Sir John Barleycorn, Miss Hop and their only child Master Beer: accounting for malt 1700-1939

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And malt does more than Milton can
To justify God's ways to man
Ale man, ale's the stuff to drink
For fellows whom it hurts to think

A.E. Housman (1896) - *A Shrophshire Lad*

Introduction

The central debate amongst accounting historians remains focused on the origins of accounting's pivotal role in modern managerial capitalism. Many have sought to locate this in the industrial capitalism of the Industrial Revolution from 1760 onwards with the creation of large businesses, the divorce of ownership and management, the demands for unprecedented levels of capital finance, and the growth of a separate and identifiable professional management class. However, others argue that modern accounting's use as a management decision-making tool precedes this period, and can be discovered in the earlier Agricultural Revolution, whereby accounting developments in this sector were transfused into an industrial context.[1] The use of the term Agrarian Revolution is itself contentious and is disputed by some writers who claim it was a progressive continuation and improvement on earlier practices,[2] but it is generally accorded this broad label to a period of substantive British agricultural improvements.[3] An insight into these practices may be gained through the examination of accounting records, and by how this accounting information was applied because,

> Subjects, which can be usefully investigated through farm accounts … a word, might also be about changes in accounting methods, which may be significant in that they often reflect a new capitalist spirit.[4]

In the case of malt, which is the principle raw material of the brewing sector, the close link between agriculture and industry has led to claims that the brewers were both agriculturalist and industrialist,[5] and indeed malting and brewing became combined in the government's census of production. Consequently, the aim of this paper is to examine whether the hypothesis that agrarian accounting innovation was transferred to the brewing industry through an examination of primary and secondary sources and to also explore

the relationship between the maltsters, brewers and accounting profession.

Malting and the Agricultural Revolution

The Agrarian Revolution of the late seventeenth and early eighteenth centuries witnessed the rise of a new class of capitalist farmers exhibiting a new capitalist mentality,[6] whereby the increased output of crops and animal products was achieved by employing a decreasing amount of direct labour. Innovative farming methods and land enclosure transformed farming into a business with an emphasis on profit. This new emphasis required a reliable calculative technology to determine an accurate profit for management decision-making. The contemporary leading agriculturalist Arthur Young, a farmer and editor of the *Annals of Agriculture*, exemplified the advance of the new agrarian capitalist mentality when he wrote,

> Agriculture is beyond all doubt the foundation of every other art, business or profession … Make two blades of grass grow where one grew before … to cultivate that crop whatever it be, which produces the greatest profit valued in money.[7]

The most cited agrarian accounting text of this era is Roger North's *The Gentleman Accomptant* (published in 1714, 1715 and 1721), which is used to substantiate the claims that farm accounting transformed the use of accounting for management purposes. The distinguishing feature of the new accounting was that it divided the larger farms into different divisions or profit centres, which permitted the calculation of yields and returns on capital,

> ... what every Tenant owes; what Discomtps are upon his Farms, and the net Payments of Rent; how interest goes; whether he receives or pays more; and what is due either way; how his Steward's or Bailiff's Accompt stands; what his managery of Corn, Grazing, Dairy and Sheep yields him: and in general, at one, two, or three, &c. Years end, whether his Estate advances, or is Retrograde, and how by much.[8]

North's accounting framework provided for an intricate sub-division of farm accounts that included a section devoted to 'Tabular Arithmetick', employed for the estimation, measurement and derivation of labour performance so that

> the knowledge that such an Accompt as this kept is sufficient to keep Men to true Reckoning, lest they lose their Credit, and their work.[9]

This was not just textual theory as the well known seventeenth century farming examples of Robert Loder of Berkshire,[10] and Henry Best of Yorkshire[11] demonstrates that accounting was being used in this manner, although it remains arguable how extensive these practices were.

The only indirect eighteenth century reference to malting lies in the Scottish

academic Robert Hamilton's *An Introduction to Merchandize* (1779), but it is only to be found within the first five editions of this work.[12] Hamilton's work is notable for including various costing methodologies for industrial manufacturers and also farmers. Within this body of work he included a set of problems to test the skills of the readers by asking them to consider designing suitable book-keeping systems for various types of business, including a brewer.

> A brewer purchases barley and convert into malt; he also occasionally purchases and sells malt; he carries on the different branches of strong ale, small beer and porter brewing; and desires a form of book-keeping that shall exhibit his expence and sales, his debts and credits, the quantities of malt obtained from barley, the quantities bought, sold or consumed, the quantities beer of different kinds obtained from malt, and compared with price of the barley, and a comparison of the different branches of his business.[13]

The author unfortunately provided no model answer as a solution and his overall accounting legacy of ideas 'seem to have had no influence on his contemporaries'.[14]

Malting process and taxation

Prior to engaging with the post eighteenth century malt accounting environment it is necessary briefly to understand the process of malting. The traditional manufacture of malt was a seasonal process, beginning at the end of September and the beginning of October, which continued until the end of April although it could be extended into May or even June with substantial hazard because of temperature control problems.[15]

The malting process is the controlled germination of grain followed by its artificial termination through the application of heat. Initially the grain, usually barley, was taken to the upper floor of the malt house where it was stored and screened in order to clean it prior to the first conversion stage.

> Malt, there made of no other Grain, but Barley. Whereof there are two kinds; one, which hath four Rows of Grains on the Ear; the other two Rows. The first is the more commonly used; but the other makes the best Malt.[16]

The first conversion stage involved steeping, the soaking of the grain in water for three to four days to initiate the germination process. This could involve two or three soakings to cleanse the grain and remove the 'swimmings' and trash. Originally the germinating grain was placed in large wooden framed enclosures, known as couches, so that it would generate internal heat and expansion. This couching conversion stage played a financial role, because the grain had to be measured for a malt tax that was introduced in 1697. This was not abolished until 1880 when, after political pressure from the maltsters, the tax base was transferred to beer gravities

Year	England and Wales
1697	616/21d
1760	9¼d
1780	1s. 4¼d
1791	1s.7¼d
1803	4s.5¾d
1816	2s.5d
1854	4s.0d
1856	3s.8½d
1880	Abolished

Figure 1. Malt tax regimes per bushel, from The Manual of British and Foreign Companies. *1939: 104, National Museum of Brewing.*

that led to couches being dispensed with. In Scotland and Ireland a similar tax was imposed from 1713-1880. However, from 1725 onwards, these were at lower rates than in England and Wales to reflect these countries inferior native barley.

The next stage was to lay the germinating grain on large and long growing floors of the malt house to a depth of up to twelve inches for a duration lasting up to a fort-night, depending on weather conditions. The grain was manually turned at regular intervals by wooden shovels and the humidity and temperature in the growing floors was controlled by the opening and closing of louvered or shuttered widows.

The penultimate processing stage involved the drying of the 'green malt', normally in a heated kiln, to arrest the germination, which usually took three days until it was cured. This required great skill by the maltster to convert the starch into the desired level of sugar content, flavour and colour. This was important because different malts were needed to produce specific types of beer, e.g. the popular porter beer of the eighteenth century required deep, dark brown coloured, caramelised malt.

The last process involved screening and polishing the finished malt which was then packed into sacks and stored in the malt cellar awaiting distribution to the brewer.

Malt accounting valuation problems

The overall manufacture of the cured malt via its distinct production stages presented the problem of accounting for the yield of each malt quarter from the steeped barley. This in itself was not as straightforward as it first appears since

the standard malt quarter was 336lbs and the standard barley quarter was 448lbs. This was influenced by the two crucial factors inherent to the malt conversion process, the loss during malting and screening, which were influenced by the quality and variety of the barley and its moisture content.

The accounting process was further complicated by the existence of two distinct types of maltsters, namely malting-for-sale and commission maltsters. A sales maltster purchased his own barley and manufactured his own malt for selling normally via an intermediary malt factor to customers. A sales maltster usually realised his income some three to four months after delivery, but this method of business organisation had declined with the dominance of the commission maltster after 1830.

Engaging commission maltsters after 1830 was the preferred arrangement of the brewers who negotiated annual forward contracts, although Allsopp's at Burton on Trent negotiated contracts of five and seven years duration. Such contracts imposed stringent quality conditions upon the maltsters by the brewers on their supply chains. The financial arrangements within these types of contracts made the commission maltster reliant on the brewer providing the capital to purchase the barley and various other costs, although these detailed arrangements varied considerably between contracts. Thus, in this type of operational cost structure, a commission maltster's operational overheads were substantially lower than that of the sales maltster.

Primary sources: Staffordshire sales maltsters

The dominant area for barley production was in East Anglia, but it was also an important crop in east Staffordshire near to the important brewing centre of Burton upon Trent.

> The best of the English barley-growing districts are the Chalk and the 'wash' lands of Norfolk and Suffolk, especially about Bury St. Edmunds; but Lincolnshire and Bedfordshire supply excellent examples, and the light valley- lands of the Midland Counties, including Staffordshire contribute to supply.[17]

The historical business records held at Stafford Records Office and the Lichfield Records Office contains several maltster records used in this research.

Surviving documentary evidence revealed that malting was carried out in Staffordshire from at least the seventeenth century onwards,[18,19] although these early sources exclude any financial records.

The earliest surviving accounting records of a Staffordshire farmer and maltster is that of John Brown of Yoxall with accounting records surviving from 1845 until 1900. These disclose no accounting innovation and comprise simple financial

Source	Dates	Detail	Reference
John Brown Maltster's Business Yoxall, and the Trent Brewery[20] Staffs. Staffordshire Record Office (SRO)	1845-1865 1861-1874 1871-1894 1889-1895	1. Malt ledger 2. Accounts, malt, hops supplied. 3. Cash Book 4. Wages book	D653 D901 D1125
Lichfield Brewery and Malting[21] Co. Lichfield Record Office	1864-1870 1865-1870	1. Register of Members 2. Register of share transfers	D13/1 D13/2
Staffordshire (LRO)	1862-1870	3. Ledgers (3 volumes)	D13/3
Joseph Law &Co,[22] Wombourne, Staffs (SRO)	1923-1932	1. Memorandum book	D1534

Figure 2. Maltsters - primary sources.

accounting entries in sales day books, cash books and accounts ledgers maintained on a double entry bookkeeping system of the sales of 'flakes' of malt. Thus, barley was recorded in a barley account without any attempt to calculate a malt conversion cost. The malt sales are recorded amongst numerous local customers, two of whom represented a class of declining small brewer-publicans that endured in Staffordshire, the nearby Crown Inn and James Beresford who was found described in the *Staffordshire Gazetteer* as a butcher and beerhouse proprietor.[23] Brown's accounting records also reveal a mixture of other sale diverse transactions, which included, ale, hops, barley hay, meat and livestock, and a stock book for miscellaneous ironmonger's and chemists sales.

The Lichfield Malting Company records provide more sophisticated accounting records comprising a series of large ledgers with numerous detailed customer accounts. Amongst these is an 'Outcast Account' for malt and barley volumes which used an internal control to reconcile production volumes in bushels albeit not entirely successfully (see Fig. 3).

Clearly an unexplained discrepancy arises between the two outcast accounts of 80 bushels and the latter account has alongside it the clerk's pencilled attempts at reconciling the error without success which may be attributable to either or a combination of natural wastage in conversion, inaccurate bookkeeping or pilferage.

1st Oct 1866			Bushels	31st Mar 1867		Bushels
	To barley in stock		572		Malt sold during ½ year	20750
	To malt in stock		852	30th Sept 1867	Malt sold during ½ year	19794½
31st Mar 1867	Barley purchased and delivered		36396		Malt in stock	3791
			37820			
	Deduct barley sold during the year		-232			
			37588			
1st Aug 1867	Barley Purchased	4300				
	Deduct barley sold	-348	3952			
			41540			
30th Sept 1867	Barley Purchased	1150				
	Deduct sales	-673	477			
			42017			
	Outcast for year		2318½			
			44335½			44335½

Figure 3. Lichfield Malting Co and Lichfield Brewery barley and malt outcast accounts - outcast account for year ending 30th Sept. 1867

Nonetheless, these accounts demonstrate no calculative attempt to place a manufacturing valuation on the malt produced.

The brewing maltsters

The brewing industry had industrialised in London in the early seventeenth century with the creation of unprecedented large scale brewing factories and the establishment of wealthy and enduring family dynasties such as Whitbread, Barclay-Perkins and Truman. The large demands for malt were obtained via malt factors as the brewers preferred to restrict their activities to beer manufacturing.

In the nineteenth century increasing urbanisation and a growing population increased the demand for beer in the absence of widespread sanitary water supplies. The centre of large scale beer production shifted from London to Burton upon Trent, Staffordshire with the establishment of the leading companies Allsopp, Worthington and Bass, whose new, clearer, lighter beers eclipsed the demand for the older, metropolitan, darker porter stout type beers. The improvements in transport infrastructure allowed the Burton beers to reach a national and international consumer group so that demands for malt increased and the commission maltster became more common. At the beginning of the nineteenth century 'there is enough scattered evidence ... to suggest that separate identity of maltster and the brewer ... was still almost universal'[24] but this became increasingly eroded as the brewers engaged in the vertical integration of their business to secure their supply chains. This led to the brewers constructing their own maltings, which were notable for their unprecedented size as Alfred Barnard's 1889 *Noted Breweries of Great Britain and Ireland* describes the Allsopp maltings at Burton,

> The maltings consist of four blocks of handsome elevation, constructed brick, and all communicating with each other. Each double block is spanned by a spacious barley floor, forming a covered avenue to a street 40 feet wide between each house and at the western end it combines a well house, engine house, a water house, containing a tank holding 40,000 gallons ...
>
> In one of the barley rooms which spreads itself over the divided broadway. It is a spacious and lofty apartment, and some idea of this floor may be conceived, when we state, that after leaving a gangway of ten feet clear all round, it holds 8,000 quarters of barley.
>
> The malt stores are not all the same size, two of them hold together 8,000 quarters and two 14,000 quarters of malt.[25]

Bass also engaged in an extensive malt house building spree both in Burton and elsewhere. The company occupied 18 modern malt houses in Burton which they built between 1859-87 and by 1878 this had increased to 28 malt houses and a further ten in Lincoln and Retford in East Anglia. During the period 1901 to 1905

Year ending 30th June	Burton Manufactured Malt Quarters (a)	Retford and Lincoln Manufactured Malt Quarters (b)	Externally Purchased Malt Quarters (c)
1889	186,834	47,552	15,702
1890	212,193	51,829	35,109
1891	208,671	48,518	62,556
1892	209,156	47,177	43,948
1893	218,895	43,441	53,775
1894	199,958	39,681	44,164
1895	216,803	40,024	37,674
1896	236,581	45,364	26,655
1897	242,283	46,290	37,494
1898	243,630	47,364	49,200
1899	231,873	46,689	86,773
1900	219,664	44,580	94,616
1901	227,751	47,664	111,510
1902	233,790	48,275	100,019
1903	238,895	48,036	85,735
1904	237,033	47,621	79,064
1905	239,721	45,570	38,050
1906	210,639	38,804	33,804
1907	208,665	49,791	40,876
1908	207,556	61,563	32,752
1909	203,998	58,636	25,778
1910	177,446	51,658	13,200
1911	187,839	54,609	2,414
1912	202,328	60,404	9,720
1913	202,179	58,241	7,234
1914	197,978	58,324	38,969

Figure 4. Bass Ratcliffe and Gretton Ltd - Comparative Malting Statements 1889-1914. From Bass Accounting Statistics, A144, A145, A149, A139, A129, National Museum of Brewing. Columns d-g was constructed by the author.

Total Quarters (d)	Burton % (e)	Retford & Lincoln % (f)	External Purchase % (g)
250,088	74.7	19.0	6.3
299,131	70.9	17.3	11.7
319,745	65.3	15.2	19.5
300,281	69.6	15.7	14.6
316,111	69.3	13.7	17.0
283,803	70.5	13.9	15.6
294,501	73.6	13.6	12.8
308,600	76.7	14.7	8.6
326,067	74.3	14.2	11.5
340,194	71.6	13.9	14.5
365,335	63.5	12.8	23.7
358,860	61.2	12.4	26.4
386,925	58.9	12.3	28.8
382,084	61.2	12.6	26.2
372,666	64.1	12.9	23.0
363,718	65.2	13.9	21.7
323,341	74,1	14.1	11.8
283,247	74.4	13.7	11.9
299,332	69.7	16.6	13.7
301,871	68.8	20.4	10.8
288,412	70.7	20.3	9.0
242,304	73.2	21.3	5.5
244,862	76.7	22.3	1.0
272,452	74.3	22.2	3.5
267,654	75.5	21.8	2.7
295,271	67.0	19.8	13.2

the Bass company built a further 8 large malt houses at Sleaford at a cost of £340,000.[26] The malt manufacturing process replicated that of the maltsters although 'pneumatic malting' or mechanised malting techniques were available from the early twentieth century and widely practiced by in Germany and the United States. Bass experimented with pneumatic malting by converting some of their malt houses to accommodate the machinery, but it proved largely unsuccessful. The major reason for the widespread failure to adopt pneumatic malting, and instead retain the more labour intensive traditional methods, was explained thus,

> German malt is everything that is bad from the point of view of an English brewer … the results were so unsatisfactory that the pneumatic system got a bad name, which has not yet been wholly removed ... the pneumatic system needs to be adapted to the requirements of the English brewer. There is evidence that this now being done, and in some cases satisfactory material is being turned out. When the method of working is brought to perfection in this country, it is highly probable that the present system of floor malting will gradually fall into desuetude.[27]

Also the retention of cheaper and older labour intensive methods at this time remained economically attractive following the recent large capital investments in the large malthouses with their long working lives. Despite the increased levels of domestic supplies and its own malt production resources Bass, like many other of the larger breweries, had to resort to importing foreign grains and malt. The scale of malt consumption by Bass can be gauged from Figure 4.

At this period Bass was the largest and most dominant British brewer, with a large labour force and administrative staff. These administrative staff maintained the traditional financial accounts, but also began compiling rudimentary accounting statistics, which analysed product costs including malt.

Brewing maltsters accounting statistics

In this context statistics should not be confused with modern statistics as the terminology remained fluid in the nineteenth century and initially represented the gathering of eclectic data that was tabulated for presentation. The Bass statistics are notable for extending this process by introducing a financial metric to facilitate comparison for recognisably modern management decision making processes. These calculative processes can be identified as being applied from at least 1879 onwards as demonstrated below in Figure 5.

The total value of the malt summary figures were then posted to another summary within the overall brewing statistics ledgers producing a barrelage statement whereby the cost of malt per standard 36 gallon barrel was calculated as Figure 6 illustrates.

	1888-89 d	1895-96 d	1903-04 d	1910-11 d
Barley	487.59	373.4	365.87	382.96
Wages and	25.16	25.41	29.33	37.33
Allowances	10.76	7.43	9.33	10.29
Salaries	11.53	11.85	12.59	15.63
Rent	9.46	10.72	15.64	19.17
Coal and Coke	1.05	1.18	2.46	2.75
Cartage	2.26	1.01	11.27	10.42
Trade Accounts Engineers and stores	15.47	8.11		
Other items	0.46	0.66	0.88	0.64
Malting on commission		3.42	3.83	
	£2.6s.11.7d	£1.16s.11.2.6d	£1.17s.7.2.2d	£1.19s.9d

Figure 5a. Bass - proportionate cost of barley/malt per quarter used at Burton 1888-1911. From Owen C.C. (1992) The Greatest Brewery in the World - A History of Bass, Ratcliffe and Gretton*, Chesterfirld, Derbyshire Record Society, Vol.XIX.*

Sept 30th 1867	Bushels charged with for year end	41,200	Sept 30th 1867	By malt sold and in stock	44,335½
	Add malt in stock 30th Sept 1866	852			
	Outcast for the year	2,238½			
		44,335½			44,335½

Figure 5b. Outcast account of malt for year ending 30th Sept. 1867. From D13/3, Lichfield Record Office.

	£.s.d. Cost	£.s.d Average Cost per barrel		£.s.d. Proceeds	£.s.d. Average per barrel
Costs of bought and own made malt	£904,949. 7s.6d	£1.2s.3. 095d	Proceeds of ale & Beer	£2,290,517. 0s.9d	£2.16s.4. 052d
Hops	£283,469. 19s.3d	6s.11.666d	do Grains	£3,7233. 10s.9d	10.989d
Returned Ale	£7,629.9s.10d	2.251d	do Barrel Hops	£5,588.5s. 0d	1.649d
Coals	£14,590.3s.2d	4.306d	Excise duty drawbacks	£9,001.2s. 9d	2.656d
Plus 26 other line item costs			Rent Rates & Taxes	£4,348.13s. 11d	1.283d
Profit	160,000. 0s.0d*	3s.11.224d			
Totals	£2,346,688. 13s.2d	£2.17s.8.615d		£2,346,688. 13s2d	£2.17s. 8.615d

*The profit figure at first appears suspicious being a conveniently rounded figure but the figures do cast and from a sample check undertaken the line items values were correctly posted.

Figure 6. Bass Ratcliffe and Gretton Ltd Comparative Barrelage Statement 1879-1880 (barrelage 813,138). From Bass, A144/1, National Museum of Brewing.

It is apparent that no differentiation is made between the manufacture of the company's own malt and externally purchased malt. Apart from the period 1899-1904 (this is the period when Bass built new maltings) outside malt purchases were insubstantial so this may have coloured the decision not to distinguish between both types.

It is apparent, therefore, that such larger breweries exhibit the conditions described by Chandler[28] of a modern multi unit business which required new methods of

%	Uncontrollable Costs	s. d.
18.999	Costs of bought & own made malt	10s.6.647d
5.494	Hops	3s.0.619d
13.563	Excise duty	7s.6.410d
17.991	Discounts & Allowances	9s.11.928d
5.891	Carriage of ale to customers and agencies	3s.3.269d

Figure 7. Bass Ratcliffe and Gretton Ltd comparative barrelage statement (part) - uncontrollable costs 1896-1897. From Bass A/149, National Museum of Brewing.

administration and co-ordination. These methods in turn could potentially be aided and abetted by developments in accounting practice. Thus, once the barley had been manufactured in house into malt it would be transferred to the brewing process, an early example of 'divisional' product transfer and presenting an opportunity to engage in transfer pricing.

Unfortunately the records held at the National Brewing Museum of the Bass and Worthington companies discloses no surviving (if these existed) subsidiary cost malting records. A further examination of some of Bass's later accounting statistical summaries from 1896 provides an insight as to why Bass may not have had any malt cost records. The company from this date had classified its expenditure into uncontrollable and controllable costs and the first item classified as uncontrollable was malt.

The cost structure analysis is illuminating in that it was an admission by the country's leading brewer that 62% of its overall costs were uncontrollable and that this included malt as the most significant cost of all. The brewers had always argued that barley and malt were price volatile and subject to the vagaries of the weather, and there is some justification in this argument. Nonetheless calculations are historic and derived at the end of a financial period, and thus not forward looking and provide no analysis on the malt conversion costs. In this period there was no textual equivalent of North's or Hamilton's eighteenth texts to provide accounting guidance.

The only specific brewing text of the nineteenth century that devotes some small accounting consideration is Tripp's *Brewery Management* (1892) that provides an illustrative malting account.

It is apparent from Tripp's illustrative malting account that a gross profit arising from manufacture has been posted to overall brewing profit and loss account due to an increase or gain on the finished product output. This prima facie seems bizarre and illogical since the manufac-

1891	Qtrs	Price	£.s.d	£.s.d
To Malt in Stock Oct 1st 1890	800	40/		1,720.0.0
Barley	60	30/		90.0.0
Barley Purchased	6,200	31/		9,610.0.0
Rent of kilns			375.0.0	
Wages, coke etc			545.0.0	
Increase Gross Profit	250			920.0.0 2,502.14.8
	7,370			14,842.14.8

Figure 8. Tripp's malting account for the year ending September 30th, 1891. From Tripp,[29] 1892: 12, National Museum of Brewing.

* The culm is the stem of a plant especially of grasses and in malting refers to dried rootlets of the screened malt. It was collected and stored for a month. The malt culms as a by-product of manufacture were sold as cattle cake. The selling price varied according to the quality of the culms and the season of the year but could realise between £3 and £5 per ton, fetching a higher price in winter.[30]

1891	Qtrs	Price	£.s.d.	£.s.d.
To Malt delivered to brewery	5,800	40/		11,000.0.0
Barley sold for seed	100	36/		180.0.0
Malt sold	60	40/		120.0.0
Culms* account sold			134.14.8	
Culms account stock Sept 30th 1891			32.0.0	
			162.14.8	
Less stock Sep 30th 1890			40.0.0	
				122.14.8
Malt stock Sept 30th 1890	1,410	40/		2,820.0.0
	7,370			14,842.14.8

turing process previously described always realises a loss or natural wastage through manufacture. However, it must be recalled that the posting of quantities in this account of quarters of barley and malt are not of equal sizes as the malt quarter was smaller than a barley quarter. Therefore, the 'profit' was simply a balancing figure posted in the accounts to remove the difficulty of more accurate and intricate calculations.

Nevertheless some malt costing was being conducted, albeit without a financial metric, by the master brewers in calculating the product mix and yields for each brewing batch,

> From consideration of what has been written about the malting process, it will be apparent that 100lbs will produce less 100 lbs of malt. This loss in dry weight is accounted for by certain soluble constituents being removed.
>
> It is however usual to speak of the malting increase, and for this reason: The loss in weight from screened barley to malt does not amount to so much as the difference between weight of a bushel of barley and malt, a bushel of barley weighing 56lbs., and of malt 42lbs. This apparent increase varies according to the class of barley malted: the average is about 3 to 3½ per cent. With dry foreign barleys this is greater, being sometimes as much as 10 to 15 per cent. When however, barley is harvested under bad conditions there is frequently no apparent increase at all.[31]

Thus, the different barley and malt quantification created an artificial increase when the malt quantification was applied. This was accorded a simple balancing figure both in quantity and value which was treated as a profit on manufacture, which in modern cost process accounting would be termed as a normal or abnormal gain.

A rare and possibly unique paper on brewery accounting delivered by the chartered accountant Edward Charles De Peyer to the London Section of the Federation of Brewing in 1915 reveals,

> Where maltings are attached to a brewery and no accounts are kept of their separate working, I think in addition of 4s per quarter to the cost of the barley (which would otherwise go to the maltster in addition to his profit) is a sufficiently near estimate of the cost of conversion, but this again varies in different circumstances and localities.[32]

Consequently the empirical evidence before the Great War indicates that although the brewers understood the malt conversion process, and could accurately calculate the mix and yields, a more simple accounting methodology was used, based on ad-hoc methods, even amongst the professional accounting class.

The maltsters: cost accounting

The paucity of maltsters records has presented a major problem of research since ‘no glimpse by the outside public ... of this essentially private trade’[33] exists.

Certainly malting was becoming increasingly less profitable as maltsters margins were being eroded by the brewers and foreign grain imports with the 'the margin of profits becoming smaller each year'.[34]

This economic environment focused attention towards malt accounting matters with the publication in the *Brewing Technical Review* of Hugh Lancaster's (1908) 'Practical Floor Malting.' Lancaster provided two examples of how maltsters could calculate the cost of manufacturing a quarter of malt and overcome the inherent variable production problems identified previously. The examples are informative in that they treat both domestic and foreign barley.

It is apparent that the cost construction of some sub-processes, such as sweating, are not explained and that any incidental income, i.e. the sale of broken quarters, is netted off against production cost to derive a cost per screened and dried barley quarter.

		Shillings and pence
Sweating		
	100 quarters of barley at 28s	2,800s.0d
	Cost of sweating at 6d a quarter	50s.0d
	Loss of 10 quarters	-
	90 quarters of dried barley	2,850s.0d
	Cost per quarter of dried barley	31s 8d
Screening		
	90 quarters at 31s 8d	2,850s.0d
	1 quarter broken sold at	-20s.0d
	1 quarter thin sold at 15s	-15s.0d
	½ quarter dust	-
	87½ quarters screened barley	2,815s.0d
	Cost per quarter screened and dried	32s 2d
Malting		
	87½ quarters barley 2,815s	
	92 quarters malt a 6s a quarter	552s.0d
		3367s.0d
	Cost per quarter malt	36s 7d

Figure 9. Lancaster's first example (1908) - damp English barley requiring sweating.

		Shillings and pence
Sweating		nil
Screening		
	100 quarters barley at 25s	2,500s.0d
	1 quarter broken sold at 15s 5 quarters thin sold at 10s 2 quarters stones and dirt	-65s.0d
	92 quarters screened barley	24,35s.0d
	Cost per quarter screened nearly	26s.6d
Malting		
	92 quarters barley	2,435s.0d
	100 quarters malt at 6s quarters	600s.0d
		3035s.0d
	Cost per quarter malt	30s 4d

Figure 10. Lancaster's second example (1908) - dirty foreign barley such as Syrian Tripoli.

The malting manufacturing process stage is also not immediately transparent and it unclear as to why 92 quarters (the second example, see Figure 10, below suggests it should be 90 quarters) was used or how the 6 shillings per malt quarter was derived, although this is later explained as an average manufacturing cost.[35]

The foreign imported barley did not require sweating as it did not contain as high a moisture content as the domestically produced barley. Again, the 6s per quarter malting is used as an average manufacturing cost per quarter based on the screened 100 quarters of barley.

Overall Lancaster suggested that the malt quarter cost structure should approximate to 80% of raw materials and 20% production costs. He analysed the latter costs as averaging 3s 6d per quarter fixed costs (i.e. rent, depreciation on buildings and machinery, and rates and taxes) and between 3s to 4s for variable costs (i.e. interest on working capital, ages, fuel and general expenses). These gross costs, once aggregated, totalled 6s 6d. These were then netted off with the average sales of by products of 6d per quarter providing the 6s direct and indirect manufacturing cost used in the formulae.

Cost per quarter	Pale malt s. d	Brown Malt s. d
Labour	1s. 2d	1s. 8d
Coal	1s. 0d	-
Faggots	-	3s. 0d
Delivery	1d	3s. 0d
Cartage	5d	9d
Charges and Oddments	6d	3d
Screening	1d	-
Making and delivering	4s. 2d	6s. 11d
Screened barley#	31s. 6d	31s. 6d
Total Cost Per Quarter	35s. 8d	38s. 5d

calculated on the basis of unscreened barley at 30 shillings a quarter and a screening loss of 10 quarters for every 110 quarters purchased. Screenings were sold for 15 shillings per quarter.[36]

Figure 11. Henry Page's formulae for making pale malt and brown malt - October 1905.

Although this type of cost calculation is unprecedented given previous practice it provides only averages as yardsticks, but the economic advantages of using cheaper foreign barley is apparent. The formulae assumes that a standard barley is used, thus ignoring the different types of malt needed for distinct types of beers that could produce alternative unit costs.

Clearly a different costing approach was presented here. The basis of cost apportionment is unclear, with direct and indirect production costs being allocated to a 'standard' screened barley cost. There is also a range of unit costs presented by Lancaster and Page, ranging from 30s 4d to 38s 4d. As Clarke noted it remains unclear which was the more accurate of the two.

However, referring back to Bass accounting statistics for the same period they also reflect similar cost structures, i.e. 1903-04 37s 7d per quarter and 1910-11 39s 9d.

The Great War and Post War

The commencement of the Great War (1914-1918) had a severe impact on the brewing industry as cereal production was diverted to food instead of beer

manufacturing. The reduced beer output had considerably weaker gravities, but this still did not prevent incidences of drunkenness. This was noticeable amongst the highly paid munitions workers especially, in the centre of the British ammunition production at Carlisle, which allegedly had created a fall in output. This led to the unprecedented nationalisation of the brewing industry in Carlisle and District, from 1916 until 1974, when it came under the control of Liquor Central Control Board. Post war it was re-designated as the State Management Scheme, accountable to the Home Office.

This partial nationalisation involved the compulsory purchase of five private breweries of which four were closed down and one retained for government beer production. One of the former private breweries, the New Brewery Carlisle Ltd, was converted to maltings until it was sold in 1974.[37] It is here that evidence of the application of a recognisably modern

Item 14. Brewing Cost Sheets

A cost account is prepared for each Brew, showing he quantities and values of materi als used, the wages and other charges, and the loss in the various processes, and in racking, and he cost a the Brewery per barrel racked. It also contains the technical information relating to extracts, gravities &c, necessary to enable judgement to be passed on the efficiency of the Brewery Staffs, and the outcome of the materials used. The results arrived at are carried to a Brewing Cost Summary in which the cost of delivery and Management charges are added, and he total cost per barrel delivered to the Branch or customer is shown. These cost sheets and Summaries have already proved very useful in enabling wastage of materials, and losses of the finished product through carelessness to be traced and investigated.

Item 15. Malting Cost Sheets and Summaries

These are similar to the above, and show the cost per quarter of malt produced

Figure 12. Liquor Central Control Board / State Management Scheme accounting system 1916. From General Managers Report 1916, Appendix C, Accounting System, pp12-13, TSMS 1, Cumbria County Archive, Carlisle.

cost accounting system for malt production is found from the government brewery's codified accounting framework.[38]

Regrettably none of these early malt or brewing cost sheets have survived and the malt summaries remain untraceable. The only brewery summaries extant from 1933 onwards contain the postings of malt costs to the beer summaries, which also notably contain overheads prepared on an overhead absorption cost basis of production.[39] This accounting system is distinguished by presenting a distinct improvement in accounting calculative practices beyond those that preceded them, and continued to be used until the closure of the brewery.

Compared with contemporary commercial practice, where a less sophisticated system was used, it was notably advanced for the period.

Indeed, immediately prior to the outbreak of the Second World War the chartered accountant G.S. Hamilton's *Brewery Accounting* represents the most advanced brewery accounting theory. This text is noteworthy for its subject matter and, although it is heavily focused on financial accounting, it contains a small section on cost accounting. In the text Hamilton introduced a pro-forma Malting Account which is less detailed than Tripp's earlier example from 1892 (see Fig. 13).

Hamilton proceeded to state that the malt manufactured in a brewery's own maltings could be either transferred at cost or by a profit taken on the malt account and posted to the beer trading account by charging the transfer out at higher rate

	1938 £.s.d	1939 £.s.d		1938 £.s.d	1939 £.s.d
Barley purchased			Malt for brewing…		
			Stock as at 30th June 1939		
Coal					
Wages and State Insurance			Less Stock at 30th June 1938		
Sundry expenses					
Rates			Malt dust, &c, Sold		
Profit					

Figure 13. Hamilton's pro-forma malting account 1938-1939.[40]

than the actual cost.[41] Hamilton later explained the rationale behind this method of malt accounting,

> It need scarcely be stressed that the malt house should be closed if it does not show a profit after charging the malt made at the same price as it could be purchased outside. A loss on this account may be caused by insufficient use, that is to say, when only a small quantity of malt is made and the expenses are practically unchanged.[42]

However, somewhat surprisingly, Hamilton neglects to expand on what constitutes malt at 'cost' and the subject fails to appear within his final chapter, devoted to costing, other than as an item making up the prime costs of production.

Conclusion

The evidence suggests that the new agrarian capitalist mentality of the late seventeenth and early eighteenth centuries, as reflected in accounting practices, does not appear to have extended to the malting trade, either at the individual maltster or malting company levels until, inexactly, the beginning of the twentieth century. The same lack of advanced accounting practices also appears amongst the large brewing maltster companies operations (albeit that Bass employed a simple statistical accounting analysis) despite their realisation that it was a large and uncontrollable cost, due to it being subject to the vagaries of the harvest. This, Lancaster alleged, was

	£ output (000's)	£ Av weekly utput per person employed	Total nos employed	% of overall GB workforce	Waged	Salaried	% salaried to waged
Drinks and malt trades	67,250	15.17	84,969	1.22	68,996	15,973	18.8
All UK	1,765. mill	1.95	6,984,976				

Figure 14. 1907 Census of Production Brewing[43] *and Malting Trades Tables. From HMSO. 1912: 524-526.*

		£ output (000)	£ Av weekly output per person employed	Total nos employed	% of overall workforce	Operatives GB	Admin	% Admin to Ops
	Drink	199,929	40.93	97,679	1.44	79,001	18,678	19.12
541	Aerated waters, cider, vinegar, wine	8,427	11.31	14,895	0.22	11,946	2,949	19.80
542	Brewing & malting	140,884	47.15	59,754	0.88	48,687	11,067	18.52
543	Spirit Distilling	4,827	26.80	3,602	0.05	3,116	486	13.49
544	Bottling	45,791	47.13	19,428	0.29	15,252	4,176	21.49

* excise duty of £70,800,000 included in the value of the brewing output

Figure 15. HMSO 1930 census of production section 500, chemicals drink (s540) and food. From HMSO. 1930: 66.

		£ output (000)	£ Av weekly output per person employed	Total nos employed	% of overall workforce	Operatives GB	Admin	% Admin to Ops
All		3,240,912	9.55	6,784,100	100	6,099,553	684,556	10.09
100	Metals & Engineering	855,001	9.97	1,714,721	25.28	1,479,869	234,852	13.7
200	Textiles	508,443	7.98	1,273,711	18.77	1,181,025	92,686	7.28
300	Coal & minerals	250,592	4.14	1,210,517	17.85	1,172,968	37,549	3.1
400	Civil engineering & building	396,176	7.2	1,100,298	16.22	1,017,651	82,647	7.51
500	Chemicals, drink & food	780,907	21.98	710,402	10.47	578,026	132,376	18.63
600	Sundry Inds	421,265	12.2	684,845	10.09	590,364	94,481	13.8
	Govt depts	28,528	6.38	89,615	1.32	79,650	9,965	11.12

Figure 16. HMSO - 1930 Census of Production Section All Categories. From HMSO 1930: 62.

because most brewers remained completely ignorant of the real cost of malting.[44]

This failure to develop a modern accounting system, particularly a cost and management accounting system, could initially be construed as a failure of innovative management. However, it must be remembered that this type of modern accounting is usually accorded to the industrial experiences of the Great War,[45] although ad-hoc diverse examples can be located before this date. Also the cost and skills required for establishing such accounting systems would have been time consuming and costly, especially for small and medium sized malting operations. There was also the considerable problem of accurately accounting for the barley and malt conversion process with its inherent loss, sale of by products, which was further complicated by the different types of grains used. The absence of accurate malt valuation was thus explained away as being too difficult to engage with being as it was dependant upon local considerations and varying local costs.[46] Consequently, simpler methods were employed, as demonstrated by Tripp and G.S. Hamilton whereby balancing figures entered into the accounts were used to post artificial profits on manufacture that could facilitate make or buy decisions by the brewers. Indeed it is implied by De Peyer that smaller breweries could employ a rule of thumb estimation based on experience and current market prices. This practice endured until 1939 and beyond, even at the largest breweries such as Bass. The State Management Scheme's malt costing system imposed by the government appears to be far in advance of commercial practice.

The maltsters appear to have only adopted cost accounting from the early twentieth century as evidenced by Page and Lancaster. It is suggested that this arose because of the increasing number of both brewer-maltsters and foreign competition that was progressively squeezing their profit margins. Therefore, the economic imperative for a greater understanding of their product cost structure became essential for the maltster.

Despite the evidence of the employment of relatively primitive accounting techniques throughout malting this did not equate to an inefficient industry as both the 1907 and 1930 censuses of production indicate. The statistics evidence that malting and brewing remained highly efficient in capita output, surpassed by very few other industries, despite its lack of a recognizably modern malt cost accounting framework.

The only partial evidence of a modern malt cost accounting system was that employed by the State Management Scheme. Again an explanation may be suggested. This brewery business was unique in its ownership and management. It was also established at the same time as the widespread government intervention in the economy as part of national efficiency measures in pursuance of war aims.[47] Thus state intervention in the

brewing industry at Carlisle imposed, as it had done in munitions manufacturing, new costing accounting disciplines to achieve production efficiencies. Nonetheless, although Hamilton reflects a potential adoption of such cost accounting disciplines within the beer producing industry, this appears to have not extended to malt.

Finally an answer must be suggested at this lack of accounting innovation. The most likely reason is that the brewing industry did not require such sophisticated and costly techniques Traditional *ad valorem* methods continued to deliver highly efficient and largely successful businesses where the labour process remained mainly unskilled and minimal.

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18. Stafford Record Office, D (W)1721/1/4 Malt Mill Stafford 1617.

19. Stafford Record Office, D4598/2/1-24 Stafford Town Malt Mill 1656-1854.

20. The 'malting ledger' or rather day book of 1862-1864 (SRO D901/02) contains the Waste Book (a list of transactions) for the Trent Brewery with the first entry dated 1st December 1862 although the malting business's relationship with the brewery is not obvious and remains confusing. The Trent Brewery, at Burton on Trent was not built until 1881 for Thomas Sykes a Liverpool brewer that traded as Sykes and Co until 1889 when it incorporated changing its name to the Trent Brewery Co. in 1893 when it went into liquidation. (Richmond, L. and Turton, A. (1989) *The Brewing Industry: A Guide to Historical Records*. Manchester University Press: Manchester. p.335).

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42. ibid. p.46.

43. The first Census of Production was undertaken in 1907 and the final report was published in 1912 by HMSO in a slightly different format to the later 1930 version rendering direct comparisons difficult. The 1907 figures are also distorted slightly because Ireland is included as part of Great Britain at this earlier date. The 1930 figures exclude Irish figures apart from Northern Ireland which remained as a part of the British state. However no significant distortion is apparent if Irish figures are removed from the 1907 figures.

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