INTERCROPPING
in semi-arid areas

Report of a symposium held at the
Faculty of Agriculture, Forestry
and Veterinary Science,
University of Dar es Salaam,
Morogoro, Tanzania,
10-12 May 1976

Editors:
J.H. Monyo, A.D.R. Ker,
and Marilyn Campbell

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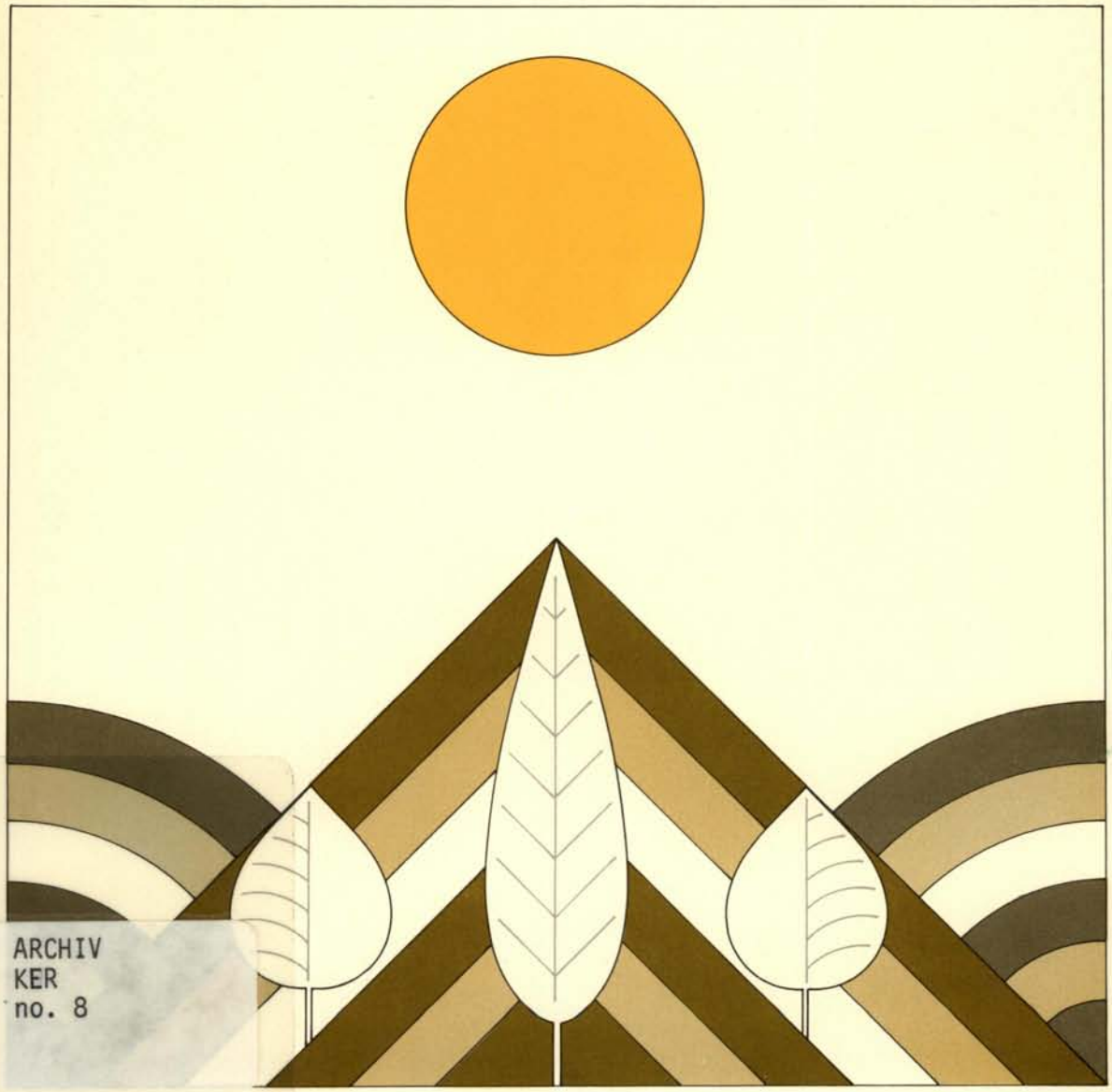

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Farmer's field near Ibadan, Nigeria, showing intercrop of cowpea under maiz

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Some Aspects of the Productivity and Resource Use of Mixtures of Sunflower and Fodder Radish

R. W. Willey[1] and D. A. Lakhani

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Initial studies at Makerere University (Kampala, Uganda) showed that maize–beans and sorghum–beans mixtures were capable of using growth resources more effectively than pure stands, producing yield advantages up to 38 and 55%, respectively (21, 22). These results must have been achieved because resource use by the component crops was to some degree complementary rather than purely competitive. Since the beans had a much shorter growth period than the cereals (85 days compared to 120 days) this complementary effect could have occurred because: (1) the component crops were using resources at different times; or (2) the component crops were using resources in rather different ways or from different parts of the environment.

The relative importance of these temporal and spatial aspects was examined in subsequent experiments (28) by delaying the sowing of the beans so that the growth patterns of the component crops were more closely synchronized. In maize–beans mixtures, advantages declined from an average of 23.0% for simultaneous sowing to an average of 6.3% when the beans were sown 1 month after the maize; in sorghum–bean mixtures the comparable effect was a decline from 33.1% to 10.6%. Similar results were obtained when maize was grown in mixture with an early (85 day) or a late (120 day) soybean variety. With the early soybean variety an average yield advantage of 21.6% was achieved; with the late variety, which matured at the same time as the maize, the average advantage was only 6.5%.

From these and other Makerere experiments it was concluded that the greatest potential benefits of mixtures were likely to be where there was greatest scope for combining crops of very different growth patterns. Conversely, it was thought that advantages of mixtures were likely to be very small where component crops had to have similar growth patterns. This latter restriction may often exist in, for example, highly developed agriculture when mechanization dictates that component crops cannot be sown or harvested at different times. It was with this latter situation in mind that a series of experiments on sunflower and fodder radish was started at Reading to investigate the possible advantages of mixtures in which component crops were sown and harvested together.

Perhaps the main finding of these experiments was the importance of temporal resource use by the mixtures, despite sowing and harvesting component species together and despite the relatively short growing period. Of the particular resources involved in this effect, light was probably a major one because of the large temporal difference in leaf area development between the species. This lends further support to the earlier Makerere conclusion that mixtures are likely to give greatest yield advan-

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tages where components of different growth patterns can be combined.

With regard to spatial resource use, the important finding was perhaps not so much that there was any single effect of major importance but that there was some evidence of several effects. In particular, there was evidence that the root systems of the mixtures could have been more efficient in taking up water, an effect that may have been partly responsible for the large yield advantages in the very dry season of 1973. There was also evidence that when nitrogen was limiting, mixtures gave greater uptake. Improved nutrient uptake by mixtures has been suggested for the less mobile nutrients, but these results indicate that this may also be possible for nitrogen.