

Greenhouse cultivation of papayas in Okinawa

We usually think that papayas are cultivated in the out fields. But recently, the greenhouse of papayas has come up. In winter, the minimum temperature drops to 12-13 in Okinawa, the southern-most prefecture in Japan, and it is not warm enough for papayas to bear fruits, however, greenhouse has made it possible to provide high quality papayas throughout the year. Papayas can be classified into two varieties by color of the flesh. One is yellow and the other is pink, and recently pink ones are becoming popular because of its mild smell. Papayas are expected to be widely eaten not only as fruits but also as vegetable when it is not yet ripen. As a vegetable, it can be cooked in various ways - salad, saute, pickles, etc.

**Papayas growing in a greenhouse**

But the greenhouse method still has many technical problems. For example, papayas grow up to 5m tall, therefore they have to be laid down inside the greenhouse, and improvement of facility

utilization is desirable. The dwarf papayas are not popular because the quality of their fruits are not preferable. In Okinawa, various plants are extensively cultivated. In addition to sugarcane and vegetables for local consumption, tropical farm products targeting domestic market such as chrysanthemum and starches are popular items among farmers. Like other rural villages in other prefectures, Okinawa (except for Naha city) has depopulation problem and it is necessary to develop attractive industries. And agriculture seems to possess great possibility to solve depopulation problem in Okinawa. (Reported by Abe in Okinawa)

Related information:

Main agricultural products in Okinawa are industrial crops. The cultivation area is 6,473ha. Some 95% of that is upland farming, and 64% of the upland farming is for industrial crops. 38% of farmers (28,160 house hold) are full time farm households and this rate is quite high compared with other prefectures in Japan. Production of Amorpophalux konjac is No.4, chrysanthemum is No.2 in Japan. 100% of pineapple, 61% of sugar cane and 60% of raw sugar come from Okinawa.

**Long-shaped Papaya**

Kind of Tree-planting Activities in United Arab Emirates

Part 4: Various Trials by Forestry Department

1) Afforestation without irrigation

An experiment to quit irrigation has been carried out since 1977 at Al Khazna area located between Abu Dhabi and Al Ain where *Prosopis juliflora* were planted in 1970. Most of the trees are still alive till now, which indicates the possibility of afforestation without irrigation. Forestry Department also tested various trees in other areas and confirmed that *Prosopis cineraria*, *Acacia tortilis*, *Zizyphus spina-christi* can live without irrigation if they are more than 7 years old. They are also conducting a comparison test on frequency of irrigation.

2) Afforestation using drainage water for irrigation

Afforestation trial using drainage water for irrigation has been carried out since 1987 for a forest (200ha) next to Al Ain Sewerage Treatment Plant. Main varieties for afforestation are *P. cineraria*, *A. tortilis* and *Z. spina-christi* and the result is generally favorable. The test area is planned to be expanded in future. The drainage water is used for irrigation and quantity of water is 90 litter per tree in 4 days. The test is carried out in the area where shifting dunes are observed. The planted trees are growing better than other large scale afforestation area and function well as sand and/or wind protection forest.

3) Planting test of Jojoba (*Simmondsia chinensis*)

Planting test of Jojoba is operated in Sulaimat nursery station. Planting density is 4.0m x 1.5m with male/female tree ratio of 1:9. Drip irrigation of 20 litter/tree in 2 days is adopted. Usually Jojoba blooms in April and bears fruits in June or July. They can grow with saline water (11,000-13,000ppm), but the harvesting will be delayed for 2 to 3 years. High quality oil like cachalot oil can be obtained from Jojoba seed, and is used as a raw material for shampoo, wax, etc. Jojoba oil has a great potentiality as a material for various products.

4) Test of sand dune fixation

A test of fixing sand dune is carried out at a shifting dune area near the Al Ain airport. The drip irrigation facility is installed on the slope of the dunes and various kinds of trees are planted. Varieties used for afforestation are *Prosopis cineraria*, *Pithecellobium dulce*, *Acacia seyal*, *Tamarix* spp., *Calligonum comosum* and *Leptadenia pyrotechnica*.



Sand dune fixation trial near Al Ain airport



Planting test of Jojoba in Sulaimat

You can do it! Remote Sensing Analysis

Part 4 : Combination of satellite data and ground data

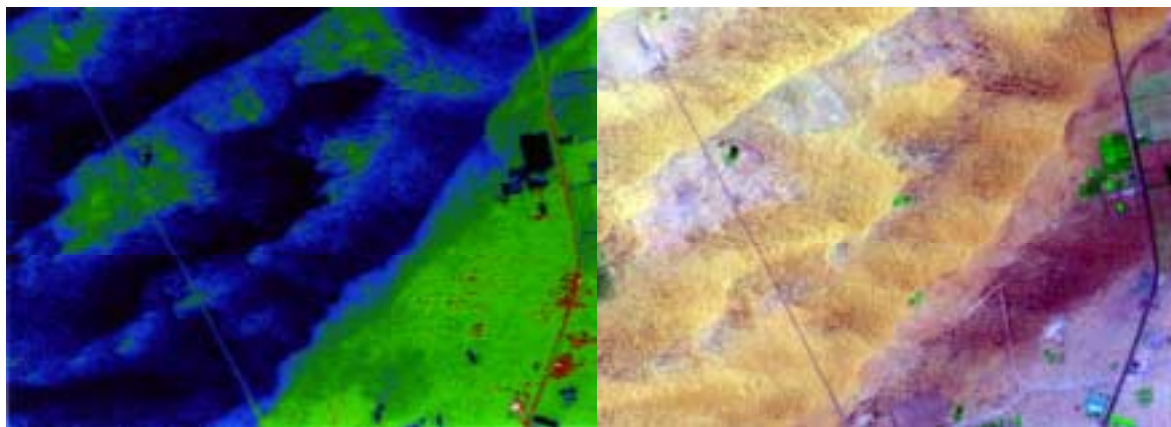
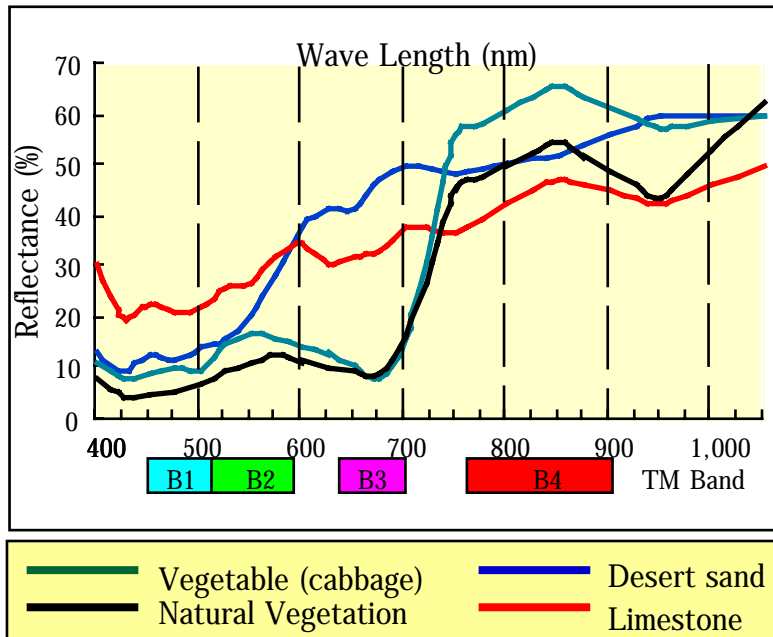
It is indispensable for Remote Sensing Analysis to use information on the ground for analyzing satellite data. Therefore, it is vital to collect ground information as much as possible. Ground information can be divided into two groups; visual and numerical as follows. Visual information is collected by observing the spot by naked



Visual information:
Land use, vegetation, soil, geological features, etc.
Numerical information:
Latitude, longitude, temperature, reflectance, etc.

eyes. So it does not need special equipments. However, it requires mechanical equipments to collect numerical information, such as thermometer to measure temperature, a GPS receiver to record latitude and longitude, etc. To measure reflectance of spectral diffraction, the

equipment shown in the photo above is used. The reflection rate measured by this equipment and the one taken by the satellite are compared and analyzed. The right figure shows four kinds of reflection rate measured in UAE. The reflection rate of plants increases at 650nm to 750nm wavelength. This tendency is obvious when plant grows rapidly because of its high vitality and having a large quantity of chlorophyll. The reflection rate of rocks and soils tends to increase as wavelength gets longer, and differs depending on the characteristics of rocks or soils. The photo below were processed to emphasize dune, using ground data of 500nm (band 2) and 750nm (band 4) of the TM band.



Analyzed satellite photo (2 bands) (left) and satellite photo by natural color (right)

Plants in Arid Lands and Their Utilization (4)

PART 4 : Dune



Dunes around Al Ain (Suleimat)

This issue describes sand dunes and vegetation around the dunes. The word "desert" brings about an image of far-stretching sand dunes and roaming camels. Some dunes are slowly moved by wind and sands are blown and accumulated in farmlands or roads around the dunes. Sands of dunes around Al Ain are homogeneous in particle size and reddish because the surface is covered with iron oxide. A herbaceous plant, such as *Cyperus conglomeratus* is widely seen in the dunes. *Hammada elegans*, *Haloxylon salicornicum* and *Panicum turgidum* are also typical herbaceous dune plants. A woody plant,

Prosopis cineraria can also be seen around or on the slope of the dune. The root of *Cyperus conglomeratus* is very long and the surface is covered with the material like cotton, so that the root can collect water easier.

1) *Cyperus conglomeratus*



Characteristics: Frequently seen in the dune area of the Arabian Gulf countries. Perennial grass, the height is around 60cm. When it is young, the color is green. Ripen seeds become brown and fall down in winter (December and January).

Condition of growth: Regarded as xerophytic and halophytic plant because it

grows in dune and coastal areas. Few report is available.

Use: Feed for camels.



2) *Hammada elegans*



Characteristics: Perennial grass which is seen around the dune. New shoots are green and succulent. As it grows, stems lignify gradually. Annual rings are seen inside the stem. Blossom season is September or October and the fruition starts simultaneously. The flower is yellow and the seed looks like a shuttlecock with pink, white and brown feathers.

Condition of growth: It grows on fixed dune or

desert. Germinates easily. Only few report is available about the growth conditions.

Use: The woody part is used as fuel. Feed for camels.



Seeds of *H. elegans*