

**Clean  
Rivers  
Trust**

Charity Registration No. 1037414

**QAT**  
(*Catha edulis*);

**CHEWING WHILE A NATION  
THIRSTS.**

**An Enquiry into Aspects of Growing the  
Shrub and its Relationship to the Water  
Supply of Yemen.**

Harvey Wood.

2010

## Information.

Published by Clean Rivers Trust.

72 Appletongate Newark Nottinghamshire NG24 1LR UK.

Clean Rivers Trust is a Registered Charity; Number 1037414.

Printed on ecologically sound and sourced paper, using ecologically sound inks and bindings.

Printed 2010.

The first in a series celebrating 20 years of research and making waves.

Notes.

*Catha edulis* or Qat.

This plant has a large number (41 at the last count) of regional, ethnic and slang names including; Khaad, Khat and Kat, for the purposes of standardisation it will be known in this work by its Latin or by the Yemeni; Qat.

Qat and Coffee

Qat has been blamed for the decline in the production of coffee (Coffee Arabica), also a non native species which is believed to have been introduced into the country from Ethiopia in the 15<sup>th</sup> century; no mention is made in Yemeni literature of coffee before that date. Coffee grows between 700 and 2600 metres along the whole Escarpment region, few major areas of production now exist: Jafariyah region of Jabal Raymah, the slopes above Hillah on Jabal Bura' and Jabal Safan in the Haraz region. The other areas of significance are the wadis such as Dabab near Taiz, the Udayn wadis, Wadi Suknah and Wadi La'ah. These latter do not receive the mists but the plants receive irrigation for at least part of the year.

Incidentally it was from the port of Mukha that coffee was shipped to Constantinople, then the capital of the Turkish Empire, and from there the customs of coffee drinking spread across the world. It also gave its name to 'mocha'.

Law.

Qat is legal to grow, sell and consume in Yemen and United Kingdom.

## Contents

page

4	Introduction.
5	Catha edulis.
6	Yemen.
7	History and Culture.
8	Climate.
8	Qat.
8	At Home.
9	Medical.
10	Agriculture.
14	End Piece.
15	Bibliography.

## Illustrations.

6	Sana'a skyline.
7	Sabaeen tablet commemorating the digging of a well. The Bayhan Museum.
9	Qat at a wedding.
10	Vine decoration from the time of Sheba. Sana'a National Museum.
13	Terraced landscape near Dhamar.
15	Map of ancient Southern Arabia.
16	Qat, Catha edulis.

## **Introduction**

This enquiry into the subject of Qat, properly known as *Catha edulis* came about because of the publicity regarding the problems of water supply that was affecting the Republic of Yemen in 2008/9 and the huge issues of civil strife, relocation of the capital, Sana'a, the issues of wealth and agricultural shortfall all were making headlines in the international press. The Yemen usually makes the headlines only when some terrorist event takes place, nothing much is really known of this remarkable and underestimated country. It is one of the founding centres of civilisation, one of the most pivotal centres of industry, engineering, arts and culture; it was a leader in the development of agriculture and at the forefront of developing a scientific approach to potable water supply that many countries still strive to achieve. This mastery of civilised life was flowering 2500 years ago and made the country a prize that every country wanted to control for the millennia since. The problem of lack of water has now been dropped by the worlds media and international attention is now focused on oil slicks in the Gulf of Mexico and volcanic dust clouds from Iceland; but the problems of Yemen and its water supply's dwindling reserves has not gone away.

During initial trawls of the internet, to begin research into the water shortage issue, one major subject appeared to hold a key: Qat is not the Holy Grail, but it has an important role in the question and at the same time it must play one in the answer(s). As such it must be accommodated within the structures that may form a solution.

I am grateful to several Yemenis who have given me time and information to help me to reach a modest understanding of this plant. It certainly has a number of powerful proponents and has the potential to create huge wealth. This is an important element of a conundrum in what is a fiscally poor country.

This work is not a call for aid; it is an outline produced with no particular moral view point or political agenda, other than that the population and the Republic needs for adequate water to develop and slake its thirst.

Medical opinions have been considered and theological views have been sought though both areas of thought diverge on theoretical and practical lines. In medical literature there are reported case-studies that are more journalistic than scientific.

The whole country is the study area; Sana'a as capital and the uplands of its High Plateau region are a main focus, as information is more readily available, particularly with regard to agricultural issues, including Qat production and water supply.

### **Catha edulis.**

*Catha edulis* is a slow growing woody unarmed shrub or tree, its branches are rounded. It grows to between two and five metres in height. Foliage is shiny leathery green leaves; elliptic, oblong or obovate, the blade between 3 and 10 mm long, darker green above, paler beneath and its almost unnoticeable flowers which are bi-sexual, are small, 2-3mm across and coloured yellow white. The flowers' fronds are pendulous in nature and can be numerous if the shrub has not been heavily harvested for its new growth.

Qat was, it would appear, introduced into Yemen in the 15<sup>th</sup> century from Ethiopia; this is surmised due to its absence in local literature before the 16<sup>th</sup> century. By the 18<sup>th</sup> century its cultivation was common across the whole Escarpment west of Sana'a High Plateau region. At that time it would have been grown to satisfy local markets, only fresh leaves have the right properties to satisfy the effects desired.

With the development of easy and fast transport the sprigs of Qat leaves are moved as any other commodity and it is available across the whole country. Great care is taken of the harvested young shoots, which are traditionally wrapped in a mature leaf, or leaves, to protect them in transport.

Today Qat is grown on land between 1000 and 2700 metres wherever rainfall is sufficient and or generous irrigation is possible. Particularly famous areas of production include Jebel Sabir above Taiz and the Mahabishah region; though many users have their own particular favoured region. On the High Plateau and in the Mashriq the rainfall and mists allow for much to be grown. At lower altitudes and more arid conditions Qat is grown widely using irrigation, without which, it could not prosper. The shrub is commonly grown alongside coffee, around the capital and the valleys of the area such as Bani Hushaysh. Qat is grown commercially as far east as Al Bayda' and Harib. Beyond these points its cultivation is more sporadic due to the lower rainfall and semi-arid conditions.

## Yemen.

Yemen is one of the oldest and cultured countries in the world renowned for its culture, art, architecture, engineering, painting, I need not go on. It is also one of the newest countries of the world being a confederation of two states that have had poor relations between them for many years. This has thankfully ceased and the country is proud of its modernism and ability to put forward radical principles of design many of which are at the cutting edge of global taste and fashion.

The country has a population estimated as around 15,000,000 people, and a land area of 205,356 square miles of which only about 7% is suitable for agricultural use. The capital Sana'a is the largest city with other major towns and cities including Taizz, Al Hudaydah, Ibb, Adan and Amran.

The exports of the country are oil and derivatives; some specially quarried stone is also exported. The oil, which has supported much of the costs of the country, particularly during the costly healing processes at unification in 1990, and throughout the transitional problems, is now running out. The need to encourage new or nascent industries and the exploitation of the rich mineral resources can allow for the future economic development and create stability for the Yemeni people.

Sadly it is true that in 2010 the country is not conducive to any tourist ventures that would have economic value to the nation. The government states that this is being rectified.

At this same time the country has found that is on the verge of running out of water. (*The next in this series of briefings will look in more detail at these issues.*)

picture

Sana'a Skyline.

## History and Culture.

The Yemeni people have a rich history and a still spirited and vibrant culture as already touched on earlier. In this short section which avoids the issues of gold, frankincense and myrrh, as for all three the country has always been famous. This section looks at the culture and history of the Sheba, Saba and other ancient influences on water and agriculture.

Strabo the Greek historian of the 1<sup>st</sup> century BC wrote of the Yemeni (they possess) ‘a great quantity of articles wrought in gold and silver, couches, tripods, basins, drinking vessels, to which must be added the costly magnificence of their dwellings, for the doors, walls and roofs are variegated with inlaid ivory, gold, silver and precious stones.’ These were the Sabaeans and Gerraeans. Strabo also noted that these peoples did not need to import any food from outside their country, yet the agricultural systems of irrigation relied only on rainfall which appears to have been less than today; there were no permanent rivers of note to exploit. Water storage methods of the period are still not fully understood or how the great Ma’rib Dam 610 metres wide which deflected water from the mountains above and directed it to irrigate over 1,600 hectares was realised.

These peoples also channelled water underground by subterranean canals to fields great distances away from the water source; demonstrating knowledge of evaporation loss not today much considered. The reservoirs that were built around this period are still admired by water engineers. These remarkable feats of hydrological prowess were in many instances several hundred years old when they were reported by Strabo. The traditional cross slope ploughing was another legacy which is another visible reminder of today's inheritance.

The present is a mirror of the past; the glass does need buffing a bit but there is much that can be gained in reconsidering the above.

Sabaeans Tablet  
Commemorating  
the Digging of a  
Well. The Bayhan  
Museum.

Picture

## **Climate.**

The Yemeni climate is extremely varied, from mist drenched hill country to desert, coastal wetlands banking the large volumes of rainfall from the mountains to dry wadis in the rain shadow of the mountains.

Yemen's five rainy months of March, April, May, and July and August, are all are monsoon fed downpours which fall on the central and southern mountains, monsoon rains also fall on areas of the al-Mahra region.

The desert areas around Tihama are exceedingly hot and dry in winter and hotter in summer with temperatures reaching 50C.

## **Qat.**

This herb has many proponents; also a growing number of detractors.

Internally Yemeni land owners, who grow wealthy year on year as the consumption increases, would have much to loose if land reverted to cereal production; or even grapes. Many small farmers who lease land would be similarly disadvantaged. The population in these rural areas would also suffer as the plant can be cropped upto five times a year and would find wages decline from little to less.

The government at local and national levels are in a 'cleft stick' where it, would be a great relief if much less was needed to be grown as the nation's water shortage of around 40% equates neatly with the same number being the percentage used to husband this crop. Any reduction would be received with enthusiasm; though 70% of the population enjoy both the effects of using it and at the same time the social interaction of talk, debate and relaxation.

## **At Home.**

Qat consumption is a social occasion even if enjoyed every day. The adults will gather drinking coffee talking and chewing the leaves from the growing tips of the plant. There are drawbacks in that the cost of Qat increases and the custom continues, many families should cut back their consumption, certainly before 1/3 of an individual's or family's income is spent with the



Qat seller, (traditionally female), who is just one in a line of production and supply as with any crop or product.

## Picture

It is also an important aspect of large social gatherings such as weddings, (as above in 1983, the location of which is unknown).

### **Medical.**

There are several medical papers and other writings that attempt to say how bad Qat is for the habitual user: impotence, increased sperm count, constipation, lethargy, wakefulness, mental health and personality changes are all claimed. It has been noted as having caused optical atrophy and laziness; though you have to chew for a fair while to get any effect. In the West the street cultures of Britain and the US do not use it as a 'drug of choice'.

Some medical journalists have given it a poor reputation as a blood curdling horror story, one when US troops were killed in Somalia and their corpses dragged through the streets. This horror was carried out 'by Qat chewing maniacs brought to a bloody climax by this narcotic.' This is not the reality.

There is no serious science that shows this natural product will do anyone too much harm in moderation. It, in reality, may be different in extreme use or if chemically altered. That is no part of this short paper.

## Agriculture.

As has been made clear in the preceding section, Qat is widely grown across the uplands of Yemen. This section considers Qat's role in the national agricultural regime: its importance as a cash crop and a brake on national security of food supply; its thirst and the methods used to satisfy that need. The rural areas of the Sana'a plain on the High Plateau are home to around 50% of the region's population, which up till the 1990s was considered to have sufficient water for day to day needs. This was gathered mainly from shallow hand dug wells. Some of these are however of immense size and depth, the same ones (or similar) to those in use at the time of Sheba.

The traditional agricultural regime of terracing of the land to allow harvesting of rainwater, channelling of flood / storm water so that it is not lost and the storage of the same, the complex structuring of channels and terraces allow for the irrigation of the crops of the region.

With the development of the large groundwater resources that started to be developed in the late 1990s, such as the Twailah aquifer the traditional methods as described were considered to have been superseded. The aquifers appeared to allow for a profligate use of water, on ground previously not used before.

The largest, and most financially valuable, crops in the region are Qat and grape vines. These two crops amount to 48% and 27% of the land that has access to groundwater-irrigated land that surrounds the capital, amounting to around 20,000 hectares (in 2004) and continually expanding in area.

## Picture

Vine decoration from the time of Sheba. Sana'a, National Museum.

This growth in production in the area is due to an expansion of the urban population. This increase is fuelled by migrants from both urban and rural communities from across the country. Much of this has been funded by Yemeni working away; sending large, by local standards, sums of money back to their families. This migration to the capital has fuelled demand for all agricultural produce which inevitably encourages the expanded production of the high value crops. This increasing market also drives up the prices of the staples of life including vegetables and grain. This need has to be achieved without any increase of natural rainfall (with global warming this is likely to decrease markedly). The lack of sustainable water has further increased the need for further new groundwater sources to be identified and exploited.

Sana'a the capital and its growing urban population, has risen from less than 1,000,000 people fifteen years ago; to now (2010) in the region of 2,000,000 and is forecast to rise to 4,000,000 in 2025. This population is being encouraged by the globalisation of the media to require a more water hungry domestic life style. (This is not an option, it is the perceived right that for every one who requires goods and services, as others do around the world, should have these 'necessities' available). This need is being mirrored in the rural areas; that need though is not so much lifestyle, but for more water to irrigate the crops that are require to satisfy the urban population's growing needs. The higher the crop's value the better for the farmers (and even more so for the middlemen and the controllers of the land that is farmed). The government has found this a difficult conundrum, and, realising that the majority of the population are poorly paid and live close to the national poverty line, have intervened by subsidizing cereal importation; this though has been a two headed serpent with the capability of biting back: the production of cereals has declined markedly and the Qat, grape and vegetable production has increased. Two reasons are apparent for this. Firstly the cereal staples of life are at present kept at an artificially lower price so allowing for more and greater individual expenditure on non essentials, but desirable commodities. Secondly there is more leisure time for urban dwellers which further develops the requirement for non-essential produce. The bight in the tail for the government is that as an urban expanding population gets used to the artificially low price of staple commodities it gibes at any increase at all; the world market where these necessities are sourced is always prone to fluctuation and seldom does the price decline.

This growing market is requiring more and more water, also fertilisers (which can damage the shallow aquifers). This ever increasing demand for water is to the detriment of the rural dweller. The farmers do still grow cereals but usually only for the sustaining of the local populations in the countryside, the urban dweller relying on foods brought in from abroad.

The figures for water use and the recharge of these deeper aquifers do not make for happy reading. The newly developed aquifers are accessing pure water at depths that signify that it fell as rain and percolated through the surrounding strata several hundreds of years ago.

Figures put forward by Mohamed Al-Hamdi (2000) regarding the Tawilar aquifer are worth quoting verbatim; 'Within the Sana'a basin area all water needs are being satisfied from groundwater resources particularly from the Tawilah aquifer. As of 1995, the extensive groundwater withdrawal has resulted in a deficit of around 120Mm<sup>3</sup>/a or 300% of the total natural recharge. The deficit is being satisfied from fossil storage, which is estimated to be in the order of 3,220Mm<sup>3</sup>. Assuming a moderate deficit of only 100M<sup>3</sup>/a and a constant abstraction rate, it is clear that the total usable storage would be depleted within 32 years. Recognising that groundwater overdraft has been taking place since the 1970s, it can be concluded that groundwater in the basin is expected to run dry within the coming few years.'

A short news item published in the Yemen Times in February 2010 announced that a new aquifer had been opened up and that the quantities of water that were available should be so large that it would last the area for 30 years. This find was near Marib.

This statement is not over pessimistic and today this is being realised as a threat not just to the area agriculturally, but to the basic fabric of the country. All the aquifers have been developed; there is consideration of recycling of used water within the capital, at the same time this used water is being found infiltrating some of the shallow wells in the city itself affecting its use and desirability.

The need for unpolluted drinking and cooking water has developed a major business opportunity, that of the water seller, no longer a churn or other small container but large tankers that are filled up as many times a day as the

tanker is emptied. These retailers mainly take on water from shallow wells on the edge of the city.

## Picture

Terraced landscape near Dhamar.

It is though not all doom and gloom. In Sana'a there is good quality water that is delivered to people's homes via the mains water supply infrastructure; the population covered is not great. This supply is managed by National Water and Sanitation Authority (NWSA). There is still a growing need for an extensive development of the public supply of water. This can allow some form of control on urban water use. The NWSA is also now developing sewage treatment facility, in the past sanitation had been on a dry waste route where the effluent was used as solid fertilizer, there is now a slurry disposal problem in that though it can be used for liquid plant nutrient there is the risk of contamination of more shallow aquifers.

The agricultural focus on Qat is not that which is needed in Yemen: it is though the reality of the country. Life for the majority of the population revolves round the regular chewing sessions that are in many instances a daily social occasion.

One major concern that has not been expressed in the media or by academics is that, regarding over-pumping of both shallow and deep aquifers. This can have the effect of concentrating natural salts or encouraging saline intrusion of the aquifers rendering them of little or no use. This has been seen else

where in the world, most notably in the US and Australia. In both countries many thousands of acres are no longer able to be farmed and are contaminated beyond any economic future.

In March 2010 it was reported on several web news sites that two farmers had stopped growing Qat and had turned their farms over to growing 'food crops'. They farmed land in the region of Dhamar The local authorities were pleased with this act, however it is rather difficult to see the financial draw for the farmers' altruism and the story left many more questions that need to be addressed. The farmers stated that they had done this of 'their own will'.

### **End Piece.**

The purpose of this paper is to put down the basic information of Catha edulis and its relationship with the Yemeni water crisis and the agricultural framework that exists in the country today. There are areas that have not been covered: Islamic Law and the politics of water are exceedingly difficult to research from a distance.

The findings have been unexpected in part, some have been couched in such a way as to allow further work in this area to be carried out.

Qat is no doubt a factor in the water shortage, but the country has overcome major problems before and come out of them stronger. There is much that will be said in the next paper which, when read together will allow some theories to start to come to the fore.

The problems all cut across the heart of Yemeni society and will ask questions that may be hard or hurtful to answer. That though is for the next paper to reveal.

Dr Harvey Wood FRSA, FGS.

## **Bibliography.**

### The Internet.

Wikipedia, The on-line Encyclopaedia.  
Aljazeera English TV as appearing on Face Book.  
Aljazeera Web Site.  
The Yemen Times.  
BBC and other News Websites.

### Traditional Books, Papers and Journal Articles.

Thulin, *Flora of Somalia*, Royal Botanic Gardens, Kew 1999.  
*Arabian Peninsula*, Time Life Books, Amsterdam 1985.  
McLaughlin, *Yemen*, Bradt 2009.  
Wood and Haig-Thomas, *a Handbook of the Yemen Flora*. Royal Botanic Gardens, Kew 1997.  
Mohamed I Al-Hamdi, *Competition for Scarce Groundwater in the Sana'a Plain, Yemen*, AA Balkema, Rotterdam 2000.  
Handley, *Water Stress, Some Symptoms and Causes*, Ashgate 2001.  
St John Simpson, *Queen of Sheba, Treasures from Ancient Yemen*, British Museum 2002.  
Girgihah, Maktari, Sattar, Mohammed, Abbas and Shoubihi, *Wadi Development for Agriculture in PDR Yemen*. 1987.  
Al-Kirshi and Abbas, *Protected Agriculture in the Yemen*, 2000.  
*Agriculture and Food – Yemen*, Earth Trends 2003.  
Csato, *Extensional Tectonics and Salt Structures, Marib-Shabwa Basin*, 2005.  
Warttig, *the Edenic Pishon Riveris Wadi Bishah*, 2008.

*Yemen Mining*, the Economist Intelligence Unit 2010.  
*Mining Yemen*, M Bendi Information Services 2010.  
Naff, *Islamic Law and the Politics of Water*, Springer 2009.  
*Yemen Zinc*, Entrepreneur 2010.  
*Constitution of the Republic of Yemen*, 1990.  
*Yemen's Water Crisis*, British-Yemeni Society 2005.  
Milich and Al-Sabbry, *the Rational Peasant, vs Sustainable Livelihoods*, @1996.  
*Khat*. US Drug Agency 2009.  
Roper, *The Presumed Neurotoxic Effects of Catha Edulis* BMJ, Br Journal of Ophthalmology 1986. Al-Thobhani, Sathyanarayana, Simon and Sondur, *First Genotypic Study on Khat Geotypes from Yemen*, Russian Journal of Plant Science 2008.  
Horodotus, *The Histories*, Oxford 1998.