

## The Marginal Cow II

The Marginal Cow – Part I (TMC I) stressed maximizing operating surpluses by producing to the point where marginal cost equaled marginal revenue (MC=MR). This is the point of allocative efficiency – the right level of resources being used to provide the maximum operating surplus. TMC II is not about moving along a production function to the point where MC=MR, but looking at different production functions – presumably still with the intention of setting production to MC=MR.

Figure 1 shows marginal operating surplus per cow and total operating surplus against herd size for the same farm and production function used in TMC I. That being an average 107 Ha Waikato dairy farm producing 12,150 Kg DM averaging 11 MJME DM and using 500 Kg liveweight, 350 Kg MS cows. Per cow costs excluding feed are \$790. MS payout is \$5.50. The farm has infrastructure to allow 400 cows to be milked and the feeding of up to 40% of required DM as supplements. The production function from TMC I will be considered the base function, and to illustrate the impact, new production functions created representing different management options.

It should now no longer be necessary to stress marginal effects. Figure 1 shows that operating surplus is maximized where MC=MR. Total operating surplus will be used to represent various production functions. The marginal operating surplus line should be recognized as being the same as that in Figures 2 and 3 of TMC I.

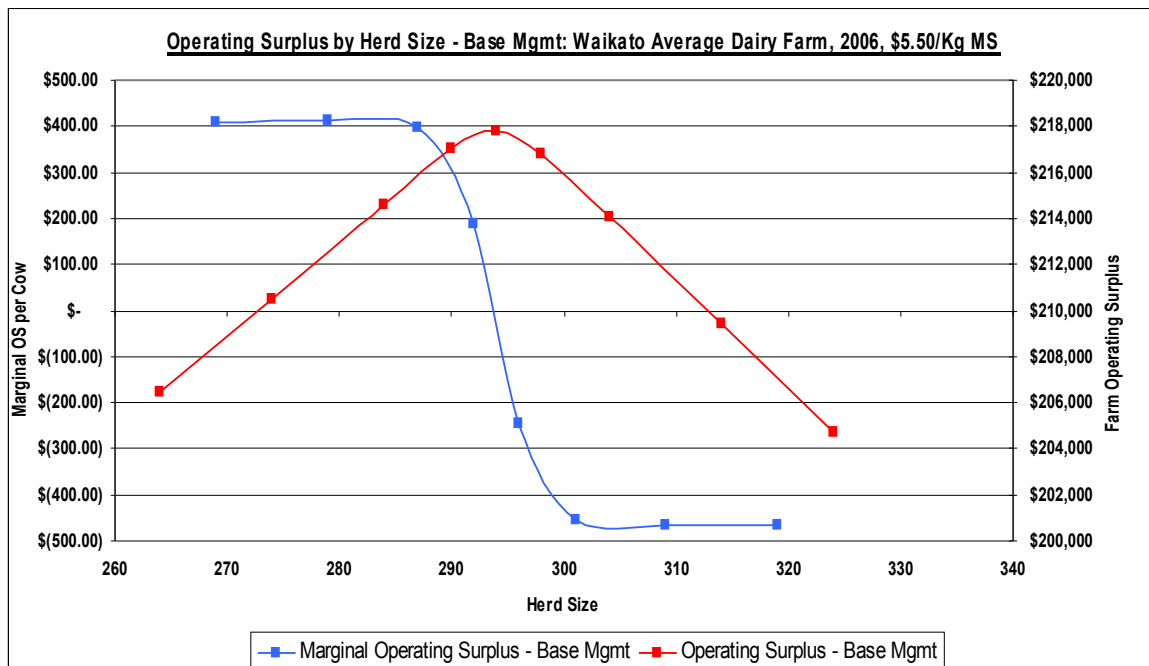


Figure 1

Before complicating the picture by looking at multiple production functions it is worth looking to our single production function for a possible cause of sometimes confusing or contradictory research findings. Often a conclusion is drawn from comparing results from points on two different systems. Figure 2 uses our base production function to illustrate how the selection of points can lead to very different conclusions.

A comparison of Point B with Point C would correctly lead to a conclusion that increasing herd size from 274 to 304 cows (requires feeding supplements) increases operating surplus.

A comparison of point A with Point C would also correctly lead to a conclusion that increasing herd size from 294 to 304 cows and feeding supplements decreases operating surplus.

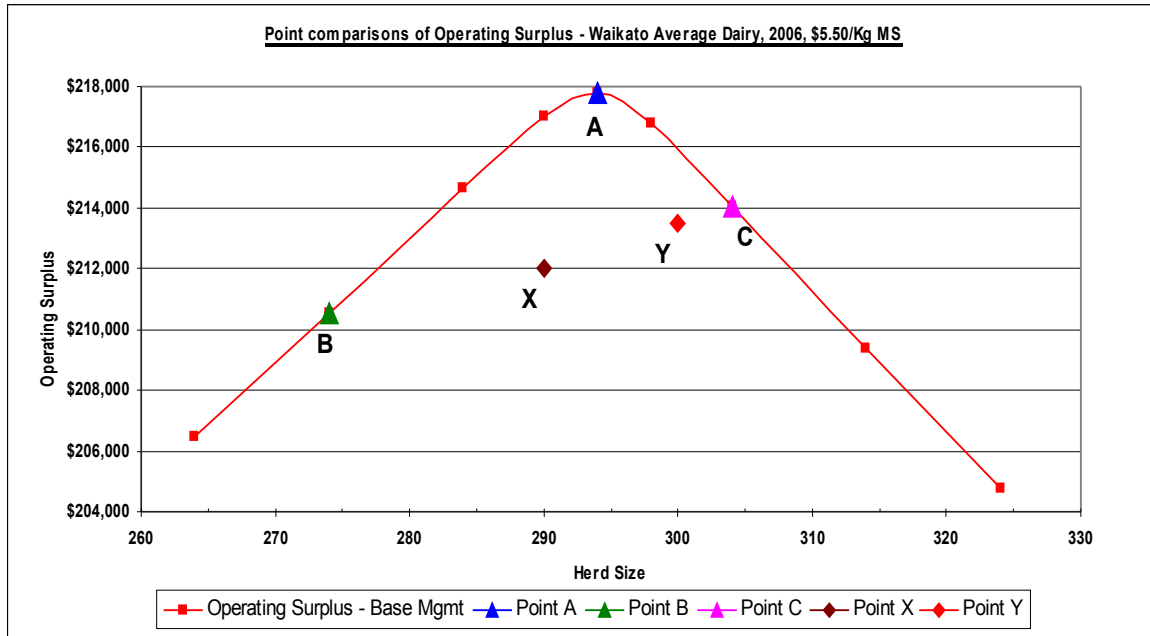


Figure 2

Both conclusions are valid, even if they appear contradictory. It is only when fuller information is available that sense can be made of the situation. Figure 4 from TMC I is shown below for that purpose:

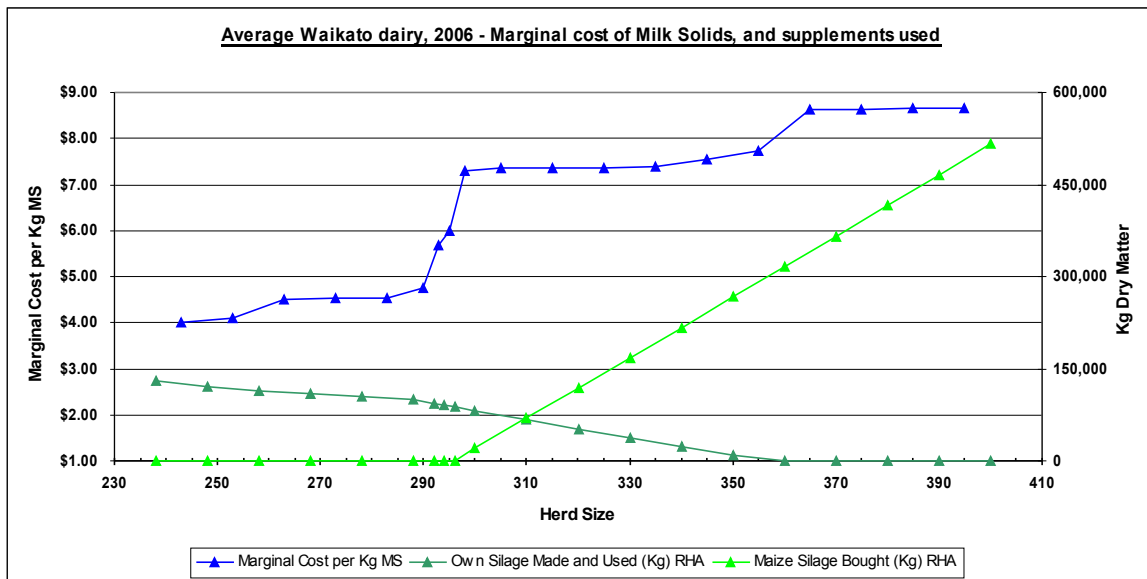


Figure 4 from TMCI

Unfortunately, the situation is mostly worse than the example of comparing points on a production function illustrates. All points below the production curve of Figure 2 are possible although not efficient operating points for the farm system. It is therefore possible to make comparisons such as between Point X and Point Y. These comparisons are common but essentially meaningless in isolation, and can be extremely misleading.

Knowledge of the production function and the position of any point of comparison on or relative to it is crucial to drawing sound conclusions. Comparisons between production curves would appear to be far superior to comparisons between points. Production curves though are only currently feasible using simulations.

It is worth stressing again that production functions will be different for each farm, and vary each year as costs and environment change. For any farm system there will be many options that may assist in increasing operating surplus. Even though production may be decreased by operating at  $MC=MR$ , management options that further improve operating surplus include some increasing as well as decreasing milk production.

Figure 3 provides examples that include changing the timing of calving (from 13<sup>th</sup> July to 27<sup>th</sup> July), herd management (reducing replacement rate to 18% from 25%, increasing maximum cow age from 7 to 10 years and reducing losses from 5% to 2%) and improving pasture utilisation from 81% to 85%.

In one case better herd management is coupled with the later calving date. There are many more combinations that offer potential improvements in operating surplus. The farm can operate along the production curves at  $MC=MR$  or other points, but the impact of changes in management or production level are clear from the positions and nature of the curves.

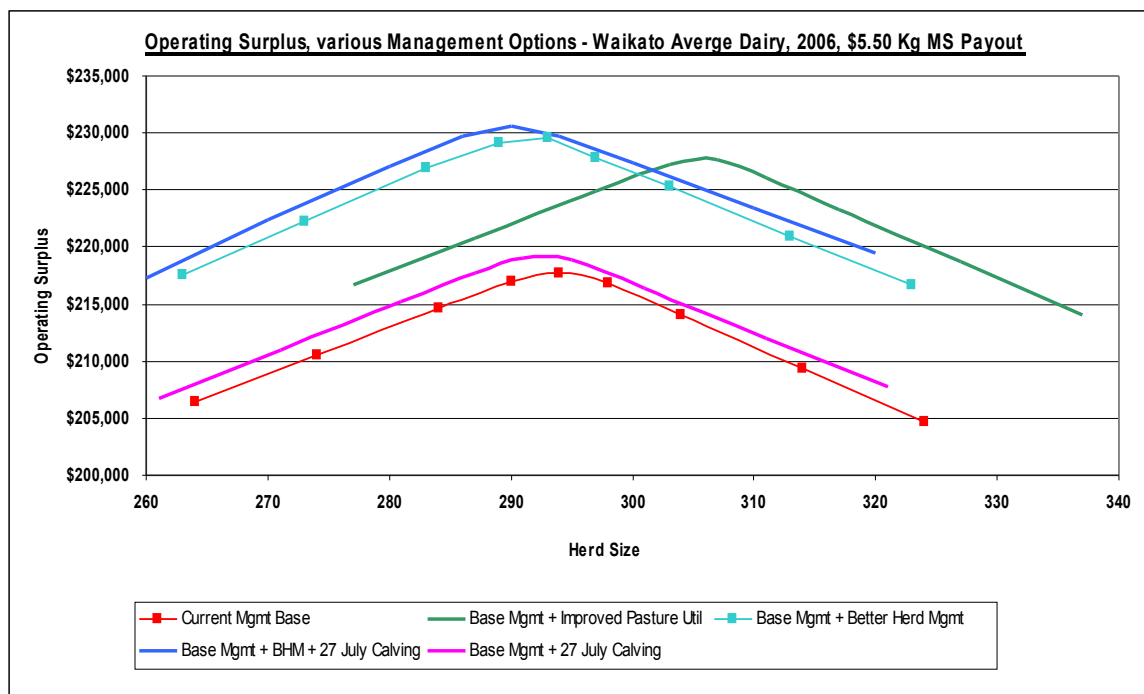


Figure 3

To be of most value, production curves need to be both specific to a farm and have the close involvement and interest of the farm manager.