The America's Cup of Cotton Costs: Australia versus the United States

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Abstract

The comparative advantage[1] of cotton production was examined for three production systems in the United States and four production systems within Australia. Operating expenses, income, operating margin and machinery fixed costs are presented. Tax, social structure, subsidies and capital investment differences are also discussed. Sensitivity analysis was conducted varying the exchange rate and crop yields. Conclusions were drawn on the competitive advantages of investing in cotton production in Australia versus the US.

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[1]**Comparative advantage** refers to activities in which a group performs better relative to others. Typically comparative advantage performance is based on soils, climate and other resources. **Competitive advantage** represents the actual trade advantage a country has, including all comparative advantage items plus those artificially created by government (eg., direct subsidies, barriers to trade), (Perry et al., 1994).

Introduction

Australia normally produces 2 million bales of cotton per year, 10-15% of the US production levels. However, due to drought conditions, last seasons crop was only 1.4 million bales and this season only 1.2 million bales are expected. Almost all the Australian crop is exported, in contrast to the US where less than half of the crop is exported (Dowling, 1994).

The Australian cotton crop is produced in an area which runs from the Macquarie Valley in New South Wales, 1,200 miles North to Emerald in Queensland. Of this, three quarters is produced in New South Wales, with most of the production centered around irrigated river valleys. The area farmed has declined, also as a result of the drought, from a peak of 697,000 acres in 1992 down to a projected 537,000 acres for this season (Foster, 1994). Approximately fifteen percent of this area is dryland cotton production.

Australian cotton yields are the world's highest at 1033 lb/acre, two to three times the world average (Dowling, 1994). Typically Australian cotton is of high quality (base grade 3135), similiar to Californian desert irrigated cotton.

The cotton season spans the 7 months from October through April, with a mean rainfall of approximatly 26 inches per year. At Narrabri, in Northern NSW, they receive 33% of this during the cotton growing season. Moving North, the climate becomes more tropical, and Dalby on the Darling Downs in

Queensland receives 68% of the mean annual rainfall during the growing season (Clewett et al., 1994). Since the majority of Australian cotton production is irrigated, the central importance of the rainfall is its ability to recharge the water storage dams, rivers and underground acquifers for the next season.

There is a tradition of investment in Australian cotton production by multinational companies. Northern Hemisphere countries can reduce their production risks and spread their cash flows more evenly across the year due to the reverse seasons. A common question is whether or not there is a comparative advantage in Australian cotton production which also drives this investment. The objective of this paper was to compare the costs of growing cotton in three regions of the US to two regions in Australia, to go some way towards answering this question.

Methods

For comparative purposes production budgets were chosen for the US and Australia which represented the production systems typical of the major production areas (see Table 1). All information is presented in US dollars on a per acre basis.

The US budgets were for irrigated Californian desert cotton, San Joaquin Valley, (University of California Cooperative Extension, 1992), Texas High Plains furrow irrigated, heavier textured soils (Texas Agricultural Extension Service, 1994), and Mississippi Delta dryland cotton grown on sandy soil (Mississippi State University, 1994). The Australian budgets were for the Namoi Valley, Northern New South Wales, dryland cotton (NSW Agriculture et al., 1994) and irrigated cotton (Patrick, 1994); and for the Darling Downs, dryland cotton (NSW Agriculture et al., 1994) and irrigated cotton (Department of Primary Industries, 1994).

The agronomic yields, production income, operating costs, and margin above operating costs were collated on a spreadsheet and grouped into similiar categories. All units were converted to a US dollars per acre basis using an exchange rate of 0.75 US dollars per Australian dollar. Unless otherwise specified, interest rates were assumed to be 9% for the US and 12% for Australia.

Fixed costs were included for machinery costs only, due to the consistency of the information available. Values are included however, on the investment in land and infrastructure typical for Australian cotton farms.

The cotton lint prices and cotton seed prices used were consistent with those indicated in the crop production bugets for each region. The income was estimated initially based only on cotton lint and cotton seed income (no loan subsidies or deficiency payments). A world cotton price of US $0.70/lb was used for all the Australian budgets and the Californian budget. Texas and Mississippi cotton prices were assumed to be US $0.65/lb and US$0.63/lb respectively. The value of the US producer loan interest subsidy and the deficiency payments were calculated separately. Cotton lint production breakeven levels were estimated for the operating margin.

Within this paper, conclusions from previous research was used as an indicator of the magnitude of the relative benefits from tax rates, social programs and government intervention in the cotton industry.

The exchange rate was varied from US$0.65/A$ to US$0.85/A$ to observe the effect on the comparison between Australia and the U.S. The influence of production risk on the long term expected operating profit was tested by varying the expected crop yields.

Results and Discussions

Production Comparisons

The highest lint yields were for the irrigated cotton grown on the Darling Downs, Queensland (see Table 2). This was followed by irrigated Namoi Valley cotton and irrigated Californian San Joaquin Valley cotton. All three systems produce in the vicinity of 1000 to 1350 lb/acre.

Mississippi Delta Cotton had the highest dryland yield, and was ahead of irrigated Texas High Plains cotton yields and dryland Darling Downs cotton. The lowest yield was from the dryland Namoi Valley system at 485 lb/acre.

Operating Expenses - Overall Comparisons

There were a number of significant differences between US production costs and the Australian production costs, (see Tables 3 and 4).

Australia generally had no extra seed treatment costs, which were required for the Mississippi and Texas systems. Growth regulators were not included in the Australian budgets, but were in the Californian and Mississippi budgets.

Machinery operating costs were higher in the US, however this was offset in Australia by higher custom machinery operation costs.

Ginning costs were higher in Australia (10 cents per lb versus 7.5 cents per lb for spindle picked cotton). Combining this with the higher picking and cartage costs made the overall harvest costs in Australia much higher.

Bale assessments and the associated bale levies for R&D organisations were higher and involved more recipients in the US than in Australia.

Consultant charges within Australia were $12-14/acre as opposed to $4-5/acre in the US. However, all Australian budgets included an allowance for a consultant, as opposed to the US budgets, where it was only included in the Mississippi budgets.

Crop insurance was allowed for within all Australian budgets, but was only present in the US budgets for the Texas High Plains. Generally

Australian crop insurance cost $6/acre, while on the Texas High Plains it cost $15/acre.

Operating Expenses - Production system comparisons

For the high input, high production, and irrigated areas of California and the Darling Downs, the operating expenses were remarkably close for both areas ($611/acre and $613/acre respectively). However, within the operating expenses there were significant differences. The costs were higher in the Californian budgets for hoeing, growth regulators, irrigation, machinery operating costs, casual labour and bale assessment costs. Seed, fertiliser, herbicide, harvest aid and interest costs were about the same for both systems. While the custom rates for spraying, picking, hauling and ginning were higher for the Darling Downs system.

The Mississippi cotton production system (although "non-irrigated") was considered comparable to the irrigated Namoi/Gwydir and dryland Darling Downs production systems. The total operating expenses for the Mississippi Delta ($413/acre) lay between those for the Namoi/Gwydir irrigated cotton ($487/acre) and the Darling Downs dryland cotton ($316/acre).

Fertiliser, seed costs herbicide insecticide, growth regulator, machinery costs, and casual labour were all higher (around double) for the Mississippi Delta than both the irrigated Namoi Valley and dryland Darling Downs cotton. On the other hand, hoeing, custom work and consultant costs in the Namoi/Gwydir Valleys and on the Downs were two to three times higher than those in the Mississippi Delta. The primary reason for the Namoi/Gwydir irrigated budget having a higher total cost was due to the higher custom rates for picking, cartage and ginning associated with the higher yields.

The low yield cotton budget for the irrigated Texas High Plains was comparable to a dryland Namoi/Gwydir Valley cotton budget. Overall the operating expenses were $74/acre (30%) higher in the Texas High Plains. The only production costs which were more expensive in the dryland Namoi/Gwydir Valleys were the insecticide, harvest aid, custom cartage and the consultant.

Fixed costs

Fixed costs related to only machinery and implements, as consistency across the budgets restricted the range of fixed costs which could be included (see Table 4). Overall, the machinery fixed costs were significantly higher in the US than for Australia ($25-$79/acre more). This is possibly due to the higher machinery costs within Australia which in relative terms appear to deter investment in machinery in Australia. The Australian budgets had a correspondingly higher custom work cost.

Operating margin (gross margin)

In terms of the net returns after operating costs, the irrigated Darling Downs and Namoi Valley in Australia made in the vicinity of $460-480/acre, which was double the operating margin achieved by the next best system - Californian cotton at

$232/acre (see Table 6).

Darling Downs dryland cotton made the next highest margin, which at $206/acre was close to the Mississippi Delta margin of $171/acre.

Texas High Plains and dryland Namoi Valley cotton made a similar operating profit of $102 and 116/acre respectively.

It should be noted here that the dramatic differences in operating margin for the Darling Downs and Namoi/Gwydir systems is primarily due to the higher yields achieved.

Breakeven yields
The yields required to breakeven over the operating costs were in general between one half and three quarters of the yields assumed. The lowest breakeven yield was 319 lb/acre for the Namoi/Gwydir dryland cotton. The two highest cost systems (California and irrigated Darling Downs) had the highest breakevens of 701-744 lb/acre.

Loan value and price support subsidy
The value of the US governments advance on cotton sales, on paper, is worth at least the interest saved on funds which would otherwise have been borrowed. According to the production budgets used here, this would add an extra $10/acre, $13/acre and $25/acre to the cotton income for Texas, Mississippi and California respectively.

The security of effectively having a floor price on the lint value, (before the cotton is planted) is difficult to value. However a guaranteed minimum price is bound to promote investment in cotton because of the attractiveness of an industry without a downside price risk. It is also likely to keep non-efficient farmers in cotton production.

Exchange Rate Effect

As price takers in the world cotton market, an increase in the value of the Australian dollar, effectively reduces the price we recieve for cotton in Australia. However, a strengthening of the Australian dollar also means the cost of imported inputs decrease, making machinery purchases cheaper. The desirability of this situation or the reverse situation with a weakening of the Australian dollar, depends on the proportion of imported inputs required as compared to the value of the cotton income.

The effect of the exchange rate on the Australian gross margins was to increase the profitability of the Australian budgets with a weakening of the Australian dollar (strenghtening of the US dollar). At an exchange rate of US $0.85/A$ the operating profit from irrigated Darling Downs cotton was still higher than that for the Californian desert cotton (see Table 8).

Production Differences and Yield Effects

With the majority of the Australian crop relying on irrigation, the central importance of rainfall is in recharging the water storages for next season. However, rainfall during the growing season also reduces the need for irrigation. Many of the irrigation dams are relatively recent developments (under 30 years), and the water licences allocated are now at maximum capacity or overallocated. Even with a dam 100% full, in some regions this only ensures 30% of the allocated water licence will be available.

Historical data would indicate that one year in ten it is likely that the growing season rainfall will be below 8 inches at Narrabri and below 15 inches at Dalby. The lowest annual rainfalls on record are around 10 inches for both Narrabri and Dalby (Clewett et al., 1994).

The risk of insufficient rainfall and irrigation water is very real to the Australian cotton farmers at the moment, as water shortages in the Namoi, Gwydir and Mackintyre regions have that many farmers had significantly reduced yields last year, could not plant this year, and unless there is substantial rain in the short term, they will not be able to plant next year. It can be argued that rather than a straightforeward gross margin, an expected value gross margin should be used, taking into account the probabilities of achieving the specified yields.

The practice of rotating crops on the farm brings a different dimention into the economics of cotton growing. Some farmers plant cereal crops or legume crops with the prospect of only small returns, to improve the soil for the following cotton crops. In dryland situations crop land is also often fallowed to allow the soil profile to fill with moisture, for the subsequent cotton crop. Hence a return is effectively spread over two years.

The yields required to breakeven over the operating costs are shown in Table 6, along with the proportion these yields are of the original yields assumed. From this it can be seen that the crop can still cover the operating expenses in both Australia and the US as long as the yields are between two thirds and three quarters of the assumed yields.

Infrastructure Differences
Aside from agricultural production differences, other factors related to a country's institutional framework can dramatically influence farm profitability. Australia for instance has no deficiency payments, loan subsidies, acerage restrictions, or government marketing programs relating to cotton. There is a voluntary levy paid to the Australian Cotton Foundation of $2.50/bale, and $0.25/bale paid to the Cotton Research and Development Fund. There are significantly fewer government regulations in the Australian cotton industry as compared to the US.

On the other hand, Australia has an extensive (and generous?) social welfare system which includes education assistance allowances, job search allowances, unemployment benefits, single parent benefits, sickness benefits, invalid pensions, old age pensions, a rural assitance scheme, and a partially socialised health system.
Income taxes within Australia are paid to the Federal government. State taxes are levied on goods such as fuel, and through local council and shire rates. An analysis by Perry and others (1994) of wheat production in the US, Canada and

Australia found that the tax and social program advantages favoured Australia for small and medium-sized farms. Large corporate US farms came closest to being on the same footing as their Australian counterparts.

Fuel costs in Australia are significantly higher than in the US, at $2.40/gallon to the general public and $1.35/gallon tax free if used in primary production. Wages for farm labour are also higher in Australia at approximatly $10.50/hour with taxes included.

Farm machinery is another input typically more expensive in Australia. The higher costs are related to the fact that Australia does not produce its own tractors, and produces only a few implements. As a result the international machinery companies tend to view Australia as a small market with inelastic demand. These higher fuel, wage and machinery costs combine with less well developed country infrastructure to result in generally higher transport costs within Australia.

The value of land set up for cotton production ranges from $1100-$1800 per "green" acre in the Australian cotton growing regions. While investment in the machinery and implements necessary for an average size cotton farm (780 acres) costs in the vicinity of $192,000, or $246/acre (175 hp tractor, cultivator, planter, spray rig). Some farms also invest in their own cotton pickers ($144,000 for a 4 row picker), and hi-boy tractor sprayers ($65,621 for a 60 foot folding boom).

Conclusions

Total operating costs appeared to be comparable across production systems in the US and Australia. However, there were differences within the total costs between the two countries.

Key difference related to the significantly higher use of custom machinery within Australia, and a higher use of farm machinery in the US. Ginning costs and consultancy rates appeared to be higher in Australia, while casual labour, crop insurance, and bale levies were higher in the US. The higher reliance on custom operations in Australia was reflected in an overall lower level of fixed machinery costs.

There appears to be some comparative advantage in the production of cotton on the Darling Downs and in irrigated production in the Namoi Valley, in Australia. This is due to considerably higher yields which can be achieved compared to the US systems. However, the higher yields must be considered in the context of the Australian climate and the chance of drought (an integral part of farming in Australia).

Irrigated Darling Downs cotton production was comparable to Californian San Joaquin Valley cotton production. Similiarly, Mississippi Delta cotton production was comparable to dryland Darling Downs and irrigated Namoi/Gwydir Valley cotton. While the Namoi/Gwydir Valley dryland production system was comparable to the Texas High Plains irrigated cotton. The loan subsidy was estimated to be worth between $10-$25/acre, or 10% of the operating costs.

If the exchange rate used here to convert the Australian budgets to US$/acre values is considered too high, this implies that the gross margins are generally underestimated. The reverse is the case if the exchange rate is considered too low.

Given the current drought situation in Australia, it is crucial that the higher yields assumed for the Australian budgets are viewed with this in mind. The yields can drop to between one half and two thirds of those assumed, and the operating costs can be covered. However, this is little consolation to the Australian farmers' who have only covered their operating costs (or less) for the last three years.

Infrastructure differences as highlighted by Perry (1994), indicate an advantage for small to medium firms in Australia due to the social and tax structure of the country.

In Conclusion then, with similiar costs, higher yields and a favourable tax and social structure, there could be a comparative advantage in producing cotton in Australia. However, these advantages appear to be negated by the higher production risks associated with the irrigation and rainfall reliability in Australia.

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References

1. Australian Bureau of Statistics. 1994. Agricultural Industries Financial Statistics 1992-93. Catalogue Number 7507, Canberra, AGPS.

2. Andrew, P., and D. E. Ethridge. 1986. Cost of Producing Cotton in the U.S. and Competing Countries. Paper presented at the NCC meeting.

3. Clewett, J. F., N. M. Clarkson, D. T. Owens and D. G. Abrecht. 1994. Australian Rainman: Rainfall information for better management. Department of Primary Industries, Brisbane.

4. Department of Primary Industries. 1994. Darling Downs Crop Management Notes. Department of Primary Industries, Brisbane.

5. Dowling, D. 1994. A Season of Contrasting Fortunes. in Cotton Yearbook 1994. The Australian Cottongrower, Toowoomba, Qld.

6. Foster, 1994 ABARE production estimates.

7. Mississippi State University, 1994 Costs and Returns, Major Crop Enterprises, Delta, Mississippi, 1994, Agricultural Economics Department, Mississippi State University, January 1994.

8. NSW Agriculture, Department of Primary Industries, Cotton Research and Development Corporation. 1994. Australian Dryland Cotton Production Guide. Information Series QI93044. Agdex 151/10. Queensland Government.

9. Perry, G. M., C. J. Nixon, J. J. Actis, K. Bunnage, and R. Batterham. 1994. The Effect of Taxes and Social Programs on Competitiveness in International Agriculture: A Case Study of the Wheat Industry. Special Report 679. Agricultural Experimental Station, Oregon State University.

10. Patrick, I. 1993. Summer Crop Budget Handbook, 1993, Northern NSW. NSW Agriculture, Agdex 100/10.

11. Texas Agricultural Extension Service, 1994. Cotton Budgets for the Texas High Plains. Texas A&M University System, US Department of Agriculture, and the County Commissioners Courts of Texas.

12. University of California Cooperative Extension, 1991. Sample Costs to Produce 40 Inch Row Cotton in the San Joaquin Valley.

Table 1. Cotton production systems analysed for the US and Australia.

Short name	Production System	Percent of Cotton from this farming system
	US	
Ca	California San Joaquin Valley, desert irrigated	~8% of US acreage
Ms	Mississippi Delta, dryland, sandy soil	~8% of US acreage
Tx	Texas High Plains Irrigated, heavier soils	~32% of US acreage
	Australia	
DDi	Darling Downs, Queensland, irrigated	~15% of Aust. acreage
NGi	Namoi - Gwydir Region New South Wales, irrigated	~52% of Aust. acreage
DDd	Darling Downs, Queensland, dryland	~5% of Aust. acreage
NGd	Namoi - Gwydir Region New South Wales, dryland	~9% of Aust. acreage

Table 2. Operating Costs - growing costs - USA v Australia ($/acre).

Operating Cost ($/acre)	Production system[1]						
	Ca	Ms	Tx	DDi	NGi	DDd	NGd
Fertiliser	44	53	19	56	28	16	10
Seed+treat	11	23	18	11	8	5	5
Crop insure	0	0	15	24	6	6	6
Herbicide	8	41	12	11	13	6	6
Hoeing	25	6	12	8	13	13	13
Insecticide	16	64	18	88	52	47	51
Growth reg.	15	9	0	0	0	0	0
Custom spray	10	16	18	29	15	6	4
Consultant	0	4	0	12	14	14	14
Irrigation	87	0	45	55	21	0	0
Machinery	115	67	53	12	31	18	25
Cas. labour	97	15	0	24	0	0	0
Interest	25	13	10	24	19	12	10

1. Ca= California San Joaquin Valley, Ms= Mississippi Delta, Tx= Texas High Plains, DDi= Darling Downs irrigated, NGi = Namoi/Gwydir irrigated, DDd= Darling Downs dryland, NGd= Namoi dryland.

Table 3. Operating Costs - harvest costs - USA v Australia ($/acre)

Operating Cost ($/acre)	Production system[1]						
	Ca	Ms	Tx	DDi	NGi	DDd	NGd
Harvest aid	15	21	9	16	22	12	22
Custom pick	0	0	34	77	91	77	30
Custom haul	0	3	0	26	21	11	8
Ginning	108	66	61	138	128	69	49
Bale levies & assesment	33	12	9	6	5	3	2

1. Ca= California San Joaquin Valley, Ms= Mississippi Delta, Tx= Texas High Plains, DDi= Darling Downs irrigated, NGi = Namoi/Gwydir Valleys irrigated, DDd= Darling Downs dryland, NGd= Namoi/Gwydir Valleys dryland.

Table 4. Production comparisons - US v Australia (lb/acre)

Yield lb/ac	Production system[1]						
	Ca	**Ms**	**Tx**	**DDi**	**NGi**	**DDd**	**NGd**
Lint	1150	825	600	1360	1262	679	485
Seed	1725	1279	874	2775	1918	1034	740

1. Ca= California San Joaquin Valley, Ms= Mississippi Delta, Tx= Texas High Plains, DDi= Darling Downs irrigated, NGi= Namoi/Gwydir Valleys irrigated, DDd= Darling Downs dryland, NGd= Namoi/Gwydir Valleys dryland.

Table 5. Income, operating costs and margin after operating cost - US v Australia ($/acre)

$/acre	Production system[1]						
	Ca	**Ms**	**Tx**	**DDi**	**NGi**	**DDd**	**NGd**
Income	843	584	434	1075	969	522	373
Oper. costs	611	413	332	613	487	316	256
Oper. margin	232	171	102	461	482	206	116
Fixed costs	103	77	49	12	25	12	12
Margin above fixed costs	129	94	54	449	457	194	104

1. Ca= California San Joaquin Valley, Ms= Mississippi Delta, Tx= Texas High Plains, DDi= Darling Downs irrigated, NGi= Namoi/Gwydir Valleys irrigated, DDd= Darling Downs dryland, NGd= Namoi/Gwydir Valleys dryland.

Table 6 Yield required to breakeven with operating costs (lb/acre).

	Production system[1]						
	Ca	**Ms**	**Tx**	**DDi**	**NGi**	**DDd**	**NGd**
Yield	744	554	443	701	575	386	319
% of base yield	69%	67%	74%	51%	46%	57%	66%

1. Ca= California San Joaquin Valley, Ms= Mississippi Delta, Tx= Texas High Plains, DDi= Darling Downs irrigated, NGi= Namoi/Gwydir Valleys irrigated, DDd= Darling Downs dryland, NGd= Namoi/Gwydir Valleys dryland.

Table 7 Exchange rate effects on the operating margin ($/acre).

Exchange rate US$/A$	**Production system[1]**						
	Ca	**Ms**	**Tx**	**DDi**	**NGi**	**DDd**	**NGd**
0.65	232	171	102	527	535	242	146
0.75	232	171	102	461	482	206	116
0.85	232	171	102	396	428	170	87

1. Ca= California San Joaquin Valley, Ms= Mississippi Delta, Tx= Texas High Plains, DDi= Darling Downs irrigated, NGi= Namoi/Gwydir Valleys irrigated, DDd= Darling Downs dryland, NGd= Namoi/Gwydir Valleys dryland.