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System 6:
Chips Versus Blanks Program

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Abstract

This paper gives a computer program to be used on the IBM-PC to evaluate the tradeoff between chips and boards. In System 6, bolts are sawed to cants, and cants are resawed to boards. All boards with a minimum clear area are stacked, dried, and processed to blanks. All other boards are chipped. When the bolts are of poor quality, many boards will have only the minimum clear area. By increasing the size of the minimum clear area used in sorting, only the better boards will be used for blanks and more chips will be made. Additional cants will have to be purchased to replace the boards chipped.

System 6 is a new technology (Reynolds and Gatchell 1982) to convert small-diameter, low-grade hardwood timber to standard-size blanks. Blanks are edge-glued panels (Araman et al. 1982) used to make furniture and kitchen cabinet parts.

In System 6, the tree stem is bucked to 6- or 8-foot-long bolts, the bolts are sawed to cants, and the cants are resawed to boards. The boards that do not have at least one minimum cutting (1-1/2 by 15 inches) are chipped. All other boards are stacked for drying. After drying, all boards are processed to blanks.

It is assumed that the reader is familiar with System 6 rough-mill operating procedures (Reynolds 1984).

Operating the Rough Mill

In making a System 6 rough mill run, the wood species, blank thickness, and blank quality to be made are specified. Boards of the correct species and thickness are used. Boards are not graded. Every board must contain at least a 1-1/2- by 15-inch piece because this was the criterion used to choose the boards to be dried. All of these boards are processed.

System 6 rough mill runs are preplanned. Board-yield data per operating method (GCL's—gang cross-cut length) and blank requirements per length (cutting bills) are put through a linear program (LP). The LP solution gives the minimum quantity of boards to be cut up by each GCL to satisfy the cutting bill requirements. When board quality is good, yields are high and only a few short blanks are made. When board quality level is poor, yields are low and many short blanks are made. Board quality and cutting bill requirements will both affect the LP solution.

When board quality level is high and few long blanks are required in the cutting bill, yields will be high. If board quality levels are low and many long blanks are required in the cutting bill, yields will be low. This will cause profits to suffer. Since the cutting bill requirements are set by customer demands, only the board quality level can be controlled by the System 6 operator. Better quality timber should be purchased, if possible, when cutting bills require many long blanks.

When poor-quality timber must be used and many long blanks are needed, the green-board sorting criteria after cant resawing must be changed. By increasing the size of the minimum clear area, fewer boards will be sent to the stacker from the cant gang resaw. The quality level of the dried boards will be better and more long blanks will be made.

When sorting to get higher quality boards, a tradeoff must be made. The chips versus blanks program is used to resolve this tradeoff (Appendix). Chips are much less valuable than blanks. However, by chipping more boards, more chips are made and more money is realized from the sale of chips. On the other hand, additional timber must be purchased to produce enough of the better quality boards to keep the rough mill operating at full capacity. The program is used to resolve whether the value of the additional chips and blanks of shorter lengths that are in excess of cutting bill requirements offsets the cost of the additional roundwood.

Input Data Required

Eleven variables must be known or estimated to create a meaningful input to solve the chips versus blanks tradeoff.

1. Board input per shift: The System 6 rough mill is designed to process a given input of boards per shift. The input board quality will affect the blank output. Poor-quality boards will produce fewer blanks while good-quality boards will produce more. The input board quantity is based on board quality and is determined in a pretest. Board quantity is a function of mill design and must be stated.

2. Cash flow-in: The System 6 mill operator is expected to earn a given amount of money per year to meet the owner's earnings requirement. This annual cash flow-in requirement is placed on a per shift basis. The per shift cash flow-in is a function of the mill business design and must be stated (Hansen & Reynolds 1984).

3. Percent boards chipped: This is the percentage of boards, by board feet measure, sent to the chipper when sorting for higher quality boards. The remainder of the boards go to the stacker for drying. When sorting for higher quality boards is not done, this value is zero.

4. Chip price: This is the amount per green ton the chips are sold for f.o.b. (free on board) the System 6 mill.

5. Cant cost (chip replacement): This is the cost, per M bf (thousand board feet), to be paid for the additional cants that are required to make up for the board footage sent to the chipper.

6. Required blanks yield: This is the yield, in percent blanks surface area, of the blanks required by the cutting bill.

7. Extra blanks yield: In some instances, more blanks that are less than 50 inches long but longer than 20 inches, are made than are required by the cutting bill. These blanks accumulate, as the 50 inch and longer blanks are made, and must be sold.

8. Excess salvage blanks yield: In System 6, blanks 20 inches or shorter are made on a salvage basis. If these blanks accumulate up to the quantity stated in the cutting bill, they are accepted. If more than the cutting bill quantity is made, they are excess and must be sold.

9. Required blanks price: This is the average price, per square foot surface area, of the blanks required by the cutting bill.

10. Extra blanks price: Since the extra blanks are of the same quality as the required blanks, they can be sold. However, a lower price will probably have to be used to create a new market and sell them promptly.

11. Excess salvage blanks price: These blanks are also of the required blanks quality. But due to their short length, a much lower price will have to be used to sell them promptly.

Using The Program

Program CHVBL1.BAS, Appendix, must be loaded onto a diskette containing the COMMAND.COM, ANSI.SYS, SYS.COM, PRINT.COM, FIND.EXE, and BASICA.COM DOS files. This diskette is put into drive A. A formatted disk, as a scratch file, must be put into drive B. First enter BASICA then LOAD "A:CHVBL1.BAS" to put the program into memory. F2 starts the program. The program has an associated data file, "B:CHVBL1.DAT". The input data from a run is saved and is entered as input data for the next run. This "old" data is changed to be the "new" data for that run. Only the data changed need be entered.

When the program is first run, there will be no CHVBL1.DAT file on the B diskette. Program lines 80, 90, and 100 must be deleted with the program in memory. All 11 data lines are entered during this first run. The CHVBL1.DAT file will be entered on the B diskette during this first run. Then on the second run the program must be reloaded so that lines 80, 90, and 100 are available and the data from a run is read as "old" data for the next run.

The program is written with prompting messages so data entry and use are simple and quick. We recommend no more than 70 characters or spaces on the run identification line. If more description is used, the line will scroll and not all data will appear on the screen when the solution is given.

Program Demonstrations

Input data for demonstration run 1 is taken from the standard mill option by Hansen and Reynolds (1984) as follows:

1. The System 6 mill will process 16 M bf per shift.
2. Normal operations bring in $11,520 per shift.
3. No boards will be chipped except those not meeting the minimum 1-1/2- by 15-inch clear area requirement.
4. Chip price is $0 per ton.
5. Since no boards are to be chipped, this value is not used in this run, so cant cost = $0.
6. For the cutting bill and the quality of boards used, yield in blanks required by the cutting bill is 45.0 percent.
7. There is no additional yield in extra blanks.
8. There is no additional yield in salvage length blanks.
9. Required blanks will sell for an average price of $1.60 per square foot.
10. Extra blanks will sell for an average price of $1.20 per square foot.
11. Extra salvage blanks will sell for an average price of $0.80 per square foot.

Results are given in two ways (Figure 1): (1) Cash flow-in as a result of operating the System 6 mill as described by the input data, and (2) blank prices needed to meet the $11,520 cash flow-in required.

There was $11,520 realized from the sale of the 7,200 square feet of blanks made and sold at $1.60 per square foot. As there were no other earnings or costs, the $11,520 matched the required cash flow. The prices calculated were the same as the prices given as input data.

Then the cutting bill was changed so that more long blanks were required, but the same quality boaros were used. The yield of required blanks fell to 35 percent, but there was a 3.5 percent yield of shorter blanks in excess of requirements. There was also a 1.5 percent yield of blanks less than 20 inches long (the salvage blanks).

As shown in Figure 2, 5,600 square feet of required blanks realized $8,960 at $1.60 per square foot. The extra blanks brought in $672, and the salvage blanks brought in $192. The total cash flow-in was $9,824 which was $1,696 short of the $11,520 cash flow-in required by the System 6 mill business plan. So, to earn the additional $1,696, the required blanks price had to be raised 28 cents per square foot to $1.88, the extra blanks 21 cents per square foot to $1.41, and the salvage blanks 14 cents per square foot to $0.94.

If, however, we had chipped 20 percent of the poorest boards when we ran the second cutting bill, the overall board quality for blanks would have improved and yields would have risen. There would have been a 42.5 percent yield of required blanks, a 2.0 percent yield of extra blanks, and a 0.5 percent yield of excess salvage blanks.

As shown in Figure 3, 6,800 square feet of required blanks realized $10,880 at $1.60 per square foot. The 320 square feet of extra blanks were worth $384 at $1.20 per square foot, and 80 square feet of salvage blanks were worth $64 at $0.80 per square foot. An additional $80 was raised from chips made from the 20 percent poor-quality boards, but $576 had to be spent for cants to replace those boards. At this point, total cash flow of $10,832 is $688 shy of the $11,520 goal. This $688 is raised by increasing the required blanks price by 10 cents per square foot, the extra blanks by 7 cents per square foot, and the salvage blanks by 5 cents per square foot.

Look at the System 6 mill operations another way and return to Figure 1. For the cutting bill requirements used, a 45 percent yield of required blanks was obtained and no extra or excess salvage blanks were made. If we had chipped 20 percent of all boards as they left the cant gang resaw, the board quality would have improved to give a 48 percent yield of required blanks.

Figure 4 shows the effect that chipping 20 percent of the green boards and replacing them from cants costing $190 per M bf will have on the blank price and cash flow-in. There will be $240 more coming in when $1.60 per square foot is charged. The mill operator can pocket this additional profit or pass the savings on to customers by reducing the blank price by 3 cents per square foot.

```
                 CHIPS Vs BLANKS Program 1                          04-08-1985

            Poorest boards chipped; all blanks sold                 11:28:42

                                   Input Data
  1 Board input per shift  16.00mbf     6 Req'd blanks yield=      45.0%
  2 Cash flow req'd=   $11,520.00       7 Extra blanks yield=       0.0%
  3 Percent boards chipped=  0.0%       8 Exc salv blanks yield=    0.0%
  4 Chip price=           $  0.00/ton   9 Req'd blanks price      $ 1.60
  5 Cant cost(chip repl)= $  0.00/mbf  10 Extra blanks price      $ 1.20
                                       11 Exc salv blanks price= $ 0.80

RUN IDENT:DEMONSTRATION #1

                          Output Values: Cash Flow In
   Required blanks made=           7,200sqft       Value $11,520
   Extra blanks made=                  0sqft       Value $     0
   Exc sal blanks made=                0sqft       Value $     0
   Chips made=                      0.00tons       Value $     0
   Additional cants for chips=     0.00mbf         Value $     0
   Total cash flow in (Excess/shortage $      0)         $11,520

                          Output Values: Blank Prices
   Required blanks made=           7,200sqft       Value $11,520
   Extra blanks made=                  0sqft       Value $     0
   Exc sal blanks made=                0sqft       Value $     0
   Chips made=                      0.00tons       Value $     0
   Additional cants for chips=     0.00mbf         Value $     0
   Total cash flow in (Equal cash flow req'd)            $11,520
   Req'd Blanks Price= $ 1.60/sqft
   Extra Blanks Price= $ 1.20/sqft
  Exc Sal Blanks Price=$ 0.80/sqft
```

Figure 1.--Program CHVBL1 output: Run No. 1

CHIPS Vs BLANKS Program 1 04-08-1985

Poorest boards chipped; all blanks sold 11:30:53

Input Data

1 Board input per shift 16.00mbf	6 Req'd blanks yield=	35.0%
2 Cash flow req'd= $11,520.00	7 Extra blanks yield=	3.5%
3 Percent boards chipped= 0.0%	8 Exc salv blanks yield=	1.5%
4 Chip price= $ 0.00/ton	9 Req'd blanks price	$ 1.60
5 Cant cost(chip repl)= $ 0.00/mbf	10 Extra blanks price	$ 1.20
	11 Exc salv blanks price=	$ 0.80

RUN IDENT:DEMONSTRATION #2

Output Values: Cash Flow In

Required blanks made=	5,600sqft	Value	$ 8,960
Extra blanks made=	560sqft	Value	$ 672
Exc sal blanks made=	240sqft	Value	$ 192
Chips made=	0.00tons	Value	$ 0
Additional cants for chips=	0.00mbf	Value	$ 0
Total cash flow in (Excess/shortage $-1,696)			$ 9,824

Output Values: Blank Prices

Required blanks made=	5,600sqft	Value	$10,507
Extra blanks made=	560sqft	Value	$ 788
Exc sal blanks made=	240sqft	Value	$ 225
Chips made=	0.00tons	Value	$ 0
Additional cants for chips=	0.00mbf	Value	$ 0
Total cash flow in (Equal cash flow req'd)			$11,520

Req'd Blanks Price= $ 1.88/sqft
Extra Blanks Price= $ 1.41/sqft
Exc Sal Blanks Price=$ 0.94/sqft

Figure 2.--Program CHVBL1 output: Run No. 2

```
                    CHIPS Vs BLANKS Program 1                   04-08-1985

              Poorest boards chipped; all blanks sold           11:06:53

                                  Input Data
   1 Board input per shift  16.00mbf    6 Req'd blanks yield=     42.5%
   2 Cash flow req'd=   $11,520.00      7 Extra blanks yield=      2.0%
   3 Percent boards chipped= 20.0%      8 Exc salv blanks yield=   0.5%
   4 Chip price=           $ 10.00/ton  9 Req'd blanks price     $ 1.60
   5 Cant cost(chip repl)= $180.00/mbf 10 Extra blanks price     $ 1.20
                                       11 Exc salv blanks price= $ 0.80

RUN IDENT:DEMONSTRATION #3

                              Output Values: Cash Flow In
    Required blanks made=            6,800sqft       Value $10,880
    Extra blanks made=                 320sqft       Value $   384
    Exc sal blanks made=                80sqft       Value $    64
    Chips made=                       8.00tons       Value $    80
    Additional cants for chips=     3.20mbf          Value $  -576
    Total cash flow in (Excess/shortage $  -688)           $10,832

                              Output Values: Blank Prices
    Required blanks made=            6,800sqft       Value $11,541
    Extra blanks made=                 320sqft       Value $   407
    Exc sal blanks made=                80sqft       Value $    68
    Chips made=                       8.00tons       Value $    80
    Additional cants for chips=     3.20mbf          Value $  -576
    Total cash flow in (Equal cash flow req'd)             $11,520
    Req'd Blanks Price= $ 1.70/sqft
    Extra Blanks Price= $ 1.27/sqft
   Exc Sal Blanks Price=$ 0.85/sqft
```

Figure 3.--Program CHVBL1 output: Run No. 3

```
                 CHIPS Vs BLANKS Program 1                         04-08-1985

             Poorest boards chipped; all blanks sold              11:11:36

                                 Input Data
    1 Board input per shift   16.00mbf     6 Req'd blanks yield=      48.0%
    2 Cash flow req'd=   $11,520.00        7 Extra blanks yield=       0.0%
    3 Percent boards chipped= 20.0%        8 Exc salv blanks yield=    0.0%
    4 Chip price=           $ 10.00/ton    9 Req'd blanks price      $ 1.60
    5 Cant cost(chip repl)= $190.00/mbf   10 Extra blanks price      $ 1.20
                                          11 Exc salv blanks price=  $ 0.80

RUN IDENT:DEMONSTRATION #4

                         Output Values: Cash Flow In
    Required blanks made=          7,680sqft       Value $12,288
    Extra blanks made=                 0sqft       Value $     0
    Exc sal blanks made=               0sqft       Value $     0
    Chips made=                     8.00tons       Value $    80
    Additional cants for chips=     3.20mbf        Value $  -608
    Total cash flow in (Excess/shortage $    240)        $11,760

                         Output Values: Blank Prices
    Required blanks made=          7,680sqft       Value $12,048
    Extra blanks made=                 0sqft       Value $     0
    Exc sal blanks made=               0sqft       Value $     0
    Chips made=                     8.00tons       Value $    80
    Additional cants for chips=     3.20mbf        Value $  -608
    Total cash flow in (Equal cash flow req'd)           $11,520
    Req'd Blanks Price= $ 1.57/sqft
    Extra Blanks Price= $ 1.18/sqft
   Exc Sal Blanks Price=$ 0.78/sqft
```

Figure 4.--Program CHVBL1 output: Run No. 4

Conclusions

When chips can be sold and additional cants can be purchased, profit opportunities arise for the System 6 mill manager. By chipping some of the poorest green boards, the boards sent through the mill are of a higher quality level. Thus, total yields increase and the quantity of long blanks increases. A wide range of cutting bills can be made at the System 6 mill with only slight increases in blank prices.

When board quality is at a normal or low level, chipping some of the poorest green boards will raise the average dry board quality. Total yields will rise and profits will increase if the additional cant price is not excessive.

Since each set of the 11 input variables will result in different outputs, general statements are difficult to make. Instead, we have provided this IBM-PC program to be used to make calculations easily and quickly.

Literature Cited

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Appendix

```
10 REM This program will calculate either (1) the cash flow in per shift for a
20 REM given cutting bill, chip %, & blank prices; or (2) the blank prices
30 REM req'd for a specified cash flow with a given cutting bill & chip %.
40 REM It is written in BASICA for the IBM PC & is saved as "A:CHVBL1.BAS".
50 CLS
60 KEY OFF
70 DEFINT N
80 OPEN "B:CHVBL1.DAT" FOR INPUT AS #1
90 INPUT #1, CFIR,YRB,YEB,YESB,RBP,EBP,ESBP,PBC,CC,CP,BIPS
100 CLOSE #1
110 N=0
120 ID1$="   2 Cash flow req'd=    $##,###.##     "
130 ID2$="   6 Req'd blanks yield=      ##.#%"
140 ID3$="   7 Extra blanks yield=      ##.#%"
150 ID4$="   8 Exc salv blanks yield=   ##.#%"
160 ID5$="   9 Req'd blanks price     $##.##"
170 ID6$="  10 Extra blanks price     $##.##"
180 ID7$="  11 Exc salv blanks price= $##.##"
190 ID8$="   3 Percent boards chipped= ##.#%     "
200 ID9$="   5 Cant cost(chip repl)= $###.##/mbf"
210 ID10$="   4 Chip price=           $###.##/ton"
220 ID11$="   1 Board input per shift   ##.##mbf "
230 CLS
240 PRINT: PRINT:
250 PRINT TAB(10) "CHIPS Vs BLANKS Program 1": PRINT
260 PRINT "Poorest boards chipped; all blanks sold": PRINT
270 PRINT TAB(15) "Input Data"
280 PRINT USING ID11$; BIPS
290 PRINT USING ID1$; CFIR
300 PRINT USING ID8$; PBC
310 PRINT USING ID10$; CP
320 PRINT USING ID9$; CC
330 PRINT USING ID2$; YRB
340 PRINT USING ID3$; YEB
350 PRINT USING ID4$; YESB
360 PRINT USING ID5$; RBP
370 PRINT USING ID6$; EBP
380 PRINT USING ID7$; ESBP
390 PRINT "  13 To solve using this data enter 13,13": PRINT
400 INPUT  "ENTER NUMBER AND DATA VALUE FOR CHANGES"; N,DUM
410 IF N=1 THEN BIPS=DUM ELSE 430
420 GOTO 400
430 IF N=2 THEN CFIR=DUM ELSE 450
440 GOTO 400
450 IF N=3 THEN PBC=DUM ELSE 470
460 GOTO 400
470 IF N=4 THEN CP=DUM ELSE 490
480 GOTO 400
490 IF N=5 THEN CC=DUM ELSE 510
500 GOTO 400
```

```
510 IF N=6 THEN YRB=DUM ELSE 530
520 GOTO 400
530 IF N=7 THEN YEB=DUM ELSE 550
540 GOTO 400
550 IF N=8 THEN YESB=DUM ELSE 570
560 GOTO 400
570 IF N=9 THEN RBP=DUM ELSE 590
580 GOTO 400
590 IF N=10 THEN EBP=DUM ELSE 610
600 GOTO 400
610 IF N=11 THEN ESBP=DUM ELSE 630
620 GOTO 400
630 IF N>12 GOTO 640
640 OPEN "B:CHVBL1.DAT" FOR OUTPUT AS #1
650 PRINT #1, CFIR;YRB;YEB;YESB;RBP;EBP;ESBP;PBC;CC;CP;BIPS
660 CLOSE #1
670 RBM=BIPS*1000*(YRB/100)
680 EBM=BIPS*1000*(YEB/100)
690 ESBM=BIPS*1000*(YESB/100)
700 CFIC=CP*2.5*BIPS*(PBC/100)
710 CFIRB=RBM*RBP
720 CFIEB=EBM*EBP
730 CFIESB=ESBM*ESBP
740 CFOAB=(BIPS*(PBC/100)*CC)*(-1)
750 TCFI=CFIRB+CFIEB+CFIESB+CFIC+CFOAB
760 CRBP=(CFIR-CFOAB-CFIC)/(RBM+(EBP/RBP*EBM)+(ESBP/RBP*ESBM))
770 CEBP= (EBP/RBP)*CRBP
780 CESBP=(ESBP/RBP)*CRBP
790 TCM=BIPS*(PBC/100)*2.5
800 ABR=BIPS*(PBC/100)
810 CCFIRB=RBM*CRBP
820 CCFIEB=EBM*CEBP
830 CCFIESB=ESBM*CESBP
840 CTCFI=CCFIRB+CCFIEB+CCFIESB+CFIC+CFOAB
850 CFES=TCFI-CFIR
860 D$=DATE$: T$=TIME$
870 OD1$="      Required blanks made=         ##,###sqft"
880 OD2$="       Value $##,###"
890 OD21$="        Value $##,###"
900 OD4$="      Exc sal blanks made=          ##,###sqft"
910 OD3$="      Extra blanks made=            ##,###sqft"
920 OD10$="      Req'd Blanks Price= $##.##/sqft"
930 OD11$="      Extra Blanks Price= $##.##/sqft"
940 OD12$="     Exc Sal Blanks Price=$##.##/sqft"
950 OD5$="      Chips made=                    ##.##tons"
960 OD6$="      Total cash flow in (Excess/shortage $##,###)"
970 OD9$="      Additional cants for chips=   ##.##mbf"
980 OD13$="        $##,###"
990 OD14$="       Total cash flow in (Equal cash flow req'd)         $##,###"
1000 CLS
```

```
1010 PRINT
1020 PRINT TAB(20) "CHIPS Vs BLANKS Program 1";
1030 PRINT TAB(30) "Input Data"
1040 PRINT USING ID11$; BIPS;
1050 PRINT USING ID2$; YRB
1060 PRINT USING ID1$; CFIR;
1070 PRINT USING ID3$; YEB
1080 PRINT USING ID8$; PBC;
1090 PRINT USING ID4$; YESB
1100 PRINT USING ID10$; CP;
1110 PRINT USING ID5$; RBP
1120 PRINT USING ID9$; CC;
1130 PRINT USING ID6$; EBP
1140 PRINT TAB(39);
1150 PRINT USING ID7$; ESBP
1160 INPUT "RUN IDENT:"; RD$
1170 PRINT TAB(25) "Output Values: Cash Flow In"
1180 PRINT USING OD1$; RBM;
1190 PRINT USING OD2$; CFIRB
1200 PRINT USING OD3$; EBM;
1210 PRINT USING OD2$; CFIEB
1220 PRINT USING OD4$; ESBM;
1230 PRINT USING OD2$; CFIESB
1240 PRINT USING OD5$; TCM;
1250 PRINT USING OD2$; CFIC
1260 PRINT USING OD9$; ABR;
1270 PRINT USING OD21$; CFOAB
1280 PRINT USING OD6$; CFES;
1290 PRINT USING OD13$; TCFI
1300 PRINT TAB(25) "Output Values: Blank Prices"
1310 PRINT USING OD1$; RBM;
1320 PRINT USING OD2$; CCFIRB
1330 PRINT USING OD3$; EBM;
1340 PRINT USING OD2$; CCFIEB
1350 PRINT USING OD4$; ESBM;
1360 PRINT USING OD2$; CCFIESB
1370 PRINT USING OD5$; TCM;
1380 PRINT USING OD2$; CFIC
1390 PRINT USING OD9$; ABR;
1400 PRINT USING OD21$; CFOAB
1410 PRINT USING  OD14$; CTCFI
1420 PRINT USING OD10$; CRBP;
1430 PRINT USING OD11$; CEBP
1440 PRINT USING OD12$; CESBP
1450 INPUT "ENTER 1 TO PRINT. ENTER 2 FOR NEW RUN"; NN
1460 IF NN=1 THEN 1480 ELSE 1470
1470 RUN 50
1480 LPRINT: LPRINT: LPRINT
1490 LPRINT TAB(20) "CHIPS Vs BLANKS Program 1";
1500 LPRINT  TAB(65) D$
```

```
1510 LPRINT
1520 LPRINT TAB(15) "Poorest boards chipped; all blanks sold";
1530 LPRINT TAB(65) T$
1540 LPRINT: LPRINT
1550 LPRINT TAB(30) "Input Data"
1560 LPRINT USING ID11$; BIPS;
1570 LPRINT USING ID2$; YRB
1580 LPRINT USING ID1$; CFIR;
1590 LPRINT USING ID3$; YEB
1600 LPRINT USING ID8$; PBC;
1610 LPRINT USING ID4$; YESB
1620 LPRINT USING ID10$; CP;
1630 LPRINT USING ID5$; RBP
1640 LPRINT USING ID9$; CC;
1650 LPRINT USING ID6$; EBP
1660 LPRINT TAB(39);
1670 LPRINT USING ID7$; ESBP
1680 LPRINT
1690 LPRINT "RUN IDENT:"; RD$
1700 LPRINT
1710 LPRINT TAB(25) "Output Values: Cash Flow In"
1720 LPRINT USING OD1$; RBM;
1730 LPRINT USING OD2$; CFIRB
1740 LPRINT USING OD3$; EBM;
1750 LPRINT USING OD2$; CFIEB
1760 LPRINT USING OD4$; ESBM;
1770 LPRINT USING OD2$; CFIESB
1780 LPRINT USING OD5$; TCM;
1790 LPRINT USING OD2$; CFIC
1800 LPRINT USING OD9$; ABR;
1810 LPRINT USING OD21$; CFOAB
1820 LPRINT USING OD6$; CFES;
1830 LPRINT USING OD13$; TCFI
1840 LPRINT
1850 LPRINT TAB(25) "Output Values: Blank Prices"
1860 LPRINT USING OD1$; RBM;
1870 LPRINT USING OD2$; CCFIRB
1880 LPRINT USING OD3$; EBM;
1890 LPRINT USING OD2$; CCFIEB
1900 LPRINT USING OD4$; ESBM;
1910 LPRINT USING OD2$; CCFIESB
1920 LPRINT USING OD5$; TCM;
1930 LPRINT USING OD2$; CFIC
1940 LPRINT USING OD9$; ABR;
1950 LPRINT USING OD21$; CFOAB
1960 LPRINT USING OD14$; CTCFI
1970 LPRINT USING OD10$; CRBP
1980 LPRINT USING OD11$; CEBP
1990 LPRINT USING OD12$; CESBP
2000 LPRINT CHR$(12)
2010 GOTO 1450
2020 END
```

Reynolds, Hugh W. **System 6: Chips versus blanks program.** Gen. Tech. Rep. NE-106. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1985. 12 p.

This paper gives a computer program to be used on the IBM-PC to evaluate the tradeoff between chips and boards. In System 6, bolts are sawed to cants, and cants are resawed to boards. All boards with a minimum clear area are stacked, dried, and processed to blanks. All other boards are chipped. When the bolts are of poor quality, many boards will have only the minimum clear area. By increasing the size of the minimum clear area used in sorting, only the better boards will be used for blanks and more chips will be made. Additional cants will have to be purchased to replace the boards chipped.

ODC 836.1; 847.1/2

Keywords: Low-grade utilization, hardwood dimension