

## THE DEVELOPMENT AND PRODUCTION OF TARA HILLS HIGH COUNTRY RESEARCH STATION

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J.F. PEDOFSKY and M.H. DOUGLAS  
*Tara Hills High Country Research Station, MAF, Omarama*

### Abstract

When purchased in 1946 Tara Hills was in a rundown state and typical of large areas of inland Otago depleted by overgrazing. Since then development by oversowing, topdressing, fencing, irrigation, together with rabbit control have given large increases in production.

The stock units have increased from 1240 in 1946 to 11,066 in 1966 and wool production has increased from 1.3 kg/ha to 13.4 kg/ha. Since 1975 the gross income per hectare has risen from \$21/ha to peak at \$131/ha in 1964. These levels of production provide a sharp contrast to the much lower production of the average South Island high country run.

Keywords: wool, income.

### INTRODUCTION

Soon after the first white explorer Walter Mantell visited Omarama in 1852 (Stevenson 1947), the pastoralists followed, and when surveyor Thomson visited the Upper Waitaki area in 1858 the sheepmen were established (McDonald 1962). The maximum stocking load on the native range in inland Otago appears to have been reached about 1880, and by that time the rangelands were already overstocked, with the situation aggravated by an increasing rabbit population. Despite recurrent reductions in sheep numbers, range overstocking persisted until the rabbit plague was overcome in the 1950's (O'Connor & Kerr 1978). By 1951 the native grasslands had their apparent carrying capacity reduced to 10% of what it had been in 1881, and it was rightly noted as an ecological debacle (O'Connor 1980).

Climate has a great part to play in the way the native grasslands deteriorated. Although the management had been identical over the South Island tussock grasslands, in general terms the depletion in Central Otago grasslands did not occur elsewhere (Cockayne 1949). Cockayne noted that dryness governs depletion. This can be observed where sunny faces are fully depleted and shady faces are tussock covered. Cockayne observed that where rainfall increases, depletion decreases.

In 1944 Cumberland detailed a number of reforms needed to overcome the revegetation problem of the scabweed deserts, and noted runholders could do much through better husbandry and improved practices. At that time, because there was no security of tenure, it was possible to obtain a cheaper lease rental by deliberately overstocking and causing range deterioration (Wardell 1949). Cumberland wanted controls on burning, overstocking and rabbits; subdivision of blocks to give better grazing management; increased winter or stored feed from flats or irrigation; and the planting of windbreak shelter (Cumberland 1944).

In keeping with the reforms of Cumberland the Soil Conservation and Rivers Control Council wished to demonstrate "the practicability of restoring a typically eroded property" and in 1948 selected Tara Hills as such a property (McCaskill 1973).

In this paper, Tara Hills is used as an example of the effect of tussock grassland development on high country productivity and financial return.

### PHYSICAL DESCRIPTION

Tara Hills has an average annual rainfall of 520 mm with an annual variation between 380-770 mm and is classed as semi-arid. The property is 3340 ha in area,

about one third the size of the average high country run, and can be divided into two distinct areas. The 600 ha of the flat is about 465 m a.s.l and the 2700 ha of the hill country rises to 1510 m a.s.l. (Douglas & Allan 1984).

The native vegetation on **Tara Hills** varies with aspect and altitude.

Above 1200 m on the yellow-brown earth soils the vegetation is predominantly snowgrass (*Chionochloa rigida*) while between 1200 m and the flats, on the yellow-brown and yellow-grey soils the resident vegetation was dominated by hard tussock (*Festuca novae-zelandiae*), silver tussock (*Poa laevis*) and blue tussock (*Poa colensoi*). Density of tussock cover appears very dependent on the previous degree of depletion.

On the hills, clover production is limited by moisture deficit at lower altitude, and low temperature at higher altitude. At **Tara Hills** the most easily improved and most productive area on the hills is that at mid-altitude (Douglas & Kinder 1974).

In 1948 the property was in a poor state. Above 1200 m the snowgrass was badly depleted; between 750-1200 m the short tussock grassland was excessively depleted, eroded and rabbit infested on the sunny faces, while the shady faces were moderately well covered but heavily grazed; the hill country between the flats and 750 m was completely denuded of nearly all vegetation except scabweed, was severely eroded, and the home of thousands of rabbits; the vegetation on the flats was sorrel, scabweed, and fescue tussocks (McCaskill 1973).

## DEVELOPMENT

At **Tara Hills** the initial management strategies followed Cumberland's recommendations. Experiments with aerial seeding were undertaken in 1948; in 1949 rabbit poison was laid from the air; and in 1950 superphosphate was aerial spread. In 1948, 40 ha of the flat was put into borderdyke irrigation to produce winter feed, and windbreak shelter was planted.

In the initial years, **oversown** areas were plagued by rabbits. Attempts at control were not successful until the mid-fifties, and involved continued use of dogs and fumigation. Since that time periodic poisoning has been carried out, and although there are occasional increases in population, rabbits have remained a manageable problem.

In the spring of 1948, 40 ha of the lower sunny face was aerially seeded with cocksfoot, browntop, yarrow, subterranean and red clover (McCaskill 1973). In the initial years **Dunbar** and **McNeur** conducted research into alternative grasses and legumes, and it is interesting to note that of the 68 grasses tested (Douglas 1974), only cocksfoot and **ryegrass** are now sown. In addition to these grasses, white, alsike and red **clovers** are the legumes commonly used over all country including that irrigated and **lucerne** has been used on the recent soils.

## FENCING

In 1948, the only significant subdivision on **Tara Hills** was a fence dividing the flats from the hill. (Fig. 1). By 1955, 22 km of new fencing had been erected and 26 km of rabbit netting completed. Electric fencing was first used in the late fifties and is now used on the hill. There are now about 80 paddocks on the flat, which is really a product of the 150 ha of border dyke irrigation, and the need for small paddocks to cater for small experimental flocks. The hill, with an estimated 100 km of fencing, is subdivided into 32 blocks based on aspect and altitude differentiation. The subdivision allows a grazing pattern which follows, the differing growth and production patterns across aspects and altitude.

In general terms the middle altitude blocks carry stock year round, while the snow grass is used in the summer and autumn, and the dry sunny faces in the winter

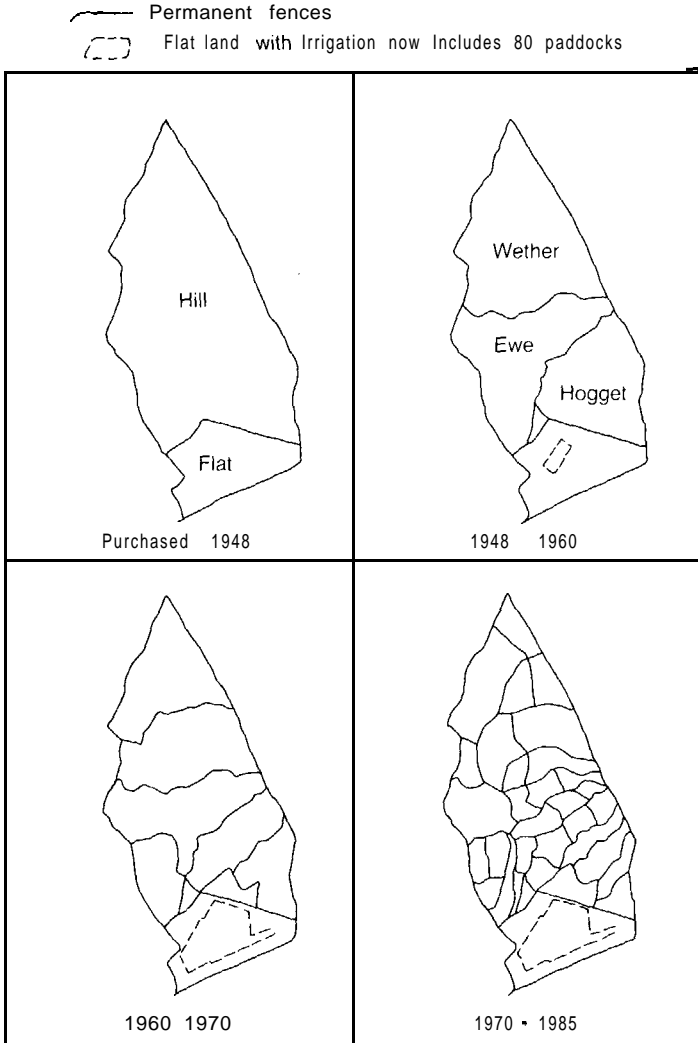


Figure 1: Tara Hills High Country Research Station, History of subdivision 1949-1985.

and early spring. The irrigation area and dry flats carry 3000 experimental stock throughout the year, while the 50 ha of irrigated lucerne produces their supplementary feed.

### FERTILIZER

Although small test areas of superphosphate were aerially applied in 1950 and 1954, it was in 1955 before large scale aerial topdressing was begun, and aerial fertilizer usage has continued annually. Sulphur was the main deficiency at all altitudes. Response to phosphate was small at low altitude, but at higher altitude and on shady faces increasing responses to phosphate were recorded.

The initial dressings have been further refined and on the yellow-grey earths 190 kg/ha of sulphur fortified superphosphate (180 kg S/t) plus Mo; and 250 kg/ha of sulphur fortified superphosphate (90 kg S/t) plus Mo is recommended on the yellow-brown earths (Douglas & Risk 1981). For maintenance, 125 kg/ha of sulphur superphosphate (180 kg S/t) extra is applied biennially on the hill soils and flats, and on the irrigation 250 kg of sulphur super (90 kg S/t) is applied annually. Latterly, because of acidification on the irrigation area, lime has been applied at 2.5 t/ha in 1985.

There has been 3400 tonnes of fertilizer applied over 35 years ie 13.5 kg/stock unit (su) per year. In the first five years, application of fertilizer was at 3.4 kgs/su, in the next five 22.4 kglu and subsequently there has been a mean application rate of 15.6 kglu per year. High country surveys have shown that during the 1970s annual use has been about 15 kg fertiliser/stock unit, while the 1981-82 survey shows a rise to 21 kglu (Kerr 1983). Of the total area of Tara Hills, 95% has been oversown and topdressed and this contrasts with the high country mean of 17%.

## STOCK

When Tara Hills was purchased the property was carrying 1240 stock units, all fine-woolled half breds. Apart from an initial reduction in number to allow spelling, the stock carried has climbed to 11,066 stock units in 1986 (Fig. 2). There has been a fluctuation in sheep numbers in comparison with cattle and this almost entirely reflects the research endeavour of the day. In 1956 the main flock was changed to Merinos of the Merivale blood line and 20-22 micron wool range. Ewe liveweight is maintained between 45 and 50 kg throughout the year.

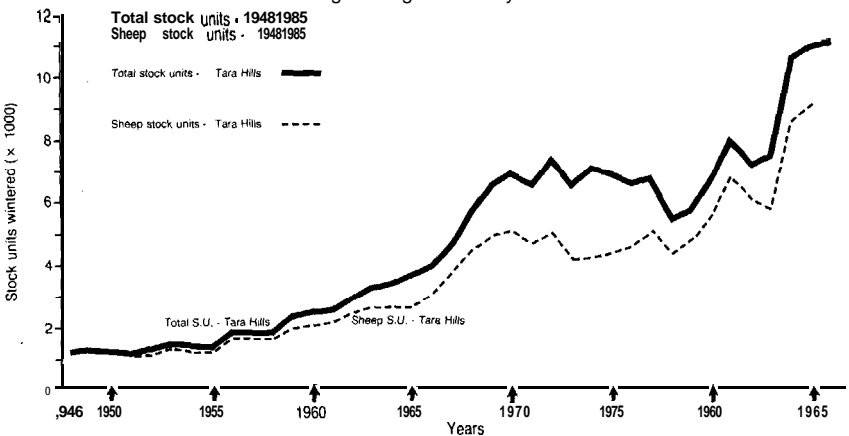


Figure 2: Tara Hills High Country Research Station.

In 1960, Hughes considered the maximum ewe numbers on Tara Hills should be 2500 (J.G. Hughes unpublished report). In 1971 Cullen considered the potential was 14,000, but not without a very real problem in winter feeding (Cullen 1971). From the initial 1240 stock units, in the first 10 years stock units doubled, rose 2.8 times between 1960 and 1970, remained static between 1970 and 1980, and have risen 1.6 times since then to 11,066 (Fig. 2).

## WOOL

In 1950 the sheep clipped an average 2.8 kg wool/head but by 1960 this had

reached 4.6 kg/head and peaked in 1962 at 5.6 kg/head. Since that time wool/head has declined to about 4 kg. This compares with the high country average of 3.8 kg/head. In sharp contrast to this, as a reflection of stock numbers carried, the initial wool production in 1948 was 3143 kg and by 1985, 44,432 kg (Fig. 3). The wool production per hectare which in 1951 was 1.3 kg/ha has continued to rise, except between 1970 and 1980, and by 1985 was 13.4 kg/ha. This compares with the high country average which was 3.5 kg/ha in 1984.

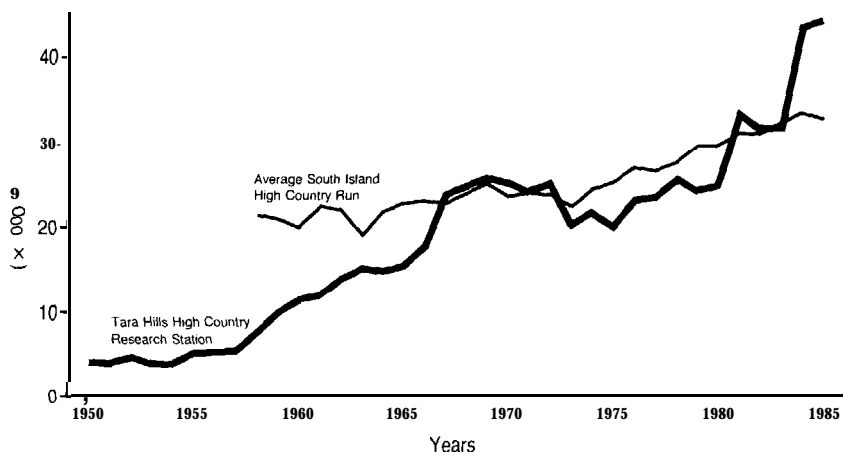


Figure 3: Wool Production 1950-1985.

Grazing trials at Tara Hills have shown stocking rate to be the major determinant of wool production per hectare (Allan 1986), and although wool production per head has declined, the total production per hectare has increased sharply between 1950-1970 and latterly from 1981 (Fig. 4). It is worth noting that in general terms wool production per head is a poor indicator of rangeland condition. Stock liveweight is far more sensitive, and therefore a better indicator.

### INCOME

Income has only been collated for the 1975-85 period, and during that time gross farm income has increased from \$10.20 to \$31.10 per stock unit, with a high of \$41.30 per stock unit in 1984. The average high country income per stock unit has risen from \$8.70/su in 1975 to \$25.50/su in 1983.

The inflation adjusted gross income per hectare decreased from \$21/ha in 1975 to \$14/ha in 1980, increased to \$43 in 1981, and peaked at \$96/ha in 1984. In sharp contrast to Tara Hills, the average gross returns per hectare in the high country have moved from \$6.70/ha in 1975 to \$10.74/ha in 1983.

As a proportion of farm income, wool has averaged 63%, with a variation between 52% and 80%. This compares with the average high country run earning 66% of their income from wool. In 1984 and 1985, cash crops (barley and peas) provided 13% and 5%, respectively, of the gross farm income at Tara Hills.

### CONCLUSION

Tara Hills, which is in a comparatively dry environment, has demonstrated a huge production increase. Tara Hills is only one third the size of the average South Island high country run, yet runs more stock, produces more wool, and has a greater

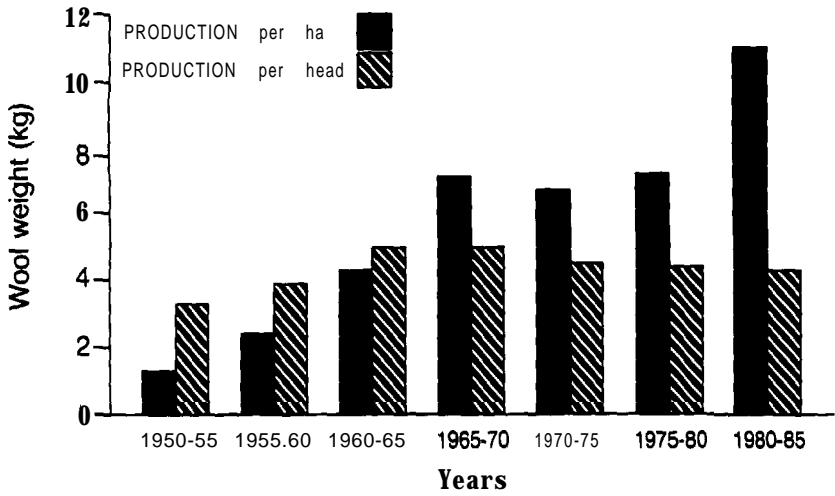


Figure 4: Tara Hills High Country Research Station. Wool Production 1950-1985.

gross income than the average holding. This clearly demonstrates there is a large production potential in the South Island high country.

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