

7. Research Priorities in Agroecological Characterization

The Arabian Peninsula suffers from a public perception that it is a subcontinent of limited heterogeneity, poor agricultural potential, and low population densities. This view is oversimplified, and the Peninsula is far from monolithic in its agroecological characteristics. In fact, some agroecological niches, admittedly small, have high agricultural potential. The subcontinent also has important potential as a source of genetic diversity and abiotic stress resistance. In order to realize this potential, there is a clear need for better agroecological characterization of the Peninsula. Numerous thematic surveys in the form of soil survey reports, climatic maps, and groundwater surveys exist, therefore, the need for new resource inventories is probably limited. The real need is to integrate this information in the form of agroecological frameworks for development. Specific methodologies, models, and decision-support systems must be developed to achieve and make use of this integration.

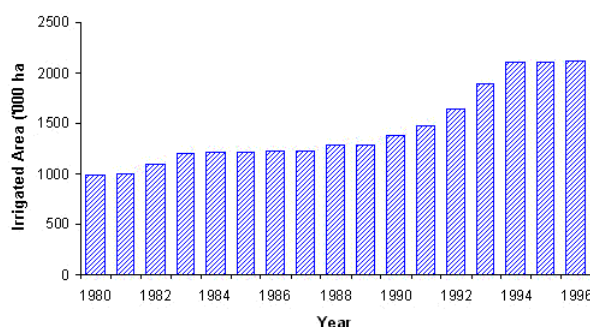


Fig. 50: Evolution of irrigated areas in the Arabian Peninsula (1980-1996)

The number of synoptic and climatological stations for a subcontinent of this size is inadequate to map the variations in agroclimatic conditions, particularly in very dry, hot, and mountainous areas. With the exception of a few areas, time series of climatic data are generally short and often interrupted. As well, the temperature, radiation, moisture, humidity, and wind regimes in the Peninsula's agroecological niches will need to be properly characterized. This will require a network of well-monitored, integrated research sites.

The following research priorities in agroecological characterization have been identified for the Arabian Peninsula (De Pauw, 1998):

- Regional assessment of crop water requirements for enhancing water use efficiency
- Agroecological zoning for biodiversity conservation, rangeland rehabilitation, abiotic stress identification, and development planning
- Improved climate monitoring

7.1. Regional assessment of crop water requirements

A basic principle behind efficient water use is irrigation to meet the crop water requirement. Crop water requirements can be calculated from climatic and crop data. The main challenge in estimating crop water requirements is extrapolation of climatic and crop coefficient data, obtained by measurement at specific sites, to areas without data. As mentioned earlier, the climatic station network in the Arabian Peninsula is sparse and records are recent. In addition, apart from literature data on crop coefficients, relatively little work has been done on the reassessment of crop coefficients for local crop cultivars under the specific climatic conditions of the subcontinent. As a result, assessment of crop water requirements is usually very site-specific and difficult to generalize to agroecological zones.

Figure 17, which shows mean annual potential evapotranspiration, is a rough basis for estimating regional water requirements. This work needs to be improved, however, by using climatic data on a shorter time scale, and linking this with crop coefficients for specific crops and cultivars, calibrated in representative sites.

7.2. Agroecological zoning

There is considerable data available on climate, soils, and water resources in the Arabian Peninsula. These information sources range from fair to excellent, depending on the country and theme. With the exception of Yemen, little work has been done in the region to integrate these data for targeted agricultural research, ecosystem and biodiversity studies, and development planning. As a result, data that are potentially highly valuable are under-analyzed, under-utilized, and under-valued.

Area profiles (agroecological zones) are required to identify different environments as a basis for a holistic approach to development planning and resource conservation. Modeling, state-of-the-art interpolation techniques, GIS, and remote sensing could be used to integrate climatic, soils, and land cover data into agroecological zones. Agroecological frameworks can form a rational basis for agricultural research priority setting, promote transferability and compatibility across countries of research results, and provide an integrated spatial view of resource availability, quality, use, and degradation risk.

The concept of this research theme is illustrated in Figure 53. A macro-scale agroecological characterization allows assessment of edaphic diversity at the level of broad landscapes. This edaphic diversity is nearly always associated

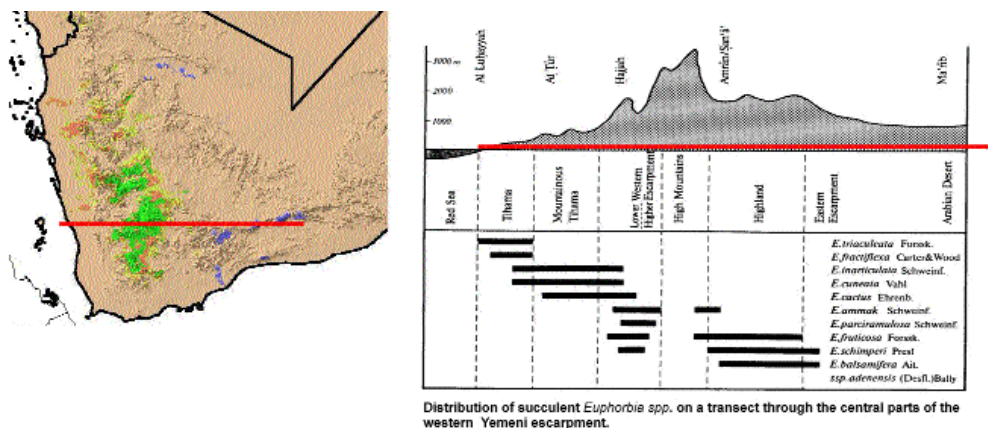


Fig. 53: Mapping the distribution of plant communities or species using landscape frameworks.

with different plant communities. The plants of the Arabian Peninsula have been described in many studies, but they have not been mapped in a consistent framework that allows extrapolation across the region. An agroecological characterization at macro-scale would address the issue of biodiversity assessment by linking landscapes (with their climatic, landscape and soil patterns) to plant communities and species.

7.3. Improved climate monitoring

Techniques of data spatialization and remote sensing, such as those used in this publication, are valuable tools for extracting maximum information content from data sparse areas. However, they cannot compensate fully for the tremendous climatic data gap in the Arabian Peninsula. Meteorological services in the region should make an effort to service the most needy areas, using agroecological frameworks as a basis for siting weather stations in representative locations. Automatic stations, with data loggers and data transmission by telephone or satellite, can overcome the remoteness of such areas.

In addition, different meteorological data networks, including those independent of the national meteorological services, should form partnerships, assisting each other with data collection, pooling, and sharing.