COMMENTS TO THE PRODUCTIVITY COMMISSION ON THE ESTIMATES OF THE IMPACTS OF BROADSCALE CLEARING RESTRICTIONS IN MURWEH SHIRE

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1.0 INTRODUCTION

This report provides a range of comments on the quantitative analysis of a clearing ban in the Murweh Shire. The report focuses on Appendix K of the Productivity commission's draft report on the impacts of Native Vegetation and Biodiversity Regulations. The four key areas examined are:

- Assumed land-use and management practices
- Estimated returns from clearing on a per hectare basis and clearing costs
- Impact of thickening and regrowth on livestock carrying capacity
- The assumed business-as-usual rate of clearing.

Additional data of both a quantitative and qualitative nature based on the PhD research of Slaughter (2003) are also provided where relevant.

2.0 PRELIMINARY ISSUES

2.1 VEGETATION THICKENING

Many parts of The Productivity Commissions' conclusions in the draft report for Murweh shire are dependent on assumptions associated with vegetation thickening. Given the complex nature of vegetation thickening, the assumption on page 501 of the draft report, that regrowth control will negate the impacts of regrowth on carrying capacity, is problematic. Financial constraints may be a barrier for some landholders to clear re-growth (Slaughter 2003). It is also likely that some areas of cleared land will not provide sufficient gains in production to warrant initial clearing or treatment of regrowth. As a consequence some land that is currently cleared is likely to revert to remnant vegetation as currently classified under the Queensland Vegetation Management Act (1999) *(as in force on 28 March 2003).* The Act classifies remnant vegetation as:

> **(a)** covering more than 50% of the undisturbed predominant canopy; and
> **(b)** averaging more than 70% of the vegetation's undisturbed height; and
> **(c)** composed of species characteristic of the vegetation's undisturbed predominant canopy.

The issue of woody vegetation encroaching on currently open grassland and the possibility of it being classified as remnant vegetation in the future based on the composition of adjacent woody vegetation also needs to be discussed.

The assumption that cleared land will remain cleared also impacts on the methodology for the thickening of remnant vegetation under the business as usual scenario. The submission by Wilson (2004 p.2) to the Productivity Commission indicates that the thickening of vegetation that can be cleared under the business as usual scenario in Table K.4 on p. 512 should be calculated as: 2.1 million ha – x1 ha in year one; 2.1 million ha – x1 - x2 and so on assuming x is the number of hectares cleared. This is realistic based on the assumption that cleared land will remain cleared. However, it is not an accurate reflection of what happens in reality. Failure to take into account that re-growth will occur on cleared land over time exaggerates the net level of clearing that takes place under the business as usual clearing scenario.

The statement by Wilson (2004 p.2) that the area is in imminent and drastic decline is well documented: Vegetation in south west Queensland has been experiencing thickening well before the 1960s and was noted before the beginning of the 20th Century (Witt, Berghammer, Beeton & Moll 2000; Witt 1997). It is also evident that thickening is not a uniform process (Page 1997; Jones and Burrows 1994). The incidence of fire along with variations in land types, rainfall and stocking management influence the rate at which vegetation will thicken over time.

Wilson (2004) refers to the work of Fenshem et al. (2002) and makes comparisons between the rate of thickening for species such as Acacia harpophylla and Acacia shirleyi in the higher rainfall region of central Queensland to the predominant Acacia anuera in Murweh Shire. Wilson claims that 1% per annum woodland thickening in Murweh calculated in the draft report is exaggerated based on this comparison. This is erroneous as the rate of thickening for different vegetation on different soil types with different rainfall should not be directly compared. Higher rainfall does not necessarily dictate that thickening will be greater.

Use of SLATs and the WARLUS maps by Kenny and Beale (2003) to measure remnant vegetation and assess land types is appropriate. However, the SLATS figures appear to be based on 1997 data that have not been extrapolated to 2003 as their starting point. This point is also raised by Wilson (2004) in his submission to the Productivity Commission. This has been discussed with Dr Ian Beale and is being addressed.

The section on vegetation thickening on page 504 of the draft report would benefit from a more detailed explanation of the methodology used. Having reviewed the raw data and the methodology of Kenny and Beale (2003) I am satisfied that the vegetation thickening figure used of 1% per annum is satisfactory. Applying the 1% per annum figure for thickening for all of the 2.1 million hectares in Table K.4 p.512 under the business as usual scenario is also important. Thickening on the entire 2.1 million hectares will on average occur at the same rate for both cleared land and uncleared land. Many woody species will survive after clearing and will quickly re-grow. Therefore thickening should be taken into account on land that is cleared under the business as usual scenario as this provides a realistic reflection of what occurs in practice.

However, if we assume that remnant vegetation will not be cleared under the restricted clearing scenario, the 2.1 million hectares is likely to increase over time rather than remain constant. This is due to the aforementioned factors such as financial constraints which prevent landholders from re-clearing land before reclassification as remnant. While measurement of this phenomenon requires further research, it is a factor that should be given consideration.

2.2 Safe carrying Capacity

The methodology used by Kenny and Beale (2003) to estimate carrying capacity is valid and well documented (Phelps and Johnston 2000; Johnston 1996; Johnston, McKeon and Day 1996; Johnston, Tannock and Beale 1996). However, Wilson (2004) argues that the highly asymptotic relationship between FPC and WI (Kenny and Beale 2003) means that the changes in carrying capacity are highly sensitive to the assumptions and accuracy of the input variables. Wilson suggests that the sensitivity analysis should be expanded to include sensitivity to variations in inputs with unknown accuracy etc. This is not a concern given the broad accuracy of the model in practice. Cooney (1995) and Crichton (1995) found that the safe carrying capacity model is suitable for use with other species apart from mulga. Practical application of the model by the Charleville QDPI office in its Safe Carrying Capacity Project also demonstrated the accuracy of the model across a range of land systems and vegetation associations. The model is currently the most accurate and robust method of measuring safe carrying capacity in Murweh shire.

3.0 ASSUMED LAND-USE AND MANAGEMENT PRACTICES

The draft report gives an accurate summary of the current land–use and land management patterns in Murweh Shire. There is no question that clearing in Murweh shire is done to improve the productivity and profitability of existing grazing enterprises. While there may be land use changes over time, it is unlikely that there will be a significant shift away from the grazing of animals such as sheep, cattle and goats in the near future.

In the event that clearing of remnant vegetation is restricted, the returns to graziers on uncleared land will certainly decline due to vegetation thickening. A factor that is not raised in the draft report is the likely affects of vegetation thickening on landholders' grazing management practices. A decline in carrying capacity as a result of increased/thickened vegetation does not necessarily mean a corresponding reduction in stock numbers by landholders. Landholders will attempt to maintain stock numbers at a level where they can make sufficient economic returns to survive, even though this may be in excess of the safe carrying capacity of their property (Slaughter 2003). As the pasture cover declines from continued overgrazing it provides an increased opportunity for other unpalatable weeds and woody shrubs to become established thereby further reducing grass growth and carrying capacity. This also results in increased soil erosion by water and wind (Heywood et al. 2000; Burrows 1999; Witt, Berghammer, Beeton and Moll 1999; Witt 1997; Witt, Moll and Beeton 1997; Partridge 1996; Young 1996; Roberts 1995; Passmore and Brown 1991; Miles 1990, 1989; Oxley 1987; Harrington, Friedel et al 1984). The availability of mulga browse can initially mask the effects of the decline in pasture condition and carrying capacity (Cameron and Blick 1991; Childs 1974). However, this only serves to accelerate the downward cycle in land condition.

Income from off-farm sources means it is likely that some landholders will be in a position to graze uncleared land below the zero gross margin threshold given on page 503 of the draft report. As a consequence, in the event that landholders are not able to manage vegetation adequately to maintain an economically viable carrying capacity, the practice of maintaining stock numbers that are in excess of a property's safe carrying capacity over an extended period of time has serious environmental implications for long-term land condition. The likely environmental costs of these actions under the clearing restriction scenario should be noted.

4.0 ESTIMATED RETURNS FROM CLEARING ON A PER HECTARE BASIS AND CLEARING COSTS

The basis for the costs of clearing of $35 per hectare for initial clearing and $20 per hectare need to be explained. In my experience landholders often comment that the costs associated with clearing regrowth can be equal to the costs of initial clearing.

Given the information provided, the average returns from clearing on a per hectare basis of $2.60 for uncleared land and $15.90 for cleared land (Table K.1 p. 500) are realistic. These figures are not inconsistent with those of Slaughter (2003) when adjustments are made to his raw data to take into account differences in the calculation of returns in the draft report, changes in commodity prices and returns being expressed in 2003 dollars. While the figures in the draft report are reasonable, it would be useful to provide a more detailed explanation of the basis on which they are calculated. For example it is not stated if the estimates of Constable (2003) are in 2003 prices.

The key assumptions that underpin the estimated average returns (p.501) appear to be realistic. The aggregate increase in carrying capacity from 0.35 dse per hectare to 0.85 dse per hectare are in line with the findings of Slaughter (2003). However, it would be useful give more detailed information of how these figures are calculated.

Slaughter (2003) provides some further insights into the returns from clearing. There is a significant positive relationship between the percentage of cleared land on properties in the eastern mulgalands and on-farm cash income and on-farm cash operating surplus (*approximately half of the eastern mulgalands are within Murweh Shire*). While this is not a definitive figure it indicates that increases in carrying capacity have a significant positive influence on cash operating surplus (see list of definitions).

Using data from Slaughter (2003) Table 1 indicates that property carrying capacity explains 39.5% of the variation in total on-farm cash operating surplus, while Table 2 shows that carrying capacity per hectare explains 38% of the variation in per hectare on-farm cash operating surplus. The percentage of cleared land directly explains 24% of the variation in on-farm cash surplus (See table 3). Together with carrying capacity the percentage of cleared land explains 42% of the variation in on-farm cash operating surplus (See table 4). It is clear from this data that both clearing and pasture improvement have a significant influence on profitability.

Table 1: Influence of carrying capacity on on-farm cash surplus

Model Summary[b]

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.643	**.414[a]**	.395	27944.1

ANOVA[b]

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	17094762536.598	1	17094762536.598	21.892	**.000[a]**
	Residual	24207054450.506	31	780872724.210		
	Total	41301816987.104	32			

a Predictors: (Constant), QDPI Safe Carrying Capacity Model (SCCM)estimate of property carrying capacity (CC)
b Dependent Variable: Average on-farm cash operating surplus 1993-94 to 1997-98

Table 2: Influence of carrying capacity on on-farm cash surplus per hectare

Model Summary[b]

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.617[a]	**.381**	.361	1.30371

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.382	1	32.382	19.052	**.000[a]**
	Residual	52.689	31	1.700		
	Total	85.071	32			

a Predictors: (Constant), *QDPI Safe Carrying Capacity Model (SCCM)estimate of carrying capacity (CC) per hectare*
b Dependent Variable: Average on-farm cash operating surplus per hectare 1993-94 to 1997-98

Table 3: Influence of percentage of cleared land on on-farm cash operating surplus per hectare

Model Summary[a]

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.491[a]	**.241**	.217	1.44277

ANOVA[a]

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	20.542	1	20.542	9.869	**.004[a]**
	Residual	64.529	31	2.082		
	Total	85.071	32			

a Predictors: (Constant) QDPI Safe Carrying Capacity Model (SCCM)estimate of carrying capacity (CC), Percentage of cleared land
b Dependent Variable: Average on-farm cash operating surplus per hectare 1993-94 to 1997-98

Table 4: Influence of carrying capacity and percentage of cleared land on on-farm cash operating surplus

Model Summary[b]

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.675	**.455**	.419	27388.55931

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18797821551.855	2	9398910775.927	12.530	**.000**
	Residual	22503995435.250	30	750133181.175		
	Total	41301816987.104	32			

a Predictors: (Constant), QDPI Safe Carrying Capacity Model (SCCM)estimate of carrying capacity (CC), Percentage of cleared land
b Dependent Variable: Average on-farm cash operating surplus 1993-94 to 1997-98

5.0 IMPACT OF THICKENING AND REGROWTH ON LIVESTOCK CARRYING CAPACITY

There is no question that increases in woody vegetation lead to a decline in perennial grasses and other pasture species. Evidence suggests that the loss of perennial grasses poses a greater soil erosion threat than the loss of woody vegetation (Young 1996; Roberts 1995; Passmore and Brown 1991; Miles 1990, 1989; Oxley 1987; Skinner and Kelsey 1964).

There is debate in the scientific community about vegetation thickening. While it is acknowledged from all quarters that vegetation thickening does occur, there is debate whether this is a cycle where vegetation will self thin through dieback or continue to thicken. Fensham (2000) gives evidence of tree dieback during drought and refers to it as “nature’s bulldozer”. There is no question that in some areas of Australia, recruitment of new trees after dieback under heavy grazing is severely limited leading to a more open landscape. There are also references to dieback in the mulgalands of western Queensland in the early 20th Century (The Queenslander Newspaper 1902 cited in Fensham 2000). However, it must be strongly noted that the late 19th and early 20th Centuries was a time of extreme drought, high stocking rates and the vegetation in the region at that time was vastly different from the vegetation of the present. Mulga was less prolific and tended to be in groves with grasslands in between rather than the continuous forest we see in uncleared areas today (Oxley 1987). *Very small and isolated* areas of dieback in the eastern mulgalands in the droughts of the early 1990s and 2001-2003 were reported to Slaughter (2003) in unpublished data. Research by Burrows (2002) indicates that dieback only occurs during drought in areas of high tree density. There is little long-term effect after drought as new trees are readily recruited in these areas and the thickening process continues. As a consequence, it is *extremely unlikely* that dieback will have *any impact* on the thickening process in Murweh Shire. What is apparent is that the thickening process dramatically reduces perennial grasses which mitigate soil erosion as well as being the key drivers of carrying capacity.

Slaughter (2003) found that there is a highly significant relationship between the percentages of cleared land and pasture improvement using buffel grass (*Cenchrus ciliaris*). Regression analysis using data from Slaughter (2003) shows that the percentages of cleared land and pasture improvement explain 70% of the variance in per hectare safe carrying capacity (See Table 5). Table 6 also shows that the percentage of cleared land alone explains 52.5% of the variance in per hectare carrying capacity. As a consequence it is clear that vegetation thickening has a significant impact on carrying capacity. This finding is consistent with Kenny and Beale (2003) and Kenny, Beale and Flynn (2003).

Table 5: Influence of cleared land and pasture improvement on per hectare safe carrying capacity

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.837[a]	**.701**	.686	.1056

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.019	2	.509	45.705	**.000[a]**
	Residual	.435	39	.011		
	Total	1.453	41			

a Predictors: (Constant), Percentage of pasture improvement; Percentage of cleared land
b Dependent Variable: Safe Carrying Capacity Model (SCCM) estimate of carrying capacity (CC) per hectare

Table 6: Influence of cleared land on per hectare safe carrying capacity

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.724[a]	**.525**	.513	.1314

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.762	1	.762	44.130	**.000[a]**
	Residual	.691	40	.017		
	Total	1.453	41			

a Predictors: (Constant), Current percentage of cleared land.
b Dependent Variable: Safe Carrying Capacity Model (SCCM) estimate of carrying capacity (CC) per hectare

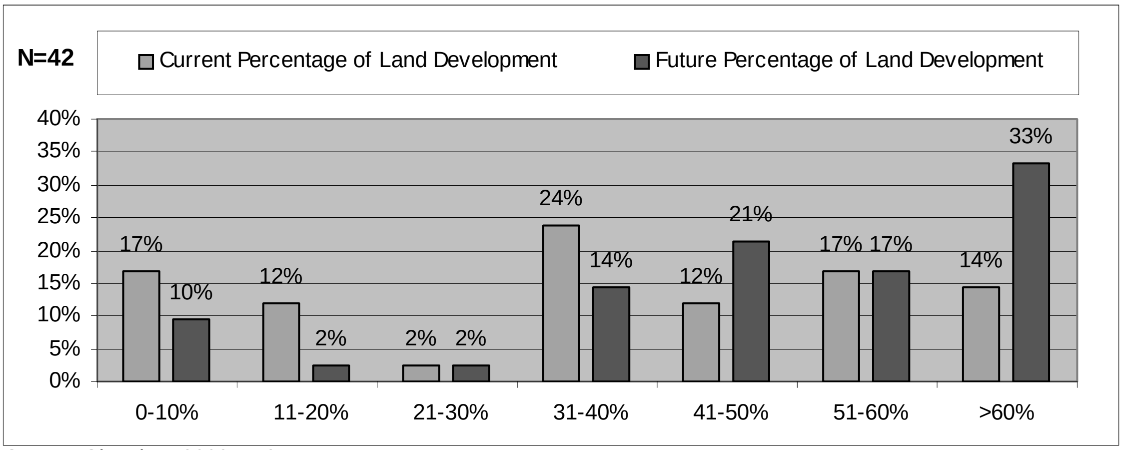
6.0 THE ASSUMED BUSINESS-AS-USUAL RATE OF CLEARING.

The assumption in the draft report on page 508 that clearing occurs incrementally is an accurate reflection of what happens in practice. While it is likely that the 2.1 million hectares of land that can be potentially cleared under the business as usual scenario would be cleared over time, it is unlikely that it will get to the point where the entire area remain permanently cleared. Over time it is likely that landholders would clear the entire area, but on a cyclical basis. That is, various areas of the 2.1 million hectares of cleared land would be at different stages of regrowth and thickening at any point in time. As a consequence, it is unlikely that the entire area would ever be at its maximum possible carrying capacity due to timber regrowth and thickening.

However, the entire area would be managed by landholders to maintain an optimum overall carrying capacity.

In response to limited evidence on the magnitude to the limits of clearing given to the Commission (p.509) research by Slaughter (2003) indicates that larger landholders tend to have smaller percentages of cleared land than those on smaller properties. This is often associated with the high cost of clearing large areas of land on larger properties. It is also evident that many small landholders clear more land in an attempt to maximise their carrying capacity. Smaller properties also tend to have a higher percentage of more productive land (Slaughter 2003). As a consequence there is a greater incentive to develop more land to gain economies of size.

It is also apparent that there are significant amounts of land that will remain un-cleared in the future. Slaughter (2003) found that the median and average percentage of cleared land in the eastern mulga was 39% and 36% respectively (See Figure 1). Figure 1 shows that landholders who intend to clear and maintain greater than 50% of their land would increase from 31% to 50%. This may change in the future, but it reflects the intentions of landholders in the eastern mulga in 2000.



Source: Slaughter 2003 p.134.

Figure 1: Current and anticipated percentage of land clearing

The approach that landholders have to clearing different types of land and maintaining regrowth also differs (see Tables 8 and 9). Where landholders indicate that they do not clear or undertake regrowth control in mulga clearing often still occurs. However, it is done this is done under a fodder permit and regrowth promoted to maintain sufficient stores for mulga feeding during drought.

Table 7: Land Development Approach Given Land Type (N = 42)

Vegetation Type		Do not Develop	Completely Clear area, leaving surrounds untouched	Leave Scattered Trees	Leave Windrows & Scat/trees	Thin out leaving most trees	Leave Clumps & Scat/trees	Clear completely leaving clumps	Other	N
Hard Mulga		4	2	3	8	1	8	0	0	**26**
		15%	8%	12%	31%	4%	31%	0%	0%	**100%**
Soft Mulga		0	6	1	11	4	15	2	2	**41**
		0%	15%	2%	27%	10%	37%	5%	5%	**100%**
Box Sandalwood		3	3	5	6	4	16	2	0	**39**
		8%	8%	13%	15%	10%	41%	5%	0%	**100%**
Box Flats		7	1	1	3	4	6	0	1	**23**
		30%	4%	4%	13%	17%	26%	0%	4%	**100%**
Pine		10	0	1	0	0	1	0	1	**13**
		77%	0%	8%	0%	0%	8%	0%	8%	**100%**
Iron Bark		14	1	4	5	1	1	0	2	**28**
		50%	4%	14%	18%	4%	4%	0%	7%	**100%**
Bowyakka		2	0	2	0	1	2	0	0	**7**
		29%	0%	29%	0%	14%	29%	0%	0%	**100%**
Brigalow/Belah		0	1	4	2	0	6	0	0	**13**
		0%	8%	31%	15%	0%	46%	0%	0%	**100%**

Source Slaughter (2003) p. 276

Table 8: Regrowth Control Given Land Type (N = 42)

Vegetation Type	No Regrowth Control	Clear and Re-clear	Clear, Burn and Re-clear	Clear and Stick Rake	Clear and Burn	Burn	Clear and Blade Plough	Other	N
Hard Mulga	4	12	6	1	2	1	0	0	**26**
	15%	46%	23%	4%	8%	4%	0%	0%	**100%**
Soft Mulga	0	15	16	1	5	3	0	1	**41**
	0%	37%	39%	2%	12%	7%	0%	2%	**100%**
Box Sandalwood	3	4	18	1	9	3	0	1	**39**
	8%	10%	46%	3%	23%	8%	0%	3%	**100%**
Box Flats	7	11	3	0	0	1	0	1	**23**
	30%	48%	13%	0%	0%	4%	0%	4%	**100%**
Pine	10	2	0	0	0	0	0	1	**13**
	77%	15%	0%	0%	0%	0%	0%	8%	**100%**
Iron Bark	14	2	6	0	4	1	0	1	**28**
	50%	7%	22%	0%	11%	4%	0%	4%	**100%**
Bowyakka	2	1	3	0	0	0	0	1	**7**
	29%	14%	43%	0%	0%	0%	0%	14%	**100%**
Brigalow/Belah	0	1	4	2	3	0	3	0	**13**
	0%	8%	31%	15%	23%	0%	23%	0%	**100%**

Source Slaughter (2003) p. 276

7.0 CONCLUSIONS

Many of the figures calculated in the draft report for Murweh Shire in Appendix K are dependent on assumptions associated with vegetation thickening. The impacts of vegetation thickening that is likely to occur on land that is currently cleared or naturally open under the clearing restriction scenario need to be discussed.

Based on the given assumptions and the quantitative information available, the costs and returns calculated in the report seem reasonable. However, there needs to be more detailed explanation of how these costs and returns are calculated. This is especially needed in the majority of the tables in Appendix K.

While the overall assumptions made by the Productivity Commission are reasonable, one key area that appears to have been overlooked is the environmental costs of the loss of perennial grasslands. It is well documented that the loss of perennial grasslands has negative environmental effects in the mulgalands of south west Queensland and north west New South Wales. Failure to manage the landscape in such a way that promotes a balance between agricultural and environmental goals will result in impoverishment in both areas.

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DEFINITIONS

On-Farm Cash Expenses (FCE): Cash expenses arising from all on-farm activities (Does not include payments to owners)

On-Farm Cash Income (OFCI): Cash income derived from agricultural activities, excludes off-farm income.

On-Farm Cash Operating Surplus (OFCOS): Cash income derived from agricultural activities (excluding off-farm income) less total farm cash costs incurred in the generation of that income.

Safe Carrying Capacity: The estimated number of dry sheep equivalents (DSEs as measured by a 50kg wether) that can be carried on a land system, paddock or property in the long term without increasing soil erosion and decreasing pasture condition. Calculated using the QDPI's Safe Carrying Capacity Model (SCCM).