

## **Assessing the influence of climate change on cereal crop water requirements and productivity in Dahamar area**

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### ***Background***

- Yemen is particularly vulnerable to climate change and variability impacts because of its current high levels of water stress. The region has no perennial surface water runoff, and is practically dependent on the use of groundwater.
- Agriculture is the main stay in Yemeni Economy, hence making it adaptive to any potential climate variability is important.
- There are some observations amongst climate change models that the rainfall is becoming more erratic in occurrence and amount as a result crop production planning becomes more important.
- Models have mentioned that the temperature by 2050 will be raised more than 2° c (World Bank, 2010) so researches about its effects of agriculture must be done.

### ***Objectives***

#### ***Main objective:***

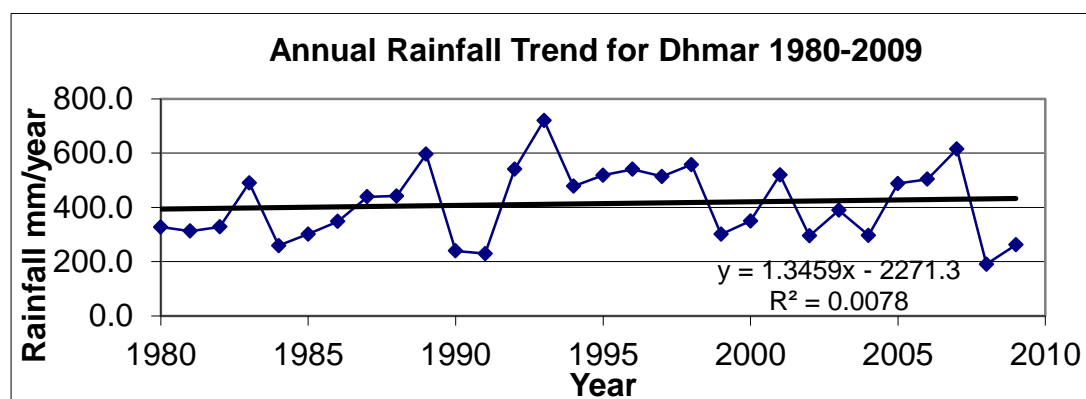
The overall objective is to determine the potential impacts of climate change on field cereal water requirements and yield and to recognize suitable adaptation methods which could be applied in Dahamar and similar areas .

#### ***Sub objectives:***

1. To determine what climate data are available and which climate change studies has been done in the study area
2. To determine the direction of change in climate factors ( temperature, precipitation, humidity, evaporation ).
3. To assess the effects of the climate change factors related to cereal production ( maize, millet, sorghum and wheat ) and its relation to food security and water consumption.
4. To assess the signs of awareness of farmers to climate change effects on their in the study area.
5. To determine the adaptive actions that could be done under this climate change conditions.

## Research findings

The annual rainfall trend line shows a weak increasing trend in the total analyzed period, although changes are different for each month (the direction of change is fluctuated).

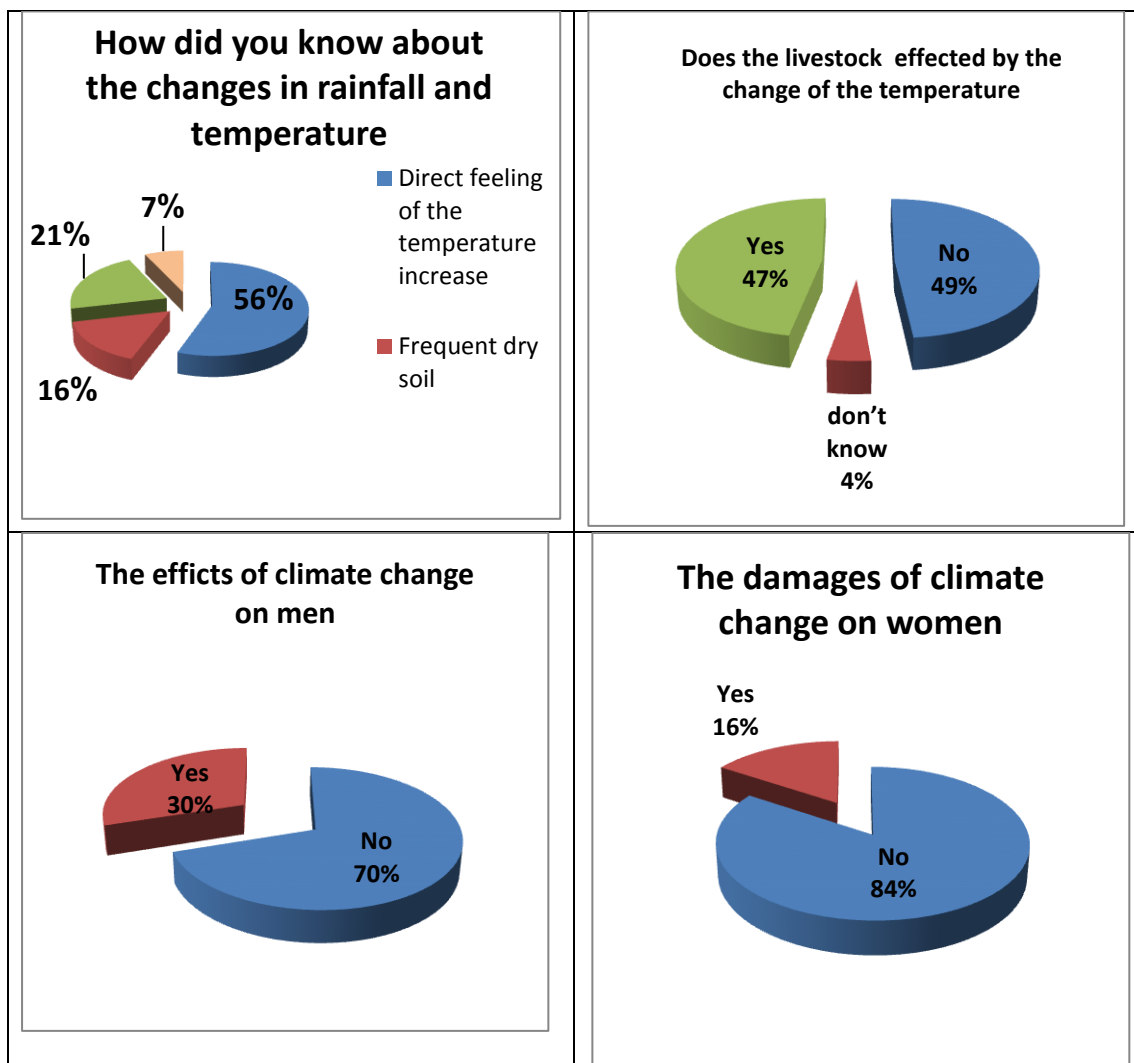


The average changes in the minimum temperature, evapotranspiration and rainfall during the period (1999-2013) calculated by: every year value minus the value of the first year in the period time series after that averages was taken ( see table below )

the result is that the minimum temperature increased by 0.1 during the fifteen years, the evapotranspiration decreased by-137.4 and the rainfall increased by 37.2

year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
mini tem	7.5	7.7	7.4	8.1	7.1	6.4	4.9	7.7	7.8	7.1	8.5	6.9	8.5	8.7	8	7.5
Av change	0.1	0.3	0.0	0.7	-0.3	-1.0	-2.5	0.3	0.4	-0.3	1.1	-0.5	1.1	1.3	0.6	0.1
ET (mm-y)	1813	1792	1574	1566	1609	1481	1216	1198	1326	1323	1355	1256	1328	1394	1314	1436.3
Av change	238.9	218.2	0.0	-7.9	35.7	-92.6	358.0	376.2	248.2	250.3	218.3	317.7	245.7	179.3	259.7	-137.4
R (mmly)	194.0	276.3	375.9	194.7	328.0	339.5	664.2	578.0	747	315	237.6	641.0	387.8	427.2	490.1	413.1
Av change	181.9	-99.6	0.0	181.2	-47.9	-36.4	288.3	202.1	371.1	-60.9	138.3	265.1	11.9	51.3	114.2	37.2

Although, majority of the people observed the increasing of temperature and rainfall variability from their expediencies, some of our people have little information concerning the basic causes of climate change and how climate change will affect the whole systems from food insecurity to risk of shortage of water and good health

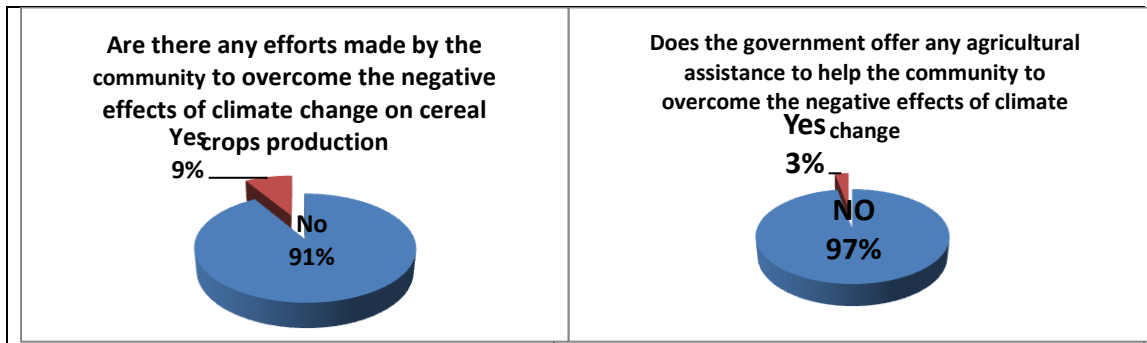


All crops are not affected equally by climate change. Crops such as wheat and maize are highly affected and other crops like millet, which resist high temperature and low levels of water may be less affected. Also, the cereal crops productivity trends of five crops : wheat, maize, sorghum, millet and barley during the time series from 1985 to 2011, shows a negative variation in wheat and barley productivity. The growth season of wheat and barley starts in mid-February and ends in May. The monthly trends during the same months shows a negative variation in rainfall

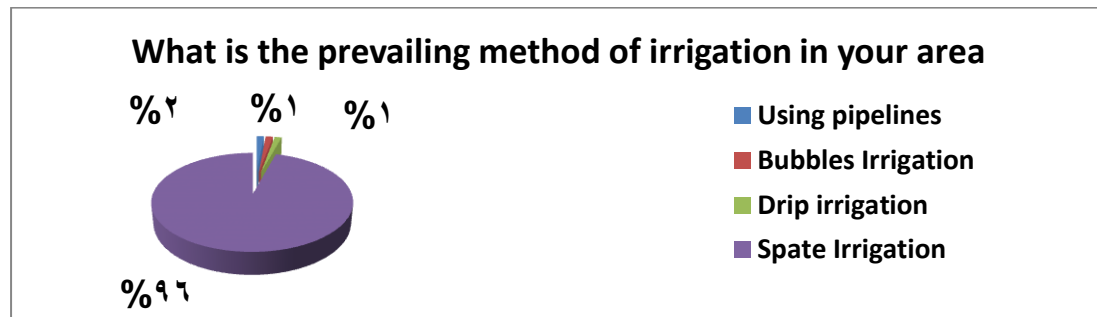
For maize, sorghum and millet Production trends shows a positive variation. The growth season of them starts in mid-June and ends in September. The monthly trends show a positive variation in rainfall during the same months.

Farmers were not very aware about the barriers and needs for adaptations actions

There aren't any adaptations actions applied either from the community or the government side.

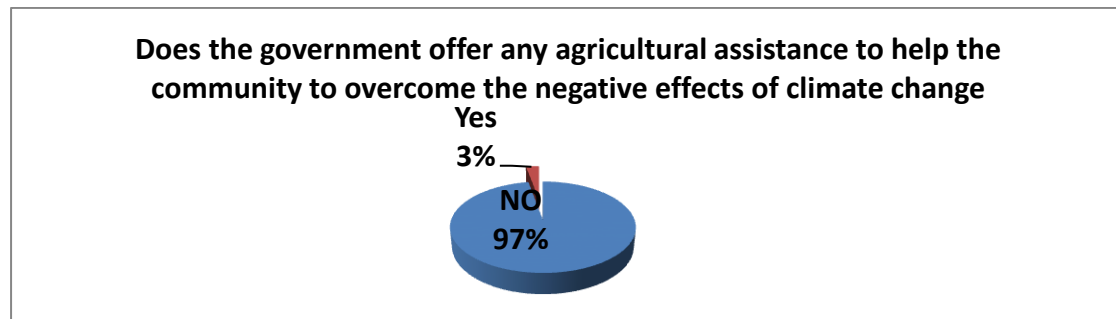


Farmers low education level & lack of awareness leads to less use of irrigation technologies and the most are using the traditional irrigation way which causes more water scarcity

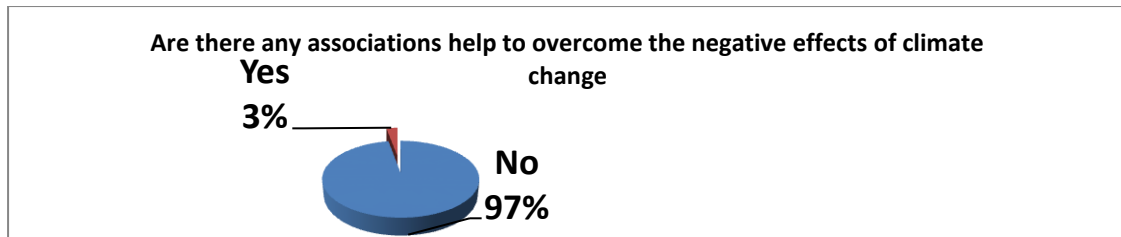


Weakness in water law applications and only there is tradition and customs use

There is an absence of institutions role in regard to climate change awareness.



Almost no water use associations were found in the studied area



### ***Conclusions:***

- The annual rainfall trend line shows a weak increasing trend in the total analyzed period, although changes are different for each month (the direction of change is fluctuated).
- The result of assessment proved that there is weakness in farmers awareness regarding the effects of climate change on agriculture activities although majority of farmers observed the increasing of temperature and rainfall variability from their long term observation.
- It appears that the effects of climate change on crop production in Dhamar varies from crop to crop as example crop yield for wheat reduced slightly and for barley reduced with high amounts which refer that effect of climate change vary from crop to crop.
- The research study proved that the local community of Dhamar has no enough awareness on action plans that could be applied to overcome the negative effects of climate change on agricultural activities to release adaptation of the community within the changes occurred in climate.
- The intervention of governmental sectors to relief the negative impacts of climate change on agriculture activities had been started several years in delay because of the weakness of economic situation in the state in general, that caused low capacity of governmental sectors to plan and implement required actions to adapt the agricultural community face of the negative effects of climate change. Therefore most of farmers found that there is absence of governmental institutions role regarding to rising climate change awareness.
- There are obstacles face transferring of modern agricultural technics to Dhamar farmers. As most of farmers are at low education level and have dought on effectiveness of modern agricultural technics, most of them are afraid to transfer their agricultural process from traditional to modern technics.
- The un capability of governmental sectors on implementing the water low lead to increase the un security of water situation in Yemen. As excessive of groundwater use in agriculture activities threaten the groundwater reservoir of Yemen and increase the number of aquifers under critical situation with time.

## ***Recommendation:***

Action plan for adapting the agricultural activities to overcome the negative effects of climate change on production of cereal crops in Dhamar:

- Increase farmers awareness on importance of modern agricultural technics on reducing of groundwater (as green houses, drip irrigation, fertigation and plastic mulching).
- Transfer all diesel subsidy to subsidize modern agricultural techniques and make it available for simple farmers to own it.
- Improve agricultural processes as using of improved seeds which has less sensitivity to water stress and provide high yield quantity and quality.
- Improve traditional water harvesting technics to be adopted with effects of climate change ( flood and drought) such as storage dams, diversion dams and ponds.
- Development of rain-fed areas with adaptation of rain fed-crops.