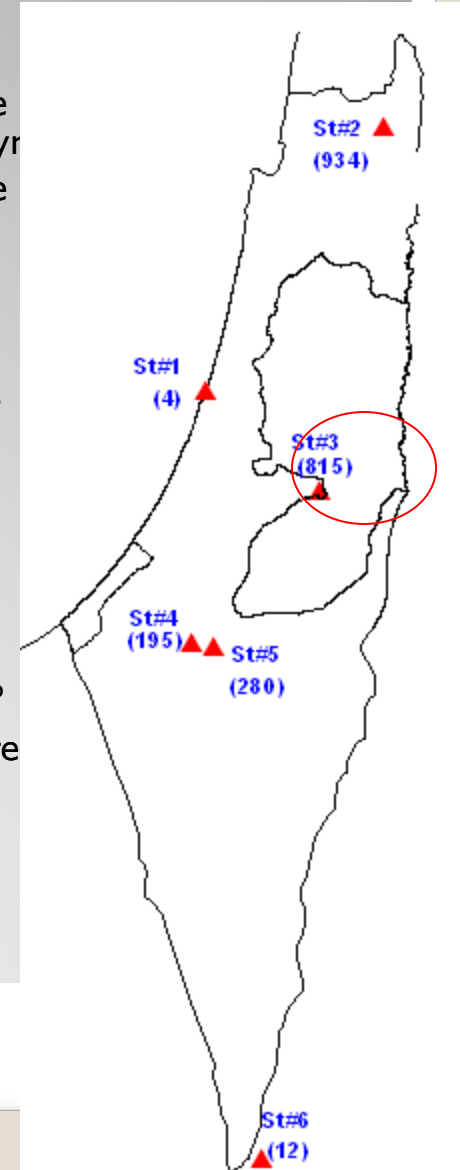
- Period: 41 years
- Mean annual average temperature= 24.3 C°
- Change in temperature trend= 2.3 C° (increase)



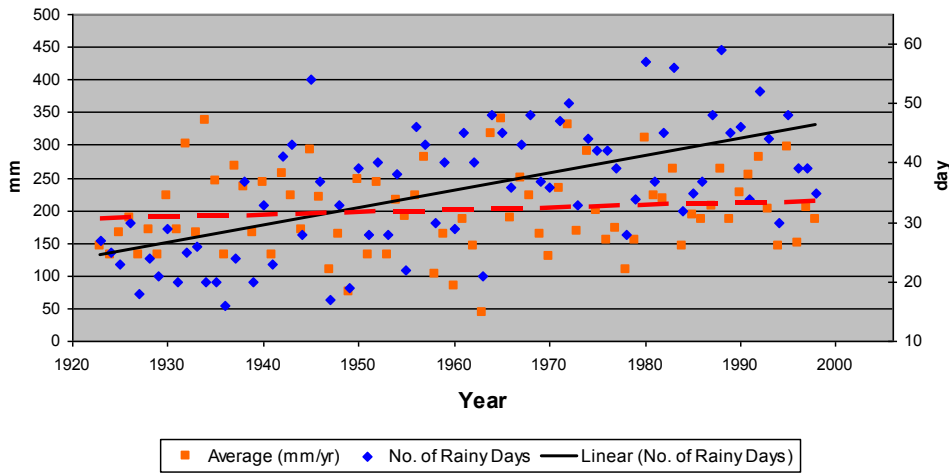


- Period: 97 years
- Mean annual average rainfall= 522.7 mm/yr
- Mean annual average rainy days= 54 days
- Change in rainfall trend= 106 mm (increase)
- Change in rainy days trend= 30 days (increase)

- Period: 34 years
- Mean annual average temperature= 21.4 C°
- Change in temperature trend= 0.7 C° (increase)

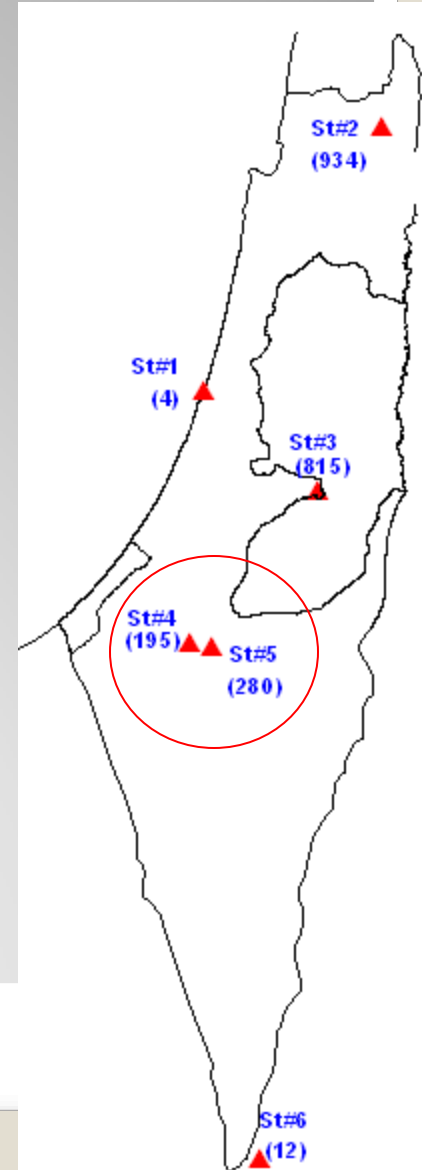
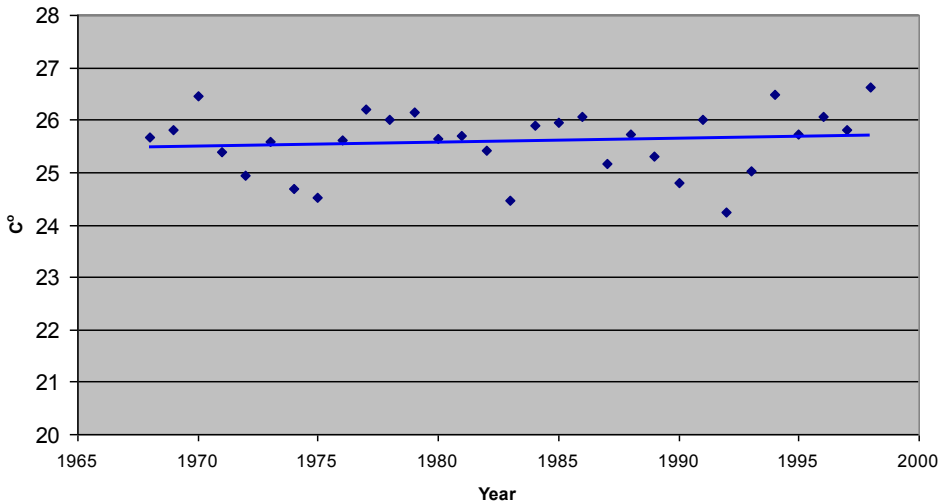


Yearly Rainfall for St#4



- Period: 75 years
- Mean annual average rainfall= 198.5 mm/yr
- Mean annual average rainy days= 35 days
- Change in rainfall trend= 28 mm (increase)
- Change in rainy days trend= 22 days (increase)
- Period: 30 years
- Mean annual average temperature= 25.6 C°
- Change in temperature trend= 0.2 C° (increase)

Average Yearly Temperature



Temperature & Precipitation Trend Analysis

تحليل التغير في درجات الحرارة وكميات تساقط الامطار

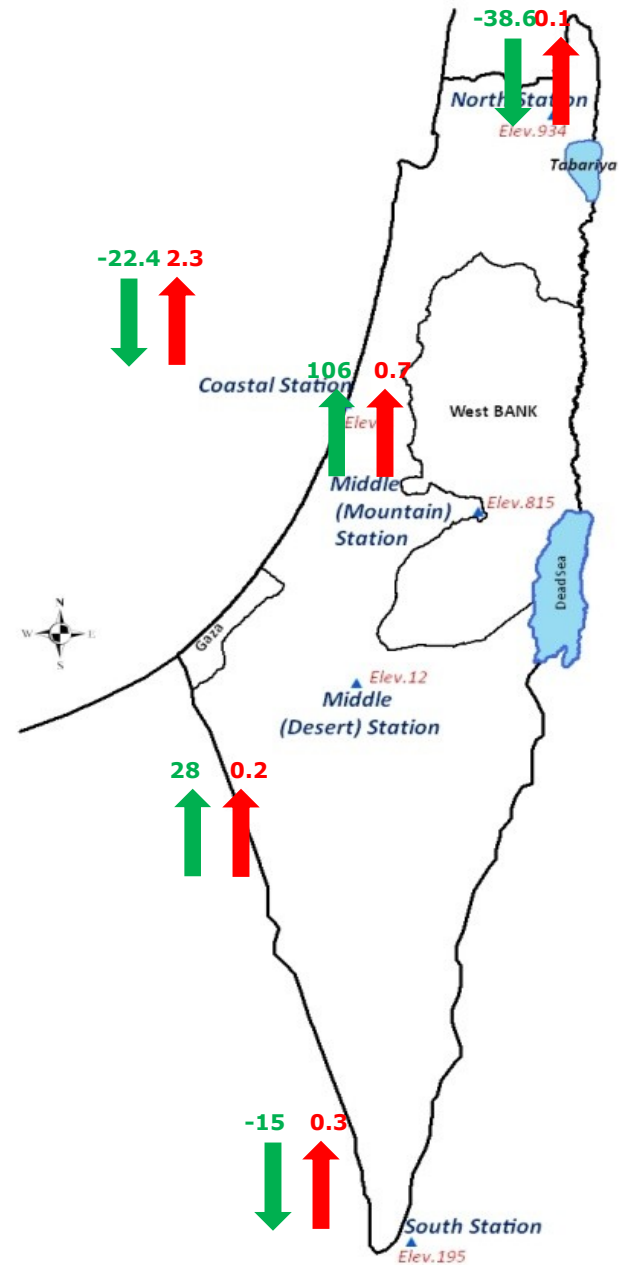
Where;



Refers to Temperature change in °C



Refers to Precipitation change in mm



Vulnerability of Main Sectors to

Climate Change القطاعات الأكثر تعرضاً للتأثر بالتغير المناخي

- Greater intensity and frequency of droughts will impact
- تكرار فصول الجفاف
-rangelands مراعي
-rain-fed cropland زراعة
بعلية

This can contribute to -
- water shortage نقص مياه
-land deterioration تدهور
الاراضي
-biodiversity loss فقدان
التنوع الحيوي
- desertification التصحر

Sector	Vulnerability Level	
	Very High	Moderate
Food	X	
Water Resources	X	
Human Health	X	
Land Degradation	X	
Biodiversity		X

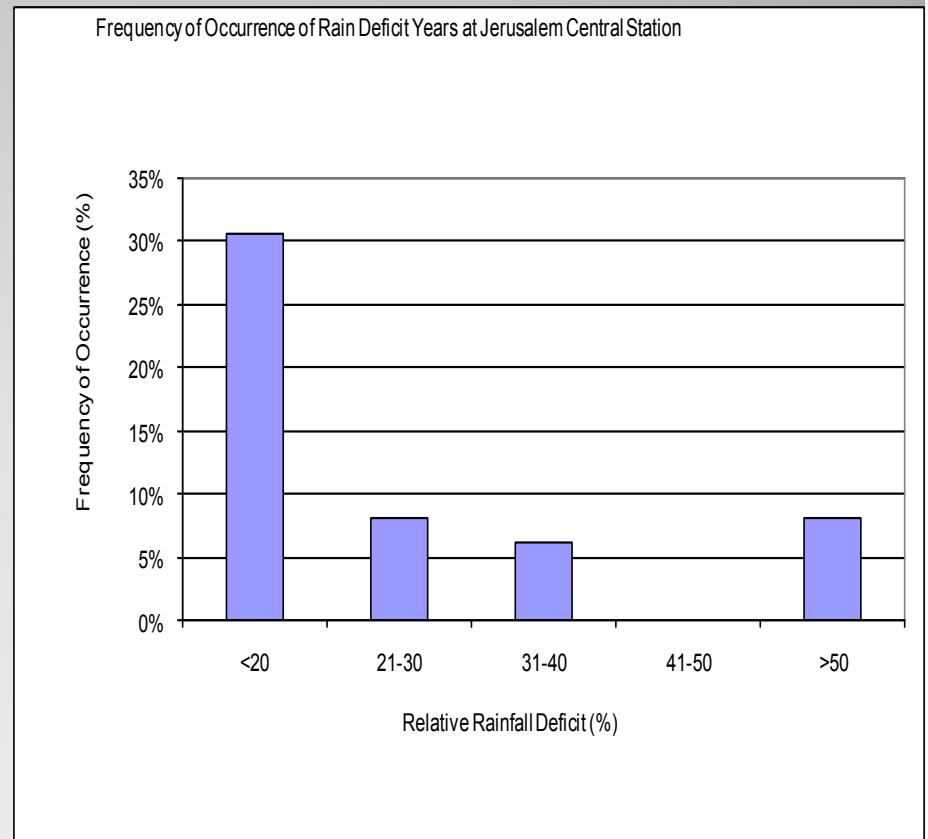
Water Supply & Demand in West Bank

Year	Supply (MCM/year)	Demand (MCM/year)			Deficit (MCM/year)
		Municipal	Industrial	Agricultural	
2005	159	135	11	168	155
2010	159	156	25	190	212
2015	159	181	30	208	260

- Agriculture is the biggest consumer of water.
- Supply is assumed to be constant over the years.
- Water demand is estimated based on population growth

Drought Phenomena ظاهرة الجفاف

- The frequency and duration of drought in the region is not fixed over time.
- The time between two occurrences of drought can be described as random variable.



Case Study Areas

- Both areas are characterized by an arid and semi arid nature.
- The area of case study 1 is mainly cultivated with irrigated agriculture (citrus, dates and vegetables) and is a plain area that lies as low as 200 m below sea level
- The area of case study 2 is hilly with steep slopes with elevations up to 800 m ASL. Most of the area in case study 2 is not cultivated and considered as range land used mainly for grazing while some parts are classified as nature reserves.



Case
Study
1

Case
Study

Jericho District Socio-economic profile

- 17% of HH income is used to purchase water
- 71% of population is less than 30 years
- 15% of population immigrate seasonally
- Unemployment lowest in WB at 9.1% (PCBS, 2008)

Impact on Crop Water Requirement based on temperature parameter

	T+1°C	T+2°C	T+3°C
CWR change rate	2.7%	5.4%	8%

Impact on Crop Water Requirement based on precipitation parameter

	P-20%	P-10%	P	P+10%	P+ 20%
Change rate %	5.53	1.47	0.00	-1.44	-2.84.

Irrigation Water Demand Under Hypothetical

Climate Change Scenarios الطلب على المياه للري بناء على فرضيات التغير المناخي المحتملة

Deficits:

	T	T+1	T+2	T+3
P-20%	1.104	1.685	2.285	2.881
P-10%	0.294	0.877	1.469	2.065
P	0.00	0.581	1.172	1.763
P+10%	-0.286	0.291	0.880	1.470
P+20%	-0.566	0.010	0.596	1.181

As T & P decrease , IWR deficits increase

•Values are expressed in MCM/Year

Policy Recommendations: case study one

- Further efforts needed to **improve the predictions** of future irrigation water requirement for agriculture in Palestine; studies that consider the climate change impact on rain-fed and greenhouses agriculture and studies to cover the whole agricultural areas in Palestine. تحسين وتطوير ومراجعة طرق التنبؤ باحتياجات المياه للري ، البعلية والمروية
- Climate change should be addressed in **water resources management and planning**, for development of future water resources in Palestine, as one of the factors affecting water supply and demand. اخذ بعين الاعتبار التغير المناخي في ادارة مصادر المياه
- **Adaptation measure** should be considered to cope with climate change potential impacts on water demand and supply. وضع مؤشرات تكيف للتخفيف من الاثر على الحاجة والتزود بالمياه

Case Study 2:

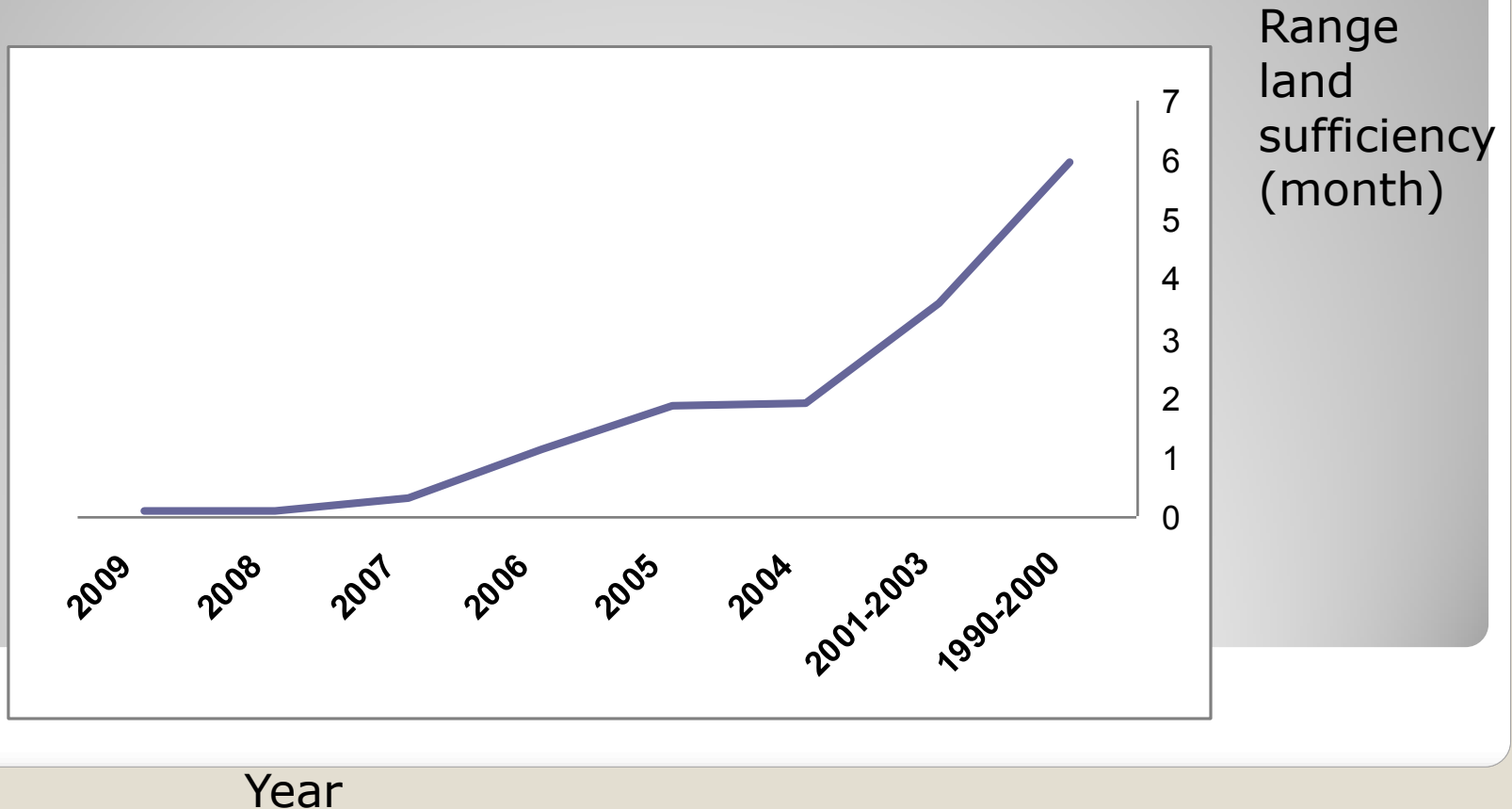
Socio-economic Profile

- Daily per capita income is <0.8\$
- Poverty Rate is 22.5%
- Average family size is 8.6 and 76% is young
- Almost 74% of people rely on Livestock
- Population Growth is 3.3%
- Unemployment rate 24% (vs 15.6 in north)
- 40-50% of HH income goes for food
- 21% of HH income goes to purchase water
- Cultivated field crops are 66% ,25% and 9% barley ,wheat and legumes respectively
- Unconnected to electrical , water or sanitation networks hence electrical generators, water tankers and cesspits and septic tanks.

Impact of the successive drought

اثر فصول الجفاف المتتالية

- Deterioration and retrogression of rangeland productivity تراجع و تدهور انتاجية المراعي



Range Land Deterioration

تدهور المراعي

- Lack of field crops seeds نقص البذور
- Extinction of some grass species فقدان اصناف من الاعشاب
- Overgrazing رعي جائر
- More purchase of animal feed شراء اعلاف

Impact on livestock- main source of income

- Increased livestock mortality rate with 10% at least
زيادة نسبة نفوق الماشية
- Decrease the quantities of the produced milk with 48%
انخفاض انتاجية الحليب
- Delaying the breeding season for one month at least
تاخر فترة الارضاع لشهر واحد على الاقل
- Increase the demand of the water consumption since there's the lack of the grasses and relying in the grains feedings
زيادة استهلاك المياه للشرب بسبب اكل الاعلاف بدل العشب
- Reduction in the flock sizes – livestock sold to afford buying water tankers
زيادة الاقبال على بيع الماشية لتغطية نفقات شراء المياه

Socio-economic impacts

- Outbreak of certain diseases- 32% live in concrete houses only, rest in tents or metal roof shelters. انتشار امراض ، 32 بالمئة يعيشون في بيوت من الباطون والباقي في خيام وبيوت صفيح
- Less water collected and Increased water costs اقل كمية مطر يتم جمعها و زيادة سعر المياه المشتراه
- Internal Migration reaches 40% in some communities هجرة داخلية 40%
- Social instability عدم توفر استقرار اجتماعي ونفسي
- Reduction in percentage of population relying on raising livestock انخفاض نسبة المعتمدين على تربية الماشية
- Change in profession-shift from farming تغيير المهن
- Less expenditure on basics affecting household nutritional levels. تغير انماط الصرف على المتطلبات الاساسية.

Policy Recommendations

- It is important to re-assess the potential water resources (ground and surface) and consider the new change in the precipitation and temperature. اعادة حساب التزود بالمياه و الحاجة مع الاخذ يعين الاعتبار التغير المناخي
- Adopt more appropriate plans to eliminate internal migration from the vulnerable areas, invest in infrastructure, health and education services as well as WATSAN services. وضع خطط لتخفيض الهجرة الداخلية من توجيه الاستثمار في الصحة ، البنية التحتية ، ..
- Develop an alternative plan for both irrigated agriculture as well as dry land farming. More drought resisting varieties, less water requiring crops, etc. تطوير الانماط الزراعية
- Develop plans to regenerate the grazing areas and to maintain the current pattern of land use in those areas. تطوير المراعي
- Develop appropriate means to increase the water availability and accessibility to the vulnerable areas, mainly storage of surface water. زيادة فرص توفير المياه للمناطق المهمشة.

- PWA in cooperation with NGOs and Civil society put effort on finding a strategy in order to mitigate impact of CC and they found matrixes include adaptation measures on different sectors , have been partially accomplished and still work need to be done particularly :
 - Put a realistic plans
 - Finding source of funds
 - Fair and equitable agreement to control implementation of all proposed measures with out any political aggressive obstacles from the occupation side.

Thank you