

Understanding yields in alley cropping maize (*Zea mays* L.) and *Cassia siamea* Lam. under semi-arid conditions in Machakos, Eastern Kenya

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Abstract:

Six seasons of experiments in Machakos, Kenya, revealed that above about 150 mm of rainfall, maize yields per row in alley cropped "replacement" agroforestry (AF) plots, of *Cassia siamea* Lam. and maize (*Zea mays*, cv. Katumani Composite B), may be expected to exceed those in the control (sole maize) plots. Such yields were insufficient to compensate for the area "lost" to the hedgerows. Below about 150 mm the control plots may be expected to perform better. This result was due to competition for water. Greater association of the fine roots of *Cassia* and maize was observed in the middle of the alleys than near the hedgerows. Photosynthetic consequences of shading were insignificant relative to other factors. In the alleys, reductions of soil temperature due to shade in the western and eastern maize rows were higher than in the middle row. Soil moisture extraction was higher in the AF than in the control plots. In the AF plots, moisture extraction was greater under the central maize rows than under those nearest the *Cassia*. Yield patterns followed such soil temperature and soil moisture patterns. Maize transpiration and photosynthetic rates were significantly higher in the control than in the AF plots during a below-average rainy season but not during above-average rainy seasons. It is concluded that alley cropping under semi-arid conditions should be approached differently from the system worked on. It must at least provide strong physical protection of crops and/or soils and have a strong economic incentive to be of interest to the farmers.