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**FEASIBILITY OF AN OKLAHOMA FRESH GREENS AND COWPEAS
PACKING COOPERATIVE**

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*Selected Paper prepared for presentation at the Southern Agricultural Economics
Association Annual Meeting, Tulsa, Oklahoma, February 14-18, 2004*

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Abstract:

Oklahoma's green producers are not benefiting from a growing fresh market. In order to seize the opportunities offered by the growing fresh market for leafy greens, investment in packing facilities have been evaluated. To make use of these facilities during summer months, the addition of a cowpea shelling enterprise is considered. A business plan for a new generation cooperative is estimated using an updated version of "The Packing Simulation Model" (PACKSIM) The business associates PACKSIM with @RISK®, to incorporate risks in the financial analysis.

Introduction

Oklahoma has proven to be a very good location for the production of spinach and fresh greens, especially in the eastern half of the state. Additionally, this portion of the state has seen considerable growth in the production of cowpeas (e.g. black-eyed peas, purple hulls, etc.). However, Oklahoma's producers are not benefiting from the fresh market growth. Currently, Oklahoma's production is primarily marketed to food processors in Arkansas and very little fresh marketing of the product is done.

In order to seize the opportunities offered by the growing fresh market for leafy greens, investment in packing facilities have been considered by regional producers. The fastest growing segments of the market are the small size, packaged spinach and greens (6 and 10-ounce bags). Producers may recognize the possible advantages of having a fresh outlet for their products but may not individually have the financial capacity, land resources or marketing expertise to operate an independent fresh greens packing and marketing facility.

Previous research examined the economic potential for a producer-owned fresh greens packing enterprise in eastern Oklahoma using a modified PACKSIM model and @RISK® (Nkengoum, 2003). The study described in this paper is an extension of the previous Nkengoum study with the addition of a cowpea shelling enterprise to make use of the facilities in the summer months between the spring and fall greens harvest. Thus, the earlier Nkengoum study is heavily referenced throughout the paper, and the changes associated with the addition of the cowpea operation receive the greater focus.

Objectives of the Processing Plant

The main objective of the processing plant is to pack, refrigerate, and deliver high quality fresh cut spinach, greens and green-shelled peas to the regional market, while providing to producers a more profitable marketing channel than the current system that consists of direct sales to bulk buyers or processors. Other potential services include repacking fresh vegetables using brand names or packing for other producers during the winter months.

Production Facilities

A pea shelling machine will be added to the minimum equipment for startup described by Nkengoum, which consists of a 6-station preparation table trim line with hand packing (Figure 1). The shelling machine can process 2 bushels in 5 minutes, which is 24 bushels per hour or 384 bushels a day. These estimates mean the plant can process roughly 2.5 acres of cowpeas per day or about 75 acres per month during the summer, and the plant can process roughly 19 tons (approx. 2 acres) of greens per day during the spring and fall.

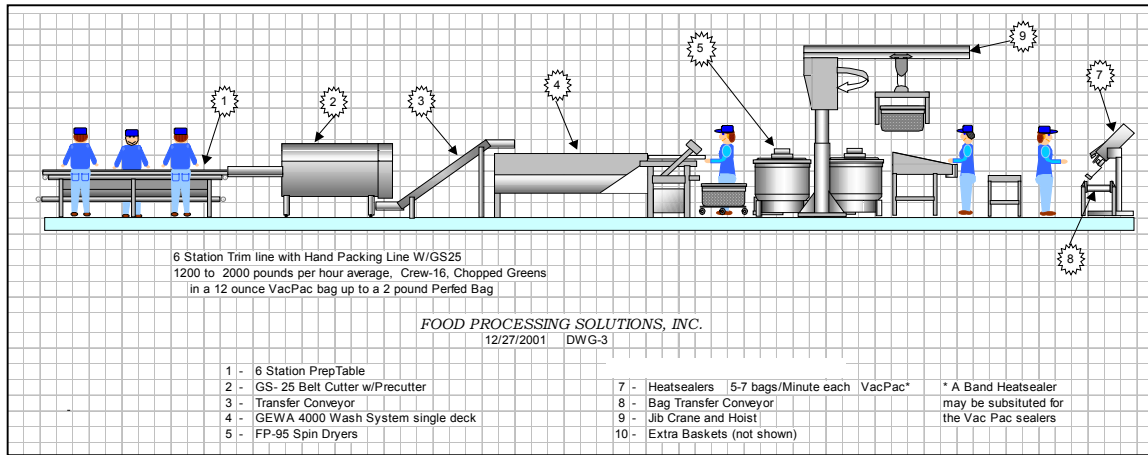


Figure 1: 6-Station Trim Line with Hand Packing

Assumptions

A 9,000 square foot facility is projected for the operation. This includes 1,000 square feet for a raw products warehouse, 6,100 square feet of factory area, 1,000 square feet of a cool store warehouse suitable for the storage of finished product, and 900 square feet for office and break rooms. Building construction costs are estimated and rounded at \$593,500. General assumptions are included in Table 2.

PACKSIM: the Model

For the purpose of this research, the original PACKSIM model is associated to @RISK®, to account for risk management in the financial analysis. The various identified risks are included in the analysis through @RISK® macros embedded into the PACKSIM model.

The @RISK® software adds the power of Monte Carlo simulation to any spreadsheet model. Uncertain values in the spreadsheet are replaced with @RISK® functions, which represent a range of possible values. @RISK® recalculates the model thousands of times, each time selecting random values from the @RISK® functions entered. The result is a distribution of possible outcomes and the probability of getting

those results. This not only tells what could happen in a given situation, but how likely it is that it will happen. The model is slightly modified to included cow peas as a crop.

An additional \$ 4,000 is added to the initial startup expense of \$1,169,600 for the Nkengoum greens packing model to account for the pea shelling equipment. The startup expense is covered by a minimum initial equity investment of \$700,000 and long term borrowing of 506,155.

The proposed cooperative's products are fresh greens and spinach cut and packed in either 6- or 10-ounce bags, and peas packed in 1 pound bags for the fresh market. Baby spinach is prepackaged and shipped in cartons of 25, while peas are shipped in cartons of 10. Additional product possibilities would be salad blends that consist of mixing different vegetables in one small size package that is convenient and ready to use.

Data on pea prices were obtained from the Agricultural Marketing Service of the United States Department of Agriculture. The prices paid to farmers are derived from the Dallas terminal market prices. Crops on the Dallas terminal market are priced for a 10-pound container including brokerage fees. To determine the price paid to farmers, prices for 10 pounds of product are derived from the terminal market price (the cartons hold 10 pounds), and then 20 percent abatement is subtracted to account for brokerage fees. Farmers only receive a fraction of the crop price, plus an eventual return to equity (1). Shipping prices are aligned on competitors' average prices.

The acreage and yields are based on the values obtained from the farmer survey carried out by Nkengoum. The amount of crops processed for the product is entered in Table 4. The quantity of cowpeas is based on processing capacity of 173 acres for 2

¹ In this case, Farmers receive 60 percent of crop prices. Prices on Dallas terminal Market are \$14.00-15.00 for peas.

months between greens harvesting months, which is equivalent to a processing capacity of roughly 24 bushels per hour and 16 hours a day. The input variables are the stochastic variables defined in Table 5.

The output not only includes an expected return or mean, but it also provides a standard deviation of the return as well as each of the values from the number of iterations. The number of iterations in this analysis was 2000. The statistical results of the simulation of the stochastic input variables are summarized in Table 6. Table 8 displays the sensitivity analysis results for total sales, after tax profits and return on investment (ROI). Multivariate stepwise regression and rank order correlations are used to determine the relationships between input and output variables, and then to rank them from the most to the least important.

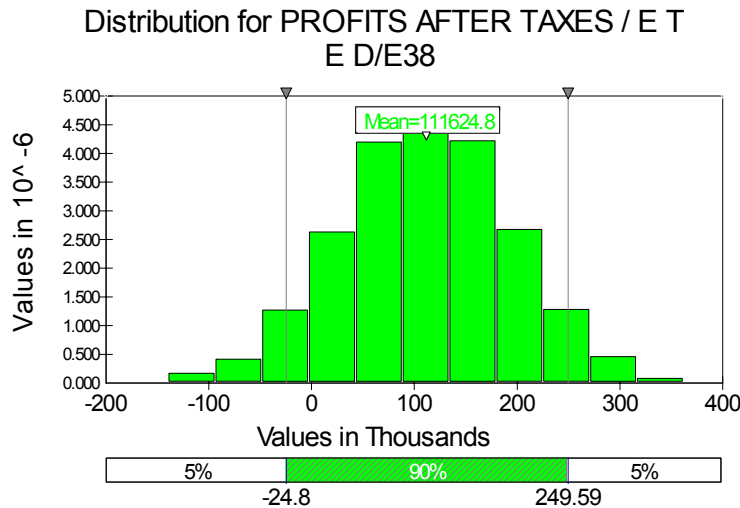
Results and Implications

The results suggest that utilizing the facility to shell and package cowpeas during the summer months have an impact on the profitability of the cooperative. However, it appears that the acreage of greens crops (fall, spring and overwinter) as well as the yield of all three spinach crops (expressed in boxes per acre) influence the total sales more than any other variable. Spinach prices paid to farmers, followed by selling prices, are the main factors influencing the profit after taxes and the return on investment.

The first year sales figure is \$2,314,981, well above the \$1,794,812 needed to break even on the first year of operation (Table 7). In consequence, the plant has 92% chance of breaking even on the first year of operation. Similarly, Figure 2 shows that 90 percent of the distribution of the profits after taxes lies between -24,800 and \$249,590.

This means that the probability of having a loss is very small and has been evaluated at around 8 percent at worst (Table 6).

Figure 2. Distribution of Profits after Taxes



At the means, the operation posts a profit after tax of \$111,227 for the first year. The current ratio shows that the operation has the potential to be very solvent, as it disposes of \$2.41 for every \$1.00 dollar of current debt. The Debt to Equity Ratio is 0.74, which means that total liabilities are equal to 74 percent of owner equity. The operation will turn its assets about 2 times during the year. The return on equity, which measures the returns relative to insider (member) investment or owner equity, is 13.16 percent while the return on investment, which measures net returns relative to both insider and outsider investment, is 10.49 percent. There is a 92 percent chance of breaking even the first year of operation, and 8 percent chance of having a loss equal to or greater than \$1,000.

A fresh marketing cooperative with the capacity to package and sell 3,720 tons of products (3,456 tons of greens, 264 tons of cowpeas) operating at 2 shifts per day can pay growers prices equivalent to 60-70 percent of the Dallas terminal market plus an eventual

return on investment. The incentives to producers are further enhanced by an Oklahoma state tax credit of 30% on investment by agricultural producers in new, value-added enterprises located in the state, which can be recovered across a seven-year period.

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US Census Bureau. Text available online at:

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Table 1. Expected Harvest Season for Oklahoma and Arkansas

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Cowpeas							■	■				
Spring Spinach					■	■						
Fall Spinach											■	■
Overwinter Spinach				■	■	■						
Fall Greens										■	■	
Spring Greens				■	■	■						

Table 2. General Assumptions

Long term Interest Rate	10%
Collection Days	30 days
Payments Days	30 days
Sales on Credit	100%
Personnel Burden	15%
Initial Minimum Equity	\$700,000
Initial Working Capital	\$700,000
Initial Start Up Expenses	\$1,174,600
Long term borrowing	\$506,155
Income Tax Application	Exempt Cooperative

Table 3. Source and Use of Funds

Capital Expenditures	Cost +Freight + Install
Building (Factory + Warehouse + Cool store + office) (*)	\$593,500
Process Equipment	\$489,450
Tape Machine (Carton Sealer)	\$15,000
Used Delivery Vehicle	\$20,000
Used Forklift Truck	\$15,000
Others (**)	\$18,240
Working Capital	\$700,000

(*) Factory + Warehouse estimated at \$60.00 per sq. ft., A Cold Storage and its refrigeration estimated at \$100.00 per sq. ft. and an office block for estimated at \$75.00 per sq. ft.

(**) Office Equipment (\$7,850); Phone System; (\$300); Pallets and Miscellaneous equipment (\$10,090).

Further assumptions include:

As a result of local business development incentives,

- City/County provides utility hook-ups;

- City/county provides any necessary road construction/repairs.

Table 4. Amount processed per crop and per month (in tons)

	April	May	June	July	August	Total
Spring Spinach	-	192	192			384
Overwinter Spinach	288	192	192			672
Spring Greens	288	192	192			672
Cowpeas	-	-	-	132	132	264
Subtotal	576	576	576			1,992
	October	November	December			Total
Fall Spinach	-	288	576			864
Fall Greens	576	288	-			864
Subtotal	576	576	576	132	132	1,728

Table 5. @Risk input Variables

Variable	Distribution	Historical Data Source
Spinach price	Uniform (2.5, 3.75) (Min, Max)	USDA/AMS Jan 1985 – Dec 2000 monthly prices
Greens price	Uniform (2.75, 3.6) (Min, Max)	USDA/AMS Jan 1985 – Dec 2000 monthly prices
Cowpeas Price	Uniform (6, 7.2) (Min, Max)	USDA/AMS Jan 1985 – Dec 2000 monthly prices
Shipping Prices	Uniform (4.75, 6.6) (Min, Max)	The Packer, report on competitor shipping prices
Cowpeas Shipping Prices	Uniform (9, 12) (Min, Max)	Based 25% margin on the total production cost
Acreage – Spring Greens	Uniform (74, 84) (Min, Max)	Based on the processing capacity of the plant
Acreage – Fall Greens	Uniform (94, 190) (Min, Max)	Based on the processing capacity of the plant
Acreage- Spring Spinach	Uniform (42, 48) (Min, Max)	Based on the processing capacity of the plant
Acreage - Fall Spinach	Uniform (96, 108) (Min, Max)	Based on the processing capacity of the plant
Acreage- Overwinter Spinach	Uniform (67, 74) (Min, Max)	Based on the processing capacity of the plant
Acreage- Cowpea	Uniform (70, 80) (Min, Max)	Based on the processing capacity of the pea Sheller
Carton Per Acre Spinach	Uniform (933, 1,066) (Min, Max)	Based on the average yield reported in the farmers' survey
Carton Per Acre Greens	Uniform (1,066, 1,200) (Min, Max)	Based on the average yield reported in the farmers' survey
Carton Per Acre Cowpea	Uniform (330, 375) (Min, Max)	Based on the average yield reported on the extension fact sheet F- 6029

Table 6. Selected Output Variables

Name	Total Acres	Total Tons	B.E. SALES	ENDING CASH BALANCE	NET SALES	PROFITS AFTER TAXES
Description	Output	Output	Output	Output	Output	Output
Minimum	440.32	2,957.476	1212988	90972.86	2,053,694	-138,308.2
Maximum	475.71	3,372.538	3616706	620685.7	2,582,374	415,909.2
Mean	457.53	3,162.45	1869571	343120.5	2,316,807	110,077.6
Std Deviation	5.9186	65.584	307,746.8	75,703.94	78,056.89	82,447.14
Variance	35.03	4301.27	9.470	5.73	6.09	6.80
Skewness	0.0439	0.0683	1.098	0.0623	0.0725	0.0427
Kurtosis	2.794939	2.787114	4.99754	2.940386	3.056719	2.944816
Target #1 (Value)			2,314,982			-1000
Target #1 (Perc%)			92.05%			8.84%

Table 7. Break Even Analysis

BREAKEVEN ANALYSIS		Year 1					
TOTAL SALES:	2,314,981.77						
FIXED COST:	370,137.05						
% TO B.E.:	-0.22						
B.E. SALES:	1,794,812.24						
Crop	Fall Spinach	Spring Spinach	Overwinter Spinach	Fall Greens	Spring Greens	Cowpeas	TOTAL
Cartons Sold	91,754.10	40,479.75	63,418.28	92,792.70	75,457.80	23,793.75	387,696.38
Avg. Selling Price	5.68	5.68	5.68	5.68	5.68	10.50	
Tot. Variable Cost	4.50	4.50	4.50	4.55	4.55	8.12	
Gross Margin	108,245.57	47,755.40	74,816.79	104,831.21	85,247.36	56,513.22	477,409.56
Weighted BE Cartons	71,137.23	31,384.07	49,168.38	71,942.46	58,502.66	18,447.36	300,582.15
Weighted BE Acres	79.08	34.89	54.66	70.55	57.37	58.15	354.70
Unweighted BE Cartons	824.81	-50,449.54	-27,511.01	-2,160.95	-19,495.85	-21,371.18	-120,163.70
Unweighted BE Acres	0.92	-56.08	-30.58	-2.12	-19.12	-67.36	-174.35

Table 8. Sensitivity Analysis

Rank Inputs for Output B.E. SALES			
Rank	Rank Name	Regression	Correlation
#1	Pay. to Farmers / Fall Spinach	0.436	0.442
#2	PRICE / Fall Spinach	-0.322	-0.311
#3	PRICE / Fall Greens	-0.319	-0.312
#4	Pay. to Farmers / Overwinter Spinach	0.303	0.28
#5	Pay. to Farmers / Fall Greens	0.285	0.29
#6	Pay. to Farmers / Spring Greens	0.247	0.259
#7	PRICE / Fall Greens	-0.212	-0.207
#8	PRICE / Fall Spinach	-0.212	-0.212
#9	PRICE / Spring Greens	-0.211	-0.235
#10	Pay. to Farmers / Spring Spinach	0.194	0.177
	R-Squared=	0.926842	

Rank Inputs for Output NET SALES			
Rank	Rank Name	Regression	Correlation
#1	PRICE / Fall Greens	0.376	0.387
#2	PRICE / Fall Spinach	0.372	0.367
#3	PRICE / Spring Greens	0.26	0.255
#4	PRICE / Fall Greens	0.252	0.222
#5	Carton per Acre / Fall Spinach	0.251	0.263
#6	PRICE / Fall Spinach	0.246	0.254
#7	Carton per Acre / Fall Greens	0.228	0.188
#8	Total Acres / Fall Spinach	0.225	0.213
#9	PRICE / Overwinter Spinach	0.216	0.241
#10	Total Acres / Fall Greens	0.213	0.218
	R-Squared=	0.998336	

Rank Inputs for Output PROFITS AFTER TAXES			
Rank	Rank Name	Regression	Correlation
#1	Pay. to Farmers / Fall Spinach	-0.396	-0.381
#2	PRICE / Fall Greens	0.359	0.35
#3	PRICE / Fall Spinach	0.356	0.344
#4	Pay. to Farmers / Overwinter Spinach	-0.281	-0.246
#5	Pay. to Farmers / Fall Greens	-0.269	-0.248
#6	PRICE / Spring Greens	0.252	0.258
#7	PRICE / Fall Greens	0.24	0.224
#8	PRICE / Fall Spinach	0.235	0.235
#9	Pay. to Farmers / Spring Greens	-0.233	-0.227
#10	PRICE / Overwinter Spinach	0.212	0.229
	R-Squared=	0.994786	

PRO-FORMA BALANCE SHEET

ASSETS	1	2	3	4	5
CURRENT ASSETS					
Cash	187933.9	342776.6172	352978.3872	1235135.306	1752983.121
Accounts Receivables	145797.3	145797.2649	166992.462	179838.036	179838.036
Inventory	0	0	0	0	0
Total Current Assets	333731.2	488573.8821	519970.8492	1414973.342	1932821.157
FIXED ASSETS					
Buildings and Land Improvements					
(less deprec.)	586946.2	572892.3077	558561.5385	544784.6154	530730.7692
Machinery and Equipment					
(less deprec.)	520040	467480	411505	362360	309800
Value of Land	30000	30000	30000	30000	30000
Total Fixed Assets	1136986	1070372.308	1000066.538	937144.6154	870530.7692
TOTAL ASSETS	1470717	1558946.2	1520037.4	2352118	2803351.9
LIABILITIES					
CURRENT LIABILITIES					
Accounts Payables	21837.48	21837.4758	21837.4758	21837.4758	21837.4758
Payments to Farmers	116884.8	116884.8401	122957.264	128050.6194	130536.2889
Accrued Interest	0	0	0	0	0
Operating Loan	0	0	0	0	0
Total Current Liabilities	138722.3	138722.3159	144794.7398	149888.0952	152373.7647
LONG-TERM LIABILITIES	486767.9	465058.48	441092.55	414635.53	385428.49
TOTAL LIABILITIES	625490.2	603780.8	585887.29	564523.63	537802.25
OWNER'S EQUITY	734000	734000.2838	729906.2023	734000.9015	734001.0754
RETAINED EARNINGS	111227.1	221165.1101	204243.8956	1053593.431	1531548.596
TOTAL LIABILITIES & CAPITAL	1470717	1558946.2	1520037.4	2352118	2803351.9

PRO-FORMA ANNUAL INCOME STATEMENT

YEAR	1	2	3	4	5
NET SALES	2,314,982	2,314,982	2,398,507	2,820,947	2,832,843
INTEREST ON CASH BALANCE	2,303	614	411	2,346	4,069
Other Revenues	0	0	0	0	0
TOTAL SALES & REVENUES	2,318,936	2,322,502	2,404,231	2,854,240	2,887,137
Direct Materials	329,542	329,542	313,651	329,542	329,542
Direct Labor	205,383	205,383	287,824	219,341	219,341
Factory Overhead	72,224	72,224	72,064	72,224	72,224
TOTAL COST OF PACKING	607,149	607,149	673,539	621,107	621,107
Other Expenses	0	0	0	0	0
GROSS MARGIN	1,711,787	1,715,352	1,730,692	2,233,133	2,266,030
GENERAL EXPENSES					
Administrative Salaries	145,000	145,000	145,000	145,000	145,000
Fuel & Oil	8,800	8,800	7,900	8,800	8,800
Utilities	18,500	18,500	17,500	19,500	18,500
Telephone	4,400	4,400	3,600	4,400	4,400
Office Supplies	3,600	3,600	3,400	3,600	3,600
Promotion	4,000	4,000	3,500	4,000	4,000
Property Tax	4,000	4,000	4,000	4,000	4,000
Other Gen. Exp.	0	0	0	0	0
TOTAL GEN/ADMIN EXP.	188,300	188,300	184,900	189,300	188,300
FUNDS FROM OPERATIONS	1,523,487	1,527,052	1,545,792	2,043,833	2,077,730
NON-CASH OPERATING EXPENSES					
Depreciation	66,614	66,614	66,511	66,614	66,614
OPERATING PROFIT (LOSS)	1,456,873	1,460,438	1,479,281	1,977,219	2,011,116
Interest	42,999	47,853	45,597	43,106	40,356
REVENUE AFTER PACKING	1,413,874	1,412,585	1,433,684	1,934,113	1,970,760
Payments to Farmers	1,263,877	1,263,877	1,186,425	1,404,654	1,454,035
Freight & Misc.	38,770	38,770	44,280	38,770	38,770
PROFITS BEFORE TAXES	111,227	109,938	202,979	490,689	477,956
Income Taxes	0	0	0	0	0
PROFITS AFTER TAXES	111,227	109,938	202,979	490,689	477,956

PRO-FORMA ANNUAL CASH FLOW

YEAR	1	2	3	4	5
CASH BALANCE	700,000	187,934	126,442	187,934	1,235,135
Bank Loans	506,155	0	0	0	0
Receivables	2,169,185	2,314,982	2,377,312	2,314,982	2,832,843
Other Revenues + Interest	3,955	7,520	5,723	7,520	54,294
TOTAL INFLOWS	3,379,294.11	2,510,435.32	2,509,477.16	2,510,435.32	4,122,272.34
Accounts Payables	307,704	329,541	313,650	329,541	329,541
Direct Labor	205,383	205,383	287,824	205,383	219,341
New Purchases	1,173,600	0	0	0	0
Overhead	72,224	72,224	72,064	72,224	72,224
Administrative Salaries	145,000	145,000	145,000	145,000	145,000
Fuel & Oil	8,800	8,800	7,900	8,800	8,800
Utilities	18,500	18,500	17,500	18,500	18,500
Telephone	4,400	4,400	3,600	4,400	4,400
Office Supplies	3,600	3,600	3,400	3,600	3,600
Promotion	4,000	4,000	3,500	4,000	4,000
Property Tax	4,000	4,000	4,000	4,000	4,000
Other Gen. Exp.	0	0	0	0	0
Other Expenses	0	0	0	0	0
Scheduled Int. Payments	42,276	47,853	45,597	47,853	40,356
Scheduled Prin. Payments	15,387	21,709	23,966	21,709	29,207
Freight & Misc. Charges	38,770	38,770	44,280	38,770	38,770
TOTAL OUTFLOWS	2,043,645	903,781	972,281	903,781	917,739
CASH AFTER PACKING	1,335,649	1,606,654	1,537,196	1,606,654	3,204,533
Payments to Farmers	1,146,993	1,263,878	1,184,217	1,263,878	1,451,550
Income Taxes	0	0	0	0	0
CASH POSITION	188,657	342,777	352,978	342,777	1,752,983
Oper. Int. Payment	723	0	0	0	0
Oper. Loan Prin. Payment	49,240	0	0	0	0
Oper. Loan Increase	49,240	0	0	0	0
ENDING CASH BALANCE \$	187,934	342,777	352,978	342,777	1,752,983
OPER. LOAN INTEREST ACCRUED	0	0	0	0	0
OUTSTANDING OPERATING LOAN	0	0	0	0	0