from the 1960-61 season through the 1975-76 season, show the average cash price exceeding the average non-priced return in 11 out of 16 seasons. Cash price averaged 47.0¢ per pounds solids (p.s.) while non-priced averaged 44.8¢/p.s. However, year to year variance was considerably greater in the cash market with the standard deviation of the cash averages being 13.9¢ while the standard deviation of the non-priced averages was 12.4¢. Similar analysis by variety reveals that over the period 1963-64 through the 1975-76 season in 8 of 13 seasons for early and mid-season oranges and 10 of 13 seasons for 'Valencia' oranges, the average cash price exceeded the average non-priced processing return. The means and standard deviation (showed in parenthesis) in cents per p.s. were for early and mid-season, 44.4 (15.8) and 42.4 (12.0) and for 'Valencia', 48.1 (13.6) and 44.2 (11.7), respectively, for cash and non-priced.

It must be emphasized that this discussion has been concerned only with averages. There will be returns from cooperatives and participation plans that are above and below the averages, just as there are cash prices above and below the average cash price.

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ECONOMIC ANALYSIS OF STRATEGIES FOR RESETTING CITRUS GROVES

RONALD P. MURARO
IFAS Extension Unit,
P.O. Box 50,
Bartow, FL 33830

JAMES A. NILES
IFAS, Food and Resource Economics Department,
University of Florida, Gainesville, FL 32611

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Abstract. **A computer routine is available through the Florida Cooperative Extension Service that evaluates the economic return to a strategy of resetting citrus trees. Decisions in the strategy are based upon the annual expected net return prior to incurring planting and young tree costs. The user inputs his anticipated tree removals over the coming years and the computer program calculates removals and the number of open spaces year by year. Resetting occurs when the expected net return, including planting and care costs, is positive. Should revenues not be sufficient to cover planting and care costs then no resetting occurs. The computer program is interactive and allows a grower to analyze his own situation—variety, number of trees per acre, average age of trees and yield, and the basic level of grove care costs per acre.**

A citrus tree is a working asset and a means to replace that asset must be developed. Furthermore, with the continuing increase in the grove care costs, it is important that every tree space be kept productive.

The grower needs to inspect his citrus trees periodically and keep accurate records of the yield condition of questionable trees, and costs. Orderly replacement of non-productive trees must be planned for, but at the same time flexibility maintained. The grower should also budget a cost for the replacements in each year's financial planning. This budgeted amount can be compared to the "sinking fund" which most non-agricultural businesses establish to replace capital assets. It will allow a given amount of funds to be assigned to replace trees that are removed from a grove.

This paper provides a reset analysis method which a grower can utilize in developing his own tree replacement program. The advantage of this approach is that a grower's individual situation can be readily analyzed since a model is developed of his grove. The grower can compare several resetting strategies with respect to his estimated costs and returns. The end result will be a method by which the grower can better determine the amount he needs to budget each year.

Computer Program Analysis

A computer program is available to analyze resetting strategies. The computer program is designed to calculate, on an annual basis, the net return from a strategy of grove resetting. The overall sequence of the program is shown in Fig. 1. After the signing on to the computer, accessing the program and initiating the run, the user (grower) is asked a series of questions about his own grove situation. He is asked to input the variety (see Table 1 for the varieties), number of trees per acre, average age of existing trees, the average yield of existing trees, and the number of years to run the analysis. The maximum number of the latter is 30 years.

The yield function (yield by age of trees) for the variety is then selected. Two yield functions for each variety are stored, so that the yield varies according to the number of trees per acre (density). The functions internally stored are a slight modification of Savage's average yield per tree by age and variety (2). Next the grower inputs his basic grove care cost per acre. This cost should include all production costs such as fertilization, spraying, cultivation, irrigation, etc. and fixed costs such as land taxes and insurance. This figure should not include cost of resetting or young tree care, which is the next cost to be inputed. The estimated costs of removing, replanting, and caring for the reset trees through four years of age are internally stored with the costs used in the analysis process shown in Table 2. These costs were calculated from information provided by citrus nurserymen and production managers (1). The costs are presented with respect to the number of trees per acre.

For a given analysis, the user supplies information on his

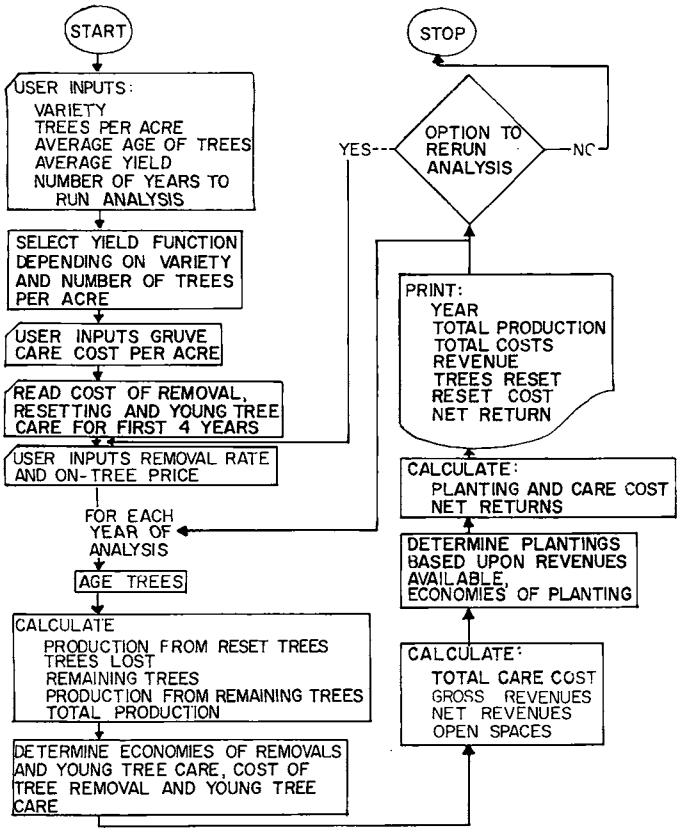

Fig. 1. Flow diagram for computer program.

Table 1. Varieties that can be selected for analysis.

Early oranges
Mid-season oranges
Valencia oranges
Temple oranges
Seedy grapefruit
Seedless grapefruit

Table 2. Cost per tree of removal, planting, and young tree care by number of trees per acre.[z]

Activity	Number of trees per acre				
	1-2	3-5	6-10	11-25	26-50
	dollars/tree				
Tree removal cost	10.10	6.79	5.05	3.35	2.00
Planting cost	6.65	6.00	5.40	5.05	4.60
First year care cost	15.65	13.71	12.35	10.85	9.60
Second year care cost	10.65	9.40	8.50	7.55	6.60
Third year care cost	5.75	5.10	4.80	4.15	3.80
Fourth year care cost	4.00	3.35	3.35	2.85	2.75

[z]Source (1).

expected removals and the expected on-tree price for the time horizon considered. The expected removals may either be entered as a constant rate per year or by anticipated removals year by year. On-tree price can be entered either as a constant price for all years or prices year by year.

The computer takes the above mentioned data, which describes the growers own individual situation and calculates the outcome for each year. To start with, all the trees in the grove are aged, *e.g.*, adding one year to the age of existing and reset trees from the previous year. For the first year of the analysis this step is by-passed. The production (in boxes) from all reset trees is calculated utilizing the previously mentioned yield functions that vary with the tree density. All removals to date are summed to get the trees lost and from this, the number of remaining trees determined. The production from the remaining trees is calculated using the average yield per tree inputed by the user.

To allow for economies in removals and in the care of young trees, a different cost per tree is utilized depending upon the number of trees being removed or cared for under four years. Once the cost of tree removals and young tree care per acre is calculated, it is added to the basic grove operating cost to get the total cost prior to resetting. Based upon the total grove production and the expected on-tree price, the gross and net returns prior to planting are established.

Subject to open spaces being available for planting, the number of resets in the year are determined. The number of resets planted depends upon the expected net revenues prior to planting. If these revenues are sufficient to cover planting and care costs for the first year, then all open spaces are reset. Should revenues cover only partial planting and care costs, then the number of trees reset are limited by the funds available. Should revenues prior to planting not cover the expense of planting and caring for a single tree, no planting occurs. As was the case for removals, the planting care cost per tree is dependent upon the number of trees planted and being cared for. Upon establishment of a planting and care cost per acre, the net returns per acre are calculated.

The annual calculations are then complete and the selected information shown in Fig. 1 is printed out via the computer terminal. The analysis then proceeds to the next year carrying forward the open spaces, trees remaining, etc. and the entire process is repeated. This continues until the number of years inputed by the user for analysis has been completed. The user is then asked if he wishes to rerun the analysis with a different set of removals and on-tree prices. This allows the user to examine the sensitivity of the model outcomes.

An Example

The following grove example demonstrates the model operation. Consider the following situation:

> A 'Valencia' orange grove, planted 72 trees per acre, with an average age of 25 years and an average yield of 5.0 boxes per tree. The time horizon for the analysis will be 30 years with an average grove operating cost of $325 per acre. The cost of removals, planting, and young tree care will be taken as those in Table 2. Removals are projected to be 4% per year (3 trees per year) with the expected on-tree price of $1.96 per box.

Table 3 shows the output for this analysis. The high rate of removals (3 trees per year) takes its toll on the grove in a short time. In the early years, production is maintained and returns are sufficient to cover resetting costs. However, production and therefore returns show a rapid decline, and by the 12th year, the revenues cannot pay for resetting all the open spaces. At the end of 25 years, there remains 30 open spaces. Note that by the 25th year, all the original trees have been replaced with total production coming from new trees planted. Total production increases after the 25th year, but only for a limited time period.

Table 3. Production, plantings, costs and returns for example 'Valencia' grove by year.

Year	Production reset trees	Total production	Total costs	Gross net returns	Tree reset	Reset cost yr. planted	Net return
			Per acre values by year				
1	0.0	354.00	345.37	330.83	3	59.13	271.70
2	0.0	330.00	373.57	273.23	3	55.05	218.18
3	1.20	316.20	387.97	231.78	3	55.05	176.73
4	3.30	303.30	398.02	196.45	3	50.55	145.90
5	6.30	291.30	398.02	172.93	3	50.55	122.38
6	10.50	280.50	398.02	151.76	3	50.55	101.21
7	15.60	270.60	398.02	132.36	3	50.55	81.81
8	21.30	261.30	398.02	114.13	3	50.55	63.58
9	27.90	252.90	398.02	97.66	3	50.55	47.11
10	35.40	245.40	398.02	82.96	3	50.55	32.41
11	43.50	238.50	398.02	69.44	3	50.55	18.89
12	52.50	232.50	398.02	57.68	2	35.00	22.68
13	62.10	227.10	392.02	53.10	2	38.00	15.10
14	71.90	221.90	386.92	48.00	2	38.00	10.00
15	82.30	217.30	383.57	42.34	1	19.00	23.34
16	93.00	213.00	372.92	44.56	1	19.00	25.56
17	103.50	208.50	368.50	40.19	1	20.36	19.83
18	114.00	204.00	365.12	34.72	1	20.36	14.36
19	124.60	199.60	365.12	26.10	1	20.36	5.74
20	134.80	194.80	365.12	16.69	0	0.0	16.69
21	144.70	189.70	345.37	26.44	1	22.30	4.14
22	154.40	184.40	360.02	1.40	0	0.0	1.40
23	163.90	178.90	345.37	5.27	0	0.0	5.27
24	172.80	172.80	345.37	6.68	0	0.0	6.68
25	181.20	181.20	345.37	9.78	0	0.0	9.78
26	189.40	189.40	345.37	25.85	1	22.30	3.55
27	196.90	196.90	356.02	29.90	1	22.30	7.60
28	204.00	204.00	361.77	38.07	1	20.36	17.71
29	210.70	210.70	365.12	47.85	2	40.72	7.13
30	217.10	217.10	375.12	50.40	2	38.00	12.40

Conclusion

A number of alternative resetting strategies can be considered by varying the values of variables inputed. By analyzing several outcomes, a grower can develop a resetting program. Additionally, tree replacement costs and annual capital needed for the alternative strategies can be compared.

Not only does this analysis method enable the grower to consider several alternatives when developing a resetting program but this analysis method encourages and requires a grower to keep accurate and useful records. By inspecting his grove periodically to develop the necessary input data for his grove, the grower becomes more aware of individual tree problems which may result in the grower taking the necessary steps to extend the economic life of the trees. Most of all, this method encourages the grower to annually budget his grove care costs so that he can better manage his citrus operation.

The above resetting analysis program will not provide a grower with the best tree replacement program he should follow. The model provides the grower with a quick analysis of several alternatives from which he can develop the best reset program for his situation. The model can be a very useful management tool when establishing annual tree replacement budgets.

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