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AAINews

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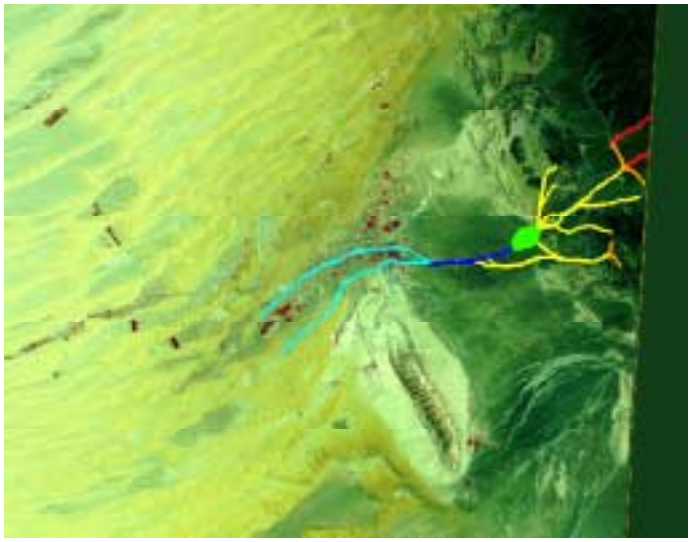
How wadis in Al Ain are formed



Many bridges can be seen in Al Ain, an inland city of the United Arab Emirates. There is no permanent flow under the bridges, just barren land comparatively well-endowed with plant life. Only after heavy rainfalls does water fill these dry river beds, which are known by local people as "wadi". Wadis are mainly seen in and around mountain areas, because it is in the mountains that heavy rainfalls create flash floods that rush downhill scouring out watercourses. No matter how much rain falls in the middle of large deserts, all water is swiftly and steadily absorbed into the sands. No flash floods occur here to wipe away the dunes. So, why are there bridges, some as long as 70 m, in Al Ain? After all, Al Ain is some 40 km away from the nearest mountain areas.

Broadly speaking wadis fall into two categories - there are the wadis that occur in mountain areas and then in downstream areas there are the wadis that occur in alluvial fans. In mountain areas, if there is a large amount of rainfall, even in a very small area, wadis are very prone to flash floods (refer to the red lines in the picture). In many cases, the water flowing in mountain wadis is absorbed into the wadi beds before reaching alluvial fans, and, comparatively speaking, it is rare for wadis in alluvial fans to bear any water. However, if a certain amount of rainfall prevails over large areas, by the time the wadi beds in the alluvial fans become waterlogged, the rainwater that fell in the mountains races down through the alluvial fans (see orange line in the picture). Reaching the alluvial fans, some wadis join together and water flow increases until it reaches the top of alluvial fans (see yellow line). There are various water sources for the wadis that run through Al Ain but all flows join at a point some 20 km away from the town , where a lake is swiftly formed (green patch on picture). From the lake, the muddy water flows, at speed, into Al Ain (light blue line on picture). In the case of the flash flood that occurred on March 11, 1996, for example, the rainfall that started some time that day had already filled the wadis indicated by the red, orange and yellow lines in the picture by 8am. By 12am, the green patch in the picture was already inundated. Furthermore, by 3pm, the flow reached the entrance of Al Ain (as shown in joining point of the blue and light blue lines). The water flow continued until next morning, and the total length of the flow from sources in the mountains to the point where the water finally disappeared into the dunes amounted to roughly 70km.

The annual rainfall of Al Ain averages between 50 and 100mm. This winter, however, precipitation reached levels of 180mm. Although there is no accurate data on the amount of rainfall in mountain areas since these areas fall under the jurisdiction of the neighbouring state of Oman, it is estimated that rainfall in these areas may have approached 400mm. Because of the year's rainfall, the underground water table of Al Ain continued to rise until August. The last time the wadis of Al Ain carried water was in 1988. Such an event apparently occurs once in a decade. For people living in the area, rain is perceived as a blessing from the heavens. Despite the dramatic transformation of local peoples lives that has occurred as a result of oil money this feeling has not changed. However, foreign residents, who account for a large percentage of the population in this country, seem to be less impressed with the blessings of the heavens and more concerned about the paralysis of metropolitan functions that such blessings cause. (Reported by Abe in UAE)

Agriculture and irrigation in arid lands : From a viewpoint of sustainability (4)

Part 4: Rain-fed Agriculture in Syria

The basic problems facing agriculture in Syria are the extreme instability of agricultural output due to dependence on rainfall, and the lack of adequate agricultural infrastructure, for example, irrigation facilities. To resolve these problems many irrigation plans have been proposed and some facilities have been constructed. However, due to technical problems such as soil property and salinization, aggravated by lack of funding, irrigated land only accounts for around 20% of the total cultivated land. It is therefore important to seek methods of agricultural development which make the best use of low rainfalls. Methods of rainwater utilization are not standardized nation-wide. They differ from region to region reflecting prevailing natural conditions.

Terraced fields in mountain areas along the Mediterranean can only use relatively high rainfall efficiently, but they also prevent soil erosion on the slopes. The stone walling skills are traditional and, little by little, these terraces were constructed manually many years ago. Easier parts were terraced first, followed by successively difficult areas. In order to minimize the efforts involved in stone walling and to maximize the beneficial effects, it is considered that the regional topography and water courses were observed in amazing detail by these early stone wallers. Investigating old terraced fields, one cannot help being surprised to see how well the micro-topographic conditions prevailing on the slopes were utilized. New stone walls created by machines following plans look beautiful, but it is said that they are much more fragile when compared with traditional stone walls. The mechanization of terrace building should be promoted, without forgetting the skills nurtured in the traditional stone walling process.

There are reasonably good levels of precipitation in the plains along the border with Turkey and efficient farming is possible by rotating crops and by introducing fallow. Although rainfall is limited, it is possible to use water efficiently by making the best use of the micro- topographic conditions. If 50% of the land surface is covered with stones, rainfall on the other 50% of the land is calculated as double. Also, under and between large stones, fertile soil is likely to be formed due to the activity of microorganisms encouraged by the micro-climatic conditions. Therefore, depending on conditions, some stones are removed and trees are planted for fodder to make the area a grazing field, or stones are put together to make square fields and crops such as grapes are planted. In these cases, stones have important water and soil retentive functions and also serve as windbreaks. However, recent large scale projects using machinery have tended to eliminate both stones and fertile soil. Moreover, due to the introduction of tractors, "gamble agriculture" which counts on occasional rain has become possible, and soil erosion and desertification in semi-arid areas have been accelerated. The shift from manual labour to the use of machines is considered to be exerting negative effects on the sustainability of agriculture. In the future, mechanization of agriculture should be planned on a regional basis, taking into account the unique conditions that pertain to each area. It should also take advantage of the benefits bestowed by existing agricultural methods.

Terraced fields

Vineyards

Nature and Agriculture in Syria (4)

Part 4: Inland plains

On the inland slopes of coastal mountains and at the south foot of the northern hill region, there are stretches of alluvial and basin plains. In winter, there is a relatively good rainfall, and rivers and springs emerge in mountain areas. Summer is blessed with hot and dry climatic conditions, and from ancient times this area has developed as an important granary. One can see vast areas of wheat fields in winter and this scene really deserves the name "the Fertile Crescent".

The main crops of this area are barley, wheat, cotton and sugar beet. Pulses such as chick peas and lentils, and maize are also widely cultivated. Barley can be cultivated with rain water, however, summer crops such as cotton and maize require irrigation. The main characteristic of this area's agriculture is that excess crops and residue (e.g. stubble) from the fields are utilized as an important resource for livestock fodder. From the beginning of Spring to the beginning of Summer, livestock grazes on natural vegetation. When wheat cultivation is over, livestock is brought into the wheat fields. After eating what is left on the land, livestock is moved to other summer crop areas. After they have fed on the residue of the cotton crop they are fed artificially during the winter, waiting for the growth of natural vegetation in spring.


Fertile crescent


Use of harvest residue by livestock

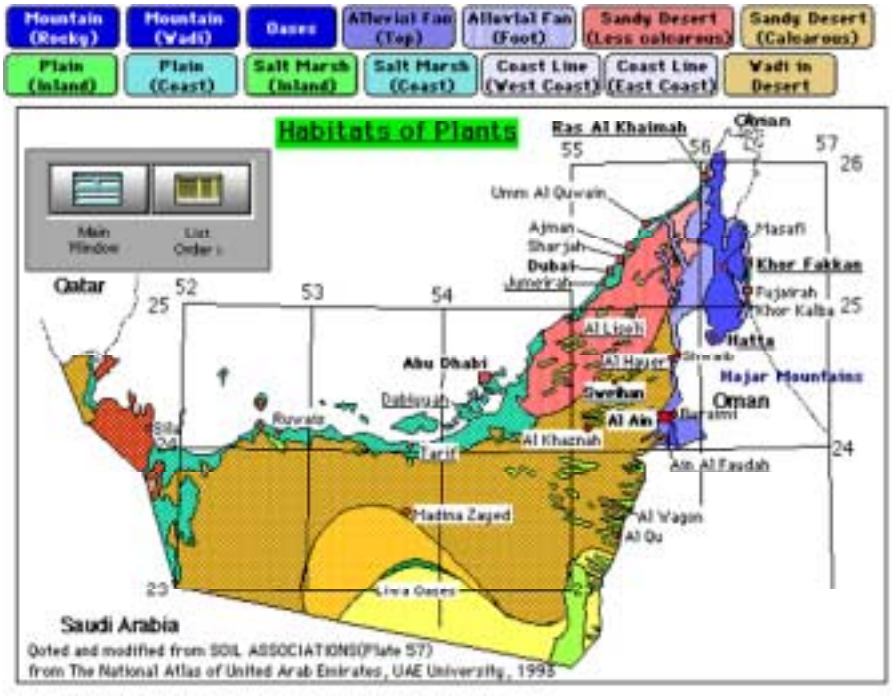

Salt-accumulated area


Drainage canal


Fish farming

As far as land use is concerned, the important key to promotion of sustainable agricultural development in the future is a shift in direction away from existing overly exploitative agricultural methods involving wheat and cotton rotation. Although it seems to be necessary to revise basic crop rotation patterns, it is not always easy since these major crops are planted according to production plans formulated by the Government. Sometimes these production plans prevent implementation of adequate crop rotation patterns. In the future, it is necessary for concerned governmental bureaux to co-ordinate their activities with a view to realizing efficient and sustainable land use. In order to develop agriculture that keeps soil fertile, the active introduction of leguminous crops in rotation is desirable, although this has not been very successful because it is difficult harvesting such crops using machinery. Given this, it is highly important to develop organic farming methods, rationally combining crops and livestock production. For this, research needs to be further promoted regarding the use of animal manure, green manures and also recycled fertilizers. Regarding water use, salinization on irrigated land has become an extremely serious problem. Once salt accumulates on the surface of soil, huge costs are incurred should the land be improved. An important task for the time being is to establish a water management system which prevents the accumulation of salt. To realize this, it is necessary to formulate and introduce sound water supply systems that fit cropping patterns. It is also necessary to consolidate water management at the field level, with farmer's groups voluntarily maintaining irrigation channels. There has been a new and interesting experiment which aims to use salinised soil effectively by introducing salt-resistant crops and establishing fish farming.

Miscellaneous notes upon the compilation of "Plants in UAE"



In the past there have been few facilities enabling one to conduct computer search for the plants that grow in the UAE. It is only recently that an encyclopaedia of plants in the UAE has been commissioned by the botanical garden of the University of UAE's Marine and Desert Environment Research Institute. Fortunately our task entailed working on the big theme of the introduction of salt resistant and arid climate resistant plants and facilitating computer search systems for such plants. We commenced field investigations from the end of 1994 in order to list plants in the UAE. At the same time, as we compiled the results of the investigation, we decided to construct a computer data base which can be used as a plant encyclopaedia by a wide range of people. The data base programme uses software called "FileMaker pro" (although it may have been more desirable to use "stand alone"), so that end users can easily add data whenever necessary.

As you may know, the UAE is extremely arid with an annual rainfall of 100-150 mm. Unless a certain level of rain falls during the cold season (between November and February), it is almost impossible to take reasonable photographs of plants, in particular grass species. However, we were extremely lucky, because from the beginning of 1996 to mid-March in the same year, the UAE had record amounts of rain, which enabled us to take pictures of grass samples in mountain areas, as well as in rocky and sandy desert areas. At this stage, the data base includes 158 species of plants (2 phylum, 3 classes, 25 orders and 39 families), and the end product is expected to detail around 180 species. During this work, it became apparent that photographs of particular plant habitats, satellite images of the area and rough vegetation maps were necessary. These images were therefore included in the data base so that people can browse through them.

To input images of plants in the data base, we used Nikon's film scanner. For photo retouch, Photoshop Ver.3 was used. Moreover, by adjusting resolution to 180dpi, one image takes up only a little over 400KB. Even so, the end product seems likely to become a data base of around 200MB. MO (Magnet-Optical) discs are used for storing the data, and a 230MB disc should be sufficient for the data base. We are planning to improve the contents and ease of utilisation of the data base, as and when we have critical input from people concerned. We are also considering the compilation of another data base containing the results of investigation into the growth of trees planted in the UAE's large scale afforestation project. In this data base we are hoping to include visual relativity between tree ages, variables regarding root diameters, canopy and height of trees, and various environmental factors, such as the characteristics of each afforestation area (which match plant habitat classifications in the aforementioned data base), water quality of irrigated water and salinity of soil. The provisionally titled "Plants in UAE" project is still in its infancy, however, please contact AAI if you are interested.