

Clover ley pasture maintains soil nitrogen and crop yield

Mark Norton

NSW Agriculture, Agricultural Research & Advisory Station, Glen Innes, NSW 2370

Many basaltic soils of the Northern Tablelands were of such high fertility in the early days of settlement that crop rotations commonly consisted solely of the exploitative cereals maize and oats. However as these soils became depleted of fertility and crop yield declined it became apparent that legume leys would have to be incorporated into crop rotations to maintain soil fertility and crop production (Anon. 1948). Therefore a rotation experiment was established at Glen Innes in 1921 with the objective of developing stable and productive crop rotations. This paper describes the effect of red clover ley on levels of total soil nitrogen (N) and the association between these and yield of spring sown oaten hay in two contrasting rotations over the 45 year period from 1939 to 1984.

Methods

The experiment consisted of the following seven rotations:

- maize/spring oats;
- maize/spring oats/red clover;
- maize/maize/spring oats;
- maize/maize/spring oats/red clover;
- maize/ spring oats/autumn oats;
- maize/spring oats/red clover/autumn oats;
- maize/spring oats/ autumn oats/red clover.

Levels of total soil N were determined for all rotations in 1939, 1952, 1959 and 1984 and yields of spring sown oaten hay recorded.

Results and Discussion

At sampling in 1984, rotations which did not contain clover (maize/spring oats, maize/spring

oats/autumn oats, maize/maize/spring oats) had markedly lower levels of total soil N (0.11, 0.13 and 0.11% N respectively), than rotations which did contain a ley. The ley rotations maize/spring oats/clover, maize/spring oats/clover/autumn oats, maize/spring oats/autumn oats/clover, maize/maize/spring oats/clover contained 0.17, 0.16, 0.16 and 0.14% N, respectively.

Levels of total soil N increased as the proportion of time under clover ley increased. The presence of autumn oats also had a positive impact on soil N levels. Soil nitrogen levels in contrast declined as the frequency of maize cropping increased. Comparison of spring oat yields between the rotations maize/spring oats/clover and maize/spring oats over the period from 1939 to 1984 reveals the difference between a rotation in which production is sustainable and one in which it is not. In maize/spring oats soil N levels declined from 0.13 to 0.11% and hay yield declined from 3790 to 1270 kg/ha. In contrast, in maize/spring oats/ clover soil N levels increased from 0.14 to 0.17% and this was associated with the maintenance of hay yields (4870 kg/ha in 1939 and 4600 kg/ha in 1984).

In conclusion, for productivity to be maintained in a low-input cropping system, the rotation must contain a legume ley.

Acknowledgments

The contribution of I.C.R. Holford is appreciated.

References

- Anon. (1948) *Agricultural Gazette NSW*, 59: 339-343.