TECHNICAL BRIEF

Agroforestry

Agroforestry systems for improved productivity through the efficient use of water

WRC-funded research investigated the implementation of on-station agroforestry systems to determine their impact on water and plant production.

Benefits in planting trees in combination with food/forage crops

Agroforestry systems, (whereby there is a deliberate planting of trees in combination with food/forage crops for the benefit of people and the environment) have been reported to be potentially productive in degraded and marginal soils. However, in South Africa, the implementation of agroforestry systems has been relatively slow and may be attributed to lack of farmer knowledge on applicable crop and tree combinations.

A major challenge is to build the capacity of small-scale farmers to implement agroforestry systems to increase production and food security. There is an urgent need to review South Africa's agroforestry policy and legislation to support agroforestry research and implementation.

Implementation and impact of agroforestry

The aim of this project was to implement on-station agroforestry systems to determine their impact on water and plant production in order to facilitate the adoption of agroforestry locally.

The impact of the selected agroforestry systems on efficient use of water, soil health dynamics and plant production has been documented in the report.

Technology transfer

Technology transfer has been undertaken in the form of information days and/or demonstrations to local communities/ NGOs/CBOs and extension services.

Study area

The major part of the study was conducted at the University of KwaZulu-Natal's Research Farm (Ukulinga) outside Pietermaritzburg (Coast Hinterland Thornveld bioclimatic zone). In addition, lessons learnt from an on-farm WRC-funded agroforestry project in the Southern Tall Grassveld bioclimatic zone were used to address the problem of fodder shortage for small-scale dairy farmers.

Various options for farmers

Choice of crops in agroforestry systems will depend on the farmers' specific objectives. The potential crops for this study included traditional crops as well as new crops. The potential species were tested to give farmers various options for agroforestry systems (alley cropping, fodder banks and silvopastures) depending on their specific objectives.

Implications

Long-term projects

Research on potential species in different bioclimatic areas needs to be long term since the results from the alley cropping trials in this study clearly demonstrate that benefits of agroforestry are generally not realised in the first two seasons after establishment. The long-term nature of agroforestry systems necessitates the use of models to facilitate the planning and optimisation from the wide range of species and tree spacing options available for implementation.

Hedgerow intercropping model

The agroforestry systems established in this study enabled the development of a hedgerow intercropping model. The

model performed well in the determination of crop growth changes with distance from tree rows and estimation of tree water-use. For future applications the model could be improved by incorporating tree growth and productivity as a predictor. It also needs to be evaluated for various crop and tree types (field, cash, shade-loving crops; evergreen and deciduous trees).

Economic return estimator

An economic return estimator that takes into account values of crop and tree outputs and estimates system return needs to be included in the current model. This makes the model not only a field-level management and planning tool but also a decision-making tool from an economic return point of view (by manipulating the row width and orientation; tree and crop selection).

Species combinations

On-farm trials of different species combinations selected by farmers need to be implemented and documented to promote the potential effectiveness of agroforestry practices.

Time frames to measure potential

Realistic timeframes for potential benefits need to be given to rural farmers before they establish agroforestry systems.

Biodiesel

The silvopastoral agroforestry system, with *J. curcas* trees, which have the potential to produce biodiesel, were planted in different alley rows with kikuyu, a valuable pasture fodder species. Due to the low seed production (for oil) the trees would not be suitable as a source of energy. This study supports the government to ban the widespread planting of *J. curcas* until the potential impact of the species could be evaluated through a comprehensive research programme before it can be used effectively for agroforestry purposes before it can be used effectively for agroforestry purposes. However, this study provides valuable insight into the water-use, seed production, palatability and competitive effects of *J. curcas*.

Further reading:
To obtain the report, *Agroforestry systems for improved productivity through the efficient use of water* (**Report No: 1480/1/12**) contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or visit: www.wrc.org.za to download a free copy.