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Accounting for a Staple-cotton Plantation

BY ROY C. BROWN

The accountant's first assignment to an extensive staple-cotton operation will be almost an adventure in topsy-turvy land. He will become acquainted with accounts receivable which are expenses; with relations with so-called tenants who are in reality closely supervised employees; with actual conditions of depreciation necessitating the employment of percentages which may, at first, look fantastic, and with inventories of such shifting values that the use of them will manifestly not correctly reflect the income, or be expressive of the facts in the case.

Plantation accounting should preferably be confined closely to the history of the main product. Every activity of the plantation is subordinated to the raising of cotton. Statistics as to the value of feed crops compared with the cost of production will avail little, because the accountant can hardly bring into the record the value to the land of crop rotation and the nitrate-fixing properties of the legumes which are commonly planted with the corn crop. Cotton is the "money crop", the basis for credit, the maintenance for the day and the hope for the future. The value of any attempt to departmentalize the accounting or to elaborate on the cost of other farm products which are produced and consumed as an incident to cotton cultivation will be largely neutralized because of the tendency of such digressions to distract attention from the main and all-important issue—cotton.

Before considering the accounting, a brief discussion of the nature of the crop and its cultivation may be of interest. Cotton is the fibrous covering of the seeds of the species of *Gossypium*,

a genus belonging to the mallow family. What is known as staple cotton is probably a variety of the West Indian "G. Barbadense," and is akin to sea-island cotton, but shorter stapled. Varying according to latitudes, the production can be roughly summed up by periods as follows:

Breaking land and burying vegetation, December and January.

Bedding up and fertilizing, February and March.

Planting, April.

Cropping out to stand and throwing soil up to roots, May.

Ploughing out grass and throwing dirt up to roots, June.

Picking, beginning in August.

The plant usually appears above ground in from one to two weeks after the seed has been sown. In about forty days after the appearance of the plant, the "square" or bud develops. In about another thirty days the flower opens, showing a dull white or yellow color on the first day and a pinkish hue on the second, and dropping off on the third day. After the petals fall there remains the boll, enveloped in the calyx; this develops until it becomes almost the shape and size of an egg, and finally bursts, about sixty days after the appearance of the bloom. When the boll bursts it exposes several cells divided by membranous walls, each cell containing seeds attached by filaments to the membrane of the boll. These filaments disappear, leaving the seed loose in the cavity and covered with the fiber known as cotton. When first picked from the boll it is known as seed cotton, which is separated by ginning into cotton seed and lint cotton.

The average yield per acre is from 1,000 to 1,200 lbs. of seed cotton, giving by weight about one third lint and two thirds seed. The moisture content in the lint runs about eight per cent. and most of this disappears between the time of picking and marketing.

The cultivation is almost universally done by contract labor, negro families who are described as "tenants," and known as "half-hands" or "quarter-hands." In the case of half-hands, the owner furnishes living quarters, fire-wood, work animals and tools, without charge, and charges the tenant with one half of the cost of the seed, fertilizers and poison for dusting to protect the

plant against insect pests. Under this arrangement the farm takes one half of the lint cotton, the seed and one half of the lint cotton going to the tenant. Quarter-hands furnish their own tools and work animals, and the farm takes only one fourth of the lint.

In either case the owner furnishes the tenant with his necessities, advances him cash and produce against his crop and, beginning March 1st and continuing until August 1st, pays him a stipulated amount monthly, or bi-monthly, of \$1.50 to \$2.00 a month per acre of cotton he is cultivating. This payment is known as a "limit." An average of seven acres of cotton land per adult member is assigned to a family, and considerable judgment is needed to prevent families from taking on more land than can be worked efficiently, in order to increase the "limit."

A separate account is kept with each tenant, and all advances, including the limit, are charged against his account. When the cotton is picked, ginned, baled and graded, the owner settles with the tenant for the seed and for his share of the cotton at the current market price. A proportion of the plantation overhead, which usually masquerades under the name of "interest," is charged to the account; the cotton and seed and any miscellaneous credits are passed to the account, and the tenant receives the difference in cash. If the production is not sufficient to pay out the account the owner is in nine cases out of ten forced to close out the balance into the cost of the crop. Thus, for the tenant, it is a case of "heads we win, tails you lose." These accounts with tenants are, properly speaking, not accounts receivable at all, but merely a segregation of the cost of producing the crop. In the preparation of returns of income all the debits should be considered as production expense, and none of the accounts charged off should be considered as a bad-debt deduction. Where debit balances are small and where the family has good workers who normally make a profit, the balances are commonly carried forward if the tenant elects to remain on the place and cultivate another crop, the effect being to lessen slightly the cost of producing the subsequent crop.

When we bear in mind the irresponsible character of the labor, the risks of damage to grade and weight by storm, insect pests, early droughts, later and excessive moisture, and also the frequent and violent fluctuations of the market, the conclusion is inevitable that the cultivation of cotton is a continuous gamble.

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The best estimate that the writer has been able to make of the cost per acre to produce "wages" cotton, as distinguished from cultivation by the tenant system, is given below as an average production cost for use in testing figures.

Man hours, all operations up to picking, 70 @ 20¢	\$14.00
Feed raised on plantation, cost75
Feed bought	2.00
Seed, cotton, pedigreed seed, 50 lbs. @ 3½¢	1.75
Poison and dusting80
Fertilizer	2.00
Depreciation, work animals	1.50
Depreciation and repairs, buildings	2.00
Depreciation and repairs, farm machinery, gin, etc.	1.50
Small tools, hardware, harness and supplies	1.00
Interest on bank advances, average	1.60
Picking, 1,000 lbs. seed cotton	15.00
Overseer, hostler and blacksmith	2.80
House expense, not deductible for income tax	3.00
Cleaning and opening ditches50
Taxes, including school, road and drainage	3.00
Ginning, baling and hauling	3.00
	\$56.20
Cost per acre (1,000 lbs. seed cotton)	\$56.20

The assumption is fair that the seed from one acre of cotton, sold to the oil mills on laboratory test, will bring an average of one cent a pound for 640 lbs., which deducted from the above table leaves a net cost of the lint cotton in the bale (360 lbs. less 8% moisture, net 335 lbs.) of practically fifteen cents a pound, or fourteen cents, if we exclude the "house" or owner's account. In years when the crop is practically a failure, all the costs remain about the same, excepting that of picking, and the owner suffers heavy losses.

The avenues to credit open to the planter are various, and the accountant should investigate very thoroughly the possibility of the existence of liabilities to banks, factors, investment bankers, oil mills, the federal land bank, the staple discount corporation, and jobbers and machinery houses. It may be necessary to examine the land book and the mortgage record in the chancery office of the county courthouse to determine not only the existence of liabilities but also whether or not part extinguishments have been made matters of record, and in some instances, where properties have been disposed of, to determine the original cost.

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The chances are that the sum total of the records the owner will be able to produce will be entirely inadequate and not even approximately in accord with good accounting practice. Usually the accountant can depend on finding available records somewhat as follows:

- Statements from cotton factors or coöperative marketing associations,
- Tax receipts and invoices for some or all of the supplies bought,
- Canceled cheques and bank statements,
- Account book with tenants, and possibly a payroll book,
- Gin ticket stubs, if a gin is operated.

The general accounts must be built up from this foundation. Even if an attempt has been made to keep general accounts these will usually be limited to cash, plantation, cotton, expense, house, and loss and gain. Depreciation will very rarely be reflected by the books, and the owner will be inclined to consider the term as a convenient device allowed him to lower the taxable net income on his return. Indeed, until the income-tax law of 1917 came into existence, many planters made no attempt to keep a system of books, and literally thousands of deficiency assessments have been made, and will continue to be made, because examining officers can not verify the income and deductions from the records presented to them.

Hence the problem of the accountant who is first called in is quite as much a matter of education and conciliation as of producing a fair balance-sheet, a reasonably accurate profit-and-loss account, and, particularly if the engagement has been the outgrowth of a deficiency assessment, income returns that will stand up under inspection.

Procedure will vary with conditions. Usually the first step will be to set up the property accounts intelligibly. Lists of the structures should be prepared, with the cost, or estimated cost, or March 1st, 1913, value; equipment and machinery reasonably segregated and properly valued, and the value of the acreage segregated from the value of the structures and any standing timber on the property.

Next, there should be an examination of the gin ticket stubs and other gin records, if a gin is operated, to determine the

number of bales ginned from new and previous crops, the weight of seed and of cotton, prices allowed tenants and amounts charged for bagging and ties and tolls.

Then the tenant ledger on which the accounts with the so-called tenants are kept should be analyzed on wide columnar paper, to find the bales of cotton and pounds of seed credited to each account and any miscellaneous credits, as well as the charges against each account, segregated as merchandise, feed, bills paid, corn-land rent, gear and implements, rent of gear and implements and of live stock, hogs and cattle, the so-called interest charge and other debits. If work animals are found charged to tenant accounts, it will be well to suggest to the owner that such a charge technically completes a credit sale, and that possible trouble and expense of repossessing may be avoided by suspending such charges until settlement time, and bringing them on to the ledger page if the tenant can turn over enough cotton and seed to clear the account, including the cost of the animals.

After the digest of these records is completed, the canceled cheques and bank statements for the period, with statements from oil mills, factors and coöperative selling associations, purchase invoices and payrolls should be carefully examined, distributed and summarized.

Where a commissary is operated there will probably be a separate small set of books, with inventories, which can be tied up with the other records. As the commissary man is customarily interested in the profits, these books should receive special attention. It is usually well to make a complete list of jobbers, retailers, and supply and machinery houses with which the owner has been dealing, and to write to each a request for information as to any debit or credit balances carried against the planter or plantation as of the closing date of the period under review.

The books of account suitable for a plantation cultivating a thousand or more acres of cotton and operating a store and a gin are as follows: general ledger, tenant ledger, cashbook, journal, payroll book, gin book, gin ticket books, commissary ledger, commissary combined cashbook and journal. Subsidiary records: cards for mules, horses and machinery, commissary inventory sheets, settlement sheets for tenants, and numbered tags for the gin.

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The following chart of accounts will be found good practice, subject to such changes as conditions may suggest:

<i>Assets</i>	<i>Liabilities</i>
1. Cash account	51. Accounts payable
2. Bank account	52. Notes payable
3. Accounts receivable, tenants	53. Mortgages payable
4. Accounts receivable, others	54. Reserve for depreciation
5. Notes receivable	55. Accrued taxes payable, state and county
6. Inventory, commissary	56. Income taxes payable
7. Stocks and bonds	60. Proprietor's account
11. Cleared land	
12. Cut-over land	
13. Wood land	
14. Standing timber	
21. Owner's residence	
22. Overseers' houses	
23. Tenant houses	
24. Tenant barns and outbuildings, including seed houses	
25. Main barns	
26. Blacksmith shop	
27. Gin buildings, seed house and platform	
28. Commissary building	
29. Bell tower and other outbuildings	
31. Artesian well and piping	
32. Lighting plant	
33. Farm machinery	
34. Trucks, tractors and automobiles	
35. Tractor-drawn ploughs, trailers, etc.	
36. Wagons and harness, plows, cultivators, etc.	
37. Power plant, gin	
38. Gin machinery	
39. Hand implements and miscellaneous	
41. Saddle horses	
42. Work horses	
43. Work mules	

NOTE.—Hogs and cattle can permissibly be treated as expenses when purchased and as revenue when sold. On a cotton plantation neither their number nor value will usually warrant setting up an asset account for them.

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<i>Income</i>	<i>Expenses</i>
71. Sales, cotton	91. Purchases, cotton
72. Sales, cotton seed	92. Purchases, cotton seed
73. Sales, other farm products	93. Standing timber severed
74. Sales, feed	94. Purchases, commissary
75. Sales, commissary	95. Purchases, bagging and ties
76. Sales, timber	96. Purchases, miscellaneous, for resale
77. Gin tolls	97. Planting seed (cotton)
78. Sales, bagging and ties	98. Feed, purchases
79. Interest and discount	99. Salaries, overseers
80. Dividends and bond interest	100. Salaries, bookkeeper, commissary clerk, etc.
81. Rent	101. Salary, gin operator
82. Miscellaneous income	102. Gin payroll
	102a. Gin supplies
	102b. Gin fuel
	103. Farm payroll
	104. Planting seed, other than cotton
	105. Fertilizer
	106. Poison
	107. Small hardware and harness
	108. Repairs to owner's residence (not deductible for income tax)
	109. Repairs, other farm buildings
	110. Repairs, farm machinery
	111. Repairs, gin buildings and machinery
	112. Repairs, wagons and implements
	113. Repairs, trucks, autos and tractors
	114. Gas, oil and supplies, trucks, autos and tractors
	115. Miscellaneous supplies
	116. House expense (not deductible for income tax)
	117. Depreciation
	118. Taxes, state and county
	119. Taxes, income
	120. Interest on notes payable
	121. Interest on mortgages
	122. Rent, additional acreage
	123. Miscellaneous expenses
	130. Profit and loss

Many plantation owners follow a practice of maintaining a plantation account to which they credit the farm's share of the cotton at the immediate market price, and charge a corresponding

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amount to cotton purchases. In the foregoing charts such a device has been entirely eliminated, for the reason that the market on cotton has a habit of doing a very "devil's dance" at the most unexpected intervals, which usually makes it necessary to eliminate these entries in order to make a true accounting. Likewise no provision has been made for a cotton inventory, because such cotton as is carried is usually stored in a bonded warehouse, and credits against this cotton are extended on surrender, as collateral, of negotiable warehouse receipts on which weights and grades are stated.

A footnote at the bottom of the balance-sheet showing the bales of unpledged cotton on hand and tons of seed is more satisfactory than an attempt to fix a value on a product that may be off or on several hundred points in a week. Incidentally, farmers are not required to use cotton inventories and seed inventories in preparing returns of income for tax purposes.

In this article it has been attempted to outline a strictly utilitarian system, devoid of frills and devoted to accounting for the main product, but with operations outlined in sufficient detail to permit the preparation of a statement by which an experienced and understanding reader may estimate the attention given to upkeep and management, and the productive possibilities of the plantation. There is probably no known industry which combines as many operations or provides as many temptations to delightful little experiments in cost accounting as does a large farming enterprise. But the opinion of one who has been "through the mill" is given, for what it may be worth, that an accounting for a staple-cotton plantation should be reduced to the essentials and confined to the utmost simplicity consistent with good practice.

[The writer wishes to acknowledge his indebtedness to Professor George B. Walker, of the Stoneville Pedigreed Seed Company, Stoneville, Mississippi, for valuable information related to the subject of this article.]

Amortization of Discounts on Serial Bonds

BY F. C. BELSER

It has been a common practice to apportion the discount on serial bonds over their life on the basis of the par value of bonds outstanding at the end of each year. This has been done on the assumption that a distribution made on this simple arithmetical basis is substantially accurate and equivalent to amortizing the discount on a scientific basis.

In some circumstances the arithmetical method yields substantially accurate results. For instance, in the following case, taking \$200,000 of bonds payable in four instalments of \$50,000 each, interest at 6% to yield 7%, the bonds would have a present value of \$195,623, or a discount to be amortized of \$4,377, and the result would be:

	Amount of bonds outstanding	Arithmetical basis	Scientific basis
1st year	\$200,000	\$1,751	\$1,694
2nd "	150,000	1,313	1,312
3rd "	100,000	875	904
4th "	50,000	438	467
		<u>\$4,377</u>	<u>\$4,377</u>

In some cases, however, instead of showing a constantly declining amount of amortization from year to year, the scientific result is actually the other way about and gives a constantly increasing amortization. For instance, in the following case, taking again \$200,000 of 6% bonds to yield 7%, but payable at \$5,000 per annum for twenty years, and the last \$100,000 also payable at the end of twenty years, the present value would be \$182,688, or a discount of \$17,312. In this case the amortization on the two bases would be as follows:

	Amount of bonds outstanding	Arithmetical basis	Scientific basis
1st year	\$200,000	\$1,135	\$788
2nd "	195,000	1,107	793
3rd "	190,000	1,079	799
- "	-	-	-
- "	-	-	-
- "	-	-	-

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	Amount of bonds outstanding	Arithmetical basis	Scientific basis
20th year	105,000	596	981
		<u>\$17,312</u>	<u>\$17,312</u>

In the second case, the scientific result is directly the opposite of the arithmetical result. The reason is that in some circumstances the basis rate applied against the amortization of the first period is greater than the difference in rates applied against the redemption of bonds. For instance, in the first case cited, the second year's amortization is \$382 less than the first year's amortization, and is made up as follows:

$$\begin{aligned}
 7\% \text{ of } \$1,694 &= \$118 \text{ plus} \\
 1\% (7\% \text{ minus } 6\%) \text{ of } \$50,000 &= 500 \text{ minus} \\
 \text{Net effect on amortization} &= \underline{\underline{\$382}} \text{ minus}
 \end{aligned}$$

In the second case there is an increase in amortization of \$5 which is accounted for as follows:

$$\begin{aligned}
 7\% \text{ of } \$788 &= \$55 \text{ plus} \\
 1\% \text{ of } \$5,000 &= 50 \text{ minus} \\
 \text{Net effect on amortization,} &= \underline{\underline{\$5}} \text{ plus}
 \end{aligned}$$

Although the arithmetical method is often the more conservative and causes the deferred charge to be written off more rapidly, the scientific method is entirely justifiable.

Another consideration which often affects a schedule of amortization of discount is that some bonds are retired before their due date. When this happens it follows that corresponding adjustment should be made of the unamortized discount. The adjustment required is the difference between the par value of the bonds retired and their true present value at the original yield rate. This adjustment is brought out in the following schedule of amortization of the discount on the first bond issue illustrated above:

	Principal	Yield @ 7%	Interest @ 6%	Amortization on scientific basis	Bonds retired
1st year	\$195,623	\$13,694	\$12,000	\$1,694	\$50,000
2nd "	147,317	10,312	9,000	1,312	50,000
				362	20,000*
3rd "	78,991	5,529	4,800	729	50,000
4th "	29,720	2,080	1,800	280	30,000
				<u>\$4,377</u>	

* \$20,000 of bonds due in 4th year retired in 2nd year.

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It follows that any amount paid on the retirement of a bond in excess of its net yield basis would require to be written off to profit and loss. Thus, in the foregoing case, if the \$20,000 of bonds retired were bought at 101, the journal entry would be as follows:

Bonds outstanding.....	\$20,000	
Profit-and-loss account.....	562	
Cash, purchase @ 101.....		\$20,000
Deferred charges.....		362
Purchase of \$20,000 of bonds @ 101.....	\$20,200	
Present value @ 7% yield.....	19,638	
Excess over value.....		\$562

As has been shown above, the amortization of the discounts on serial bonds is in some circumstances a constantly declining amount and in other circumstances a gradually increasing amount. It follows that there might be circumstances in which there would be the same amount of amortization throughout the life of the bonds. This is in fact the case. Take the case of a 6% bond issue of \$600,000, payable in instalments of \$17,500 a year for twenty years with the remainder of \$250,000 at the end of twenty years. On a 7% basis the present value of these bonds would be \$550,000 and the discount of \$50,000 would be amortized at the rate of \$2,500 for every year during the entire period, as is shown by the following table:

	Principal	Yield @ 7%	Interest @ 6%	Amortization on scientific basis	Bonds retired
1st year	\$550,000	\$38,500	\$36,000	\$2,500	\$17,500
2nd "	535,000	37,450	34,950	2,500	17,500
3rd "	520,000	36,400	33,900	2,500	17,500
- "	-	-	-	-	-
- "	-	-	-	-	-
- "	-	-	-	-	-
20th year.....	265,000	18,550	16,050	2,500	267,500
				\$50,000	

From the foregoing it will be seen that the practice of amortizing bond discount on the arithmetical basis should be abandoned, and the scientific basis adopted in every case. With the application of Makeham's formula it is a very simple matter to

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get at the true yield of serial bonds. The application of this formula is set out fully in an article by A. S. Little, on page 352 of volume XXI of THE JOURNAL OF ACCOUNTANCY (May, 1916). For convenience this formula is given below:

$$\text{Present investment value} = \left(\frac{\text{Present value of principal}}{\text{of bonds}} \right) + \frac{\text{Coupon rate}}{\text{Yield rate}} \left(\frac{\text{Compound discount on the principal}}{\text{of the bonds}} \right)$$

This formula applies whether the principal of the bonds is in one sum or payable serially. In the latter case, the present value of the annuity represented by the serial payments would be found for the first member of the equation.

In all calculations involving the determination of a yield or basis rate, the process followed must be one of trial and error. It is, therefore, often convenient to find the first trial rate by some simple arithmetical method. A close approximation to the true rate may be obtained by adjusting the coupon rate by an aliquot part of the discount over the life of the bonds, and comparing the adjusted rate with the average of the principal sum, that is, the average of the present value and the par value. Thus, in the case of a 5% bond with 20 years to run, purchased at 90, the adjusted income rate would be 5.5% and the average principal would be 95, giving a rate of 5.79%, which closely approximates the true yield rate of 5.86%. In the case of serial bonds, their average life may be used as a factor.

The arithmetical method results in a rate somewhat lower than the true rate in the case of bonds at a discount and slightly greater than the true rate in the case of bonds at a premium.