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PAYMENT FOR EXPORT STEERS ACCORDING TO ESTIMATED LEAN MEAT YIELD

by

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INTRODUCTION

Australia has a large and expanding beef trade with Japan. Most of our beef exports to that country are in the form of vacuum packaged, boneless and trimmed full sets (12 specified cuts from a side of beef) packed in cartons and chipped frozen or chilled. This product, which is commonly referred to as the A2 specification, is obtained from heavy weight steer carcasses with abundant fat cover, most commonly raised and finished off grass. For the purposes of this paper, the critical carcass specifications can be taken as:

- minimum carcass weight 300 kg
- acceptable fat cover 7 - 20 mm (measured at a specific site on the rump known as P8)

The current basis of financial exchange between the beef producer and processor is relatively crude. Where the producer sells direct to the abattoir, he will be paid a 'top' price per kilogram of carcass weight providing the minimum specifications are met. The top price is constant across a wide fat range but is sometimes discounted when the fat cover is excessive, to reflect the fact that some trimming will be required to achieve a cover acceptable to the end market. The producer may not always suffer a discounted price for excess fat cover because competition between processors for slaughter stock can, in some circumstances, be so keen that the individual processor will do nothing to cause a supplier to take his livestock elsewhere.

The unit of exchange between the processor (exporter) and the importer is dollars per kilogram of cartoned product (also known as 'saleable' meat). This price will have been pre-determined by competitive tender and refers to a particular specification (A2 in this case), a total quantity (tonnage) and last delivery date.

The above outline is a simplification. In practice, the minimum and maximum standards can vary somewhat between abattoirs and the approach they take to grading and pricing can also vary. The outline does, however, provide the context for several pertinent questions:

(i) what incentives are implied by the current exchange systems?

(ii) would it be in the best interests of the beef industry to have different incentives?

(iii) does scope exist to introduce new pricing systems?

PRESENT SYSTEM

Under the existing A2 specification, the tolerance applying to fat cover is large. Fat depth can vary by as much as 13 mm (ie., 7 to 20 mm) with little or no trimming being done.[1] However carcasses with less than 7 mm of fat will be regarded as unacceptable for the A2 market, (because of the poor appearance of some of the full set cuts which will lack fat cover) and would suffer a discounted price. Carcasses with more than about 20 mm of fat are regarded as acceptable but only after trimming, so they too will sometimes suffer a discount but not as severe as for unacceptable carcasses.

Producers react to the current pricing system by turning-off overfat carcasses. They intentionally incur additional costs to fatten beyond the minimum cover required. One reason they do this is to avoid the risk of delivering a carcass with unacceptable fat cover (<7 mm) which would suffer a price penalty. Risk avoidance of this nature could be expected to operate for practically any pricing system. A somewhat more important contributor to overfattening however, is the insensitivity of unit price to a very wide range in acceptable fat depth. Offered the same unit price for fat as for muscle, the producer is happy, whilst the feed holds out, to add fat to achieve extra weight.[2] He can do this profitably whilst the extra return from weight added exceeds the extra cost of achieving that weight.

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[1]At a common carcass weight of around 300 kg, a fat depth difference of 13 mm is likely to translate into a lean meat yield difference of 4-5 percent. A difference of this magnitude makes the tolerance (in fat depth) applied to the A2 specification somewhat surprising. Some would even argue that a tolerance of this magnitude is irrational. Thus if 7 mm is the minimum fat cover required, why would a cover of 20 mm or sometimes more, be regarded as acceptable?

[2]Fed beyond maturity, practically all of a steer's weight gain will be deposited in the fat depots. A second point to note is that it requires about three times more feed energy to add a weight unit of fat than it does for muscle.

THE PROPOSED NEW PRICING SYSTEM

Given that the optimum carcass for any market has a maximum of muscle (lean), a minimum of bone and an ideal coverage of fat, a pricing system could be designed so that the producer is paid nothing for fat in excess of requirements (ie., a requirement specified to meet a quality need). This would give him a positive incentive to produce up to but not far beyond the minimum quality specifications. The pricing system that would achieve this result relies upon complete separation of the quantity and quality aspects of the carcass. Unit price would refer exclusively to the quality aspects of the carcass meat and be expressed in terms of $/kg of lean meat. Correspondingly, the yield expected from the carcass would be expressed in terms of lean meat. There would be no need to adjust unit price to reflect 'expected yield' because this step can be accomplished via an objective estimation equation.[3] Typically, total carcass return is calculated by multiplying the unit price and estimated yield of lean meat in the carcass.

When lean meat yield is estimated objectively - using an equation - it is treated as a continuous variable. Thus the equation estimates the actual percentage or weight of lean meat in each carcass. This is a vast improvement over the current situation where the livestock buyer, in the process of making his own estimation of yield, tends to treat yield as a discrete variable. Thus 'flat' prices are applied across a range of fat depths (with a corresponding range in yield of lean meat). Implied is inaccurate pricing in terms of actual lean meat yield.

The question is: should a pricing system based on objectively estimated lean meat yield be implemented? The poignancy of this question is heightened by the fact that the customer for the A2 specification (a Japanese importer) has

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[3]An equation which can explain over two thirds of the variation in lean meat yield between beef carcasses has been developed. The equation takes the general form:

$$\text{Lean meat yield} = a - b1\,(\text{fat depth at rump P8}) - b2\,(\text{hot standard carcass weight})$$

The actual coefficients are not given here but the percentage yield estimates shown in Table 1 were derived using the equation and actual carcass data.

hitherto expressed no wish for a tighter fat specification. Accordingly there now exists a close concurrence between the 'standard' of payment at the importer/exporter level and at the processor/producer level. Is there an argument for breaking this concurrence by implementing a relatively sophisticated payment system at the processor/producer level? Various arguments relevant to this question are developed below.

1. Cost saving

If producers were paid only for the lean meat in acceptable carcasses there would be no incentive to add fat beyond some (minimum) level needed to satisfy the 'quality' specification of a particular market. As a consequence, the cost of producing lean meat would be reduced since the turn-off of cattle would be finely-tuned to satisfy no more than the minimum standards required. Feed that currently goes into making steers 'excessively' fat would be channelled into another, more profitable use. Under the current pricing system however, the most economic use of feed is often to add weight as fat, because there is no immediate penalty for fat in excess of minimum requirements.

The end result is a wide variance in the quality and lean meat yield of product supplied to Japan under the A2 specification. Notwithstanding this variance, it could be argued that our industry is responding to a fundamental of consumer sovereignty - give the consumer what he/she wants. A second interpretation is that the market agency which lies between our meat exporters and end users in Japan is in fact detached from these users and as a consequence does not insist on a close concurrence between actual consumer preferences and the specifications applying to imported beef.Support for this second line of reasoning rests with the fact that most beef imports into Japan have traditonally gone via a single agency (the Livestock Industry Promotion Corporation). With the LIPC stronghold on beef imports scheduled to become less influential, it can be expected that end users' preferences will become more recognisable. A preference that could be logically foreshadowed is for lower and more consistent subcutaneous fat cover.

If this is indeed the case, a strong argument exists for inserting a 'circuit-breaker' between the price messages sent by the LIPC and those

received by the Australian beef producer. A 'circuit-breaker' in the form of payment according to lean meat yield would cause producers to adopt a more rational objective viz - turnoff of acceptable quality at minimum cost. Note that adoption of a lean meat pricing mechanism would generate two desirable outcomes. It would lead to a reduction in the cost of production and the quality of our A2 product into Japan would become more consistent thus protecting our long term access to the market.

2. Yield cross-subsidisation

Implicit in the current pricing system is subsidisation of relatively low yielding carcasses by relatively high yielding carcasses. This comes about because of the wide range in acceptable fat depth applying to the A2 market. This range can be as much as 13 mm (ie., cuts can be packed with fat cover varying by almost 13 mm). Applied to a heavy weight carcass, a variation of such magnitude could translate into a 20 kg difference in lean meat yield worth over $60 at 1989 market prices.

If a lean meat payment system were put in place it would redistribute this $60, taking it away from the lower yielding carcass and giving it to the higher yielding carcass. This redistribution of rewards would not affect how processors go about meeting market specifications but it would send a strong message to producers. It would say to producers that they are paid nothing for fat and therefore they should add only the minimum required to satisfy the quality needs of a given market - about 7 mm in the case of the A2 specification.[4]

Yield based payment would bring about a better utilization in feed resources since it provides an incentive to achieve acceptable quality with the minimum usage of feed. The special point to be made here however, is that production techniques aimed at enhancing the yield of carcass lean would be rewarded. For example, genotypes with superior yield characteristics would assume far greater importance than they do presently.

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[4]In practice, producers may not aim to achieve the bare minimum but quite clearly they would adjust their production strategy to satisfy a very specific target after considerations of risk and within-herd variations.

3. Value of specification information

The ability of unit price to convey a clear message about meat quality is presently limited by the fact that it is adjusted to take into account the buyer's own subjective estimate of carcass meat yield. If the need for this 'own' estimate were to be replaced by an objective estimate (supplied to the buyer like other specifications) then unit price would be freed of any need to reflect yield. As such, it could better reflect the quality of the meat as implied by the quality related specifications. It follows that carcass specification would be better placed to perform its intended function and the value of all associated information would be enhanced.

When combined, the three arguments above make a strong case for moving to a new basis for exchange between the producer and processor. The new basis calls for an objective estimate of lean meat in the carcass. It should be noted that lean meat yield can be estimated relatively accurately (SEE <2.0 per cent) whereas saleable beef yield, because of the inherent problems in trimming to a specification, may vary by over 7 per cent between otherwise identical carcasses. With carcass yield expressed in terms of lean meat, unit price would be expressed as dollars per kilogram of lean meat and total carcass return derived by the usual practice of multiplying unit price by weight [ie., Carcass return ($) = $/kg LM x ELMY (kg)]. The remainder of the paper will be devoted to demonstrating how lean meat payment would work in practice and how it would distribute returns relative to existing payment systems. The emphasis will continue to rest with the A2 market.

Table 1 contrasts payment according to carcass acceptability (ie., minimum weight and minimum fat cover) and two weight bases, hot carcass weight and estimated lean meat yield. It will be obvious from the table how carcass return (a), based on the existing payment system, has been derived. Carcass return (b), was derived via an objective estimate of the lean meat yield in each carcass. The percentage estimate was multiplied by carcass weight to establish the weight of lean meat in each carcass and this quantity, multiplied by the lean meat unit price to get carcass return. The lean meat unit price was derived by dividing the total weight of lean meat into the total return ($) from the 31 carcasses under the existing payment system (ie., $24,227.92/6132.48). This procedure was employed to ensure that the total outlay by the abattoir was

the same regardless of pricing system. Implicit is an assumption that competition between abattoirs will ensure parity between prices regardless of the unit of exchange (total carcass weight or weight of lean meat). From a competitive point of view, the difference in pricing systems will be no more significant than the difference that exists now between saleyard exchange (based on $/kg liveweight) and direct to works exchange (based on $/kg carcass weight).

The next point to observe is that all of the carcasses are acceptable in the sense of having more than the minimum fat depth and weight. This means that they will all attract the same unit price in terms of lean meat yield. However, some carcasses have more than the maximum acceptable fat depth, so under the existing payment system they suffer a discounted price of $2.10/kg of carcass weight. Despite the existence of a premium and discount price under the present system, variations in lean meat yield will not be rewarded by commensurate variations in total returns.

The poor relationship which currently exists between carcass returns and lean meat yield is highlighted by the last column in Table 1. This column shows that only at fat depths of around 11 and 12 mm (about optimum fatness) do both pricing systems return the same money (ie., within a few percent). Either side of these fat depths, the distribution in rewards that would be brought about by lean meat payment are quite startling. Thus carcasses on the low end of acceptable (7-8 mm of fat) could return over $30 more whilst carcasses over about 17 mm could return over $20 less. The implication is obvious. The existing payment system is grossly inaccurate in terms of the yield variable and consequently producers are faced with no incentive to adopt practices that will enhance lean meat yield.

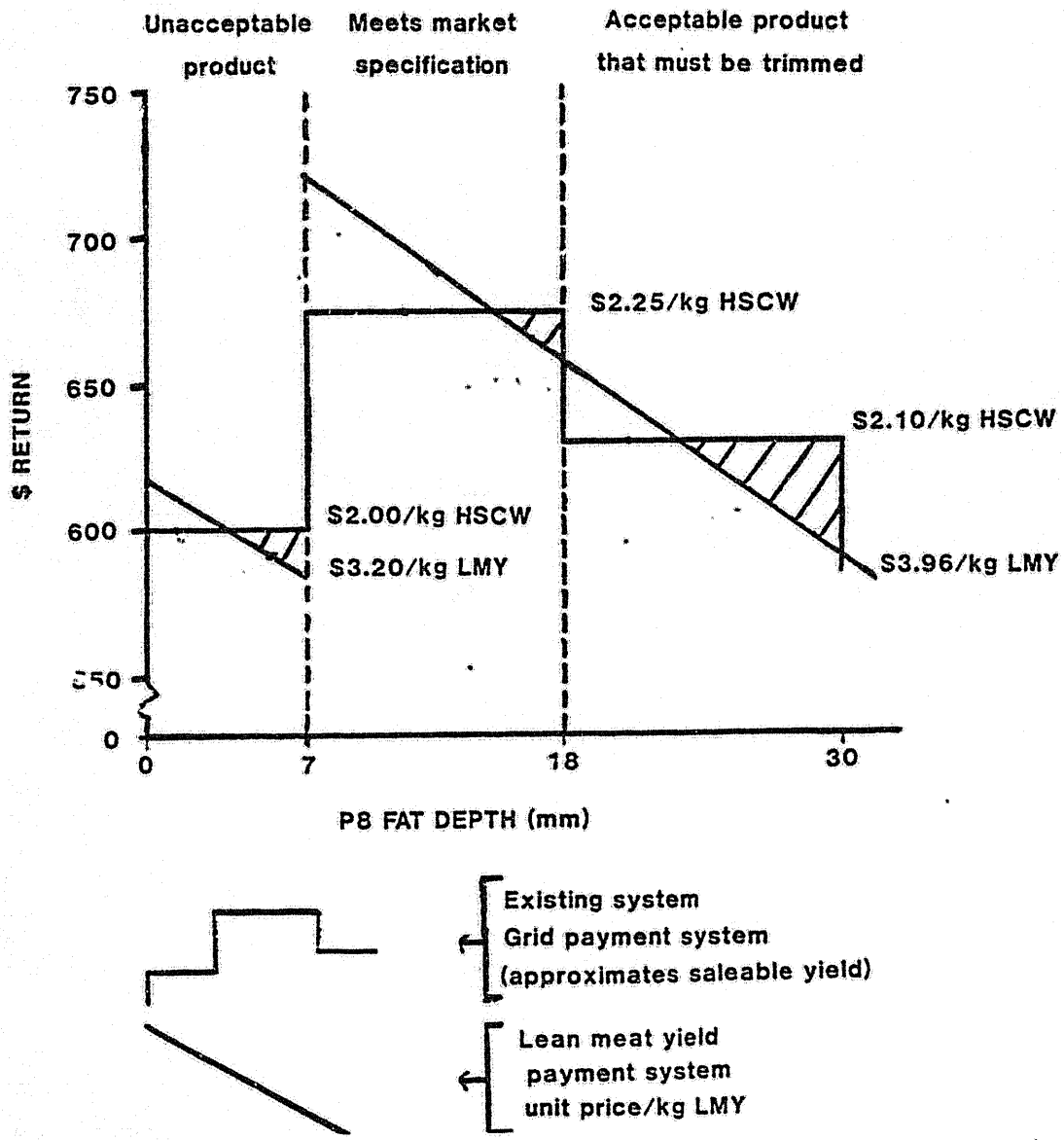
Figure 1 also contrasts the payment outcome according to how meat yield is estimated. The contrast is simplified by adoption of a common carcass weight but it suffices to make three points.

Firstly, the figure shows how provision of a lean meat estimate allows unit price to become independent of fat depth. In the example therefore, a common price of $3.96/kg of lean meat yield applies to all acceptable carcasses (ie., those with more than the minimum fat cover) regardless of how much excess fat cover they may have. Where payment is on the basis of carcass weight and the

Table 1 : A comparison of returns from 31 heavy beef carcasses (suitable for Japanese market) under two payment systems (i) $/kg HSCW x HSCW & (ii) $/kg LM x ELMY

Animal No.	Fat Depth (P8)	HSCW	Unit Price ($/kg HSCW)	Carcass Return (a)($)	ELMY (%)	Lean Meat (kg/Carc)	Unit price ($/kg L.Meat)	Carcass Return (b)($)	Redistribution (b) - (a) ($)
1	7	308.30	2.25	693.67	60.61	186.88	3.95	738.33	44.66
2	7	375.20	2.25	844.20	59.07	221.66	3.95	875.74	31.54
3	8	316.40	2.25	711.90	59.95	189.68	3.95	749.40	37.50
4	8	318.50	2.25	716.62	59.90	190.79	3.95	753.77	37.14
5	9	341.31	2.25	767.94	58.89	201.02	3.95	794.21	26.26
6	9	321.90	2.25	724.27	59.34	191.03	3.95	754.72	30.44
7	9	374.00	2.25	841.50	58.14	217.47	3.95	859.16	17.66
8	10	330.58	2.25	743.80	58.66	193.93	3.95	766.19	22.39
9	10	331.90	2.25	746.77	58.63	194.61	3.95	768.85	22.08
10	10	368.60	2.25	829.35	57.79	213.01	3.95	841.58	12.23
11	11	310.74	2.25	699.16	58.64	182.22	3.95	719.92	20.75
12	11	336.16	2.25	756.36	58.05	195.16	3.95	771.05	14.69
13	11	363.50	2.25	817.87	57.42	208.75	3.95	824.72	6.85
14	12	317.80	2.25	715.05	58.00	184.32	3.95	728.21	13.16
15	12	368.10	2.25	828.22	56.84	209.23	3.95	826.64	-1.57
16	13	309.48	2.25	696.33	57.71	178.60	3.95	705.61	9.28
17	13	369.40	2.25	831.15	56.33	208.09	3.95	822.12	-9.02
18	13	387.80	2.25	872.55	55.91	216.81	3.95	856.59	-15.95
19	14	360.67	2.25	811.50	56.05	202.16	3.95	798.71	-12.79
20	14	382.50	2.25	860.62	55.55	212.48	3.95	839.47	-21.15
21	15	366.42	2.25	824.44	55.44	203.14	3.95	802.58	-21.85
22	15	360.79	2.25	811.77	55.57	200.49	3.95	792.10	-19.67
23	15	349.20	2.25	785.70	55.83	194.98	3.95	770.33	-15.36
24	16	340.55	2.25	766.23	55.55	189.19	3.95	747.47	-18.76
25	17	350.80	2.25	789.30	54.84	192.38	3.95	760.04	-29.25
26	17	366.80	2.25	825.30	54.47	199.80	3.95	789.38	-35.91
27	20	380.55	2.10	799.15	52.71	200.61	3.95	792.56	-6.58
28	21	387.10	2.10	812.91	52.08	201.62	3.95	796.56	-16.34
29	23	381.00	2.10	800.10	51.26	195.32	3.95	771.67	-28.42
30	25	346.44	2.10	727.52	51.10	177.03	3.95	699.41	-28.10
31	29	369.80	2.10	776.58	48.64	179.88	3.95	710.67	-65.90
				24,227.92		6,132.48		24,227.92	Zero Sum

Fig. 1. Redistribution of Rewards According to Yield - Example Based on 300 kg Export Beef Carcasses with 0 - 30 mm of Fat (approximate prices only)



buyer's subjective estimation of yield, the unit price plateaux according to fat depth range. The figure shows prices of $2.25/kg and $2.10/kg of carcass weight for fat ranges of 7-18 mm and over 18 mm respectively. Of course unit price per kg of lean meat does change when the carcass meat quality changes, causing the product to be directed to some other market. In Figure 1, carcasses with less than 7 mm of fat cover are unacceptable for the A2 specification so attract a unit price of only $3.20/kg of lean meat yield.

Secondly, the graph shows how yield is treated as a continuous variable by the system of lean meat yield payment. The practical consequence of this is that each carcass is paid for in precise proportion to its estimated yield of lean meat.

The third point illustrated by the graph is that relative to the existing payment method, lean meat yield based payment brings about a redistribution of rewards within each market. The redistribution would favour superior meat yielding carcasses at the expense of poorer meat yielding carcasses.

CONCLUDING COMMENTS

The Japanese A2 market has tolerated a wide variation in fat cover. This tolerance has been transmitted by the export processor to the producer of export steers. The end result is that steers are often turned-off with a fat cover well in excess of the minimum required and producers have not been guided by market forces to strive for high meat yield as an ideal.

With liberalisation of the Japanese beef market, there is the likelihood that final consumer preferences will be transmitted with greater clarity and that specifications regarding fat cover will become tighter. In this event, a new pricing system that could convey accurate messages to the producer regarding preferred fat cover, would be extremely useful.

The basic research into carcass lean meat yield, across the typical population of slaughter cattle, has led to the development of equations which can be used to objectively estimate lean meat yield. If this were done as a routine service for buyers of carcasses, they would no longer have to adjust unit price to reflect their own estimate of carcass meat yield. Consequently unit price would be freed to reflect more accurately the meat quality preferences of the market

and producers would be rewarded according to their ability to match turnoff with the needs of the market. Thus objective estimation of lean meat yield offers the beef industry a new basis for pricing and exchanging carcasses that would bring with it many advantages.