

On-farm research to improve the measure of variability of forage production across the landscape for evaluating economic risk in forage-based enterprises

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Introduction Experiment station trials provide forage crop mean yields and standard deviations (SD) useful in evaluating risk in forage production (Rayburn, 2003). However, in the northeast USA many of these sites are on valley soils atypical of hill-farms in the Appalachian Mountains. This study used on-farm and experiment station research to evaluate the variability of forage yield across a range of soils. This information was used in stochastic budgets to evaluate the economic risks in forage production on soils differing in yield potential.

Materials and methods On-farm and experiment station trials of nitrogen fertilised grass and grass-clover mixtures were summarised into 27 yield classes based on soil and treatment yield potential. Classes contained 3 to 67 site years (348 site years in all). The class yield SD was regressed against mean yield. Deterministic and stochastic budgets were used to evaluate economic risk based on the calculated break even price (BEP) for hay. Stochastic budgets were run using Excel add-in @Risk (Palisade, 2002).

Results Yield SD was a linear function of mean yield (Figure 1), expressed by the regression:

$$\text{yield SD} = 0.371 + 0.234 \text{ mean yield}$$

$$R^2 = 0.86, \text{SD}_{\text{Reg}} = 0.266$$

When yield mean and SD were used in hay budgets to determine economic risks, stochastic budgets gave median BEP 18% greater than the deterministic budget at moderate yields and 6% greater at high yields (Table 1). Stochastic budget BEP at the 5% and 95% probability levels for moderate yields were 79% and 157% of the deterministic budget BEP. At high yield levels stochastic budget BEP at the 5% and 95% probability levels were 84% and 136% of the deterministic budget BEP.

Conclusions On-farm research provided improved estimates of forage yield and SD across soils and treatments differing in yield potential and improved the estimate of economic risk in forage production across the range of conditions occurring on farms. Stochastic budgets gave median costs higher than deterministic budget values and provided an estimate of the range of BEP that the manager is likely to experience. Differences between stochastic and deterministic budgets were greater at moderate production levels typical of farms in the study area. There was less difference between BEP estimated by these budgets at high production levels achieved on valley soils typical of experiment stations.

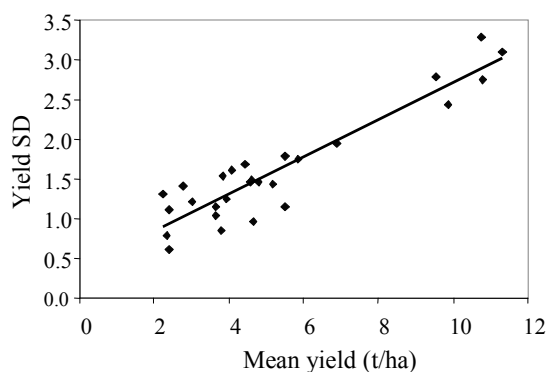


Figure 1 Yield standard deviation versus mean yield

Table 1 Comparison of deterministic and stochastic budgets on calculated break even price of hay produced at moderate and high yields

Budget type	Moderate yield		High yield			
	Probability level		Probability level			
	Mean	p 0.05	p 0.95	Mean	p 0.05	p 0.95
	Yield (t/ha)					
Deterministic	6.74			11.22		
Stochastic	6.74	3.50	10.06	11.25	6.40	16.34
	Break even price (\$US/t)					
Deterministic	53.38			40.08		
Stochastic	62.82	42.02	83.79	42.46	33.80	54.34

References

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