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## GIS-Based Survey and Nutrient Fluxes in a Mountain Oasis of Oman

MAHER NAGIEB, STEFAN SIEBERT, ANDREAS BUERKERT

*University of Kassel, Institute of Crop Science, Germany*

### Abstract

Little is known about the land use system and nutrient fluxes in oases of the Arabian Peninsula. To overcome these gaps of knowledge, field surveys were conducted between 2000 and 2002 at Balad Seet, a traditional mountain oasis of Northern Oman. The oasis system investigated comprised 650 inhabitants distributed in 80 households who rent land in and out. The 386 tiny fields are divided into six terrace systems totalling 4.6 ha. Additionally about 2,800 date palms in 14 varieties cover about 8.8 ha.

Due to price/cost relationships between imported cereals and locally produced meat, the large majority of the land grown with field crops is dedicated to feeding ruminants, whereas for their own consumption farmers buy imported grain externally. The application of manure from about 200 small ruminants and 30 cattle and considerable N, P and K inputs from mineral fertilisers lead to annual nutrient inputs of up to 380 kg N, 30 kg P and 400 kg K ha<sup>-1</sup>. However, the distribution of these inputs varies greatly throughout the year and across fields and terrace systems, which is reflected in a highly heterogeneous distribution of negative versus positive nutrient budgets (−500 to 900 kg N ha<sup>-1</sup> yr<sup>-1</sup>, −66 to 140 kg P ha<sup>-1</sup> yr<sup>-1</sup> and −1000 to 850 kg K ha<sup>-1</sup> yr<sup>-1</sup>). This does not comprise the contribution of legumes to the N balance which is in the process of being quantified by <sup>15</sup>N studies.

Nutrient inputs to the palm yards as well as the usage of the harvested dates depend on the varieties grown. Typical application rates per palm tree of 1,220 g N yr<sup>-1</sup>, 142 g P yr<sup>-1</sup> and 1,848 g K yr<sup>-1</sup> to high-quality local varieties (Khasab, Khalas and Hilali) differ from nutrient inputs to low-quality varieties (e.g. Naghal and Fardh) which are around 488 g N yr<sup>-1</sup>, 57 g P yr<sup>-1</sup> and 372 g K yr<sup>-1</sup>. High quality dates are usually consumed by the farmers' families, whereas low quality dates go into feeding livestock. An overall estimate of the nutrient balance in the palm yards is subject of future investigations.

The scarcity of irrigation water in the oasis leads to its selective distribution towards the prime agricultural land in the immediate proximity of the houses. It is evident that the sustainability of the current land use system heavily depends on external incomes of the farmers' extended families.

**Keywords:** Date palm, nitrogen, nutrient fluxes, oasis system, Oman, phosphorus, potassium