

FACTORS AFFECTING FUTURE BEEF PRODUCTION IN THE SOUTHERN SPEAR GRASS REGION QUEENSLAND

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Summary

A statistical study of the beef industry in the southern spear grass region indicates that capital was the key factor in increasing beef production in the past. Attainable increases in output in the future will be significantly greater than past trends indicate if greater use is made of capital inputs relative to other factors of production. Results from a survey of properties in the region suggest that a number of limitations to, growth of the industry will have to be overcome if full advantage is to be taken of the region's potential for beef production.

I. INTRODUCTION

In recent years, rural production in Australia has expanded to meet the increasing needs of a growing population and the increasing requirement for export income of an expanding economy. McKay (1967) indicated that rural production rose by 3.1% per annum for the period 1949-50 to 1965-66. During the same period beef production increased at an annual rate of 2.7%. If this trend continues, the beef industry will not maintain its present 13 % share of Australian rural production.

The purpose of this paper is to focus attention on those factors most likely to result in accelerated production of beef and to highlight obstacles to future development in the southern spear grass region of Queensland. Predictions are given of beef output from the region for 1975 and 1985.

II. METHODS

Two approaches were used by Hamilton (1967) to analyse the relationship between output and factors of production and to assess the relative importance of each factor. One was a geometric index method proposed by Solow (1957) to determine the contribution of labour and capital and, to calculate an index of technical change. However, the technology index is a residual term which contains unexplained random elements and which tends to overstate the importance of technology.

The alternative method, used in the present paper, includes explicit measures of technical change, for example, education level of the labour force as suggested by Griliches (1964). The additional variables are incorporated into logarithmic regression equations described by Heady and Dillon (1961).

Published statistics for local authority areas in the southern spear grass region of Queensland were used to derive indexes of production and resource inputs for the period 1952 to 1962. output was measured in terms of an index of the value

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of cattle slaughtered. **Labour** was determined from the total rural **labour** force weighted by a deflated index of wages paid. The capital index was derived from the area of available pasture valued according to its stock carrying capacity. A ratio of breeding stock to total cattle numbers was included as a measure of herd improvement, and an index of **mechanisation** was derived from the number of tractors in local authority areas. Lastly, an index of rainfall was derived from the annual rainfall averaged over four recording stations in the region. This index was taken over the period 1951 to 1961 to allow for a one year lag in production response.

After fitting the equation, predictions of likely cattle output for 1975 and 1985 were estimated by assuming firstly a continuation of the present pattern of production, and then likely production resulting from increased use of key factors. - Finally, data from a survey of properties in the region, described by Hamilton and McCarthy (1964), were used to determine likely obstacles to the acceleration in production.

III. RESULTS

The results of the statistical analysis are given in Table 1. Increased **capital** investment and capital productivity accounted for 37.9% of the increase in production for the period. Productivity of **labour** also increased although migration from the industry reduced the contribution of **labour** to 20.9%. Increased mechanization was the next most important factor, contributing 17.5% of the increase. Rainfall varied considerably from year to year but the results suggest that on average 9.2 % of the increase could be attributed to this factor. The negative contribution from herd improvement is consistent with the fact that on average the ratio of breeders to total cattle numbers had declined.

Almost one-fifth of the increase in production remains unexplained although goodness of fit as measured by R^2 was 0.87. The relatively short time period of 11 years and data limitations offer the most logical reason for so large a residual.

Assuming the annual increase of 7.4% continues, then output will increase by 96% by 1975 and by 170% by 1985. However, if capital inputs are increased by 50% per annum, the increase in output rises from 7.4% to 8.8% per year.

TABLE 1
Contribution of Factors Affecting Production, 1952-62

Factor of Production	Contribution (% per year)	Percentage Contribution (% of Total Increase)
Labour	1.552	20.9
Capital	2.799	37.9
Mechanization	1.299	17.5
Rainfall	0.683	9.2
Herd Improvement	-0.357	-4.8
Unexplained	1.423	19.3
Rate of Increase	7.409	100.0

TABLE 2
Projected Cattle Production in 1975 and 1985

Year	Present Pattern	Capital Increased by		
		10%	50%	100%
1963	224,400*			
1975	423,890	431,520	461,590	499,280
1985	590,170	603,640	659,740	728,300
Annual Rate of Increase (%)	7.409	7.689	8.808	10.208

*The area of sample properties totalled 1,992,678 acres which is approximately 15 per cent. of the total area of the region. Production from the properties was 33,660 cattle in 1963. Assuming the sample was representative, the estimate of production from the whole region is 224,400 cattle.

On the other hand, if mechanization increases by 50%, the increase in output only rises to 8.1% .

Estimates of production for 1975 and 1985 at different levels of capital intensity are given in Table 2. Production for 1963 was derived from the results of the survey.

IV. DISCUSSION

Although substantial increases in beef production could be achieved in the future, limitations of resources and the attitude of graziers will limit the rate of increase. It is clear that capital has been the key factor influencing production in the past.

(a) Increased Capital Inputs

Increased production resulting from capital inputs can occur in two ways, namely, expansion in the area of pasture and increase in pasture productivity. From the results of the survey, it is estimated that, on average, the area of cleared woodland could be increased from 59% to 81% of the total area. In addition, improved pastures could be established on 45% of the total area assuming that land negotiable by a wheeled tractor is a measure of potential improved pasture. With respect to pasture productivity, the average carrying capacity of the sample properties was one cattle-beast to 14.4 acres (5.8 ha). At current levels of technology, carrying capacity could improve to an average of one beast to 7.2 acres, that is cattle numbers could be doubled.

Factors which may affect the rate of increase in capital investment include land tenure, graziers' attitudes towards property improvement and the amount of money available for development.

The intention of 35% of graziers with leasehold land to give preferential treatment to freehold areas must retard expansion. In addition, use of funds by 33% of lessees for conversion of tenure to freehold will reduce the amount available for investment elsewhere. The use of funds for watering facilities and fencing also tends to restrict the supply of capital for the improvement of pastures,

particularly as graziers mainly think in terms of expenditure out of income for all aspects of property management. Half the graziers interviewed intended to erect additional watering points and one-third intended to sub-divide existing paddocks. Proposed expansion of the area of improved pastures represented an increase of only 0.6% of the total area although 68% of these graziers saw pasture improvement as the main avenue for increasing production. This apparent paradox needs clarification.

(b) Increased Labour Inputs

Permanent labour inputs on the sample properties were low relative to the output involved; 288 permanent labour units were used to produce \$2,394,000 worth of cattle sold for slaughter. However, 80% of the graziers also employed casual and contract labour. Casual labour, drawn mainly from neighbouring small landholders, was used for handling stock, fencing and control of timber regrowth. Contract labour was used for capital improvements such as fencing, yard building, water supplies and scrub clearing. Future increases in production may be affected by the scarcity of contract labour. In addition, staff training and raising of general education levels may be necessary if labour productivity is to be raised above the present level.

(c) Increased Mechanization

This survey revealed that 7 1% of graziers owned tractors, but since the area of improved pasture was relatively small it appears that available equipment is not being fully used. Furthermore, graziers' antagonism towards "farming" will have to be overcome before large scale increases in machinery use, and hence improved pastures can be effected.

(d) Herd Improvement

An increase of 19 % in the ratio of breeders to total cattle numbers in the four years 1959-62, indicating an increase in the rate of turnover of cattle, may have arisen from a greater use of Zebu-cross breeds. Hamilton (1967) suggested that by using such breeds, short term increases in production could be achieved without large scale property reorganization. More rapid turnover of cattle could also assist breeding programmes to meet changing requirements for future markets.

(e) Climate

Climate is an important uncertainty factor influencing graziers' decisions, but probably has little effect on production in the long term. In the short term, rainfall in particular could affect production to the extent that it influences pasture growth and consequently beef output. For this reason an index of rainfall was included in the model.

(f) General

Only one-sixth of the graziers in the survey appeared to be motivated towards rapid expansion of production. The majority of graziers were interested only in obtaining a reasonable living or "getting the place into good order". Thus an important requirement for accelerated production may be the reorientation of graziers' goals. The survey results suggest that greater contact with advisory services could facilitate these changes.

Timber regrowth was considered a major problem by 51% of graziers and infestation of herds with cattle ticks' by 66%. Control of both problems plays a major part in property management throughout the region and consequently limits the time and resources available for improvement.

V. CONCLUSIONS

The conclusion drawn from this study is that further investment of capital is the key factor likely to stimulate accelerated production in the region. In practice, acceleration will depend on the reorientation of graziers' goals. More research into pasture improvement, tick control and regrowth problems is also 'necessary.

VI. REFERENCES

- GRILICHES, Z. (1964). *Am. Econ. Rev.* **54**: 961.
- HAMILTON, C. P. (1967). "Development of the Beef Industry in the Southern Spear Grass Region, Queensland". M.Agr.Sc. Thesis, University of Queensland.
- HAMILTON, C. P., and MCCARTHY, W. O. (1964). *Proc. Aust. Soc. Anim. Prod.* **5**: 209.
- HEADY, E. O., and DILLON, J. L. (1961). "Agricultural Production Functions". (State University Press : Iowa.)
- MCKAY, D. (1967). "Agriculture in the Australian Economy". (Ed. D. B. Williams). (University Press : Melbourne.)
- SOLOW, R. M. (1957). *Rev. Econ. Statist.* **39**: 312.