

## Agroecosystem performances of livestock farms in a mountain area of Sicily

L. Stringi, G. Alfieri, G. Amato, A.S. Frenda, D. Giambalvo and P. Iudicello

Dipartimento di Agronomia ambientale e territoriale - Università di Palermo - Viale delle Scienze 90128, Palermo, Italy, Email: lstringi@unipa.it

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**Introduction** Agroecosystem performance indicators (APIs) represent instruments for studying agroecosystem performance via an input/output approach and a knowledge base, with the aim of improving the sustainability level of the farm's activity (Tellarini & Caporali, 2000). This research used APIs to evaluate the influence of stocking rate on the performance (in terms of energy) of farms in a mountainous area of northern Sicily, Italy.

**Materials and methods** Forty six livestock farms in the Madonie and Nebrodi mountains (850-1660 m asl) were examined. The farms were classified on the basis of stocking rate: L <0.75 LU/ha; M 0.75-1.50 LU/ha; H >1.50 LU/ha. The farm parameters recorded (structure, crop and livestock management, production, external resources) were used to calculate input and output energy values from which APIs were derived according to Tellarini & Caporali (2000). The results were tested for significance using PROC GLM procedure (SAS, 1996).

**Table 1** Some structural and livestock management parameters for the three classes of stocking rate

	L <sup>#</sup>	M <sup>#</sup>	H <sup>#</sup>
Mean LU/ha <sup>+</sup>	0.56	1.00	2.36
Total farm area (ha)	125.3	35.1	34.4
Wood (%)	13.5	5.3	0.0
Permanent pastures (%)	72.9	56.1	29.4
Forage crops (%)	10.4	23.6	48.2
Cereals (%)	3.2	15.0	22.4
Only grazing (d/year)	247	180	45
Housing (d/year)	56	104	292
Hay (kg/LU per d)	1.7	3.4	5.2
Concentrate (kg/LU per d)	0.9	2.0	5.5

<sup>#</sup>Number of farms: L=25; M=14; H=7; <sup>+</sup> LU: livestock unit (500 kg liveweight)

**Table 2** Some performance and structural indicators for the three classes of stocking rate

Indicators (Gj/Gj)	Stocking rate			P level of significance		
	L	M	H	L vs M	L vs H	M vs H
Total farm input	0.78	0.76	0.57	ns	0.006	0.019
Total internal input	1.37	1.60	2.14	ns	0.007	ns
Total external input	2.37	1.90	0.82	ns	0.046	ns
DoNES*	0.05	0.08	0.05	ns	ns	ns
Farm autonomy	0.58	0.50	0.32	ns	0.001	0.009
Immediate removal	0.26	0.34	0.42	0.041	0.003	ns

\*Dependence on non-renewable energy sources

### References

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**Results and conclusions** The land use was markedly different at the different farm stocking rates: with increased stocking rate, permanent pasture decreased, whilst that of forage crops increased (Table 1). Consequently a shorter period of exclusive grazing and a greater feed supply was recorded. The total farm input indicator (Gj) obtained from the production process per Gj from any source introduced into the system) was, on average, 0.72, similar to the findings of other studies (e.g. Risoud & Chopinet, 1999). The farms with the highest stocking rate showed a significantly lower efficiency than the other two groups (Table 2).

The indicator of dependence on non-renewable energy sources was, on average, very low and the differences among the farm groups were not significant. With the increase in stocking rate the farm autonomy indicator (ratio of input produced on the farm to total input) fell and the immediate removal indicator (ratio of output destined for final consumption to total output) increased. Thus energy efficiency can be increased by increasing the level of internal transfer (re-use). Furthermore, the autonomy indicator was positively related to the efficiency of performance of external inputs (the ratio of total output to external input), showing that external inputs decrease as the efficiency with which they are used increases. On the whole, the best agroecosystem performance, in terms of energy, was found on farms with a lower stocking rate, a higher proportion of permanent pasture and a longer period of exclusive grazing.