BUDGETING FARM FOREST RESOURCES AND ENTERPRISES OF MICHIGAN FARMS

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OF MICHIGAN FARMS

By

Gordon R. Cunningham

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ABSTRACT

BUDGETING FARM FOREST RESOURCES AND ENTERPRISES OF MICHIGAN FARMS

by Gordon R. Cunningham

Farm forests in the United States contain almost one-third of the forest resources of the Nation. These forests must contribute a major share of the timber to meet future wood requirements. Recent studies have shown these farm forests are less productive than forests in public and industrial ownerships. Improved management of farm forests has been encouraged through increased public and forest industry assistance and educational programs. However, one element of the problem has received surprisingly little attention, yet would appear to be the crux to the solution: integration of management of the farm forest resources and enterprises with management of other farm resources and enterprises.

The primary objective of this dissertation is to contribute to the understanding of farm forest management as an integral part of farm management.

Farm forest resources and enterprises of nine Michigan farms were included in farm plans prepared with a systematic budgeting technique. Types of farms included in the study were feeder-beef, dairy, sheep, dairy-potato, poultry and potato-livestock. The farms ranged in size from 201 acres to 685 acres.

Budgets were prepared for units of agronomic, livestock and forest enterprises which would be considered in preparing two farm plans for each farm: a 'present' farm plan which would include only those forest enterprises from which an income could be received within the next 10 years, and an 'optimum' farm plan which includes forest enterprises possible when a forest reaches some optimum level of stocking, has grown to a size which allows some special enterprise (e.g., maple sirup), or is converted from one use to another.

Farm plans were prepared by a sequence of repetitive steps. The initial step consisted of applying available resources to each enterprise as though it were the only enterprise being considered. Inevitably one resource would be exhausted for each enterprise, thus limiting further expansion of the enterprise. When all enterprises had been expanded to the limit set by an exhausted resource, the net income provided by each enterprise was determined. The enterprise which provided the largest net income was selected as the first enterprise to be entered into a farm plan.

The second step was a repetition of the first. The remaining resources were applied to each remaining enterprise as though it were the only enterprise being considered for second place in the farm plan. Again, resources were applied to each enterprise until exhaustion of one resource limited further expansion of the enterprise. Net incomes were determined and compared. The remaining enterprise having the largest net income was then added to the farm plan.

These repetitive steps were continued until all enterprises had been entered into the farm plan or until insufficient resources remained for inclusion of another enterprise.

Systematic budgeting assures the use of all the resources of a farm, including the forest resources, toward maximization of total net income. This is the only consideration foresters may reasonably ask for forest resources and enterprises: that they be considered along with other resources when farm plans are prepared. In this study forest resources and enterprises were systematically budgeted into farm plans with other farm resources and enterprises. Forest enterprises can contribute from three to forty-six per cent of the total net incomes of the study farms.

ACKNOWLEDGEMENTS

This dissertation is completed because many people contributed their time, patience, and ideas. I am deeply grateful to the nine Michigan farmers who cooperated cheerfully and patiently in the collection of necessary physical and economic information about their forests and their farming operations. My thanks are due to the nine County Extension Directors who made original contacts with the cooperators and who assisted with interviews and collection of forest inventory data. Faculty of the Department of Agricultural Economics of Michigan State University gave willingly of their time in the collection and analysis of farm business information and enterprise budgeting data. Professor Everett Elwood was particularly helpful with discussions of possible cooperators, because of his knowledge of their farming operations as cooperators in the Farm Business Analysis Project of the Department. Dr. Victor Rudolph of the Department of Forestry of Michigan State University provided guidance during preparation of a computer program for processing the forest inventories. Mr. Gerald Laatsch of the Michigan State University Computer Laboratory programmed and processed the inventories, saving weeks of calculations. Dr. T. D. Stevens, Head of the Department of Forestry, provided much encouragement and necessary financial support. Martha Harkin not only calculated for uncounted hours, but sustained our bodies and spirits during the difficult final months. Stephen and James Cunningham suffered the moves, inattention, and

numerous other disruptions to their lives with outward equinimity, for which their father is most thankful.

Dr. Lee M. James deserves inexpressible gratitude for his wise counsel and warmhearted encouragement.

This dissertation is dedicated to Vera, my wife, whose limitless energy and good humor have earned for her this third PhT.

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CHAPTER I

INTRODUCTION

The Timber Resources Review of 1958 is the latest and most comprehensive statement on national timber resources and future timber needs. It discusses present and future timber production in relation to population and economic trends, available forest lands, productivity of the forest lands, timber quality, protection of the forests and the significance of forest ownership. The Review reports that 3.4 million farm owners constitute by far the largest number of forest land owners and that these farmers own one-third of all commercial forest land in the United States.[1] The Review concluded that "Projected growth is far short of (future) needs",[2] that "The key to adequate timber supplies in the future lies with the 4.5 million farm and "other" private holdings",[3] and that "There is conclusive evidence that the productivity of recently cut lands is poorest on the farm and "other" private ownerships".[4] From this Review, the only logical inference is that farm forests must receive better management.

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[1]Forest Service, U. S. Department of Agriculture, A Summary of the Timber Resource Review, reprinted from Timber Resources for America's Future, Forest Resource Report No. 14 (Washington: Government Printing Office, January 1958), p. 83.

[2]*Ibid.*, p. 108.

[3]*Ibid.*, p. 107.

[4]*Ibid.*, p. 106.

Objectives and Scope of This Study

Objectives

How can better farm forest management be assured? By improving the management acumen of the farm forest managers: farmers, agricultural economists specializing in farm management, and 'farm' foresters. Such is the purpose of this dissertation.

The ultimate objective of this dissertation is to contribute to the understanding of farm forest management as the integration of management of farm forest resources and enterprises with management of other farm resources and enterprises, usually for the primary purpose of maximizing net farm income.

A farmer has a certain amount of land, labor, capital and credit. These are his 'bundle of resources'. His net income depends upon how efficiently he combines or budgets his 'bundle of resources' to produce crops and livestock.[5] The forest resources on a farm are part of that 'bundle of resources', yet they "are commonly left out of farm plans, dealt with only sketchily, or planned piecemeal subsequent to or without any general farm-and-home planning".[6]

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[5] C. R. Weathers, Simplified Programming...A Tool in Farm Planning, The North Carolina Agricultural Extension Service, Circular 447 (Raleigh: North Carolina State of the Univer. of North Carolina & U. S. Dept. of Agriculture, Cooperating, 1963), p. 3.

[6] J. D. Black, "Farm and Other Operating - Unit Land - Use Planning" (Seminar in Land-Use and Conservation of Harvard University, April, 1955), p. 13.

Foresters and agricultural economists together can solve the problems of farm forest management when both accept a farm forest as a part of the total farm resources, to be fit into the dynamic jigsaw puzzle of competing, complementing, supplementing enterprises which comprise the farm business.

The initial objective of this dissertation is to expand the limited discussion on integrated farm forest management. The resources of nine Michigan farms are described and several alternative forest enterprises are considered for each forest. For each enterprise a budget is prepared for a unit of the forest--in this study, the unit is one acre. Finally, the forest enterprises are combined systematically with agronomic and livestock enterprises into a farm plan aimed at maximizing net farm income.

A post facto objective of this dissertation is to reveal the astonishing absence of extensive work-performance and management-yield data for farm forest enterprises and to recommend these as fertile areas for research in farm forest management.

In 1953, Gould described the kind of research needed to determine the optimum allocation of farm land, labor, and capital among possible enterprises on a farm including farm forest enterprises.[7] Several studies of farm forest enterprises have been

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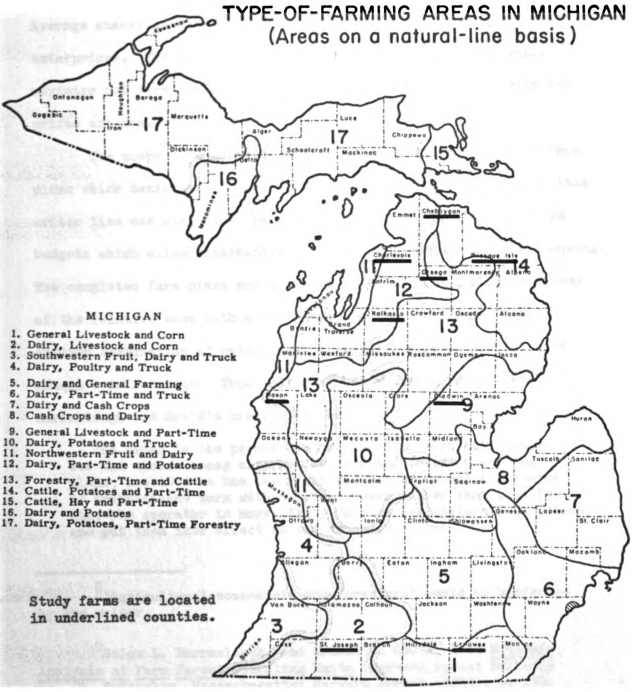
[7]E. M. Gould, Jr., "Farm Woodland Management," (Research in the Economics of Forestry, ed. W. A. Duerr and H. J. Vaux. Washington, D. C.: C. L. Pack Forestry Foundation, 1953), pp. 235-241.

completed since 1953. These excellent studies are described in the review of literature. This writer believes it is time to begin teaching the budgeting of farm forest resources and enterprises at the farm level. Since World War II, the teaching of farm resource budgeting has been intensified. Extension services of colleges of agriculture are employing increasing numbers of county farm management workers to teach farmers the essentials of budgeting. More 'farm' foresters are being employed by state forestry agencies. Channels for teaching the budgeting of farm forest resources and enterprises are becoming more numerous. Currently, the dearth of input-output data for forest enterprises limits budgeting possibilities. A more varied and realistic range of forest enterprise alternatives can be considered if foresters will provide the necessary input-output data.

Scope

This study includes nine farms in nine counties scattered throughout the Lower Peninsula of Michigan, Figure 1. The farms represent six type-of-farming areas, six combinations of farm enterprises, and three economic sizes. The purpose was to study as wide a variety of farm situations as possible within time and fund limitations. The study farms are described in detail in Chapters III, IV and V. Farm account records for 1960, 1961 and 1962 supply the data for budgeting agronomic and livestock enterprises. An inventory of each forest stand, using point-sampling, furnished stand and stocking data for forest enterprises. Forest growth estimates were



The 83 counties in Michigan are here grouped into 17 type-of-farming areas as indicated in this map. The "natural" boundaries of these areas do not, however, follow county boundaries, but lines representing the influences of soil, climate and markets.

Figure 1. Locations of Study Farms by Counties and Type-of-Farming Areas.

derived from growth studies of natural stands in New York. Annual budgets were prepared for agronomic and livestock enterprises. Average annual budgets for 10-year periods are prepared for forest enterprises. The enterprises are combined into farm plans which maximize net farm income. Agronomic and livestock productivity and prices are assumed to be fixed over the period of this study.

The scope of this study extends only to the provision of farm plans which maximize net farm income. Actually, the interest of this writer lies one step back, in preparation of the forest enterprise budgets which allow consideration of such enterprises in farm planning. The completed farm plans are prepared only for illustrative purposes of the relative ease with which resources can be combined into an optimum combination of enterprises if the decision-maker possesses adequate information. This writer agrees wholeheartedly with Barraclough and Gould's conclusion that:

> The owner is the person best equipped to work out, evaluate and choose among alternative farm and forest operating plans, provided he has the right kind of technical assistance. If technicians[8] work with a forest owner rather than plan for him, the operator is more likely to make well-informed decisions and put them into effect on the ground.[9]

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[8] 'Agricultural economists and foresters' would be preferred by the writer.

[9] Solon L. Barraclough, and Ernest M. Gould, Jr., Economic Analysis of Farm Forest Operating Units (Harvard Forest Bulletin No. 26, Petersham, Massachusetts: Harvard Forest, 1955), p. 133.

CHAPTER II

REVIEW OF THE LITERATURE

This dissertation is concerned with the budgeting of farm forest enterprises, and the systematic integration of those enterprises into a farm plan. A review of farm management and farm forestry literature reveals only three studies which are concerned with the budgeting of farm forest resources and enterprises into farm plans in conjunction with the budgeting of other farm resources and enterprises. These are: "Economic Analysis of Farm Forest Operation Units," by Barraclough and Gould;[1] "Farm Forestry Planning Through Linear Programming," by Coutu and Ellertsen;[2] and a recently completed doctoral dissertation, "Budgeting Farm-and-Forest Operating Units for Increased Net Income: Ames Plantation Cases," by Pleasonton.

Barraclough and Gould budgeted several alternatives for the resources of nine New England farms. These farms have stands of northern hardwood, spruce, fir and white pine. The plans include three alternative levels of management for the forest enterprises:

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[1] *Ibid.*, pp. 1-145.

[2] Arthur J. Coutu and Birger W. Ellertsen, *Farm Forestry Planning Through Linear Programming* (Report No. 236-60; Norris, Tennessee: Tennessee Valley Authority, December 1960).

[3] Alfred Pleasonton, "Budgeting Farm-and Forest Operating Units for Increased Net Income: Ames Plantation Cases" (unpublished Doctor's thesis, Michigan State University, East Lansing, 1964).

high intensity, medium intensity and low intensity.[4] Forest enterprises included sawtimber stumpage, sawlogs sold at roadside, pulpwood stumpage, pulpwood sold at roadside, maple sirup and Christmas greens. As shown in Figure 2, the farms are all located in the agricultural fringe area of New England where agriculture has declined. The authors selected four farms with limited cash and labor, buildings small and in poor repair, with agricultural enterprises generally small, and relatively large acreages of forest land. The other five had more arable land, better buildings and equipment, and relatively less forest land. Brief tabular descriptions of the farms are presented in Table 1.

All of the farms had sizable forest land areas, representing at least 55 per cent of the total area of any farm. The authors

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[4] Barraclough and Gould, Jr., op. cit., p. 24. "a. High Intensity of Forest Management assumes cultural treatments at 5- to 15-year intervals throughout the life of the stand. These treatments will include weedings, thinnings, and improvement cuttings when they seem silviculturally desirable. Harvest cuttings will also be made in a way to promote prompt and valuable reproduction. This silvicultural program is designed to take full advantage of the productive capabilities of the woodlands, and trees will be harvested when they have reached their most profitable development.

"b. Medium Intensity of Forest Management assumes that trees will be harvested when they have reached their most profitable development and will be cut in a way to promote prompt and valuable reproduction but that no other cultural operations will be made during the life of the stand. In exceptional cases, however, weeding will be done if it seems likely to make a marked improvement in the forest cover that will take over an area.

"c. Low Intensity of Forest Management assumes that stands will be clear-cut or high-graded whenever they contain enough value to attract a buyer. No special attempt will be made to improve production during the life of the stand or to promote reproduction."

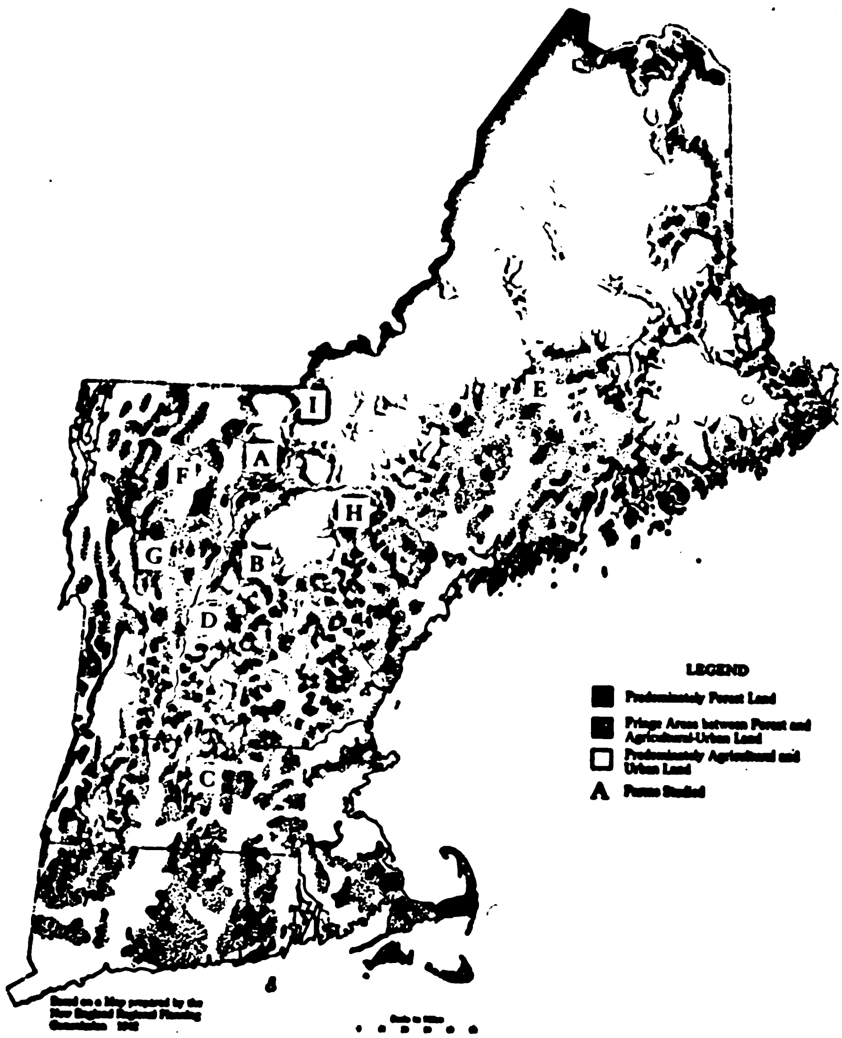

Figure 2. Locations of Farms Studied by Barraclough and Gould, Harvard Bulletin No. 26.

Table 1. **Farms Analyzed by Barraclough and Gould in Harvard Forest Bulletin No. 26.***

Farm	Total Area (acres)	Cropland (acres)	Pasture (acres)	Forest (acres)	Milk Cows (No.)	Other Dairy (No.)	Beef Cattle (No.)	Sheep (No.)	Pigs (No.)	Horses (No.)	Hens (No.)
A - Hill farm in a nearly abandoned town,											
	908	18	21	869	5	?	1		2	1	
B - Hill dairy farm that the operator eventually wants to sell,											
	765	25	34	706	1	3		14	1	2	
C - Hill dairy farm with limited forest product markets,											
	638	(-- 35 --)		603	12	?			3	2	70
D - Hill dairy farm with special problems that limit business expansion,											
	1050	42	37	978	6	?					300
E - Dairy combining crop and woodland farm.											
	396	(-- 106 --)		290	20	?					
F - Hill dairy-woodland farm,											
	206	30	60	116	15						
G - Hill farm combining beef and woodland enterprises,											
	387	(-- 111 --)		276		20					
H - Hill farm combining tourist, dairy and forest enterprises,											
	425	(-- 37 --)		388	8	?					
I - Large forest and dairy farm											
	1178	108	190	880	40	?		30		6	

*Barraclough and Gould, Jr., op. cit., pp. 13-70.

emphasized repeatedly the lack of, and great need for, input-output data with which management alternatives can be derived. In fact, equal in value to their work with budgeting woodland enterprises is their revelation of the vast amount of information needed. They found "only bits and snatches of information".[5] Out of necessity, input data were based on rules of thumb and labor input curves derived from limited information. For each farm discussion covered descriptions of the present physical, social and economic conditions of the township and markets and of the farm, the problems and possibilities of the farm, proposed plans for the farm and advantages and disadvantages of each proposed plan. For the first farm the authors also discussed soil and field descriptions, input-output data, price data, the woodland enterprise plans, forest treatments, future yield and income possibilities, and the owners actual decision concerning his program.

Coutu and Ellertsen[6] were more concerned with the adoption of linear programming to budgeting the farm forestry enterprise than with the budgeting of numbers of farms. They budgeted the non-forest and forest enterprise alternatives for a 20-acre part-time farm and a 250 acre 'large family farm'. The former included 4.5 acres of cropland, 1.7 acres of permanent pasture, 13.3 acres of woods, and 0.7 acres miscellaneous. The latter included 60.0 acres of cropland,

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[5] Ibid., p. 92.

[6] Coutu and Ellertsen, _op. cit._, p. 4.

95.0 acres of permanent pasture, 90.0 acres of woodland, and 5.0 acres miscellaneous. Both farms are located in western North Carolina.

When more than 30 different combinations of product and factor prices, discount rates and capital levels were coupled with two levels of operator labor, optimum farm plans (for the small farm) did not include timber activities.[7] However, the analysis indicated that "forestry may be an integral component on relatively large commercial farms".[8] The authors' primary objective was "to identify types of forestry operations or resource situations that are likely to be profitable and to determine the relative advantage of using resource for timber and non-timber activities".[9] Coutu and Ellertsen also noted the sad lack of information needed to budget forest enterprises. They believe "agriculturists faced the same problem when they began planning alternative uses of land, labor, and capital resources for individual farms or specific agricultural areas. Using information that was available, their analyses, though rough at first, still provide useful guides. Having to work with approximations emphasized the need for more accurate input-output data, and as these were developed the quality of the plans improved. One would expect a similar pattern in the case of forestry input-output data and forestry enterprise budgeting".[10]

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[7]*Ibid.*, p. 10.

[8]*Ibid.*, p. 14.

[9]*Ibid.*, p. 3.

[10]*Ibid.*

Pleasonton budgeted the total resources, including forest resources, of eight tenant farms of the Ames Plantation in Western Tennessee, Table 2. This 18,500-acre 'plantation' was willed to the College of Agriculture of the University of Tennessee for research and education in 1950.

As did Coutu and Ellertsen, Pleasonton budgeted agricultural enterprise alternatives as well as forest enterprise alternatives. Also, land use was planned to shift areas of brush, idle land and forest land to more profitable uses. Four plans were proposed for each farm. Except for Plan I, each plan represents "modal combinations of agricultural enterprises . . . computed from basic data for individual operating units prepared by experienced farm management specialists of the Department of Agricultural Economics and Rural Sociology of the University of Tennessee Agricultural Experiment Station":[11]

> Plan I represents present operation of the farm, with no timber sales.
>
> Plan II includes "intensive" forestry with harvesting and roadside sale of forest products.[12]

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[11] Pleasonton, _op. cit._, p. 185.

[12] _Ibid._, p. 170. "_Intensive management_ includes only measures now economically practicable in the region. The farmer will protect his woodland from fire and grazing, girdle cull trees, plant pines on open land and on areas occupied by hardwood stands of low productivity, and harvest timber selectively to maintain a profitable growing stock. Intermediate cuts will include thinnings or improvement cuts. If natural regeneration appears insufficient following appropriate harvest cutting, planting will be used to supplement it or to

Table 2. **Farms Analyzed by Pleasonton in His Doctoral Dissertation.***

Farm	Total Area (acres)	Cropland (acres)	Pasture (acres)	Forest (acres)	Other (acres)	Milk Cows (No.)	Other Dairy (No.)	Beef Cattle (No.)	Calves (No.)	Sheep (No.)	Sows (No.)	Pigs Raised (No.)	Hens (No.)	Mules (No.)
1 - Cotton - Hog - Beef - Forestry Farm														
	310	51		173	86			14				9		
2 - Cotton - Hog - Sheep - Forestry Farm														
	331	25	25	178	103	2					1	13		2
3 - Cotton - Hog - Beef - Forestry Farm														
	398	38	25	218	117			8	5		3	20		
4 - Cotton - Dairy - Forestry Farm														
	362	34	10	174	144	2	1							4
5 - Cotton - Grade A Dairy - Forestry Farm														
	230	44	20	92	74	8	6				3	30		2
6 - Cotton - Beef - Sheep - Forestry Farm														
	318	46		156	116	2	1							
7 - Cotton - Hog - Forestry Farm														
	2601	191		2022	388	9	7				2	18		
8 - Cotton - Beef - Forestry Farm														
	2408	120		1634	654	5					1	10		

*<u>Ibid</u>., pp. 202, 214, 227, 239, 252, 265, 279 and 294.

Plan III includes intensive forestry with sale of stumpage only.

Plan IV includes "extensive" forestry with sale of stumpage only.[13]

These three studies were ended at the point where optimum enterprise combinations were suggested to or were selected by cooperators. This dissertation, likewise, will conclude with suggested

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substitute for it. More intensive practices than these are not considered to be reasonable alternatives for present management planning.

"The intensive manager's production objective is to obtain as much income from his woodland as is consistent with his overall objective of maximum net income for the entire farm. This includes satisfying needs for products for farm and home use. All round products needed for farm use, fenceposts, structural members for sheds, loading or storage areas, and so forth, will be cut and put in place by the farmer, using farm equipment, or may be custom-cut along with needed farm lumber made by a stumpage buyer whenever such coordination is feasible."

[13] Ibid., p. 169. "Extensive management A farmer who has adopted extensive management of his woodland as appropriate to satisfactory over-all management of his farm-and-forest operating unit either has no wood production objective or intends primarily to hold his timber as an asset for emergency use. He has no intentional silviculture and does not invest in any stand treatment or planting of understocked areas.

"The extensive manager occasionally extracts posts, fuelwood, and possibly sawlogs for farm construction. Such harvesting of wood products is not considered in the farm plan, however, nor is it related to farm operations except that woods operations do not compete for time with agricultural enterprises. Likewise, occasional stumpage sales are unplanned, but whenever his woods contain enough to attract a stumpage buyer--usually about 1,500 board feet per acre--the farmer as a reasonably prudent man will try to sell his timber advantageously.

"Although the farmer managing his woodland extensively will take no measures to improve yields, and will build neither fences nor fire lanes, he will let his neighbors know that he objects to fire and trespass. In case of wildfire on his property or near enough to threaten it, he will aid suppression crews sent by the state fire organization."

optimum combinations of enterprises. Differences will be in the kinds, sizes and locations of farms studied, in the budgeting technique used and the alternatives offered for the forests. All four studies should encourage researchers and extension specialists in farm management and forestry to establish and/or continue studies over at least a decade to allow evaluation of farm businesses which include forest enterprises.

CHAPTER III

BUDGETING FARM RESOURCES AND ENTERPRISES

A farmer must allocate his resources among some optimum combination of enterprises if he wants to maximize his net farm income. Since his physical, economic, political and social environment are changing continuously, his farm planning must be continuous. The precision and complexity of his farm plans depend upon the importance of the consequences. Nielson has described a number of farm planning methods.[1] "Several of the methods tend to overlap," he wrote; "therefore, no sharp lines of demarcation are implied by the . . . classification.":[2] partial informal judgment, whole farm informal judgment, land-use approach, cost-accounting approach, direct comparison, productive days of work, standard system, mathematical approach (econometric models), linear programming and the budget method. The budget method is divided into simple budgeting, intermediate budgeting and advanced budgeting. All of these would appear to fit under the definition of "budgeting" as defined by the North Central Farm Management Research Committee.[3]

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[1]James Melvin Nielson, "Application of the Budget Method in Farm Planning" (unpublished Doctor's thesis, Harvard University, Cambridge, Massachusetts, 1953), Chapter I.

[2]*Ibid.*, p. 2.

[3]North Central Farm Management Research Committee, "Budgeting in Farm Management Research" (East Lansing, Michigan: Department of Agricultural Economics, December 1954), (Mimeographed).

Whichever budgeting approach is used by a farmer or farm management worker, there is no question that the forest resources on a farm are part of the total farm resources. Nor is there any logical reason why forest enterprises should not be considered when a farm plan is prepared.

However, the writer believes the integration of farm forest resources and enterprises into farm plans has been resisted by farmers and farm management workers because foresters have not presented forest management information in form, detail and quantity similar to information for other farm resources and enterprises. John Black has noted that, "Farm woodlots are commonly left out of farm plans, dealt with sketchily, or planned piecemeal subsequent to or without any general farm-and-home planning, with an extension forester or, more probably, a forester in the Cooperative Forest Management Service in the role of planning assistant."[4] Initially, the writer planned to use partial budgeting to present budgets for potential forest enterprises, prepared in a form used for other farm enterprise budgets. Nielson defines partial budgeting as "making an estimate of the changes in cash costs and cash returns which are expected to result from possible changes in a segment of the farm business."[5] The segment of the farm business budgeted would have been the forest enterprises; then, hopefully, farmers and farm

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[4] J. D. Black, "Farm and Other Operating-Unit Land-Use Planning" (seminar in Land Use and Conservation of Harvard University, April, 1955), p. 13.

[5] Nielson, op. cit., p. 56.

management specialists would be delighted to integrate these forest enterprises into their farm plans.

In 1964 the writer was introduced to Weathers' simplified programming method.[6] This method recommended itself for three reasons: first, it is being used by farm management extension specialists in teaching budgeting to county farm management agents with little prior knowledge in this technique.[7] Second, it requires the preparation of a uniform enterprise budget for each enterprise to be considered. This assures statement of forest enterprise budgets in the same terms as budgets for agronomic and livestock enterprises. Third, this method systematically and dispassionately applies resources to enterprises on the basis of their contribution to net farm income.

Simplified Programming or Systematic Budgeting

Weathers has suggested that perhaps systematic budgeting defines this method better than simplified programming; hence, systematic budgeting will be used hereafter.[8]

Three steps are involved in systematic budgeting of enterprises in farm planning:

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[6] Weathers, *op. cit.*

[7] Farm Management Agents Training Sessions by Farm Management Specialists of the Department of Agricultural Economics, (University of Wisconsin, Madison, 1963-65).

[8] Personal conversation with C. R. Weathers, University of Illinois, Urbana, Illinois, April 28, 1965.

"The first step . . . is the preparation of a budget for each crop or livestock enterprise to be considered. An enterprise budget shows the amount of each resource required per acre of crop or unit of livestock. It also includes the net income per unit to be used in planning the farming operation.

"The second step in planning the farming operation is to inventory the farmers available resources. It is important to list the available resources as accurately as possible.

"Once the enterprise budgets are completed, and the available resources are listed, a set procedure is followed in using [systematic budgeting] to determine the most profitable amount of each crop or livestock enterprise to include in the farming operation. As enterprises are added to the farm plan, resources will be used up or exhausted. . . . The principle involved in maximizing net farm income is to exhaust each limiting resource in its most profitable use."[9]

Details of the three steps are presented in Chapter V as the farm plan for Farm A is prepared.

The essential, and most difficult, first step in systematic budgeting is preparation of the budget for a unit of each enterprise to be considered in the farm plan.

Once the necessary budgets have been prepared and the farm resources inventoried, a fixed procedure is followed:

1. A resource-requirements table, Systematic Budgeting Table I, is prepared. This table presents the total amounts of resources available on a farm, the amount of each resource required to produce a unit of each enterprise and the net income from the unit.[10] For an example, see Table 32, page 98.

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[9] Weathers, op. cit., p. 3.

[10] Ibid., p. 9.

2. Each resource requirement for every enterprise is divided into the total amount available of the resource, and the quotients are recorded in a second table entitled "Determination of Limiting Resource for Enterprises", Systematic Budgeting Table II. This reveals the number of units of an enterprise which could be produced by each available resource. The maximum number of units of an enterprise which the resources of the farm can produce is the <u>smallest</u> number of units under that enterprise heading. To complete this table, the net income for a unit of the enterprise (Table I) is multiplied by that smallest number to obtain the maximum net income possible from the enterprise. For an example, see Table 33, page 100.
3. As an enterprise is selected for the farm plan, a resource is exhausted. To double-check that enterprises are selected successively on the basis of most profitable use of a resource, a third table, Systematic Budgeting Table III, is prepared showing the net income per unit of each resource used to produce a unit of an enterprise. This table is prepared by dividing the quantity required of each resource for a unit of an enterprise (Table I) into the net income for the unit (Table I). Then when an enterprise is added to the farm plan, a check can be made to be certain the enterprise will use the limiting resource most profitably. For an example, see Table 34, page 103.

4. Finally, a farm plan is prepared in tabular form: Systematic Budgeting Table IV. Enterprises are added systematically in order of contribution to net farm income. For an example, see Table 35, page 105. Farm plans for the nine study farms are prepared by this method in Chapter V.

Descriptions of Study Farms

All nine farmers were operating commercial farms during the time of this study. All are located in the Lower Peninsula of Michigan, as shown in Figure 1. Three restrictions were placed initially upon the selection of farms: (1) A number of types-of-farming areas were to be represented.[11] (2) The farmers would have been cooperators for at least one year in the Farm Business Analysis Project of the Department of Agricultural Economics of Michigan State University. (3) Each farm would have at least 40 acres or 25 per cent of the farm area in forest lands.

The records of 36 Project cooperators in 21 counties showed them to meet the restrictions. Consultation with advisors resulted in the decision to limit the study to 5 to 10 farms representing as many types-of-farming areas and economic sizes as possible.[12]

Through the District Directors of the Cooperative Extension Service of Michigan State University, County Extension Directors of

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[11] E. S. Hill and R. G. Mawby, Types of Farming in Michigan, Agricultural Experiment Station, Michigan State University, Special Bulletin 206 (East Lansing, 1954), pp. 27-41.

[12] Econimic sizes are based on total farm business investment: small = less than $60,000; medium = $60,000 - $99,999; and large = $100,000 and over.

the 21 counties were asked if they would discuss this study with the possible cooperators and rate interest of the possible cooperators as high, fair, or low. Seventeen of the County Extension Directors replied that 30 possible cooperators showed high interest in the study. The 30 farms were studied on aerial photographs in the state office of the Agricultural Stabilization and Conservation Service to check the areas in forests. With the County Extension Directors, the possible cooperators and their farm forests were visited. The final selection for the study included the following farms:

Farm	Type-of-Farming Area[13]	Kind of Farm	Economic Size[14]
A	1. General Livestock and Corn	Feeder Beef	Medium
B	2. Dairy, Livestock and Corn	Dairy	Large
C	9. General Livestock and Part-Time	Dairy	Small
D	11. Northwestern Fruit and Dairy	Dairy	Medium
E	12. Dairy, Part-Time and Potatoes	Dairy	Small
F	12. Dairy, Part-Time and Potatoes	Mixed	Small
G	12. Dairy, Part-Time and Potatoes	Dairy-Potato	Small
H	12. Dairy, Part-Time and Potatoes	Poultry	Small
I	14. Cattle, Potatoes and Part-Time	Potato-Beef-Hog	Medium

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[13]See Figure 1 for type-of-farming areas.

[14]See footnote 12, this chapter.

Many excellent potential cooperators were not selected, and it is hoped that a study of forest enterprises will be initiated in every forested county of Michigan.

Physical and Economic Data

Agronomic and Livestock Enterprises

Physical yields, resource and labor requirements and price estimates are prerequisite to the combination of enterprises.[15] For this study, yields and acreages of agronomic crops and livestock productivity were obtained from the Farm Business Analysis Project Farm Account Summary and Code Sheets for the study farms. These data are presented in Table 3. Available labor for each farm is estimated from man-months of labor reported on the Summary and Code Sheets, and is shown in Table 4. Each man-month is assumed to equal 250 man-hours. Distribution of labor over the three seasonal periods is adjusted to demands of present agronomic and livestock enterprises. A reduction for overhead labor is not made because this factor is considered in the computation of labor requirements for enterprises in the Michigan Farm Management Handbook.[16] Because productivity of agronomic and livestock enterprises is assumed fixed for this study, an indication of production efficiency for these enterprises is presented in Table 3 by the following signs: productivity above or below the average for Project farms in the same group is indicated by a plus (+) or minus (-) mark, behind each production figure.

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[15] Coutu and Ellertsen, op. cit., p. 2.

[16] John Brake et al., Michigan Farm Management Handbook, (East Lansing, Michigan: Department of Agricultural Economics, Michigan State University, A. E. No. 929, 1963), p. IA1.

Table 3. Land Use, Agronomic Crops and Yields, Livestock Numbers and Productivity of Study Farms

Study Farms	A		B		C	
	Acres	Y/A*	Acres	Y/A*	Acres	Y/A*
Corn, silage	28	12.9 T+	34	14.8 T+	18	9.1 T-
Corn, grain	52	81 bu.+	113	61 bu.-	16	58 bu.-
Potatoes	--		---		--	
Total Row Cropland	80		147		34	
Rye	--		--		--	
Wheat	24	47 bu.+	47	40 bu.+	--	
Oats	7	70 bu.+	49	59 bu.-	17	42 bu.-
Barley	--		--		--	
Hay	7	4.0 T+	82	3.3 T+	56	2.2 T-
Tillable, pasture only	--		78	2.0 T	18	2.0 T
Idle, tillable**	9		18		--	
Total Cropland	127		421		125	
Non-tillable pasture	2		48		81	
Forest 1	16		97		61	
Forest 2	50		40		22	
Forest 3	--		--		--	
Forest 4	--		--		--	
Forest 5	--		--		--	
Forest 6	--		--		--	
Total Forest	66		137		83	
Farmstead, misc.***	6		26		7	
Total Land	201		632		296	

Farm		Average Number	Productivity Per Animal, 1960-62
A	Beef steers	107 fed	Income per head fed $111 -
B	Dairy Cows	63	11,300 lbs. milk/cow +
B	Ewes	61	102 lambs/100 ewes =
C	Dairy Cows	27	7,800 lbs. milk/cow -

Table 3.--continued

Study Farms	D Acres	D Y/A*		E Acres	E Y/A*		F Acres	F Y/A*	
Corn, silage	12	9.3	T+	12	14.7	T+	--		
Corn, grain	32	72	bu.+	10	66	bu.+	--		
Potatoes	--			--			--		
Total Row Cropland	44			22			--		
Rye	--			--			--		
Wheat	9	13	bu.-	--			--		
Oats	22	61	bu.+	22	50	bu.+	--		
Barley	2	33	bu.	7	50	bu.+	--		
Hay	80	2.9	T+	70	2.0	T-	63	1.6	T-
Tillable, pasture only	9	2.5	T	22	1.9	T	77		
Idle, tillable**	70			--			10		
Total Cropland	236			143			150		
Non-tillable pasture	---			67			---		
Forest 1	33			18			25		
Forest 2	53			41			18		
Forest 3	--			44			55		
Forest 4	--			--			--		
Forest 5	--			--			--		
Forest 6	--			---			--		
Total Forest	86			103			98		
Farmstead, misc.***	39			5			72		
Total Land	361			318			320		

Farm		Average Number	Productivity per Animal, 1960-62
D	Dairy Cows	34	8,570 lbs. milk/cow -
E	Dairy Cows	22	10,210 lbs. milk/cow -
F	Ewes	155	106 lambs/100 ewes -

Table 3.--continued

Study Farms	G Acres	G Y/A*	H Acres	H Y/A*	I Acres	I Y/A*
Corn, silage	--		--		7	19.0 T+
Corn, grain	--		--		--	
Potatoes	19	357 bu.-	--		31	387 bu.-
Total Row Cropland	19		--		38	
Rye	--		--		6	30 bu.
Wheat	--		--		5	40 bu.+
Oats	23	48 bu.-	2	30 bu.-	26	92 bu.+
Barley	--		--		23	65 bu.+
Hay	67	2.1 T-	67	1.1 T-	36	3.5 T+
Tillable, pasture only	81	0.8 T	--		56	2.0 T
Idle, tillable**	9		76		14	
Total Cropland	199		145		204	
Non-tillable pasture	54		--		61	
Forest 1	59		49		49	
Forest 2	52		9		180	
Forest 3	34		--		160	
Forest 4	25		--		---	
Forest 5	11		--		---	
Forest 6	17		--		---	
Total Forest	198		58		389	
Farmstead, misc.***	14		17		31	
Total Land	465		220		685	

Farm		Average Number	Productivity per Animal, 1960-62
G	Dairy Cows	20	10,630 lbs. milk/cow -
H	Hens	3,462	$5.98 egg sales/hen -
I	Beef Cows	28	26 calves born ?
I	Sows (2 litters)	12 sows	7 pigs weaned/litter =

*Y/A = Yield per Acre

**Includes acreages in Conservation Reserve.

***Includes swamp and wildlife lands.

Table 4. **Estimates of Available Labor, Study Farm, Man-Hours***

Farm	Operator	Family	Hired	Total	Seasonal Labor Distribution Jan.-Apr.	May-Aug.	Sept.-Dec.
A	3000	----	----	3000	990	1200	810
B	3000	2830	4000	9830	3250	3440	3140
C	3000	250	750	4000	1240	1480	1280
D	3000	2830	660	6490	2080	2340	2070
E	2830	----	180	3010	940	1170	900
F	3000	380	60	3440	1160	1890	390
G	3000	420	1670	5090	1160	1890	2040
H	3000	170	170	3340	1130	1130	1080
I	2620	3620	880	7120	1150	2700	3270

*Farm account records. Months of labor x 250 man hrs. Adjusted to needs of major agronomic and livestock enterprises.

Resource and labor requirements for livestock and agronomic enterprises were obtained from the Michigan Farm Management Handbook,[17] a Quarterly Bulletin of the Michigan Agricultural Experiment Station,[18] and enterprise budgets prepared by The Department of Agricultural Economics, University of Wisconsin. These will be identified as used for individual farm plans.

Input and product prices for agronomic and livestock enterprises were obtained from or adjusted to the estimates in the Michigan Farm Management Handbook.[19] The data available to this writer did not include net worth information for the farms, so investment capital borrowing capacity was estimated with an approximation formula used by the Farmers' Home Administration: average net farm income, <u>less</u> family living expense,[20] <u>less</u> 10 per cent of average machinery investment, <u>less</u> 2.5 per cent of average land investment, <u>less</u> a contingency fund of $400. The remainder was considered to be available to amortize a 10-year loan at 6 per cent interest.[21]

The confidential nature of economic data used in this study prevents the use of actual figures to illustrate operational

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[17]John Brake *et al.*, *Ibid.*, pp. IA1, IA2, IIA2, IIA3, IIIA4, IIIA5, IIIB2, IVA3.

[18]C. R. Hoglund and K. T. Wright, "Economic Analysis of the Michigan Potato Enterprise," *Quarterly Bulletin*, Michigan Agricultural Experiment Station, Article 42-61, May, 1960, p. 698.

[19]Brake *et al.*, *op. cit.*, pp. ID1, ID2.

[20]*Ibid.*, p. IE1.

[21]*Ibid.*, p. IB2.

efficiency of the cooperators. However, efficiency relative to other farmers in the same Project type-of-farm group will be useful to agricultural economists who study the farm plans systematically budgeted for the farms using static production data for agronomic and livestock enterprises. Using several measures of efficiency, the study farms are compared to the average for their Project group.[22] These general comparisons are shown in Table 5. A plus (+) sign indicates a study farm figure above the group average, a minus (-) sign indicates a study farm figure below the group average, and an equal (=) sign indicates a study farm figure approximately that of the group.

Forest Enterprises

Yields of forests were based upon Ferree and Hagar's growth rate tables.[23] Net growth data (gross growth less mortality and cull) were used for enterprises with no management: the Nothing Alternative described later. Gross growth data were used for enterprises which included management. Productivity of forest sites for sawtimber and pulpwood was estimated with the use of Soil Capability Maps prepared for each farm by the Soil Conservation Service of the United States Department of Agriculture combined with observations of dominant tree

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[22] L. H. Brown, Some Rules of Thumb for Good Farm Management, (East Lansing, Michigan: Department of Agricultural Economics, Michigan State University, 1963). (Mimeographed.)

[23] Miles J. Ferree and Robert K. Hagar, Timber Growth Rates for Natural Forest Stands in New York State, State University of New York College of Forestry in Syracuse, Technical Publication 78 (Syracuse College of Forestry, 1956), pp. 23-39.

Table 5. Measures of Efficiency, Study Farms Compared to Project Averages*

	Study Farm								
	A	B	C	D	E	F	G	H	I
	012	012	012	012	012	012	012	012	012**
Per Man:									
Gross Income	--=	--+	-++	--+	+++	--	+-+	+-+	--***
Tillable Acres	+--	+=+	-++	+--	+++	=-	+=+	+++	--
Per Tillable Acre:									
Gross income	--+	---	-=-	--+	+-+	--	+-+	+--	--
Total cost	+-+	-=+	--+	---	---	--	---	+--	--
Machinery investment	---	---	+--	+++	+==	++	+++	=--	--
Crop value	=++	--=	--=	--+	--+	--	+=+	-	++
Fertilizer use	+++	---	---	-+-	+=+	--	+--	-	-+
Production per unit of Livestock:									
Pounds milk sold per cow		+++	---	---	--+		+--		
Pigs weaned per litter									-+
Lambs raised per 100 ewes		==-				++			
Eggs produced per hen								+--	
Livestock Income per $100 feed fed	+-+	=--	+++	-=+	--=	-+	+-+	- -	--
Gross Income per $100 Expense	--+	+=+	+++	=-+	+++	--	+++	--+	--
Net Farm Income	--+	+++	+++	+-+	+-+	--	+--	--+	--
Labor Income	--+	+++	+++	+-+	+++	--	+-+	--+	--
Rate Earned on Investment	--+	+-+	+++	--+	+++	--	+++	--+	--
Project Report used, 1960: AE	808	809	814	816	815		815	815	
1961: AE	909	908	908	908	908	909	909	876	909
1962: AE	915	912	913	918	918	917	919	911	917

*Project averages were obtained from Department of Agricultural Economic AE's listed at the foot of the table.

**0 = 1960; 1 = 1961; 2 = 1962.

***(+) = above Project type-of-farm group average, (-) = below group average, (=) = about the same as group average.

heights and apparent tree vigor. For each forest average volumes per acre in board feet and in cords were computed for successive decades. The growth rates for these average volumes were used as the annual yields for the forest for that decade. Decadal volume and growth estimates were continued until average annual value declined from above to below six per cent; or until average annual value began to decline if it did not reach 6 per cent. At this volume a forest was assumed to have reached optimum economic stocking. When enterprise budgets were prepared, an optimum forest budget was prepared for this level of stocking.

To obtain information on present volume, composition and condition a sample inventory was taken of each forest using the Bitterlich point-sampling technique. A field tally sheet was used which allowed easy transfer of data to key-punch cards. See Appendix A. For each tree sampled species, DBH[24] by 4-inch class, number of 8-foot bolts, number of 8-foot logs, tree condition and evident cause of mortality of dead trees were recorded. Diameter class limits were: 4-inch class, 2.0 - 5.99 inches; 8-inch class, 6.0 - 9.99 inches and so forth. The number of 8-foot bolts were estimated to a variable 4-inch top, inside bark. The number of 8-foot logs were estimated to a variable 8-inch top, inside bark. Seven tree condition classes were included: cull, poor:cut, poor:leave, good:cut, good:leave, special:cut, and special:leave. Another classification,

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[24]Diameter measured at 4½ feet above the ground is referred to by foresters as "diameter breast height", or DBH.

dead, was included initially, but proved to be of little value because of indeterminant cause of mortality for the few dead trees tallied. 'Cull', 'poor' and 'good' descriptions were based upon recommendations of the Cutting Practices Committee of the Lower Michigan Chapter, Society of American Foresters:[25]

1. Good growing stock. Trees of desirable species, form, and distribution, capable of making satisfactory net growth.

. . . .

3. Poor growing stock. Merchantable trees which include:
   a. Poor risk trees not likely to survive until the next cut. These trees are merchantable at the present time.
   b. Merchantable trees in which a net loss in volume and value is occurring, usually due to decay.
   c. "Wolf" trees of poor form or quality taking up growing space needed by more desirable trees.
   d. Trees that should be removed in thinnings and stand improvement cuttings, such as low value species which occupy growing space needed by more desirable species.

4. Cull trees. Any trees which are unmerchantable because of poor form, limbiness, rot, or other defect.

'Cut' and 'leave' refer to the writer's judgement concerning the value of cutting a tree versus retaining in the forest for another ten years. Species, form, present stocking and vigor all influenced his judgment. The 'special' description applied to maple sirup trees and white cedar post trees.

Stand and stock tables were prepared by an IBM 1401 computer, programmed by Mr. Gerald Laatsch of The Michigan State University Computer Laboratory. An example of the computer print-out is presented as Table 6.

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[25]Society of American Foresters, Lower Michigan Chapter, Cutting Practices Committee, Recommended Forest Cutting Practices for Lower Michigan (n.n., 1959), p. 3.

Table 6. Forest Inventory, Computer Print-Out of Stand and Stock Table.

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WOODS          9
STAND          9
ACREAGE      999
NO. POINTS    99

TREE   SPEC
COND


                  DBH  BA/AC  TRE

          99            0.0

   9                    0.0


STAND TOTAL             0.0
DBH    TOTAL       1    0.0
SPEC   TOT 99           0.0
BY SAMPLE POINT              DBH
BY SAMPLE POINT              DBH
BY SAMPLE POINT              DBH
```

For each forest basal area per acre, trees per acre, total trees, cords per acre, total cords, board feet per acre and total board feet (the last two for trees in the 12-inch and larger classes) were computed. These data were reported for sapling and pole-size trees (4-inch and 8-inch classes) and for sawtimber trees (12-inch class and larger). The data were presented by species within condition classes.

Farm A includes two forests, totalling 66 acres, or one-third of the farm. Forest No. 1 contains 16 acres with 45 square feet of basal area, 245 trees per acre and an average diameter of 5.5 inches. This forest is understocked according to U. S. Forest Service Standards.[26] It is composed largely of low-quality trees, as shown in Table 7. This forest is on Nappanee silt loam usable for agronomic crops if drained.[27] If adequately stocked with species such as white oak and white ash, sawtimber would find ready markets at $50 per MBM[28] and $40 per MBM, respectively, for stumpage.[29] See Appendix A for stumpage and log prices for each farm. Elm has an erratic market at about $20 per MBM for stumpage. Hickory has no market. If this forest is to contribute positively to net farm income, it must be

[26]Forest Service, Timber Management Guide for Upland Central Hardwoods, United States Department of Agriculture (Washington, D. C., 1962), p. 17.

[27]M. M. Striker *et al.*, Soil Survey of Lenawee County, Michigan, Soil Conservation Service, United States Department of Agriculture, Series 1947, No. 10 (Washington: Government Printing Office, 1961), p. 30.

[28]MBM = thousand board measure, synonymous with thousand board feet.

[29]Stumpage refers to trees standing in the forest. An owner who sells stumpage does none of the harvesting.

Table 7. Composition of Forest No. 1, Farm A, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)**
Hickory	33.3	181.5	4.39	----
Ironwood	6.7	57.3	----	----
Elm	2.2	2.2	----	82
White ash	1.1	0.8	----	82
White oak	1.1	0.8	----	82
Total	44.4	242.6	4.39	246
Tree Condition***				
Cull	5.5	13.5	0.44	----
Poor:cut	24.4	171.9	1.75	82
Poor:leave	13.3	54.9	2.19	82
Good:leave	1.1	0.8	----	82
Total	44.3	241.1	4.38	246
DBH Class#				
4-inch	14.4	165.5	0.20	----
8-inch	25.5	73.2	4.19	----
12-inch	1.1	1.4	----	82
16-inch	3.3	2.4	----	164
Total	44.3	242.5	4.39	246

*In trees 2 inches DBH and larger, to a variable 4-inch top.

**In trees 10 inches DBH and larger, to a variable 8-inch top.

***Recommended Forest Cutting Practices for Lower Michigan, Ibid.

#DBH Class = Diameter Breast Height (4½ feet above ground) classes. "4-inch" class: 2.0 - 5.99 inches; "8-inch" class: 6.0 - 9.99 inches, etc.

re-established or converted to some other use. Optimum economic stocking of about 4000 board feet per acre would not be reached by the present stand until the end of the fourth decade. At current prices the average value of the timber in this forest for the next decade is about $16.00 per acre, only 15 per cent of its bare land value. The average net value of a stand of Christmas trees planted on this land would be about $177.00 per acre at current prices.

Forest No. 2 of Farm A is a 50-acre central hardwoods forest. Stocking is lower than Forest No. 1, but species composition is more valuable, as shown in Table 8. Although this forest is on good soils (Griffin, Genesee and Sloan silt loams) many short, steep banks and occurence of Spring flooding preclude its conversion to other uses.[30] Interplanting of black walnut appears to have considerable potential because demand for this species has forced prices to a current level of $1,000 per MBM stumpage for reasonably sound trees. White oaks, sugar maple and black cherry have steady markets at about $50 per MBM. White ash now is worth $40 per MBM while red oak and basswood average about $35 per MBM. Red maple currently is finding markets at about $30 per MBM. Walnut, white and red oaks, sugar maple, white ash and basswood are most valuable currently. These valuable species represent about one-third of current stocking, so timber stand improvement should prove worthwhile if initiated after the walnuts are established. Without interplanting but with timber stand improvement the stand

[30]Striker _et al_., _op_. _cit_., p. 36.

Table 8. Composition of Forest No. 2, Farm A, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Ironwood	11.1	122.6	0.20	----
Elm	6.1	22.6	0.45	122
White ash	5.5	24.3	0.14	201
Butternut	1.7	2.4	0.09	59
Buckeye	1.7	9.6	0.12	----
Willow	1.2	2.3	0.12	----
Basswood	1.2	2.3	0.14	22
Walnut	1.1	0.8	----	94
Sycamore	1.1	1.0	----	100
Hickory	1.1	0.8	----	131
Cottonwood	1.1	0.8	----	144
Swamp white oak	0.6	0.7	----	41
Total	33.5	190.2	1.26	914
Tree Condition*				
Cull	6.7	19.2	0.55	----
Poor:cut	13.9	127.5	0.33	100
Poor:leave	1.1	12.7	0.05	----
Good:cut	2.8	2.2	----	203
Good:leave	8.9	28.5	.34	611
Total	33.4	190.1	1.27	914
DBH Class*				
4-inch	13.8	159.2	0.30	----
8-inch	6.1	17.5	.97	----
12-inch	7.2	9.2	----	327
16-inch	5.6	4.0	----	529
20-inch	0.6	0.2	----	59
Total	33.3	190.1	1.27	915

*See footnotes in Table 7.

would reach optimum stocking of about 4000 board feet per acre in about 20 years. At current prices, the average value of this timber during the next decade is about $85 per acre or about 80 per cent of the bare land value. With interplanted walnut this forest has a potential increase in value for the next decade of about $22 per acre.

Farm B includes two forests totalling 137 acres, or 22 per cent of the farm. Forest No. 1 is composed of several stands of mixed hardwoods on level, dark-colored soils described by Hill and Mawby as "burr[sic]oak openings"[31] The stands comprise 97 acres. The stands have reached optimum economic stocking, as shown in Table 9. Sugar maple is in strong demand. Current stumpage prices are approximately $100 per MBM for this species. Red oak and white oaks find ready markets at about $55 per MBM. Even red maple is in relatively strong demand at $50 per MBM, above the average price for white ash of $45 per MBM. These more valuable species[32] comprise 68 per cent of the stand. However, the low percentages of stocking represented by good growing stock and by smaller diameters indicate careful harvest and judicious timber stand improvement should be profitable practices in these stands. Current volume of poor:cut trees and growth allow enterprises including moderate annual or periodic sawtimber harvests.

At current prices average value of the timber in this forest during the next decade, without management, would be approximately

[31]E. B. Hill and R. G. Mawby, op. cit., p. 78.

[32]Including basswood, black cherry, tuliptree and butternut.

Table 9. Composition of Forest No. 1, Farm B, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)*
Red maple	13.0	38.9	3.68	860
White ash	8.0	11.0	2.62	696
N. red oak	8.0	4.5	2.63	1080
Bur oak	7.0	9.7	1.89	535
Elm	6.5	5.9	1.89	473
Basswood	3.1	10.5	.86	159
Sugar maple	3.0	9.4	.75	158
White oak	2.0	2.5	.62	220
Black cherry	2.0	18.6	.21	----
Ironwood, etc.	2.0	18.6	.08	----
Sycamore	1.0	.4	.34	131
Black walnut	.5	.2	.13	37
Tuliptree	.5	1.4	.08	----
Butternut	.5	.6	.13	37
Hickory	.5	1.4	.08	----
Willow	.5	.4	.19	65
Total	58.1	134.0	16.18	4451
Tree Condition*				
Cull	4.5	14.5	.75	----
Poor:cut	20.5	46.9	5.51	1388
Poor:leave	10.5	24.2	2.90	525
Good:cut	7.5	3.0	2.54	1123
Good:leave	16.0	45.6	4.44	1415
Total	59.0	134.2	16.14	4451
DBH Class*				
4-inch	6.0	68.8	.32	----
8-inch	12.5	34.4	2.55	----
12-inch	11.5	14.6	3.37	687
16-inch	14.5	10.4	4.82	1739
20-inch	11.0	5.0	3.72	1445
24-inch	3.0	1.0	.88	383
28-inch	.5	.1	.17	65
32-inch	.5	.1	.17	78
36-inch	.5	.1	.15	53
Total	59.0	134.5	16.15	4450

*See footnote in Table 7.

$285 per acre. With guidance of a forester in the careful harvest of about 1380 board feet, or $44 of the original value of low value trees, and timber stand improvement to remove the unmerchantable trees, average value of the timber for the next decade should approach $261 per acre. The average value per MBM of sawtimber would have been increased from $57 to $64.

Forest No. 2 on Farm B is a 40-acre stand of sugar maple-beech-mixed hardwoods on rolling well-drained sandy loams. It should reach optimum stocking of about 8100 board feet per acre in about ten years if only poor:cut trees are harvested during the first decade; and optimum stocking probably can be realized within twenty years even allowing harvests of 200 board feet of annual growth. As can be seen in Table 10, the valuable species comprise 60 per cent of the stand; however, good growing stock makes up less than one-third of the stocking. The proportion of sugar maple in the forest increases its potential worth if current demand for this species continues. Average timber value during the next decade for this forest without management will be about $460 per acre. Under management, an initial volume of about 2300 board feet of poor:cut sawtimber, with a value of about $70 could be harvested per acre. Removal of the low-value trees and subsequent timber stand improvement would increase value of the timber to an average for the decade of about $650 per acre.

A maple sirup enterprise is possible for this forest if the climate is not too ameliorated by Lake Michigan to allow the above freezing days and below freezing nights in late winter which are necessary for a productive sugarbush. This forest could produce

Table 10. Composition of Forest No. 2, Farm B, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Sugar maple	35.3	93.2	9.86	2633
Elm	10.6	30.5	2.95	372
Beech	10.6	6.3	3.28	1230
Basswood	3.8	3.2	.96	393
Hickory	3.7	4.9	1.39	324
N. red oak	2.5	1.1	.66	456
Ironwood, etc.	1.9	10.7	.23	----
White ash	1.2	7.6	.28	81
Hackberry	1.2	2.2	.43	97
Black walnut	0.6	.4	.24	113
Butternut	0.6	.8	.21	81
Red maple	0.6	.8	.26	113
Total	72.6	161.7	20.75	5893
Tree Condition*				
Cull	5.6	20.3	1.13	----
Poor:cut	33.8	79.3	9.21	2331
Poor:leave	5.7	8.8	1.88	519
Good:cut	3.1	1.4	.92	581
Good:leave	24.4	51.7	7.59	2461
Total	72.6	161.5	20.73	5892
DBH Class*				
4-inch	6.3	71.6	.33	----
8-inch	18.1	51.9	4.59	----
12-inch	15.0	19.1	4.82	1214
16-inch	20.0	14.4	6.98	2786
20-inch	5.7	2.6	1.49	733
24-inch	6.9	2.2	2.30	1078
28-inch	.6	.2	.21	81
Total	72.6	162.0	20.72	5892

*See footnotes in Table 7.

about 10 gallons of sirup annually during the next decade. Advice of the local service forester should be sought. The costs and returns from a maple sirup enterprise are presented in Table C17, Appendix C.

Farm C includes two forests, of 61 acres and 22 acres, which comprise 28 per cent of the farm. Forest No. 1 is a stand of pioneer hardwoods, as shown by Table 11. The soil is imperfectly drained loamy sand. The soil is gently sloping with little erosion.[33] It is drouthy when drained, very low in fertility. Stumpage and log prices for this area are low, probably reflecting the low quality of trees grown on these infertile soils. Even a relatively valuable species such as white ash demands only $20 per MBM for sawtimber stumpage on the current market. Current sawtimber stumpage prices, per MBM, include $15 for red maple, $12 for Jack pine, $10 for red oak and elm and $6 for aspen. At these current sawtimber stumpage prices, the timber will have an average value of about $17 per acre for the next decade. Current pulpwood stumpage prices average about $1.25 per cord. Evaluated as a pulpwood stand, average value of the stand for the next decade would be about $12 per acre. This forest can be managed for clearcut pulpwood harvests on a 20-year rotation, harvesting at a stocking level of about 15 cords per acre. This is somewhat below the optimum level of 17 to 18 cords, but allows for annual clearcut harvest of about 3 acres. The alternative is to

[33]Soil Conservation Service, United States Department of Agriculture, Conservation Plan for (name withheld for confidential reasons) farm, 1951.

Table 11. Composition of Forest No. 1, Farm C, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)*
Aspen	21.5	87.4	3.43	221
Red maple	16.0	101.0	1.90	150
White birch	7.0	67.3	.59	----
Elm	4.5	23.4	.52	77
White ash	2.5	14.7	.31	37
Hemlock	2.5	5.6	.38	57
Willow	2.0	8.4	.28	90
S. white oak	1.5	2.4	.34	73
White oak	1.0	1.3	.15	40
Black ash	1.0	7.2	.08	----
Cottonwood	1.0	.4	.32	130
Basswood	0.5	1.4	----	----
Total	61.0	320.5	8.30	875
Tree Condition*				
Cull	7.5	36.3	.59	----
Poor:cut	11.5	72.7	1.28	130
Good:cut	1.6	3.6	.61	167
Good:leave	38.5	207.2	5.81	578
Total	59.1	319.8	8.29	875
DBH Class*				
4-inch	20.0	229.2	1.18	----
8-inch	26.0	74.5	4.09	----
12-inch	11.5	15.3	2.35	618
16-inch	1.5	1.1	.34	127
20-inch	.5	.2	.15	65
24-inch	.5	.2	.17	65
Total	60.0	320.5	8.28	875

*See footnotes in Table 7.

convert the forest to conifers. With the acreage of relatively open land on the farm which can be planted with comparatively little overhead release, clearcutting about four acres each year for the next 15 years might be the better alternative.

Forest No. 2 of Farm C includes 22 acres of mixed hardwoods and pioneer hardwood on imperfectly drained sandy loam.[34] This forest contains a greater percentage of more valuable species, as well as a higher percentage of good growing stock than does forest No. 1. See Table 12. This forest appears to be converting from pioneer hardwoods to a mixture of more permanent species. Composition of this forest provides more timber stumpage value per acre: $46 compared to $17 for forest No. 1. This forest can reach optimum stocking of about 5,000 board feet per acre in about 15 years. This volume should produce perpetually about 300 board feet of sawtimber annually, providing for rough lumber requirements of the farm, sawlogs for sale, and about one-third of a cord of fuelwood--or about 10 standard cords from the forest.

Farm D includes two forests, comprising 86 acres, or about one-fourth of the farm. Forest No. 1 consists of 20 acres on Ogemaw and Munuscong sandy loams: imperfectly drained soils which can be used for some agronomic crops if drained.[35] This forest is essentially a stand of pioneer hardwoods: aspen, red maple and white

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[34] Soil Conservation Service, Ibid.

[35] C. H. Wonser, J. O. Veatch and W. J. DeBoer, Soil Survey of Mason County, Michigan, Bureau of Chemistry and Soils, U. S. Department of Agriculture, Series 1936, No. 1 (Washington: Government Printing Office, 1939), pp. 35-36, 46-47.

Table 12. Composition of Forest No. 2, Farm C, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Red maple	15.0	37.3	3.25	708
Aspen	12.0	28.0	2.12	194
Elm	11.0	36.9	1.46	80
White ash	10.0	14.2	2.81	643
White birch	7.0	54.4	.79	----
White oak	3.0	5.4	.57	114
Cottonwood	2.0	.9	.68	285
Beech	1.0	2.9	.09	----
Hemlock	1.0	2.9	.15	----
Total	62.0	182.9	11.92	2024
Tree Condition*				
Cull	5.0	14.3	.51	----
Poor:cut	20.0	57.2	3.46	456
Good:cut	4.0	1.7	1.19	497
Good:leave	33.0	109.8	6.74	1071
Total	62.0	183.0	11.90	2024
DBH Class*				
4-inch	7.0	80.2	.36	----
8-inch	26.0	74.5	4.11	----
12-inch	17.0	21.6	4.09	776
16-inch	5.0	3.6	1.49	563
20-inch	6.0	2.8	1.62	579
24-inch	1.0	.3	.26	106
Total	62.0	183.0	11.93	2024

*See footnotes in Table 7.

birch, with a few other hardwoods included, Table 13. Present sawtimber stocking is so low that about 35 years would be required to reach the optimum level. Cordwood stocking will average about half the optimum level of approximately 20 cords per acre during the next decade. The optimum cordwood level should be reached in 10 to 15 years. About the only alternatives for this forest are the clear-cutting of about an acre per year on a 20-year cutting cycle, or conversion to Christmas trees or agronomic crops. Present value of the timber is $12 to $15, or about one-half of the bare land value. This low valuation reflects the current low prices offered for sawtimber and pulpwood stumpage. The prices in turn reflect the relative low quality of trees grown on these "hardpan" soils.[36]

Forest No. 2 of Farm D is 61 acres of mixed hardwoods and conifers on Lupton muck.[37] This muck apparently has sufficient internal drainage to allow tree root development, especially of the more shallow-rooted species, because of excellent growth and form of the tamarack and white pine.[38] The present stand is overstocked in smaller diameter classes. About 1,800 board feet of poor:cut trees currently are harvestable per acre, Table 14. Adequate stocking would allow this timber to be removed in a single initial harvest; or, annual sawlog harvests of about 200 board feet per acre, or pulpwood harvests of about one cord per acre annually during the next decade would remove this timber. Because

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[36] *Ibid.*, p. 36.

[37] Wonser, Veatch, and DeBoer, *Ibid.*, pp. 49-50.

[38] Forest Service, *Timber Management Guide for the National Forests of the North Central States: Mixed Conifer Swamp Type*, U. S. Department of Agriculture (Milwaukee, Wisconsin, 1961), p. 2.

Table 13. Composition of Forest No. 1, Farm D, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Aspen	28.3	143.2	5.04	67
Red maple	12.8	55.1	2.37	130
Elm	10.0	38.9	1.41	209
White birch	5.0	31.6	.72	----
Black cherry	3.9	44.6	.09	----
Willow	2.2	1.9	.46	41
Ironwood	1.7	9.6	.14	----
White ash	0.6	6.4	.05	----
Total	64.5	331.3	10.28	447
Tree Condition*				
Cull	3.3	23.9	.18	----
Poor:cut	29.5	106.9	4.69	339
Good:cut	.6	.2	.12	41
Good:leave	31.1	200.2	5.28	67
Total	64.5	331.2	10.27	447
DBH Class*				
4-inch	20.0	229.2	1.04	----
8-inch	31.1	89.2	6.37	----
12-inch	7.8	9.9	1.64	174
16-inch	1.7	1.2	.35	86
20-inch	3.9	1.8	.87	187
Total	64.5	331.3	10.27	447

*See footnotes in Table 7.

Table 14, Composition of Forest No. 2, Farm D, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
White cedar	37.9	219.2	5.48	106
Elm	19.6	26.1	4.79	1381
Aspen	16.5	65.8	4.04	540
Tamarack	14.0	55.7	4.16	519
Willow	11.4	94.1	1.15	----
Hemlock	6.1	29.7	1.29	184
White ash	5.4	49.1	.65	----
Red maple	5.3	11.6	1.45	366
White pine	4.3	4.4	1.48	600
Black cherry	2.2	11.5	.41	46
Yellow birch	1.4	2.8	.35	29
Basswood	1.4	2.8	.35	93
White birch	0.8	4.5	.15	14
Butternut	0.4	.3	.11	38
Total	126.7	577.6	25.86	3916
Tree Condition*				
Cull:	5.3	35.5	.49	----
Poor:cut	33.6	90.4	7.13	1814
Good:cut	4.3	3.3	1.32	465
Good:leave	48.6	244.5	11.78	1532
Special:leave	31.4	197.5	4.34	----
Special:cut	3.2	6.4	.80	106
Total	126.4	577.6	25.86	3917
DBH Class*				
4-inch	34.0	388.8	2.53	----
8-inch	51.8	148.4	11.37	----
12-inch	22.1	28.2	6.44	1887
16-inch	14.3	10.2	4.29	1627
20-inch	3.9	1.8	1.12	356
24-inch	.4	.1	.12	46
Total	126.5	577.5	25.87	3916

*See footnotes in Table 7.

the major portion of the harvestable timber is elm, and Dutch elm disease occurs in this area, close watch must be maintained for signs of serious infection which would justify more rapid removal of this species. Logging operations in this forest would be most efficient during the winter. Although steep inclines border most of the forest, it is readily accessible in several locations. A young pine plantation of about 15 acres is adjacent to forest No. 2. This plantation is currently managed by this cooperator. However, he advised that this acreage soon may be deeded to another member of the family, hence, it has been dropped from the farm inventory.

Farm E includes three forests which occupy 103 acres, or one-third of the farm. All three of the forests are on hilly well-drained sandy loams.[39] The site is adapted only to growing forest crops, and fortunately can produce excellent sawtimber. The quality of trees which are being grown in these forests is indicated by prices quoted by the cooperator for 1964: sugar maple logs in the forest brought $80 to $120 per MBM, and the 'low-quality' species (beech, elm and aspen) brought $35 to $40 per MBM for logs in the forest. The maple prices were 60 to 140 per cent above the average for the area, and even the low-quality logs brought 15 to 30 per cent more. These price differences must reflect quality differences because the higher prices are being paid for logs in the forests, and the topography in these forests offer difficult logging chances.

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[39]Hill and Mawby, *op. cit.*, p. 75.

These forests are in the northern hardwood type group with major species including sugar maple, beech, basswood and yellow birch.[40]

Forest No. 1 is a pole stand.[41] Current stocking recommendations for a northern hardwood forest call for the following basal area: 2"-4" = 10 square feet, 6"-10" = 20 square feet and 12"-24" = 62 square feet.[42] On this basis, as shown in Table 15, stocking is just beginning to move up into sawtimber sizes. Stocking is almost equally divided between good growing stock and cull plus poor:cut. At current prices, the stand is worth about $13.50 per acre, or just about equal to the bare land value. Growth to optimum stocking for sawtimber would require about 30 years. For the next decade, removal of 20 to 25 square feet of basal area of poor:cut aspen and elm by light timber stand improvement cutting or poisoning can improve quality of composition as the trees grow to sawtimber size.

Forest No. 2 of Farm E is a northern hardwoods stand with 1,050 board feet of stocking, Table 16. Compared to the optimum stocking recommendations given in the description of Forest No. 1, sawtimber stocking is about one-third of the optimum. This forest should respond well to silvicultural treatment to increase the sawtimber stocking during the next decade. This forest and Forest No. 3

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[40] Society of American Foresters, Committee on Forest Types, Forest Cover Types of North America (Exclusive of Mexico), (Washington, D. C., 1962), p. 6.

[41] Society of American Foresters, Forestry Terminology, Third Edition, (Washington, D. C., 1958, p. 62.

[42] Forest Service, Timber Management Guide for the National Forests of the Central States: Northern Hardwood Type, U. S. Department of Agriculture (Milwaukee, Wisconsin, 1965), p. 930-1.

Table 15. Composition of Forest No. 1, Farm E, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)*
Basswood	22.2	168.7	2.83	----
Sugar maple	21.1	213.3	.74	----
Aspen	18.9	70.7	3.72	82
Elm	6.7	66.8	.20	----
N. red oak	2.2	6.4	.34	----
Red maple	2.2	6.4	.41	----
Beech	2.2	15.9	.27	----
Ironwood, etc.	1.1	3.2	.10	----
Total	76.6	551.4	8.61	82
Tree Condition*				
Cull	3.3	19.1	.34	----
Poor:cut	35.2	193.8	4.88	82
Good:leave	37.8	337.4	3.38	----
Total	76.3	550.3	8.60	82
DBH Class*				
4-inch	38.9	445.6	1.87	----
8-inch	35.6	101.9	6.26	----
12-inch	2.2	2.8	.47	82
Total	76.7	550.3	8.60	82

*See Footnotes in Table 7.

Table 16. Composition of Forest No. 2, Farm E, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Sugar maple	40.9	278.4	5.06	369
Aspen	10.5	48.2	2.12	73
Elm	6.2	20.3	1.11	162
Red maple	5.7	17.4	1.21	73
Basswood	4.3	5.6	1.05	307
Ironwood, etc.	2.4	19.1	.12	----
Yellow birch	2.0	3.9	.31	38
White ash	1.9	17.7	.22	----
Beech	1.0	2.0	.14	----
N. red oak	0.5	.6	.10	35
Hemlock	0.5	5.5	-----	----
Total	75.9	418.7	11.44	1057
Tree Condition*				
Cull	2.4	13.1	.27	----
Poor:cut	31.9	121.2	5.75	369
Good:cut	2.9	1.3	.77	316
Good:leave	38.6	283.2	4.67	373
Total	75.8	418.8	11.46	1058
DBH Class*				
4-inch	27.1	311.0	1.26	----
8-inch	31.4	90.1	6.32	----
12-inch	11.4	14.5	2.44	568
16-inch	2.9	2.0	.67	210
20-inch	1.9	.9	.47	121
24-inch	1.0	.3	.31	160
Total	75.7	418.8	11.47	1059

*See footnotes in Table 7.

have considerable potential for a maple sirup enterprise using tubing. Sap volume and sweetness can be increased by annual harvests of other species to increase the proportion of sugar maple, and to widen spacing to allow them to develop deeper, fuller crowns. About 40 taps can be made per acre during the next decade. The number should approach the optimum of about 100 taps per acre during the second decade. The average number of taps per acre by DBH Classes for the next decade should be: 8-inch class (9" to 10" trees) = 22 taps, 12-inch class = 15 taps, 16-inch class = 4 taps, and 20-inch class = 1 tap. The total forest would allow about 3,400 taps.

Forest No. 3 on Farm E possesses the best species composition, highest volume of stocking, and steepest slopes. Based on Forest Service recommendations,[43] current sawtimber stocking is about 45 per cent of optimum. The entire stand is somewhat understocked, but the optimum could be achieved within a decade with management. Almost three-fourths of the basal area is in the more valuable species. See Table 17. This forest also has potential as a sugar bush. It will provide an average of about 50 taps per acre during the next decade. However, this forest is tappable only with tubing. The volume of poor:cut trees would allow harvesting of about 100 board feet per acre per year during the next decade. Optimum stocking of about 6,600 board feet would occur in about 20 years. This assumes the poor:cut trees are harvested during the first decade.

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[43] Ibid.

Table 17. Composition of Forest No. 3, Farm E, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Sugar maple	40.8	178.3	7.20	751
Beech	11.3	18.9	2.37	388
White ash	5.7	9.6	1.41	306
Elm	5.1	6.6	1.26	298
Yellow birch	3.2	10.0	.53	50
Hemlock	3.1	2.3	.80	337
Red maple	2.5	12.5	.33	----
Basswood	1.9	.9	.53	224
Ironwood	1.9	4.4	.29	----
White pine	0.6	.8	.19	66
N. red oak	0.6	.4	.13	46
Aspen	0.6	1.8	.13	----
Total	77.3	246.5	15.17	2466
Tree Condition*				
Cull	2.5	9.2	.41	----
Poor:cut	33.2	97.1	6.38	813
Good:cut	8.8	6.8	2.24	911
Good:leave	32.5	133.6	6.12	741
Total	77.0	246.5	15.15	2465
DBH Class*				
4-inch	10.6	121.8	.75	----
8-inch	31.3	89.6	6.17	----
12-inch	20.7	26.2	4.86	1313
16-inch	10.0	7.2	2.11	624
20-inch	3.8	1.7	1.12	449
24-inch	.6	.2	.16	81
Total	77.0	246.7	15.17	2467

*See footnotes in Table 7.

Farm F included three forests which cover 98 acres, or about 30 per cent of the farm. An additional 45 acres are occupied by Greenwood peat which supports a few black spruce. This is not considered as part of the forest area.

Forest No. 1 is a 25-acre northern hardwood pole stand. Sugar maple comprises 68 per cent of the stocking, Table 18. The stand has been tapped lightly for maple sirup production. The soil underlying this forest is a gravelly sandy loam with internal drainage retarded by a clay subsoil.[44] The soil survey described this as Ogemaw sandy loam, gravelly phase. However, the Soil Capability Map of the Conservation Plan prepared for the farm by the Soil Conservation Service in 1961 describes the soil as a Kiva gravelly sandy loam. The Plan recommends continuing this area in forest with management emphasis on sugar maple. Although height of the dominant trees reflect the medium productivity of the site, sugar maples released by timber stand improvement cuttings have developed extensive, healthy crowns which could produce large volumes of high-test sap. About 50 taps per acre could be sustained during the next decade. Current stocking of sawtimber is about one-fourth of the optimum on the bases of Forest Service Standards[45] and the optimum economic stocking of about 5,100 board feet.

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[44] Z. C. Foster et al. Soil Survey of Cheboygan County, Michigan, U. S. Department of Agriculture, Series 1934, No. 15 (Washington: Government Printing Office, 1939), pp. 20-21.

[45] Forest Service, loc. cit.

Table 18. Composition of Forest No. 1, Farm F, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Sugar maple	47.0	284.3	6.21	671
Aspen	14.5	22.8	3.44	665
Ironwood, etc.	9.2	52.9	1.36	----
Elm	3.8	8.1	.88	138
Balsam fir	1.5	17.6	.14	----
White birch	1.5	4.4	.28	----
Basswood	0.8	2.2	.07	----
Hemlock	0.8	.6	.20	82
Beech	0.8	8.8	----	----
Total	79.9	401.7	12.58	1556
Tree Condition*				
Cull	3.1	28.6	.07	----
Poor:cut	17.7	114.7	2.97	138
Good:cut	10.7	25.4	2.62	522
Good:leave	36.1	208.1	5.07	645
Special:leave	8.5	25.1	1.39	251
Total	79.9	401.9	12.12	1556
DBH Class*				
4-inch	24.6	282.1	1.21	----
8-inch	33.1	94.8	6.26	----
12-inch	16.9	21.5	3.79	966
16-inch	3.8	2.8	.92	408
20-inch	1.5	.7	.40	182
Total	79.9	401.9	12.58	1556

*See footnotes in Table 7.

Forest No. 2 of Farm F is a northern hardwood stand which currently is overstocked: 101 square feet of basal area compared to 92 square feet recommended by the Forest Service,[46] Table 19. Overstocking is in the sapling and pole sizes.

At 42 square feet sawtimber sizes represent about two-thirds optimum stocking. With timber stand improvement to reduce stocking of poor:cut seedlings and saplings by about 20 square feet, optimum stocking could grow to the optimum level within the first decade. Stocking and growth of this stand would allow annual harvests of up to 400 board feet per acre from poor:cut and good:cut classes during the next decade. This would postpone optimum stocking until the second decade. This forest includes a 5-acre stand on Onaway fine sandy loam. Onaway loam is one of the best soils in this area for agronomic crops;[47] so, unless this stand is to be developed into a sugarbush, it probably should be converted to agronomic crops because the cooperator has only a few acres of soil of this quality.

Forest No. 3 of Farm F is an aspen stand with an understory of balsam fir. See Table 20. Current pulpwood prices for balsam fir are $2.40, $14.40 and about $24.00 per cord for stumpage, at road, and delivered, respectively; compared to $1.25, $7.40 and $12.40 per cord for aspen. So, the balsam fir should be favored by

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[46] Ibid.

[47] Foster et al., op. cit., p. 11.

Table 19. Composition of Forest No. 2, Farm F, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Sugar maple	46.0	221.6	7.61	2012
Basswood	17.0	23.3	4.60	1575
Aspen	15.0	38.2	3.61	318
Hemlock	6.0	34.4	.66	----
White birch	6.0	40.8	.71	130
White pine	3.0	1.8	.94	415
Beech	3.0	5.4	.73	114
Ironwood, etc.	3.0	34.4	----	----
Elm	1.0	1.3	.21	40
Balsam fir	1.0	1.3	.26	74
Total	101.0	402.5	19.33	4678
Tree Condition*				
Cull	6.0	43.0	.27	----
Poor:cut	16.0	118.4	1.64	154
Good:cut	19.0	30.8	4.80	1314
Good:leave	46.0	185.7	9.37	2062
Special:leave	14.0	24.6	3.25	1148
Total	101.0	402.5	19.33	4678
DBH Class*				
4-inch	23.0	263.6	.53	----
8-inch	36.0	103.2	7.18	----
12-inch	16.0	20.4	4.35	1460
16-inch	16.0	11.5	4.61	1997
20-inch	5.0	2.3	1.29	571
24-inch	5.0	1.6	1.38	650
Total	101.0	402.6	19.34	4678

*See footnotes in Table 7.

Table 20. Composition of Forest No. 3, Farm F, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Aspen	44.0	170.3	7.51	767
Balsam fir	17.5	165.4	1.46	37
White birch	6.5	57.3	.54	----
Elm	2.0	3.9	.36	57
Black cherry	1.0	11.5	.09	----
Sugar maple	1.0	11.5	.04	----
Tamarack	1.0	2.9	.18	----
Total	73.0	422.8	10.18	861
Tree Condition*				
Cull	3.0	14.8	----	----
Poor:cut	13.0	81.9	1.60	208
Good:cut	9.0	29.1	1.83	485
Good:leave	48.0	296.8	6.77	168
Total	73.0	422.6	10.20	861
DBH Class*				
4-inch	27.5	315.1	1.46	----
8-inch	33.0	94.6	6.10	----
12-inch	8.5	10.2	1.48	426
16-inch	3.0	2.2	.72	264
20-inch	1.0	.5	.28	106
24-inch	.5	.2	.15	65
Total	73.5	422.8	10.19	861

*See Footnotes in Table 7.

all means.[48] Soils under this forest include Detour stony loam and Munuscong sandy loam. The latter is a more productive soil and better adapted to growing balsam fir,[49] so this species should be especially favored on the west and north areas of the forest where this soil occurs. If clearcutting a portion of the overtopping hardwoods each year proves to be the most profitable enterprise for this forest, other release treatment may not be necessary.

Farm G includes 6 forests totalling 198 acres, or 42 per cent of the farm. Four of the forests are northern hardwood stands, and the other two are pine plantations. Forests No. 2, 3 and 4 are 1 - 1½ miles from the rest of the farm. Forest No. 1 is a 59-acre sugar maple-beech-yellow birch stand which includes also appreciable amounts of red maple, elm and hemlock. The forest is on loamy sand soil with rolling to steep topography. The stocking of this stand almost matches the total desired basal area recommended by the Forest Service: 98 square feet compared to the recommended 92 square feet.[50] See Table 21. However, the distribution among tree sizes is contrary to the recommendation: for saplings (4"), poles (8"), and sawtimber (12" plus) the distribution is 28, 41, and 28 square feet of basal area; rather than the recommended 10, 20, and 62 square feet, respectively, for the three tree sizes.

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[48] Forest Service, Timber Management Guide for the National Forests of the North Central States: Aspen-Paper Birch Type, U. S. Department of Agriculture (Washington, D. C., 1958), p.10.

[49] Foster *et al*., *op*. *cit*., p. 21.

[50] Forest Service, Timber Management Guide . . . : Northern Hardwood Type, *loc*. *cit*.

Table 21. Composition of Forest No. 1, Farm G, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Sugar maple	54.5	287.2	8.32	811
Beech	14.5	81.6	2.31	202
Yellow birch	8.5	33.1	1.46	143
Red maple	6.2	12.3	1.42	169
Elm	6.2	9.0	1.72	346
Hemlock	5.3	45.6	.47	138
White pine	0.8	.6	.20	100
Butternut	0.8	2.2	.16	----
Ironwood, etc.	0.8	2.2	.12	----
Total	97.6	473.8	16.18	1909
Tree Condition*				
Cull	8.4	61.5	.61	----
Poor:cut	32.3	148.5	5.53	495
Good:cut	3.1	1.7	.79	345
Good:leave	53.8	263.2	9.26	1069
Total	97.6	474.9	16.19	1909
DBH Class*				
4-inch	28.4	326.2	1.33	----
8-inch	40.8	116.8	7.72	----
12-inch	21.5	27.4	5.40	1232
16-inch	5.4	3.9	1.35	514
20-inch	.8	.4	.20	82
24-inch	.8	.2	.20	82
Total	97.7	474.9	16.20	1910

*See footnotes in Table 7.

Also, about one-third of the stocking is classed as poor-cut, so quality as well as volume would benefit from light improvement cuts and thinnings. These could produce a stand with optimum stocking of about 6,100 board feet per acre in about 15 years. This forest provides an excellent opportunity for initiating a maple sirup enterprise. During the next decade about 56 taps per acre can be made with tubing.

Forest No. 2 of Farm G covers 52 acres of the farm's most productive soil with an overstocked pole stand of sugar maple, elm and basswood. See Table 22. The sandy loam is excellent for potato production.[51] The high proportions of sugar maple in the larger DBH classes are of sufficient size to provide an average of about 60 taps per acre during the next decade. Also, this forest supports enough sawtimber volume to allow light improvement harvests while it is growing to an optimum level of stocking. Therefore, a decision must be made concerning the future use of this land: potatoes, maple sirup or sawtimber. Current value of the timber is about $70 per acre. With light improvement cuttings and thinnings the forest could grow to optimum stocking during the second decade. Value of the timber then would be about $144 per acre.

Forest No. 3 on Farm G is a 34-acre pole stand of northern hardwoods. This stand, too, is overstocked. See Table 23. Saplings and poles represent 72 per cent of stocking. The site is rolling,

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[51] Hill and Mawby, op. cit., p. 74.

Table 22. Composition of Forest No. 2, Farm G, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Sugar maple	58.0	297.6	9.33	950
Elm	37.0	112.2	7.51	906
Basswood	14.0	24.6	3.54	744
Hemlock	1.0	.7	.21	74
Total	110.0	435.1	20.59	2674
Tree Condition*				
Cull	6.0	41.4	.92	----
Poor:cut	37.0	116.4	7.07	1022
Poor:leave	1.0	2.9	.21	----
Good:leave	66.0	275.3	12.40	1652
Total	110.0	436.0	20.60	2674
DBH Class*				
4-inch	21.0	240.6	1.19	----
8-inch	55.0	157.6	10.66	----
12-inch	24.0	30.6	6.08	1718
16-inch	10.0	7.2	2.66	956
Total	110.0	436.0	20.59	2674

*See footnotes in Table 7.

Table 23. Composition of Forest No. 3, Farm G, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)*
Sugar maple	34.6	186.2	5.47	453
Elm	24.5	67.6	5.53	771
Yellow birch	20.0	59.3	3.66	140
Hemlock	8.2	44.7	.97	118
Red maple	7.3	25.2	1.37	67
Ironwood, etc.	5.5	46.9	.22	----
Beech	4.5	5.5	.86	200
Black cherry	3.6	9.0	.80	96
Basswood	0.9	1.2	.31	96
Total	109.1	445.6	19.19	1941
Tree Condition*				
Cull	6.3	21.2	.88	----
Poor:cut	47.3	153.3	8.66	1305
Good:cut	.9	.4	.23	118
Good:leave	54.6	270.7	9.39	518
Total	109.1	445.6	19.16	1941
DBH Class*				
4-inch	21.8	250.0	.80	----
8-inch	57.3	164.1	11.56	----
12-inch	19.1	24.3	4.28	1080
16-inch	8.2	5.9	1.88	609
20-inch	2.7	1.2	.66	253
Total	109.1	445.5	19.18	1942

*See footnotes in Table 7.

suited only to forest crops. The soil is a loamy sand which originally supported a cover of hardwoods, especially sugar maple.[52] One-third of the present stand is sugar maple and this forest will provide about 45 taps per acre in about 10 years. Timber stand improvement, including light harvest cuts of the poor:cut timber, should produce a forest with optimum stocking of about 6,000 board feet in about 25 years. This forest includes a considerable stocking of yellow birch. To encourage this species in areas of the forest where it shows desirable form and health, harvest cuts should be made by the group-selection method.[53]

Forest No. 4 of Farm G is a 25-acre northern hardwood forest on a loamy sand with rolling topography. Although Table 24 shows sugar maple to have the highest percentage of current stocking, white pine represents one-half of the sawtimber basal area. If this species is to be encouraged, the shelterwood method should be used for harvests of sawtimber, with subsequent control of more tolerant hardwoods which will regenerate with pine reproduction.[54] Sapling and pole sizes are overstocked. These sizes, especially, will need careful control if white pine reproduction is to compete after regeneration harvest.

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[52] _Ibid._

[53] Forest Service, _Timber Management Guide . . . : Northern Hardwood Type_, _op. cit._, p. 951.

[54] Forest Service, _Timber Management Guide for the National Forests of the North Central States: White Pine Type_, U. S. Department of Agriculture (Milwaukee, Wisconsin, 1958), p. 3.

Table 24. Composition of Forest No. 4, Farm G, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)*
Sugar maple	28.8	207.9	3.16	282
White pine	21.2	56.4	5.25	2161
Red maple	15.6	121.0	1.82	----
Ironwood, etc.	14.4	146.4	.96	----
White birch	7.8	28.3	1.58	127
Aspen	7.8	20.0	1.79	480
Black cherry	2.2	15.9	.41	----
Hemlock	2.2	4.6	.34	82
Beech	2.2	6.4	.34	----
Yellow birch	1.1	1.4	.24	82
Total	103.3	608.3	15.89	3214
Tree Condition*				
Cull	3.3	7.8	.24	----
Poor:cut	41.1	273.1	5.03	736
Good:cut	5.6	3.4	1.43	670
Good:leave	53.4	324.0	9.19	1809
Total	103.4	608.3	15.89	3215
DBH Class*				
4-inch	43.3	496.6	2.97	----
8-inch	27.8	79.6	5.12	----
12-inch	17.8	22.6	3.79	1396
16-inch	11.1	8.0	3.06	1357
20-inch	3.3	1.5	.97	462
Total	103.3	608.3	15.91	3215

*See footnotes in Table 7.

Forest No. 5 is composed of 11 acres of 3-year old plantation red pine, Scotch pine and white spruce. It is on the same soil as Forest No. 1: loamy sand, but with steep topography. This plantation can be managed for Christmas trees, pulpwood and/or sawtimber.

Forest No. 6 is composed of 17 acres of 15-year old red pine plantations. The soil is loamy sand on rolling to steep topography. This forest is past Christmas tree size, but can be managed for pulpwood and/or sawtimber. Possible yields are presented in Table C19, Appendix C.

Farm H includes two forests, a sugar maple stand of 49 acres and a smaller 9-acre mixed hardwood stand in which aspen, red maple and elm comprise one-half the basal area. Forest No. 1 is overstocked in the pole sizes. See Table 25. However, it approaches optimum stocking percentages: 38 per cent of its basal area in saplings and poles versus 33 per cent recommended by the Forest Service, and 62 per cent in sawtimber versus 67 per cent recommended.[55] This forest should yield annually 300 - 400 board feet of valuable sawtimber or logs per acre. At current prices, this annual production is worth about $9 in stumpage and about $18 in the form of logs at the road. Because of the abundance of sugar maple, at least 50 taps could be expected annually per acre during the next decade. The second decade the number would be about 100 taps per acre. Tubing could be used from the trees to collecting tanks along a forest road.

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[55] Forest Service, Timber Management Guide . . . : Northern Hardwood Type, op. cit., p. 930--1.

Table 25. Composition of Forest No. 1, Farm H, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	(board feet)*
Sugar maple	62.3	160.6	16.11	3410
Elm	18.0	43.7	4.59	645
Hemlock	13.0	20.6	3.60	1286
Basswood	9.7	10.1	3.14	1176
Beech	2.4	6.3	.52	73
White pine	2.0	1.8	.73	320
Red maple	1.7	2.7	.43	92
Black cherry	1.0	4.2	.28	112
White ash	0.7	.7	.24	65
Ironwood, etc.	0.6	1.4	.14	----
Total	111.4	252.1	29.78	7179
Tree Condition*				
Cull	6.3	24.2	1.01	13
Poor:cut	34.7	91.4	7.79	1212
Good:cut	9.3	5.9	2.99	1227
Good:leave	61.0	130.5	17.94	4725
Total	111.3	252.0	29.73	7177
DBH Class*				
4-inch	7.6	87.8	.56	----
8-inch	34.7	99.4	8.42	----
12-inch	31.7	40.3	9.27	2570
16-inch	29.7	21.2	9.08	3610
20-inch	6.0	2.8	1.93	789
24-inch	1.7	.5	.53	208
Total	111.4	252.0	29.79	7177

*See footnotes in Table 7.

Forest No. 2 of Farm H covers only 9 acres. It is located about one mile from the farmstead. Stocking is high in sapling and pole sizes. See Table 26. Present value of the timber in Forest No. 2 is about $26 per acre. This value could be doubled within a decade. Species, composition and distribution of stocking among diameter classes can be improved by judicious improvement harvests to remove the merchantable poor:cut trees, and subsequent chemical thinning of the unmerchantable ones. This timber stand improvement work could produce optimum stocking of about 6,700 board feet in 10 to 15 years.

Farm I includes three forests of 49, 180 and 160 acres which constitute 57 per cent of the total farm area. Forest No. 2 is located about one mile from the farmstead. Forest No. 3 is about 10 miles from the farmstead. These forests have been cut over for pulpwood and the cooperator has left well-formed trees. The resulting forest composition has become a mixture of patches of intolerant hardwoods among tolerant hardwoods and conifers.

Forest No. 1 is a 49-acre stand of pioneer hardwoods on sandy loam and loamy sand and mixed conifer-hardwoods on muck soil. The central muck area covers about one-fourth of the forest. Current stocking of 11.8 cords or 1,811 board feet per acre is about one-half of the optimum. See Table 27. Condition of this forest is above average. At optimum stocking the forest should yield about one-half cord per acre annually or about 200 board feet. These volumes would be in species with steady demand for pulpwood but uncertain demand for sawtimber: aspen, white birch, red maple. If pulpwood is to be

Table 26. Composition of Forest No. 2, Farm H, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)*
Aspen	24.0	53.0	7.00	2046
Red maple	14.0	108.9	1.83	----
Elm	14.0	50.9	2.58	228
Yellow birch	10.0	45.8	1.53	----
N. whitecedar	10.0	114.6	.53	----
Sugar maple	8.0	40.1	1.67	----
White birch	6.0	28.0	1.70	360
White ash	4.0	45.8	.18	----
Hemlock	2.0	2.6	.52	212
Total	92.0	489.7	17.54	2846
Tree Condition*				
Cull	2.0	5.7	.31	----
Poor:cut	40.0	198.6	7.15	884
Good:cut	4.0	4.0	1.43	670
Good:leave	36.0	166.8	7.93	1292
Special:leave	10.0	114.6	.53	----
Total	92.0	489.7	17.35	2846
DBH Class*				
4-inch	32.0	366.7	2.84	----
8-inch	30.0	86.0	5.91	----
12-inch	28.0	35.6	8.12	2486
16-inch	2.0	1.4	.68	360
Total	92.0	489.7	17.55	2846

*See footnotes in Table 7.

Table 27. Composition of Forest No. 1, Farm I, Per Acre*

Species	Basal Area (square feet)	Trees (number)	Volume (cords)**	Volume (board feet)**
N. whitecedar			.91	40
Black ash			.25	40
Red maple			1.38	106
Elm			2.08	384
White birch			1.44	326
Aspen			1.73	539
Yellow birch			2.28	114
Balsam fir			1.70	262
Total	77.0		11.77	1811
Tree Condition**				
Cull	3.0			
Good:cut	31.0			
Good:leave	34.0			
Special:leave	5.0			
Special:cut	4.0			
Total	77.0			
DBH Classes				

*Loss of data sheet prevents detailed presentation of basal area and numbers of trees per acre by species, number of trees and volumes by tree condition and of data by DBH Classes.

**See footnotes in Table 7.

the primary forest crop harvested from this forest, balsam fir should be favored whenever possible because of premium pulpwood prices received for this species.[56]

Forest No. 2 comprises 180 acres of mixed northern hardwoods and conifer. See Table 28. Total stocking is approaching 90 square feet of basal area, but 60 per cent is in the sapling and pole classes. Continued harvests of pulpwood will maintain this imbalance. If pulpwood remains the primary crop to be harvested from this forest, spruce and fir should be encouraged. The forest will yield about one-half cord of pulpwood per acre annually. The soils are loamy sands and sandy loams. An area of muck soil occurs under about 10 per cent of the forest. Topography is rolling, but does not hinder logging operations.

Forest No. 3 of Farm I is a quarter-section located about 10 miles from the farm. This 160-acre forest is underlain with level, poorly drained loams which have a sandy overburden.[57] Northern whitecedar comprises 43 per cent of present basal area. See Table 29. This forest will yield about one-half cord of pulpwood, or an equivalent volume of cedar posts, while stocking is increasing. At the current price of $.30 for an 8-foot post with a 7-inch top, at the farm, a cord of cedar posts of this size would be worth about $9.00. This assumes 30 posts per cord.

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[56]Forest Service, Timber Management Guide . . . : Aspen-Paper Birch Type, loc. cit.

[57]Hill and Mawby, op. cit., p. 73-74.

Table 28. Composition of Forest No. 2, Farm I, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)*
Aspen	30.8	113.6	6.13	784
White birch	22.4	135.4	3.19	78
Elm	8.0	39.5	1.0	121
Sugar maple	5.2	38.3	.53	----
N. whitecedar	4.0	34.7	.32	16
Beech	4.0	8.7	.72	254
Red maple	2.4	13.8	.35	----
Basswood	1.6	5.8	.25	111
White ash	1.2	6.2	.26	16
White spruce	.8	1.7	.16	30
Balsam fir	.8	9.1	.04	----
Yellow birch	.8	5.7	.06	----
Hemlock	.4	1.1	.04	----
Total	82.0	413.6	13.05	1410
Tree Condition*				
Cull	3.6	33.1	-----	----
Poor:cut	5.2	8.0	.88	231
Poor:leave	2.8	21.8	.28	----
Good:cut	21.2	43.2	4.44	830
Good:leave	46.0	277.3	7.06	332
Special:leave	2.8	28.7	.20	----
Special:cut	.8	1.4	.12	16
Total	82.4	413.5	12.98	1409
DBH Class*				
4-inch	24.8	284.2	1.24	----
8-inch	37.2	105.8	6.83	----
12-inch	15.2	19.3	3.72	970
16-inch	4.0	2.9	.99	342
20-inch	1.2	.6	.21	98
Total	82.4	413.8	12.99	1410

*See footnotes in Table 7.

Table 29. Composition of Forest No. 3, Farm I, Per Acre

Species	Basal Area (square feet)	Trees (number)	Volume (cords)*	Volume (board feet)*
N. whitecedar	32.5	240.0	3.03	228
Aspen	11.0	46.3	2.09	111
White birch	8.5	53.4	.88	20
Balsam fir	7.5	73.0	.47	----
Red maple	5.0	17.0	.87	74
Hemlock	3.5	16.0	.61	110
White spruce	2.5	20.0	.23	----
White pine	2.5	14.7	.28	65
Black ash	1.5	12.9	.08	----
Beech	0.5	.4	-----	----
Total	75.5	493.8	8.54	608
Tree Condition*				
Cull	4.5	37.6	-----	----
Poor:cut	0.5	1.4	.08	----
Good:cut	7.0	14.4	1.41	249
Good:leave	32.0	213.1	4.00	131
Special:leave	25.5	214.1	1.87	20
Special:cut	6.5	13.1	1.16	208
Total	75.5	493.7	8.52	608
DBH Class*				
4-inch	34.0	389.6	1.02	----
8-inch	32.5	93.2	5.29	----
12-inch	7.5	9.5	1.79	470
16-inch	2.0	1.4	.41	138
Total	76.0	493.7	8.51	608

*See footnotes in Table 7.

For forest enterprises which include timber stand improvement (TSI), resource and labor requirements for chemical TSI were obtained from Indiana studies.[58] Requirements are pressnted graphically in Figure 3. Costs are estimated to be $.50 per gallon of solution: (1 gallon concentrate 2,4-D + 2,4,5-T, @ 2 lbs. acid equivalent of each = $8.70 plus 20 gallons of fuel oil @ $.16 = $1.20) = $.47 per gallon of solution. Add $.03 for equipment costs.

The amount of timber stand improvement needed was estimated in terms of total diameter of trees. One estimate was prepared for all cull trees plus the 4-inch class trees in the poor:cut condition class. This is used for cordwood enterprises which include timber stand improvement. Another estimate included the 8-inch class trees of the poor:cut condition class. This estimate is used for sawtimber enterprises which include timber stand improvement. These residual low-quality trees should be removed after a harvest cut to improve the value of the growing stock which remains after the harvest.

Landowners who improve their forests with the guidance of foresters are eligible for cost-sharing not to exceed 75 per cent of the improvement expenses through the Agricultural Conservation Program of the U. S. Department of Agriculture. Owners of study farms are assumed to have followed the management recommendations of foresters after having decided which forest enterprises to include

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[58] John C. Callahan, _Labor, Machine, and Chemical Requirements for Improving Woodlands on the Southern Indiana Forage Farms_, Agricultural Experiment Station, Purdue University, Research Progress Report 118, Project 691 (Lafayette, Indiana, 1962).

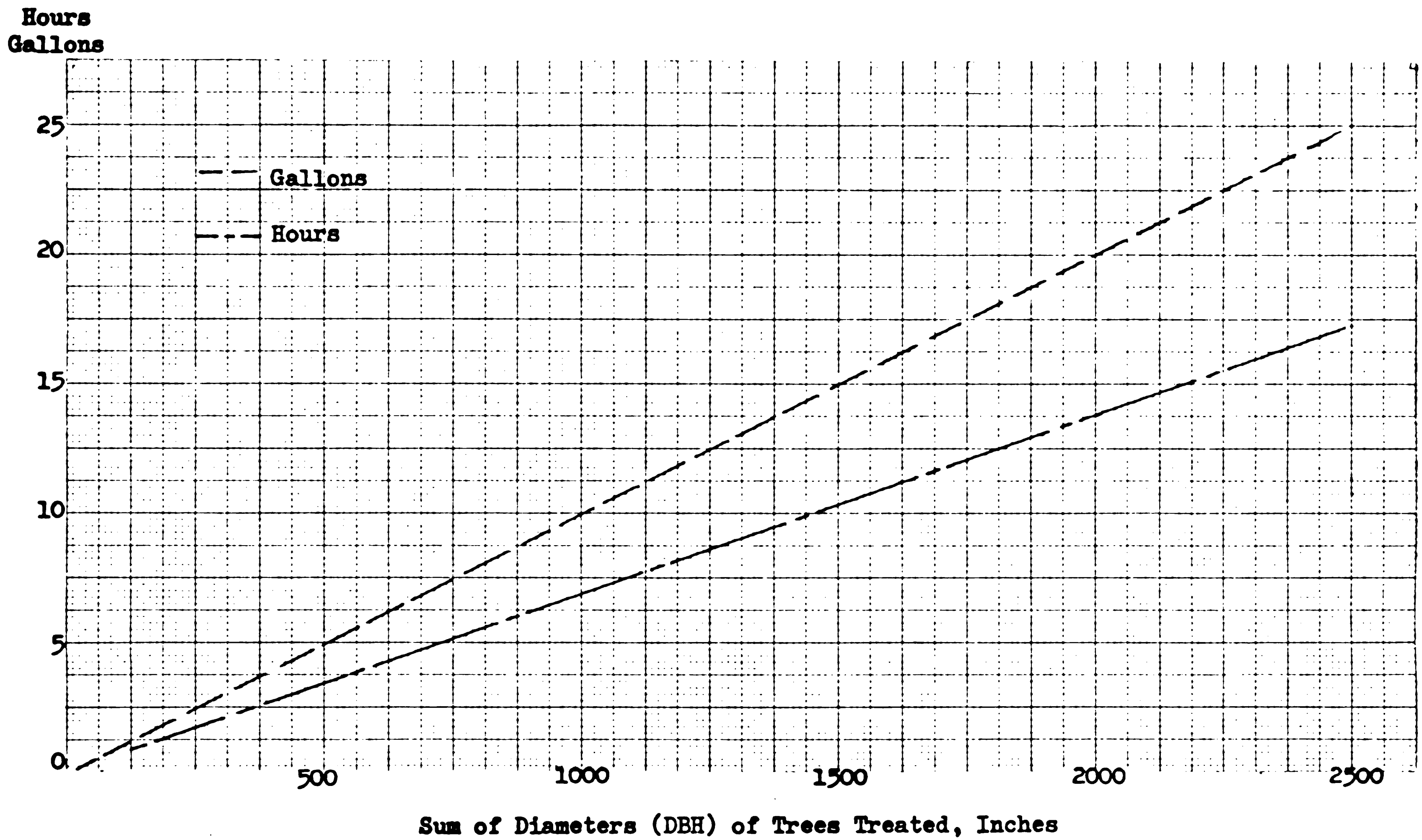

Figure 3. Gallons of Solution and Hours of Labor Frill-and-Spray Treatment, Chemical Timber Stand Improvement

in their farm plans. The owners are assumed to have applied for and received Agricultural Conservation Program (ACP) payments for their timber stand improvement work. Payments for chemicals were estimated on the basis of 1964 rates of cost sharing: 0-4" diameter trees at $1.00 per square foot of basal area, 5"-8" diameter trees at $.65 per square foot, 9"-12" trees at $.40 and 13"+ trees at $.30. These rates were graphed and interpolated to $.85 per square foot for 4"-class trees, $.55 for 8"-class trees, and $.35 for 12"-class and larger trees. Payments for labor were based on labor requirements estimated with Callahan's data.[59] Payment was at $1.50 per hour. Costs of timber stand improvement and amounts of Agricultural Conservation Program cost-sharing for the study farms are presented in Table 30.

For forest enterprises which required the use of a chain saw, cost estimates were derived from a study in North Carolina.[60] Original costs were inflated 10 per cent to represent mid-1960 estimates: operating costs = $.18 per hour and ownership costs = $.32 per hour.

Tractor costs for forest enterprises were estimated as follows: for each farm, hours of labor per acre for crops[61] were multiplied

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[59] Callahan, loc. cit.

[60] Birger W. Ellertsen and John C. Allen, Forestry Input and Output Data, Parker Branch Pilot Watershed, TVA Division of Forestry Relations, Technical Note 27 (Tennessee Valley Authority, Norris, Tennessee, 1960), p. 9.

[61] Brake et al., op. cit., p. IA1

Table 30. Costs of Timber Stand Improvement and ACP Cost-Sharing, 0.1 Acre*

Farm	Forest	Sum of Diameter To Be Poisoned		ACP Cost-Sharing**		Operating Costs ($.005 per inch/diameter)		Labor	
		Sawtimber (inches)	Cordwood (inches)	Sawtimber (dollars)	Cordwood (dollars)	Sawtimber (dollars)	Cordwood (dollars)	Sawtimber (Man Hours)	Cordwood (Man Hours)
B	1	26.2	----	$ .68	$----	$ .13	$----	.17	---
	2	32.7	----	1.33	----	.16	----	.22	---
C	1	53.9	43.6	1.43	1.10	.27	.22	.36	.30
	2	41.2	20.6	1.12	.52	.20	.10	.28	.13
D	1	----	----	----	----	----	----	---	---
	2	54.8	39.0	1.40	.96	.28	.20	.37	.26
E	1	51.0	43.4	1.26	1.06	.26	.22	.34	.29
	2	----	----	----	----	----	----	---	---
	3	52.7	22.4	1.38	.54	.26	.11	.35	.15
F	1	----	----	1.48	1.48	----	----	---	---
	2	71.2	62.0	1.76	1.53	.36	.32	.47	.43
	3	61.6	61.6	1.56	1.56	.31	.31	.42	.42
G	1	94.7	60.2	2.17	1.43	.48	.30	.66	.40
	2	81.8	38.3	2.16	.94	.41	.18	.55	.25
	3	91.0	43.1	2.44	1.06	.45	.22	.63	.28
	4	123.4	98.2	3.10	2.39	.62	.48	.87	.67
H	1	59.1	28.1	1.58	.70	.30	.14	.40	.18
	2	96.4	59.8	2.49	1.45	.48	.30	.65	.40

*Use of 0.1 acre allows distribution of costs and cost-sharing over 10-year period. Actually, 10 per cent of acreage probably would receive timber stand improvement each of 10 years.

**@.75 ($.85 x basal area 4"-class + $.55 x basal area 8"-class + $.35 x square 12" and larger classes) + $1.50 x man hours.

by average acres in crops to obtain an estimate of annual use. Operating and ownership costs per hour were then selected from the Midwest Farm Planning Manual.[62]

Estimates of labor, chain saw and tractor requirements for forest enterprises which included sale of logs were based on estimates by Campbell[63] and Callahan.[64] These estimates assume less than 1,000 board feet of logs harvested per acre. Of course, larger volumes would be harvested from smaller acreages if the regeneration desired were more intolerant species. Some economics of scale would be realized under these circumstances. The following labor requirements were used per 1,000 board feet: scaling - 0.3 hours; felling, bucking and skidding - 8.5 hours = 8.8 or 9 man-hours total. Chain saw time was estimated to be 3.7 hours per 1,000 board feet of logs: $.67 operating cost and $1.18 ownership cost. At 3.3 hours per 1,000 board feet of logs, tractor operating cost was $3.33. Tractor ownership costs differed among farms because of varying amounts of annual usage. Ownership costs per 1,000 board feet of logs were:

Farm A - $1.65	Farm D - $1.65	Farm G - $1.71
Farm B - 1.15	Farm E - 1.68	Farm H - 2.97
Farm C - 1.78	Farm F - 3.53	Farm I - 1.52

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[62] S. C. James (ed.), Midwest Farm Planning Manual, (Ames, Iowa: Iowa State University Press, 1965), p. 74.

[63] Robert A. Campbell, Ten Years of Experimental Farm Woodland Management in the Southern Appalachians, Southeastern Forest Experiment Station, U. S. Forest Service, Station Paper No. 83 (Asheville, North Carolina, U. S. Department of Agriculture, 1957), p. 10.

[64] Callahan, op. cit., p. 12.

These tractor costs are somewhat high because they do not include anticipated forest enterprise usage.

For forest enterprises which included sales of pulpwood, labor to cut, buck, skid and stack at the road are estimated at 7 man-hours.[65] This assumes less than one cord harvested per acre per year. As with sawlogs, economies of scale will be realized if more volume is harvested from less area. Chain saw costs are based on two hours per cord:[66] $.36 operating costs and $.64 ownership costs. Tractor costs were based on an estimate of 1 hour per cord.[67] Therefore, costs per cord at the road are $1.01 operating costs plus the following ownership costs:

Farm A - $----	Farm D - $ .50	Farm G - $ .52
Farm B - ----	Farm E - .63	Farm H - .90
Farm C - .54	Farm F - 1.07	Farm I - .46

One cooperator owns a pulpwood truck with loader. His loading and hauling labor and costs are estimated to be 0.75 hours and $1.65 per cord.[68]

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[65] Campbell, _loc. cit._

[66] J. S. Hensel, _A Northeastern Minnesota Pulpwood Operation_, American Pulpwood Association, Technical Release No. 60-R12 (New York, N. Y.: 1960), p. 4.

[67] J. S. Hensel, _A Pulpwood Operation in the Central Upper Peninsula of Michigan_, American Pulpwood Association, Technical Release No. 60-R10 (New York, N. Y.: 1960), p. 4.

[68] J. S. Hensel, _A Jack Pine Pulpwood Operation in North Central Wisconsin_, American Pulpwood Association, Technical Release No. 60-R15 (New York, N. Y.: 1960), p. 4.

Physical and economic data for maple sirup enterprises were obtained from Bell's study in New York State.[69] Data for Christmas tree enterprises were obtained from a report by Fox of Sinnissippi Forest Operations in northern Illinois.[70]

Product prices were obtained in 1963 from foresters of the Michigan Conservation Department. They are adjusted for each forest enterprise according to species and quality of composition. These prices have been adjusted to species, volumes, and quality in order to provide unit prices by condition classes. See Appendix A.

Forest land tax and valuation information were received directly from cooperators. The variation in assessment methods is evident in the brief statements of 'bases for valuation' in Table 31.

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[69] Robert D. Bell, Costs and Returns in Producing and Marketing Maple Products, Department of Agricultural Economics, Cornell University, A. E. 1016 (Ithaca, N. Y., 1955).

[70] Howard W. Fox, Christmas-Tree Farming Can Be a Profitable Enterprise, Illinois Research, (fall, 1961), pp. 10-11.

Table 31. Forest Land Taxes and Forest Land Values, Study Farms*

Farm	Forest Land Tax	Forest Land Value	Bases for Valuation
A	$1.56	$107	About ½ cropland value
B	.90	101	About ½ cropland value
C	.39	19	1/3 cropland value
D	.70	39	.375 cropland value
E	.37	13	3/28 cropland value
F	.38	69	Same as cropland value
G	.65	67	¾ cropland value
H	.46	57	Unknown (est. ¾ cropland value)
I	.36	40	1/3 cropland value

*From correspondence with cooperators.

CHAPTER IV

ENTERPRISE BUDGETS

Preparation of a budget for a unit of each crop or livestock enterprise to be considered is the first important step in systematic budgeting. These budgets are essential for the systematic application of a farm's resources to the various enterprises in order of decreasing contribution to net farm income. They allow the owner or manager to compare the resource requirement of one enterprise with those of another, to decide the most profitable use of a resource or of his own labor and, most important, to select that optimum combination of enterprises which applies each of his resources to the use which will maximize his total net income.

A budget defines the unit of the enterprise for which the budget is prepared. For the forest enterprises in this study the unit is always one acre. The physical productivity of the unit of enterprise is stated. Gross income from sale of the unit is stated. Operating or variable costs of production are listed. These cost data must present the requirements for resources in physical terms: amounts of crops, equipment time, building space needs. Prices are then applied to determine monetary costs.

Ownership or fixed costs are listed separately from operating costs. If buildings and equipment for a present enterprise can be assumed as completely owned, only operating costs need to be subtracted from the gross income to obtain a net income for the unit of present enterprise. This allows comparison among present enterprises as well as between a present unit of an enterprise with a new unit of an enterprise with its accompanying ownership costs of acquiring new buildings and equipment. Net income is computed for the unit of an enterprise by subtracting operating and ownership costs from the gross income. Net income is the return to labor and management. The number of hours of labor required per unit is stated on the budget.

The budget for a unit of an enterprise, therefore, states the physical productivity of the unit, states the physical resource requirements of the unit, applies appropriate prices, states net income for labor and management for the unit and states the number of labor hours required by the unit.

Agronomic and Livestock Enterprise Budgets

Enterprise budgets were prepared for units of agronomic and livestock enterprises. The unit for agronomic enterprises is one acre; for livestock enterprises, one steer, one dairy cow, one ewe and lamb, one beef cow and calf, or one sow and two litters. Budgets were prepared for "present" enterprises and for "new" enterprises for each agronomic and livestock enterprise. A present enterprise is assumed to incur only operating costs; all buildings and equipment are assumed to be owned and fully depreciated. A new enterprise incurs additional ownership costs of new buildings and equipment.

Enterprise budgets were prepared for current agronomic enterprises: wheat and potatoes. The wheat budgets were taken from the Michigan Farm Management Handbook.[1] The potato budgets are based on data in a Quarterly Bulletin of the Michigan Agricultural Experiment Station.[2]

Livestock enterprise budgets had been prepared by the Department of Agricultural Economics, University of Wisconsin, for training of farm management Extension agents with systematic budgeting, so were readily adaptable to this study. The prices were adjusted to forecast estimates in the Michigan Farm Management Handbook.

Budgets for agronomic and livestock enterprises for the study farms are presented in Appendix B.

Forest Enterprise Budgets

A budget was prepared for a unit of each forest enterprise to be considered in the farm plan as was done for the agronomic and livestock enterprises. The number of alternatives could be numerous. Only a few are considered for illustrative purposes. The use of linear programming would allow the inclusion of many more alternatives, as well as the loosening of many restrictions imposed herein.

When forests are fully stocked and producing optimum annual crops, annual budgets for forest enterprises can be prepared with comparative ease for combination with other enterprises. Unfortunately, most farm forests are understocked, unbalanced in stocking and/or are

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[1] Brake et al., *op. cit.*, p. IIIA4.

[2] Hoglund and Wright, *op. cit.*, p. 698.

producing crops far below the potential quality. Only about 40 per cent of all farm forests in the United States are near optimum productivity.[3] Of the 22 forest stands on the nine farms of this study, only one (Farm H, Forest 1) was producing wood crops of near optimum quantity and quality. Stocking of the other forests was low, unbalanced among size classes, and/or of poor quality.

How could annual enterprise budgets be prepared for these understocked forests; budgets which would reveal the dynamic condition of the forest, yet would allow planning for more than one year; budgets which would reveal the income from a forest enterprise after optimum stocking would be achieved, yet provide some indication of income during the next few years; and budgets for future forest enterprises not possible at present?

To indicate possible income during the next few years from an enterprise under present forest conditions, an average annual budget was prepared for the next 10-year period: a 'present forest' enterprise budget. For each farm these 'present forest' enterprises are included in a 'present forest' farm plan. Forest enterprises which are not now included in the farm operation but which could provide income during the next 10 years are included. For example, one cooperator has sufficient tappable sugar maple trees, labor and capital to initiate a maple enterprise now.

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[3]Forest Service, <u>A Summary of the Timber Resource Review</u>, <u>op. cit.</u> p. 74.

For each forest enterprise an 'optimum forest' budget also has been prepared for the level of stocking at which gross periodic annual value increment declines below six per cent if it has risen above that percentage, or declines if it does not reach six per cent. The writer uses six per cent as an alternative rate of return because it represents the debt charge commonly used for 10-year farm loans.[4] A silviculturist could challenge the use of six per cent on the basis that the low volume of sawtimber represented by this return would not allow perpetuation of a desired species. With this exception, one must agree with Lord, "The rational woodland owner in need of capital and able to obtain outside capital only at rates of 6 per cent or above will cut back this growing stock [returning 3 per cent annually on net worth], harvesting those mature trees which are most valuable and which are returning less than 6 per cent on their value".[5]

Included with the optimum forest budgets are those enterprises which can be initiated at present but from which no income can be expected during the next 10 years. For each farm these 'optimum forest' enterprises are included in an 'optimum forest' farm plan.

For each forest, budgets have been prepared for a limited number of enterprises. For all enterprises except the 'nothing

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[4] W. A. Duerr, John Fedkiw, and Sam Guttenberg, Financial Maturity: A Guide to Growing Profitable Timber Growing, U. S. Department of Agriculture, Technical Bulletin No. 1146 (Washington: Government Printing Office, 1956), p. 5.

[5] William B. Lord, "A Reconsideration of the Farm Forestry Problem," Journal of Forestry, Vol. 61, No. 4 (April, 1963), 264.

alternative' the following assumptions are made: all forests are fenced for protection from livestock; all cooperating owners practice and encourage fire prevention; the owners know the initial composition and volumes of their forests; the owners are rational, responsible citizens who wish their present forests to reach optimum levels of stocking, unless the land has a higher economic use as part of the farm which does not sacrifice watershed protection benefits.

Forest Enterprises Included in Present Forest Farm Plans

Nothing Alternative. This is not an enterprise. It represents disinterest on the part of the owner. The forest is assumed to receive no management, nor are forest products harvested. It is similar to Pleasonton's Plan I, "present farm operation with no timber sales".[6] The alternative is included to illustrate the return, positive or negative, from growth of unmanaged forest resources less ownership costs. It is excluded from optimum forest farm plans unless all of the units (acres) of a forest are not used by forest enterprises.

TSI. This enterprise includes only timber stand improvement (TSI), carried on in a tenth of the forest each year of the first decade. Cost-sharing payments under the Agricultural Conservation Program of the U. S. Department of Agriculture for timber stand improvement are assumed to be approved and accepted. Only the present forest

[6] Pleasonton, *op. cit.*, p. 210.

budget includes the payment under the Agricultural Conservation Program since this payment is allowed only once for any part of a forest.

Sell P:C Stumpage. This enterprise includes the sale of poor:cut trees as cordwood or sawtimber stumpage, as well as timber stand improvement (TSI) during the first decade. Only good trees are assumed to remain in the stand for the optimum forest budget.[7]

Sell P:C Logs. In this enterprise, an owner harvests and sells poor:cut cordwood or sawlogs at the forest as well as carrying on timber stand improvement (TSI) during the first decade. As above, only good trees are assumed to remain in the optimum forest.

Sell P:C + G:C Logs. Some of the forests had sufficient volume of annual growth to allow the owners to harvest part of this annual growth as well as the poor:cut trees. Timber stand improvement is included for the first decade.

Clearcut. Clearcutting of a limited acreage is alloted annually for forests of pioneer hardwoods when reliable pulpwood markets exist.

Christmas trees. A Christmas tree enterprise was budgeted for young coniferous stands which can be managed for harvests of Christmas trees during the next 10 years.

Maple sirup. A maple sirup enterprise budget was prepared for forests which would provide 40 taps or more during the next 10 years.

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[7]See page 33 for definitions of "poor" and "good".

Forest Enterprises Included in Optimum Forest Farm Plans.

Nothing Alternative. (Same as for present forest farm plans.) This alternative is used only if all acres of a forest are not used by forest enterprises.

Sell Stumpage. The forest stocking is at an optimum level. Annual growth is sold annually or periodically as stumpage in trees marked by a forester. Harvesting is by the buyer. Annual timber stand improvement is done with the guidance of a forester. However, Agricultural Conservation Program cost-sharing is not received. It is assumed that such payment can be received only once for a forest and it is received during the first decade.

Sell Logs. The forest stocking is at an optimum level. Annual growth is sold annually or periodically as logs at the farm. Trees are marked by a forester. Harvesting is to the log deck at the road by the owner. Annual timber stand improvement is done with guidance of a forester. However, Agricultural Conservation Program cost-sharing is not received. It is assumed that such payment can be received only once for a forest, and it was received during the first decade.

Christmas Trees. Several cooperators have opportunities to include a Christmas tree enterprise. A ten-year rotation is assumed. To allow spruce to reach marketable size in 10 years, four-year-old transplant planting stock is assumed to have been used.

Maple Sirup. An optimum maple sirup enterprise budget was prepared for approximately 100 taps per acre.

Special enterprises are considered for single forests--e.g., 'interplanted black walnut' for Forest No. 2 of Farm A. In Appendix C an example is presented of each enterprise considered in either a present forest farm plan or optimum forest farm plan.

CHAPTER V

SYSTEMATIC BUDGETING OF FARM PLANS FOR STUDY FARMS

Systematic budgeting "is a valuable tool in determining the combination of crops and livestock which will make the most net income from a given amount of land, labor, investment capital and other resources . . .".[1] It is a procedure by which farm resources are applied systematically to enterprises so each resource is used most efficiently. This method of combining farm enterprises appears to have great potential as a means of integrating management of forest resources with management of other farm resources. This technique can be best illustrated by proceeding with preparation of the farm plans for the study farms.

Prior to development of a farm plan, three systematic budgeting tables must be prepared:

> Table I includes the amount of resources available: land, labor, building capacities, investment capital and any allotments or restrictions which would limit use of any of the resources; the amount of each resource needed by the budgeted unit of each enterprise being considered and the net income for that unit.
>
> Table II shows the maximum number of units of each enterprise which would be possible with each resource

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[1]Weathers, _op. cit._, p. 3.

if that enterprise were the only enterprise being considered. It includes the net income provided by those units.

Table III is a check of the net return per unit of each resource as applied to a unit of each enterprise.

The systematic budgeting method is described in detail as farm plans are prepared for Farm A. Two plans are prepared: the present forest farm plan includes forest enterprises possible now, and an optimum forest farm plan which includes forest enterprises possible with optimum stocking or if the forest can be managed for a special product such as maple sirup or is converted to another use, such as Christmas trees.

Farm A - Medium Feeder Beef

Farm A is a one-man feeder beef operation. The owner is under 50 years of age and is in good health. His one son is 18 years of age. The owner plans to continue his beef and wheat enterprises. He wants to increase the number he feeds, but feels hesitant about borrowing for increased silage storage and possible conversion of Forest A to cropland until his repayment ability is certain. On the basis of a rule-of-thumb formula of the Farmers Home Administration,[2] he has no current borrowing capacity. The two forests of 16 and 50 acres comprise one-third of the farm area and represent 9 per cent of the total farm investment. Present

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[2]See page 29 for procedure used to estimate borrowing capacity.

forest enterprises for the forests of Farm A are non-existent for the present forest time period (the next 10 years). Both forests are understocked to the extent that re-establishment by artificial means is necessary if forest crops are to be harvested during the next generation. Interest on forest capital plus taxes exceed the value of growth or inventory increase. Only nothing alternatives are possible for present forest conditions (Tables C1 and C3, Appendix C).

One optimum forest enterprise is considered for each forest. Both require minimal cash expenditures since the owner cannot borrow investment capital. A Christmas tree enterprise on Forest No. 1 would accomplish two purposes: a profitable crop could be harvested from the land in about 10 years instead of 35 or 40 years; and the land would be easier to convert to cropland if such appears warranted after the first Christmas tree rotation. Poisoning of present hardwoods with 2,4,5-T and control of grasses and weeds with simazine would remove competing vegetation. Detroit and Toledo offer ready markets for Christmas trees. In Table C2, Appendix C, a unit of this enterprise returns a gross income of $900. Of the 1,000 4-year (2-2) white spruce transplants planted, 80 per cent are assumed to survive and 90 per cent of those which survive are assumed to be salable on the stump at $1.25 each. This price is the average for all species as reported by the district forester of the Michigan Conservation Department. The value and quality of the present hardwoods would interest no buyer so they are killed with basal spray or frill-and-spray using 2,4,5-T in oil: 1,300 diameter inches require

about 13 gallons of treating solution and 9 hours of labor. This operation is completed the fall before planting. Also during this time weeds and grasses at each planting spot are killed with amazine. The costs of these operations are capitalized at 5 per cent compound interest for the 10 years until harvest. Hand planting is necessary: 15 hours per 1,000 trees. To assure control of tree sprouts and brush, $5.00 and 10 hours are allocated to this activity during the 3rd and 7th years. Three hours hand weeding time is allocated every year from the 4th year. Shaping of the trees is necessary if they are to be assured of a market. Labor for shaping increases as the trees grow. Some trees need shaping the 2nd or 3rd year, others may not need shaping until the 7th or 8th. Most trees are assumed to need shaping from the 4th year on, and the labor needed per acre to be as follows: 4th year - 1.5 hours, 5th - 1.5 hours, 6th - 2.5 hours, 7th - 4.0 hours, 8th - 7.5 hours, 9th - 10.0 hours, 10th - 4 hours. Less labor is required the year of sale because the trees should receive only a 'touching up' that year. The labor requirement may be slightly high for spruce, since they are taken from pine studies.[3] Return to labor and management is discounted to the middle of the decade, then divided by 10 to obtain an average annual net return.

Interplanting of black walnut on about half of Forest No. 2 appears to be as profitable an enterprise for this forest as the vicissitude of future consumer preferences will allow. (See Table C4,

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[3]Fox, *op. cit.*, p. 10.

Appendix C) The current price for black walnut trees of moderate size and quality is reported as $1,000 per MBM stumpage. A yield of 6,700 board feet at 60 years of age is anticipated.[4]

Among the enterprises considered for this present forest farm plan for Farm A are: present beef, present wheat, forest no. 1 - nothing alternative and forest no. 2 - nothing alternative.[5] The forests are so understocked currently that little in the way of management can be recommended for the next decade. Among the enterprises considered for the optimum forest farm plan are: present beef, present wheat, forest no. 1 - Christmas trees and forest no. 2 - interplanted black walnut.

Available resources, resource requirements and net income for a unit of each present forest enterprise are presented in Table 32 and for a unit of each optimum forest enterprise, in Table 38. To illustrate, a unit of the present beef enterprise is a 400 pound steer calf, fed a liberal roughage ration with silage; 600 pound gain, 300 days on the farm. This unit requires the crops from 0.7 acre of row cropland for ear corn and corn silage and 0.9 acre of total cropland for the corn crops plus hay. The owner lot feeds, so no pasture is needed. Of course, no forest land is needed.

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[4] S. R. Gevorkiantz and H. F. Scholz, <u>Timber Yields and Possible Returns from the Mixed-Oak Farmwoods of Southwestern Wisconsin</u>, Wisconsin Department of Conservation, Publication No. 521 (Madison, 1948), p. 25.

[5] See Appendix B for descriptions of the present beef and present wheat enterprise budgets and Appendix C for the forest enterprise budgets.

Table 32. (Systematic Budgeting Table I) Resources Available and Resource Requirements for One Unit of East Enterprise, Farm A, Including Present Forest Enterprises.

Resources	Amount Available	Resource Requirements for One Unit of Each Enterprise			
		Present Beef	Present Wheat	Forest 1 Nothing	Forest 2 Nothing
Row Cropland, Acres	80	0.7	-----	-----	-----
Total Cropland, Acres	127	0.9	1.0	-----	-----
Forest Land, Acres					
Forest No. 1	16	-----	-----	1.0	-----
Forest No. 2	50	-----	-----	-----	1.0
Labor, Hours					
Jan. - Apr.	990	5.7	-----	-----	-----
May - Aug.	1200	7.1	3.4	-----	-----
Sept.- Dec.	810	4.3	2.6	-----	-----
Building Capacity					
Beef barn, steers	125	1.0	-----	-----	-----
Capital, $	0	-----	-----	-----	-----
Allotments	----	-----	24.0	-----	-----
Net Income per Unit		$26.78	$49.97	$-5.02	$-1.33

Labor requirements include 5.7 hours during January-April, 7.1 hours during May-August and 4.3 hours during September-December. These labor requirements include overhead labor. Each unit, or steer, requires one unit of space in the barn. Buildings and equipment for present enterprises are presumed to be completely owned, so investment capital is not required. The net income for a unit of this present beef enterprise is $26.78.[6]

A unit of the present wheat enterprise is one acre, so it requires one acre of total cropland; also, 3.4 hours of May-August labor, 2.6 hours of September-December labor, has an allotment limitation of 24 acres, and provides a net income of $49.97 per unit (acre). A unit of any forest enterprise is one acre, so forest no. 1 nothing alternative requires one acre of forest no. 1 and nothing else, because nothing is done in this alternative.[7] A similar condition exists for the nothing alternative for forest no. 2.

After the resources required by a unit of each present forest farm plan enterprise have been set down the next step is to determine the maximum amount of net income each enterprise would provide if it were the only enterprise on the farm. This step will guide the owner's decision concerning the selection of the primary enterprise for his farm plan. As can be seen in Table 33, resources can be

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[6]See Beef Enterprise budget, Appendix B.

[7]See page 89 for a definition of the Nothing Alternative.

Table 33. (Systematic Budgeting Table II) Determination of Limiting Resource for Enterprises, Farm A, Present Forest

Resources	Amount Available	Maximum Amount of Each Enterprise Which can be Budgeted			
		Present Beef	Present Wheat	Forest 1 Nothing	Forest 2 Nothing
Row Cropland, Acres	80	114	-----	-----	-----
Total Cropland, Acres	127	141	127	-----	-----
Forest Land, Acres					
Forest No. 1	16	----	-----	16	-----
Forest No. 2	50	----	-----	-----	50
Labor, Hours					
Jan. - Apr.	990	174	-----	-----	-----
May - Aug.	1200	169	353	-----	-----
Sept.- Dec.	810	188	312	-----	-----
Building Capacity					
Beef barn, steers	125	125	-----	-----	-----
Capital, $	0	----	-----	-----	-----
Allotments			24 acres		
Maximum Net Income		$3,053	$1,199	$-80	$-66

applied to any given enterprise only until the supply of one resource is exhausted. For example, if present beef enterprise is considered as the only enterprise, it cannot be expanded beyond the 114 head which will consume all the corn, grain and silage produced by the 80 acres of row cropland; at least, not with the restrictions that fix physical productivity, acreages of crops and enterprise requirements at present levels. Total cropland would support 141 steers, January-April labor is sufficient for 990 head and the barn will hold 125 head. However, row cropland at present yields will support only 114 units (steers). Likewise, the present wheat enterprise cannot be expanded beyond the 24 acres allotted to it on this farm. The limiting resource for the present forest alternatives is acreage. When optimum forest enterprises are budgeted, acreage still limits the Christmas tree enterprise for forest no. 1. The interplanted black walnut enterprise for forest no. 2 is limited by the interplantable area of the forest, which is assumed to be 25 acres.

Table 33 is completed when the net income per unit (Table 32) for each enterprise is multiplied by the smallest number of units which can be budgeted for each enterprise, and the results are recorded in this table: for present beef, the unit net income of $26.78 is multiplied by 114, and the product, $3,053, is recorded on Table 33.

This amount, $3,053, is the maximum net income provided if present beef is the only enterprise considered for the farm. Similarly, the present wheat enterprise alone would provide a net income of $1,199. Forests no. 1 and no. 2 are so understocked that for the present forest situation (i.e., next 10 years) interest on forest capital and taxes will surpass the value of inventory increase, resulting in negative net incomes. It should be remembered that computations are made with data in Table 32: each resource requirement is divided into the total amount of resource available.

When a farm plan is prepared which includes optimum forest enterprises, Table 43, the potential contributions to net income from the forests become more evident. For forest no. 1 a Christmas tree enterprise can contribute a net income of $644 per acre about every tenth year; or, discounted to the middle of the decade, and divided by 10, an average annual net income of $50 per acre. From forest no. 2, interplanted black walnut can contribute a net income of about $4,435 every 60 years. Discounted to the middle of the first decade, and expressed as a permanent annual income of 5 per cent of the discounted value, this represents an average annual net income of $15.15 per acre--not to mention income from annual or periodic harvests of other species in the forest.

One other table must be prepared prior to budgeting of the farm plan. Table 34 provides a means of checking relative profitability of resource use if the resource should become limiting for two or more enterprises. It is prepared by dividing the amount of each resource required per unit of enterprise into the net returns per unit of that enterprise. The resulting data show the net income per unit of resource. Thus, if the resource should become limiting to two enterprises, the enterprise which uses the resource more profitably could be selected.

Table 34. (Systematic Budgeting Table III) Net Return Per Unit of Resources, Present Forest and Optimum Forest Farm Plans, Farm A.

Resources	Net Return Per Unit of Resource for Each Enterprise					
	Present Forest Enterprises				Optimum Forest Enterprises	
	Present Beef	Present Wheat	Forest 1 Nothing Alternative	Forest 2 Nothing Alternative	Forest 1 Christmas Trees	Forest 2 Plant Walnut
Row Cropland	$38.25	$-----	$-----	$-----	$-----	$-----
Total Cropland	29.76	49.97	-----	-----	-----	-----
Forest Land						
Forest No. 1	-----	-----	-5.02	-----	50.49	-----
Forest No. 2	-----	-----	-----	-1.33	-----	15.15
Labor						
Jan. - Apr.	4.70	-----	-----	-----	33.66	11.65
May - Aug.	3.77	14.70	-----	-----	-----	-----
Sept.- Dec.	6.23	19.22	-----	-----	5.67	10.82
Building Capacity						
Beef barn	26.78	-----	-----	-----	-----	-----
Capital, $	-----	-----	-----	-----	-----	-----
Allotments	-----	-----	-----	-----	-----	-----

Now a farm plan can be prepared which will apply the limited farm resources to a most profitable combination of enterprises. As mentioned, two farm plans are prepared. One includes present forest enterprises, and another includes optimum forest enterprises. The present forest farm plan is discussed first.

A farm plan table is prepared (Table 35). The initial amount of resources available are transferred from Table 32 and entered under initial resources, Column (A): 80 acres of row cropland, 127 acres of total cropland, and so forth.

The first enterprise to be included in the farm plan should be that which produces the greatest net income before some resource is exhausted and limits further expansion of the enterprise. Reference to Table 33 shows the most profitable enterprise to be present beef: no other enterprise provides more net income than $3,053. If present beef is budgeted into the farm plan, row cropland will be the resource exhausted, hence limiting expansion of the enterprise. A glance at Table 34 shows no other enterprise competing for this resource. Since the present beef enterprise provides the most net income, and no other enterprise can use the row cropland at a higher net income per acre, present beef is the first enterprise budgeted into the farm plan.

The number of steers which can be budgeted is limited to 114 by row cropland. The amount of each resource required by 114 steers is determined by multiplying the resource requirements for one unit, or steer, in Table 32 times 114. These amounts are entered on Table 35 under present beef enterprise as follows: at 0.7 acre per steer (unit), 114 steers require 80 acres of row cropland; at 0.9 acre per steer,

Table 35. (Systematic Budgeting Table IV) Present Farm Plan, Farm A, Including Present Forest Enterprises

Resources	(A) Initial Resources	Present Beef	(B) Unused	Present Wheat	(C) Unused	Forest 2 Nothing Alternative	(D) Unused	Forest 1 Nothing Alternative	(E) Unused
Row Cropland, Acres	80	80	0	---	0	---	0	---	0
Total Cropland, Acres	127	103	24	24	0	---	0	---	0
Forest Land, Acres									
Forest No. 1	16	---	16	---	16	---	16	16	0
Forest No. 2	50	---	50	---	50	50	0	---	0
Labor, Hours									
Jan. - Apr.	990	650	340	---	340	---	340	---	340
May - Aug.	1200	809	391	82	309	---	309	---	309
Sept.- Dec.	810	490	320	62	258	---	258	---	258
Building Capacity									
Beef barn, steers	125	114	11	---	11	---	11	---	11
Capital, $	0	---	0	---	0	---	0	---	0
Allotments		---		24 acres		---		---	
Net Income, $		3,053		1,199		-66		-80	
Acc. Net Income, $			3,053		4,252		4,186		4,106

103 acres of total cropland are required; no forest land is required; 650 hours of January-April labor at 5.7 hours per steer; 809 hours of May-August labor and 490 hours of September-December; the 114 steers occupy 114 spaces in the barn; no investment capital borrowing capacity, but none for present enterprises is needed because buildings and equipment are assumed fully owned or depreciated. The net income from this enterprise is $3,053.

When the resources required for the 114 steers have been allocated to the present beef enterprise, those quantities are subtracted from the initial amounts of resources. The amounts of unused resources are recorded in column (B) of Table 35: 24 acres of total cropland; 16 acres of Forest No. 1 and 50 acres of Forest No. 2; 340 hours of January-April labor, 391 hours of May-August labor, 320 hours of September-December labor, and 11 barn spaces.

After this first enterprise has been entered into the farm plan, Table 35, how can the remaining resources be used most profitably? To decide, the remaining resources are applied to each remaining enterprise as though it were the only added enterprise to be considered. For Table 36 the remaining resources have been transferred from the farm plan, Table 35: 24 acres of unused total cropland, 16 acres of Forest No. 1, and so forth. The unit requirements for each enterprise, Table 32, are divided into the unused resources.

The limiting resource for the present wheat enterprise remains the allotment of 24 acres. It is probably not coincidental that this equals the remaining total cropland. May-August labor is still

Table 36. (Systematic Budgeting Table IIA) Determination of Limiting Resource for Enterprises, Farm A, Present Forest.

Resources	Amount Available	Maximum Amount of Each Enterprise Which can be Budgeted: Present Wheat	Forest 1 Nothing	Forest 2 Nothing
Row Cropland, Acres	0	-----	----	----
Total Cropland, Acres	24	24	----	----
Forest Land, Acres				
Forest No. 1	16	-----	16	----
Forest No. 2	50	-----	----	50
Labor, Hours				
Jan. - Apr.	340	-----	----	----
May - Aug.	391	115	----	----
Sept.- Dec.	320	123	----	----
Building Capacity				
Beef barn, steers	11	-----	----	----
Capital, $	0	-----	----	----
Allotments	---	24	----	----
Maximum Net Income		$1,199	$-80	$-66

sufficient for 115 acres, and September-December could handle 123 acres. However, the allotment limits the enterprise to 24 acres. The present forest alternatives still are limited by their total acreages.

Again, as with Table 33, the unit net income for each enterprise, in Table 32, is multiplied by the smallest number of units of each enterprise which can be budgeted (i.e., 24 for wheat) to determine the maximum net income each remaining enterprise can provide. The quantities of limiting resources remain the same as in Table 33, so the maximum net income provided by each remaining enterprise is unchanged: $1,199 for the present wheat enterprise, negative $66 for forest no. 1 nothing alternative, and negative $80 for forest no. 2 nothing alternative.

The present wheat enterprise provides the most net income, so it will be added to the farm plan. The enterprise remains limited to 24 units, or acres, so the unit resource requirements in Table 32 are multiplied by this number to allocate the necessary quantities of resources to the enterprise. These quantities are entered in the farm plan, Table 35, under the enterprise heading: 24 acres of total cropland, no forest land, no January-April labor, 82 hours of May-August labor, 62 hours of September-December labor, the allotment of 24 acres, and the net income of $1,199. The net income from this enterprise is added to the $3,053 provided by the present beef enterprise. The accumulated net income is $4,252.

After resources have been allocated to the present wheat enterprise, the unused quantities are listed in Column (C) of the farm plan table: only forest land remains since all cropland has been used by the present beef and present wheat enterprises. Considerable labor remains and 11 spaces remain unoccupied in the barn.

The two remaining alternatives are the forest no. 1 nothing alternative and the forest no. 2 nothing alternative. Since these are not true enterprises in that they represent complete disinterest on the part of the owner, no resources are used except the forest acreages. The acreages then are the limiting resources. When another table is prepared to determine which remaining enterprise provides the most net income from remaining resources, Table 37, forest no. 1 nothing alternative still is limited by the total number of units, 16 (acres) and provides the same negative net income, -$80. The forest no. 2 nothing alternative remains limited by its total number of units, 50, and still contributes a negative income of -$66. The fixed costs of these two alternatives exceed the value of their growth or inventory increase. When they are added to the farm plan, total net income is reduced to a final amount of $4,106.

Considerable labor remains unused, as do the 11 spaces in the barn. Investment capital, more cropland, higher yields, or other enterprises could make use of the unused labor and/or barn space.

When several possible optimum forest enterprises are included in a plan for the farm, the potential income from managed forest resources can be illustrated. The procedure for incorporating enterprises into the plan has been explained above. The present beef and present wheat enterprises are repeated. An optimum forest Christmas

Table 37. (Systematic Budgeting Table IIB) Determination of Limiting Resource for Enterprises, Farm A, Present Forest.

Resources	Amount Available	Maximum Amount of Each Enterprise Which can be Budgeted	
		Forest 1 Nothing	Forest 2 Nothing
Row Cropland, Acres	0	-----	-----
Total Cropland, Acres	24	-----	-----
Forest Land, Acres			
Forest No. 1	16	16	-----
Forest No. 2	25	-----	50
Labor, Hours			
Jan. - Apr.	308	-----	-----
May - Aug.	391	-----	-----
Sept.- Dec.	285	-----	-----
Building Capacity			
Beef barn	11	-----	-----
Capital, $	0	-----	-----
Allotments	---	-----	-----
Maximum Net Income		$-80	$-66

tree enterprise is added for forest no. 1 and an interplanted black walnut enterprise is added for forest no. 2. These have been included in the new optimum forest, Table 38. The Christmas tree enterprise for forest no. 1 requires 1 acre of the forest, 1.5 hours of January-April labor for planting, and 8.9 hours May-December labor for brush control, weeding and shaping. The net income is $50.49 per unit, or acre. These figures were obtained by: (1) capitalizing all costs at 5 per cent to the end of the rotation, (2) discounting the net return 5 years to the middle of the decade and (3) dividing the discounted amount by 10 to obtain the average annual net income figure of $50.49. Labor required over the 10-year rotation was 104 hours per unit. This figure was divided by 10 also to obtain the annual labor requirement of 10.4 hours.

In a similar manner, costs of the interplanted black walnut enterprise were capitalized to the end of the rotation (60 years). The net income was discounted 55 years to the middle of the first decade. This income is considered to be periodic, but at such lengthy intervals little annual income is lost if the periodic income is considered a capital fund and annual income is assumed to be 5 per cent of it. Therefore, the net income at the end of the 60-year rotation, $4,435, is discounted 55 years to the middle of the first decade. Then 5 per cent of this amount, $15.15, is assumed to be the annual net income for the enterprise. Labor requirements are assumed to occur during the first decade, so are assigned to this decade. Only half of the forest is considered interplantable, so only 25 acres are allotted to this enterprise.

Table 38. (Systematic Budgeting Table I) Resources Available and Resource Requirements for One Unit of Each Enterprise, Farm A, Including Optimum Forest Enterprises

Resources	Amount Available	Resource Requirements for One Unit of Each Enterprise: Present Beef	Present Wheat	Forest 1 Christmas Trees	Forest 2 Plant Walnut	Forest 2 Nothing Alternative
Row Cropland, Acres	80	0.7	----	----	----	----
Total Cropland, Acres	127	0.9	1.0	----	----	----
Forest Land, Acres						
Forest No. 1	16	---	----	1.0	----	----
Forest No. 2	50	---	----	----	1.0	1
Labor, Hours						
Jan. - Apr.	990	5.7	----	1.5	1.3	----
May - Aug.	1200	7.1	3.4	8.9	1.4	----
Sept.- Dec.	810	4.3	2.6			----
Building Capacity						
Beef barn	125	1.0	----	----	----	----
Capital, $	0	---	----	----	----	----
Allotments	----	---	----	----	25 acres	----
Net Income per Unit	----	$26.78	$49.97	$50.49	$15.15	$-1.33

Preparation of the optimum forest farm plan progresses as for the present forest farm plan. A farm plan, Table 43, is initiated by listing resources available, Column (A): 80 acres of row cropland, 127 acres of total cropland, and so forth. The maximum net income provided by each enterprise is determined in Table 39 by (1) dividing the unit requirements from Table 38 into the available resources (Table 38) and (2) by multiplying the unit net income (Table 38) by the smallest number of units of an enterprise possible because of some limiting resource, as determined in Table 39. As for the present forest farm plan, present beef is limited by row cropland and present wheat is limited by its allotment. In Table 39 for optimum forest enterprises, the Christmas tree enterprise for forest no. 1 is limited by the number of acres in the forest. The total acreage allows only 16 units (acres), though January-April labor is available for 660 units (or acres). The maximum annual net income provided by this enterprise, therefore, as shown in Table 39 is $808. In Table 39 the 25 acres allotted to interplanting are the limiting resource for the interplanted black walnut enterprise for forest no. 2. The total forest area would allow 50 units (acres) of the enterprise, and May-December labor would be sufficient for 1,436 units. Maximum annual net income is $379.

Table 39 of the optimum forest farm plan shows the 114 units (steers) of present beef enterprise to provide the most annual net income of any enterprise, $3,053. This enterprise is entered into the farm plan, Table 43. The quantities of resources required and maximum net income are listed under the enterprise heading, Table 43:

Table 39. (Systematic Budgeting Table II) Determination of Limiting Resource for Enterprises, Farm A, Optimum Forest

		Maximum Amount of Each Enterprise Which can be Budgeted			
Resources	Amount Available	Present Beef	Present Wheat	Forest 1 Christmas Trees	Forest 2 Walnut
Row Cropland, Acres	80	114	---	----	----
Total Cropland, Acres	127	141	127	----	----
Forest Land, Acres					
Forest No. 1	16	---	---	16	----
Forest No. 2	50	---	---	----	50
Labor, Hours					
Jan. - Apr.	990	174	---	660	762
May - Aug.	1200	169	353	226	1436
Sept.- Dec.	810	188	312		
Building Capacity					
Beef barn	125	125	---	----	----
Capital, $	0	---	---	----	----
Allotments	----	---	24 acres	----	25 acres
Maximum Net Income	----	$3,053	$1,199	$808	$379

80 acres of row cropland, 103 acres of total cropland, no forest land, 650 hours of January-April labor and so on to the net income from the enterprise, $3,053. Resources not required by this first enterprise are listed under Column (B), unused resources.

The next most profitable application of resources is decided by budgeting the unused resources to the remaining enterprises in Table 40. Again the assumption is made that each enterprise is the only one being considered.

The unused resources are divided by the unit requirements for each enterprise. For example, Table 38 shows a unit of the present wheat enterprise requires row cropland, 1 acre of total cropland, 3.4 hours of May-August labor, and 2.6 hours of September-December labor. When these requirements are divided into the unused amounts of resources available in Table 40, the quotients show that unused total cropland will allow 24 units of the wheat enterprise, May-August labor is sufficient for 115 units of the enterprise, and September-December labor is sufficient for 123 units. Also, only 24 acres are allotted to this enterprise. The unused total cropland and the allotment coinsidentally limit the size of this enterprise to 24 units. Multiplying the unit net income in Table 38, $49.97, by the maximum number of units produces the maximum net income that the present wheat enterprise can provide, $1,199. The other enterprises are treated in the same manner. Table 40 then shows that the Christmas tree enterprise for forest no. 1 is limited by the 16 acres of the forest and this enterprise can provide $808 of net income. The interplanted black walnut enterprise for forest no. 2 is limited

Table 40. (Systematic Budgeting Table IIA) Determination of Limiting Resource for Enterprises, Farm A, Optimum Forest.

Resources	Amount Available	Maximum Amount of Each Enterprise Which can be Budgeted: Present Wheat	Forest 1 Christmas Trees	Forest 2 Walnut	Forest 2 Nothing Alternative
Row Cropland, Acres	0	---	---	---	---
Total Cropland, Acres	24	24	---	---	---
Forest Land, Acres					
Forest No. 1	16	---	16	---	---
Forest No. 2	50	---	---	50	1
Labor, Hours					
Jan. - Apr.	340	---	227	---	---
May - Aug.	391	115	80	115	---
Sept.- Dec.	320	123		123	---
Building Capacity					
Beef barn	11	---	---	---	---
Capital, $	0	---	---	---	---
Allotments	---	24 acres	---	25 acres	---
Maximum Net Income	---	$1,199	$808	$379	$-66.50

by the 25 acres of interplantable land and this enterprise will provide 379 of net income. Since the present wheat enterprise will provide the most net income, it is entered into the farm plan next. The resources required for 24 units of the enterprise are determined: 24 times the unit requirements in Table 38. These and the maximum net income are entered in the farm plan, Table 43: no row cropland, 24 acres of total cropland, no forest land, no January-April labor, 82 hours of May-August labor, 62 hours of September-December labor and $1,199 net income. The net income from this enterprise is added to the $3,053 already provided by the present beef enterprise to provide an accumulated net income of $4,252. The unused resources are listed in Column (C) of Table 43.

The third most profitable application of resources is decided by dividing unit resource requirements of the remaining enterprises, from Table 38, into the unused resources, listed in Table 41. The Christmas tree enterprise for forest no. 1 still is limited by 16 acres of land and provides a maximum net income of $808. The interplanted black walnut enterprise for forest no. 2 still is limited by the 25 acres of interplantable land, and provides a net income of $379. The Christmas tree enterprise provides the larger net income, so it is entered into the farm plan, Table 43. The 16 units of Christmas tree enterprise require 16 acres of forest no. 1, 24 hours of January-April labor, 71 hours of May-August labor and 71 hours of September-December labor. Unused resources are listed in Column (D) of Table 43. The net income, $808, is added to those from present beef and present wheat to provide an accumulated income of $5,060.

Table 41. (Systematic Budgeting Table IIB) Determination of Limiting Resource for Enterprises, Farm A, Optimum Forest.

Resources	Amount Available	Maximum Amount of Each Enterprise Which can be Budgeted: Forest 1 Christmas Trees	Forest 2 Nothing Alternative	Forest 2 Walnut
Row Cropland, Acres	0	---	---	---
Total Cropland, Acres	0	---	---	---
Forest Land, Acres				
Forest No. 1	16	16	---	---
Forest No. 2	50	---	50	50
Labor, Hours				
Jan. - Apr.	340	227	---	243
May - Aug.	309	64	---	406
Sept.- Dec.	258		---	
Building Capacity				
Beef barn	11	---	---	---
Capital, $	0	---	---	---
Allotments	---	---	---	25 acres
Maximum Net Income	---	$808	$-66	$379

The interplanted black walnut enterprise is the only optimum forest enterprise remaining. Preparation of a last table (Table 42) shows the limiting resource for this enterprise to be the 25 acres of interplantable area. All other resources (total forest land, January-April labor, May-August labor, and September-December labor) would support more units of the enterprise. Therefore, the 25 units (acres) of this enterprise are entered into the farm plan (Table 43). The 25 units require 25 acres of forest no. 2, 32 hours of January-April labor, and 35 hours of May-December labor. They provide a net income of $379 (25 x $15.15). This net income is added to those accumulated from the other enterprises to provide an accumulated income of $5,439. Unused are 25 acres of forest no. 2, 284 hours of January-April labor, 390 hours of combined May-December labor, and 11 spaces in the barn.

Because half (25 acres) of forest no. 2 remains unused, the nothing alternative from the present forest plan must be included. Inventory increase (growth) and fixed costs continue for this half of the forest. Since fixed costs exceed the value of inventory increase, the net income from the 25 units (acres) is negative. This negative income is deducted from the accumulated net income of $5,530 for the optimum forest farm plan.

The total net income from the optimum forest plan, $5,406, is considerably larger than that from the present forest farm plan, $4,139. Of course, $808 of this represents income which will not be available until the end of the first decade, and $379 represents income which has been discounted from the sixth decade. These facts

Table 42. (Systematic Budgeting Table IIC) Determination of Limiting Resource for Enterprises, Farm A, Optimum Forest.

Resources	Amount Available	Maximum Amount of Each Enterprise Which can be Budgeted: Forest 2 Walnut	Maximum Amount of Each Enterprise Which can be Budgeted: Forest 2 Nothing Alternative
Row Cropland, Acres	0	---	---
Total Cropland, Acres	0	---	---
Forest Land, Acres			
Forest No. 1	0	---	---
Forest No. 2	50	50	25
Labor, Hours			
Jan. - Apr.	316	243	---
May - Aug.	238	304	---
Sept. -Dec.	187		---
Building Capacity			
Beef barn	11	---	---
Capital, $	0	---	---
Allotments	---	25	---
Maximum Net Income	---	$379	$-33

Table 43. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm A, Including Optimum Forest Enterprises

Resources	(A) Initial Resources	Present Beef	(B) Unused	Present Wheat	(C) Unused	Forest 1 Christmas Trees	(D) Unused	Forest 2 Walnut	(E) Unused
Row Cropland, Acres	80	80	0	---	0	---	0	---	0
Total Cropland, Acres	127	103	24	24	0	---	0	---	0
Forest Land, Acres									
Forest No. 1	16	---	16	---	16	16	0	---	0
Forest No. 2	50	---	50	---	50	---	50	25	25
Labor, Hours									
Jan. - Apr.	990	650	340	---	340	24	316	32	284
May - Aug.	1200	809	391	82	309	71	238	35	390
Sept.- Dec.	810	490	320	62	258	71	187		
Building Capacity									
Beef barn	125	114	11	---	11	---	11	---	11
Capital, $	0	---	0	---	0	---	0	---	0
Allotments	---	---	---	24	---	---	---	25	---
Net Income, $		3,053		1,199		808		379	
Acc. Net Income, $			3,053		4,252		5,060		5,439

Table 43.--continued.

Resources	Forest 2 Nothing Alternative	(F) Unused
Row Cropland, Acres	---	0
Total Cropland, Acres	---	0
Forest Land, Acres		
Forest No. 1	---	0
Forest No. 2	25	0
Labor, Hours		
Jan. - Apr.	---	284
May - Aug.	---	390
Sept.- Dec.	---	
Building Capacity		
Beef barn	---	11
Capital, $	---	0
Allotments	---	---
Net Income,$	-33	
Acc. Net Income, $		5,406

notwithstanding, if the land now in forests is to remain in forests, management can offer opportunities for increasing the income from the forest lands, and systematic budgeting can help select the management alternatives which will be most beneficial to the total farm business.

These farm plans have but one purpose: to provide "a basis for analyzing the overall farming operation to determine needed changes in the bundle of resources as well as the crops and livestock to produce".[8] The farm plans just completed have been prepared to help Farmer A decide the best way to integrate management of his two forests with the rest of his farm resources. His forests represent only about 9 per cent of his current total investment, yet his forests with those of over three million other farmers must grow a major share of the future wood supplies for the United States. How can he make decisions which help to assure both a continued supply of timber and his own continued economic existence? Reasonable protection from destructive grazing, fire, insects, diseases, and cutting will assure a continued supply of timber. His own continued economic existence depends upon his ability to select those forest management alternatives which maximize his net farm income. Systematic budgeting bases the selection on facts: physical and value productivity of forest enterprises in comparison with other farm enterprises. The plans for Farm A show the owner that the optimum forest enterprises can increase the contribution of his forests to net farm income from

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[8] Weathers, op. cit., p. 17.

a negative $146 to a positive $1,187 without reducing income from his other enterprises.

Optimum forest plans will not always provide more total net income. Forests on several study farms are overstocked, usually with poor:cut trees. Therefore, the harvestable volume during the period of the present forest farm plan (the next decade) can be greater than the volume which can be harvested from the forest at optimum stocking. If the unit value of the optimum volume is not sufficiently higher than that of the present forest, the latter will show a higher net income.

Following are present forest and optimum forest farm plans for the other eight farms, with brief discussions of different forest enterprises which are considered, and brief analytical statements concerning each farm plan.

Farm B - Large Dairy

Farm B is a father-son operation. The 29 year old son manages the farm. About 14 months of labor are hired. The dairy loose-housing capacity is being enlarged to handle about 95 cows and replacements. A flock of 61 ewes has been kept. Also about 47 acres of wheat have been raised for a cash crop and straw annually. Borrowing capacity is estimated to be $34,500. The two forests of 97 acres and 40 acres represent 22 per cent of the farm area and 8 per cent of total farm investment.

Forests on Farm B have sufficient stocking to allow the following present forest and optimum forest enterprises:

Present Forest Enterprise	Optimum Forest Enterprise
Nothing Alternative	Stumpage
Poor:cut Stumpage	Logs
Poor:cut Logs	
Poor:cut and Good Logs	

Every present forest enterprise also receives income from cost-sharing under the Agricultural Conservation Program and income from inventory increase. The above budgets are presented in Appendix C.

In the present forest farm plan, Table 44, the first enterprise to be budgeted is the present dairy. With housing capacity expanded from 65 to about 95 cows,[9] this enterprise utilizes most of the labor. In fact, September-December labor is sufficient only for 88 cows. Selling of poor:cut logs from Forest No. 2 utilizes most of the remaining labor. The budget for a unit of this enterprise is presented in Table C11, Appendix C.

The few hours of unused labor allow timber stand improvement and stumpage sales from 80 acres of Forest No. 1. The remaining 17 acres of Forest No. 1 are considered to have 'nothing' in the way of management. The forest enterprises take precedence over the ewe & lamb and wheat enterprises because the former require labor during no specific season. A unit of the poor:cut logs enterprise for Forest No. 2 requires 3.8 hours per unit which can be used any time of the year. Of course, September to April are the preferred

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[9]Allows room for 25 per cent replacement.

Table 44. (Systematic Budgeting Table IV) Present Farm Plan, Farm B, Including Present Forest Enterprises

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Forest 2 P:C Logs	(C) Unused	Forest 1 P:C Stumpage	(D) Unused	Forest 1 Nothing Alternative	(E) Unused
Row Cropland, Acres	147	123	24	---	24	---	24	---	24
Total Cropland, Acres	421	299	122	---	122	---	122	---	122
Forest Land, Acres									
Forest No. 1	97	----	97	---	97	80	17	17	0
Forest No. 2	40	----	40	40	0	---	0	---	0
Labor, Hours									
Jan. - Apr.	3250	3159	91					---	0
May - Aug.	3440	3379	61	152	16	16	0	---	0
Sept.- Dec.	3140	3124	16						
Building Capacity									
Dairy Barn	95	88	7	---	7	---	7	---	7
Capital, $	34,500	----	34,500	---	34,500	---	34,500	---	34,500
Allotments	----								
Net Income, $	----	23,721		1,278		314		-135	
Acc. Net Income, $	----		23,721		24,999		25,313		25,178

months for forest work, but such work can be carried on during May to August if other work allows. This freedom from a temporal restriction allows the budgeting of all 40 units of Forest No. 2, providing a net income of $1,278. A unit of the ewe and lamb enterprise requires 7.1 hours of labor; however, 3.3 hours are needed for lambing during the January-April period, 1.0 hour is needed each of the other two periods for care of the ewe and lamb, 1.6 hours are needed during May-August for feed crops. Labor for this enterprise is restricted to the extent that the 16 hours of September-December labor allow only 13 units (ewe and lamb) of this enterprise to be budgeted. This number of units would provide $102 of net income, considerably less than that from the poor:cut logs enterprise for Forest No. 2. In the same manner the wheat enterprise is restricted by the 16 hours of September-December labor to only 6 units which provide $161 of net income.

The restriction of fixed resource quantity and productivity is, of course, unreal. Unused are 24 acres of row cropland, 122 acres of total cropland, 97 unlogged acres of Forest No. 1, 7 spaces in the loafing shed, and $34,500 of borrowing capacity. One more hired man could be combined with the physical resources and $6,600 of borrowed capital to produce an additional return to labor and management of $6,100. With the restriction, however, a combination of the present dairy, Forest No. 2 poor:cut logs, and 80 acres of Forest No. 1 poor:cut stumpage enterprises provide the most profitable present farm plan. After $135 is subtracted for the unused Forest No. 1 acreage, this combination provides $25,178 of net income.

In the optimum farm plan, Table 45, the present dairy is the first enterprise budgeted. The second enterprise entered in the plan, however, is a combination of two enterprises: Forest No. 1 stumpage and Forest No. 2 stumpage. This combination will yield a net income of $513. If the forests are treated as separate enterprises, a negative income, -$314, would be provided by the forests: the Forest No. 2 logs enterprise is the second most profitable enterprise after present dairy, providing $468 from 37 units. However, this enterprise would require all remaining 168 hours of labor, leaving none for improving the remaining 3 acres of Forest No. 2 and the 97 acres of Forest No. 1. Nothing alternatives would have to be included for these, resulting in a negative income of -$782, or a net of -$314 from the forests.

Combining the forests into one enterprise also allows the inclusion of 6 units of present wheat, providing an additional net income of $233. The total net income from the optimum farm plan is $24,467.

Total net income from the optimum farm plan is less than the total from the present farm plan, because present forests contain considerable volumes of timber which should have been harvested before now: Forest No. 1 included 1,427 board feet of poor:cut timber per acre, one-third of the sawtimber volume and Forest No. 2 included 2,331 board feet per acre, 40 per cent of the sawtimber volume.[10] These volumes are planned for harvest during the present

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[10]See Tables 9 and 10 for composition of the forests.

Table 45. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm B, Including Optimum Forest Enterprises

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Forest 1 & 2 Stumpage	(C) Unused	Present Wheat	(D) Unused
Row Cropland, Acres	147	123	24	---	24	---	24
Total Cropland, Acres	421	299	122	---	122	6	116
Forest Land, Acres							
Forest No. 1	97	---	97	97	0	---	0
Forest No. 2	40	---	40	40	0	---	0
Labor, Hours							
Jan. - Apr.	3250	3159	91	27	64	---	64
May - Aug.	3440	3379	61	---	61	20	41
Sept.- Dec.	3140	3124	16	---	16	16	0
Building Capacity							
Loose Housing Barn	95	88	7	---	7	---	7
Capital, $	34,500	---	34,500	---	34,500	---	34,500
Allotments							
Net Income, $	---	23,721		513		233	
Acc. Net Income, $	---		23,721		24,234		24,467

plan time period, i.e., the first ten years. Added to the income from the sawtimber sold as logs or stumpage are small cost-sharing payments from the Agricultural Conservation Program and considerable income from inventory increase as the forests grow. Under optimum forest conditions the only income is from the assumed sale of annual growth as stumpage or logs. This difference in returns from an enterprise for the present forest and for the optimum forest can be seen by a comparison of a present budget and an optimum budget for a forest enterprise (Tables C5 and C6 in Appendix C).

These farm plans illustrate the supplemental nature of the forest enterprises of Farm B. They can utilize the few hours of unused labor more productively than can other possible supplemental enterprises. They can contribute about 6 per cent of the present net income. Under optimum conditions, the forests can provide about 2 per cent of total net income. Whether or not the owners wish to receive this supplemental income is their decision. Aside from the small net income, the management included with these present or optimum farm plans would assure efficient production of future timber crops from the farm forests.

Farm C - Small Dairy

Farm C is a one-man small dairy operation. One month of family labor and three months of hired labor are added to 12 months for the operator.[11] The operator is 55 and in good health. His

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[11] Table 4, page 28.

22 year old son may not remain on the farm. Capital borrowing capacity is assumed to be $2,800. The two forests of 61 acres and 22 acres represent 28 per cent of the farm area and 4 per cent of total farm investment. The present farm plan, Table 46, and the optimum farm plan, Table 47, differ considerably. Poor:cut and good: cut logs provide profitable enterprises in the present farm plan. A new enterprise considered for Forest No. 1 of Farm C is clearcut pulpwood, Tables C15 and C16, Appendix C. Initial stocking would allow annual harvests of about 10 cords per acre. Optimum stocking would allow harvests of about 15 cords per acre. To allow annual harvests, cutting would be limited to 3 acres per year. A rotation of 30 years would be used. Although the net incomes per acre from this enterprise ($18.81 and $41.15, respectively, for present and optimum budgets) exceeded the net returns from other enterprises, the 3-acre limit excluded this enterprise from the farm plans.

The forests contribute about 10 per cent of total net income in the present farm plan. The addition or refurbishing of building space for four new dairy cows may be possible more in theory than in reality. Unused row cropland in Column D of the plans is not possible after 'new dairy' requires the remaining total cropland. Without total cropland there can be no row cropland.

Forest enterprises contribute more to net income in the optimum farm plan than in the present farm plan primarily because of the Christmas tree enterprise planned for part of 81 acres of land designated as "trees and wildlife" on the Soil Conservation Service farm plan. In reality this land is idle. The Christmas tree

Table 46. (Systematic Budgeting Table IV) Present Farm Plan, Farm C, Including Present Forest Enterprises

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Forest 1 P+G Logs	(C) Unused	New Dairy	(D) Unused	Forest 2 P:C Logs	(E) Unused
Row Cropland, Acres	34	20	14	---	14	3	11	---	0
Total Cropland, Acres	125	109	16	---	16	16	0	---	0
Forest Land, Acres									
Forest No. 1	61	---	61	61	0	---	0	---	0
Forest No. 2	22	---	22	---	22	---	22	22	0
Labor, Hours									
Jan. - Apr.	1240	991	249	94	155	128	27	---	27
May - Aug.	1480	1187	293	---	293	153	140	---	140
Sept.- Dec.	1280	1002	278	95	183	129	54	46	8
Building Capacity									
Dairy Barn	28	28	0	---	0	---	0	---	0
Capital, $	2,800	---	2,800	---	2,800	2,640	160	---	160
Allotments									
Net Income, $		4,236		393		340		91	
Acc. Net Income, $			4,236		4,629		4,969		5,060

Table 47. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm C, Including Optimum Forest Enterprises

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Idle, Christmas Trees	(C) Unused	New Dairy	(D) Unused	Forest 1 Cut Cords	(E) Unused
Row Cropland, Acres	34	20	14	---	14	3	11	---	11
Total Cropland, Acres	125	109	16	---	16	16	0	---	0
Idle, Acres	81	---	81	20	61	---	61	---	61
Forest Land, Acres									
Forest No. 1	61	---	61	---	61	---	61	54	7
Forest No. 2	22	---	22	---	22	---	22	---	22
Labor, Hours									
Jan. - Apr.	1240	991	249	24	225	128	97		
May - Aug.	1480	1187	293	62	231	153	78	226	0
Sept.- Dec.	1280	1002	278	98	180	129	51		
Building Capacity									
Dairy Barn	28	28	0	---	0	---	0	---	0
Capital, $	2,800	---	2,800	---	2,800	2,640	160	---	160
Allotments									
Net Income, $		4,236		1,120		340		46	
Acc. Net Income, $			4,236		5,356		5,696		5,742

Table 47.--continued.

Resources	Forest 2 Nothing Alternative	(F) Unused	Forest 1 Nothing Alternative	(G) Unused
Row Cropland, Acres	---	11	---	11
Total Cropland, Acres	---	0	---	0
Idle, Acres	---	61	---	61
Forest Land, Acres				
Forest No. 1	---	7	7	0
Forest No. 2	22	0	---	0
Labor, Hours				
Jan. - Apr.				
May - Aug.	---	0	---	0
Sept.- Dec.				
Building Capacity				
Dairy Barn	---	0	---	0
Capital, $	---	160	---	160
Allotments				
Net Income, $	2	---	1	---
Acc. Net Income, $		5,744		5,745

enterprise is limited to 20 acres, partly to limit the size of this somewhat speculative enterprise and partly because 20 acres is about the maximum number one man can manage as a supplemental enterprise. On this farm with relatively infertile sandy soils, other crop yields are low and the forest enterprises can contribute a greater share of net farm income. In the optimum farm plan the forest enterprises provide $1,169, or 20 per cent of total net income.

Farm D - Medium Dairy

This medium-sized dairy farm is a two-man operation, with about 11 months of family labor and 2 months of hired labor. The operator is 43 years old and in good health. A son is 16 years old. He may go to college then return to the farm. Borrowing capacity is estimated to be $4,300. The two forests of 33 acres and 53 acres represent 24 per cent of the farm area and 5 per cent of total farm investment.

In the present farm plan, Table 48, Forest No. 2 provides a net income of $359. The best choice of enterprises for Forest No. 1 is to clearcut about 1 2/3 acres each year on a 20-year rotation. The acreage limit, however, restricts net income to only $26 from the clearcut enterprise; and taxes and interest from the remaining 31 acres of Forest No. 1 provide a negative income of -$43, resulting in a negative net income from Forest No. 1 of -$17. The two forests contribute 5 per cent of the total net income. Of the unused 108 acres of total cropland, 48 acres are in Conservation Reserve. However, considerable unused cropland and labor would suggest the inclusion of some cash crop such as field beans into the farm plan.

Table 48. (Systematic Budgeting Table IV) Present Farm Plan, Farm D, Including Present Forest Enterprises

Resources	(A) Initial Resources	Present Dairy	(B) Unused	New Dairy	(C) Unused	Forest 2 P+G Logs	(D) Unused	Forest 1 Clear Cut Cords	(E) Unused
Row Cropland, Acres	44	24	20	4	16	---	16	---	16
Total Cropland, Acres	236	109	127	19	108	---	108	---	108
Forest Land, Acres									
Forest No. 1	33	---	33	---	33	---	33	2	31
Forest No. 2	53	---	53	---	53	53	0	---	0
Labor, Hours									
Jan. - Apr.	2080	1187	893	188	705	---	705	---	355
May - Aug.	2340	1329	1011	211	800	---	800	---	800
Sept.- Dec.	2070	1210	860	192	668	164	504	140	364
Building Capacity									
Dairy Barn	34	34	0	---	0	---	0	---	0
Capital, $	4,300	---	4,300	3,960	340	---	340	---	340
Allotments									
Net Income, $		5,560		583		359		26	
Acc. Net Income, $			5,560		6,143		6,502		6,528

Table 48.--continued.

Resources	New Beef	(F) Unused	Forest 1 Nothing Alternative	(G) Unused
Row Cropland, Acres	2	14	---	14
Total Cropland, Acres*	6	102	---	102
Forest Land, Acres				
Forest No. 1	---	31	31	0
Forest No. 2	---	0	---	0
Labor, Hours				
Jan. - Apr.	31	324	---	324
May - Aug.	71	729	---	729
Sept.- Dec.	44	320	---	320
Building Capacity				
Dairy Barn	---	0	---	0
Capital, $	321	19	---	19
Allotments				
Net Income, $	26		-43	
Acc. Net Income, $		6,554		6,511

*48 acres are in Conservation Reserve

In the optimum farm plan, Table 49, forest enterprises contribute $1,842, or 23 per cent of total net income. The Christmas tree enterprise for Forest No. 1 of this farm has the same purpose as for Forest No. 1 of Farm A: a means to increased income from an interim forest enterprise with the possibility of eventually converting to agronomic crops. If the Christmas tree enterprise proves competitively profitable, the area can be continued in this use. If not, conversion to agronomic crops is relatively easy and inexpensive. The productivity of Forest No. 2 may have been underestimated. The soil description on the Soil Conservation Service farm plan led to the classification of the site as supporting relatively low productivity of about 190 board feet per acre per year. This accounts for the low net return from this forest.

Farm E - Small Dairy

This one-man dairy operation is located in hilly country. Whether or not the forests are managed, the land now in forests should remain tree-covered. The owner is 44 years old and is in good health. A son is 14 years old. Borrowing capacity is estimated at $5,900. The three forests of 18 acres, 41 acres, and 44 acres comprise one-third of the farm area and 4 per cent of total farm investment.

In the present farm plan, Table 50, the forest enterprises contribute about 11 per cent of the total net return. Forest No. 2 supports two enterprises: maple sirup on 12 acres, and log sales from the remaining 29 acres, Tables C17 and C18, Appendix C. This owner has great potential for maple sirup. Forest No. 2 can average

Table 49. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm D, Including Optimum Forest Enterprises.

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Forest 1 Christmas	(C) Unused	New Dairy	(D) Unused	Forest 2 Logs	(E) Unused	New Beef	(F) Unused
Row Cropland, Acres	44	24	20	---	20	4	16	---	16	2	14
Total Cropland, Acres*	236	109	127	---	127	19	108	---	108	6	102
Forest Land, Acres											
Forest No. 1	33	---	33	33	0	---	0	---	0	---	0
Forest No. 2	53	---	53	---	53	---	53	53	0	---	0
Labor, Hours											
Jan. - Apr.	2080	1187	893	50	843	188	655	---	655	31	624
May - Aug.	2340	1329	1011	134	877	211	666	---	666	71	595
Sept.- Dec.	2070	1210	860	100	760	192	568	111	457	44	413
Building Capacity											
Dairy Barn	34	34	0	---	0	---	0	---	0	---	0
Capital, $	4,300		4,300		4,300	3,960	340		340	321	19
Allotments											
Net Income, $		5,560		1,701		583		141		26	
Acc. Net Income, $			5,560		7,261		7,844		7,985		8,011

Table 50. (Systematic Budgeting Table IV) Present Farm Plan, Farm E, Including Present Forest Enterprises.

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Forest 2 Maple Sirup	(C) Unused	Forest 3 P:C Logs	(D) Unused	Forest 2 Logs	(E) Unused	Forest 1 TSI, Saw timber	(F) Unused
Row Cropland, Acres	22	17	5	---	5	---	5	---	5	---	5
Total Cropland, Acres	143	98	45	---	45	---	45	---	45	---	45
Forest Land, Acres											
Forest No. 1	18	---	18	---	18	---	18	---	18	18	0
Forest No. 2	41	---	41	12	29	---	29	29	0	---	0
Forest No. 3	44	---	44	---	44	44	0	---	0	---	0
Labor, Hours											
Jan. - Apr.	940	866	74	72	2						
May - Aug.	1170	1068	102	---	102	88	69	26	43	5	38
Sept.- Dec.	900	847	53	---	53						
Building Capacity											
Dairy Barn	24	24	0	---	0	---	0	---	0	---	0
Capital, $	5,900	---	5,900	816	5,084	---	5,084	---	5,084	---	5,084
Allotments											
New Income, $		6,469		403		310		92		20	
Acc. Net Income, $			6,469		6,872		7,182		7,274		7,294

40 taps per acre for the first decade, and about 90 taps the following decade. Forest No. 3 can average about 50 taps the first decade and about 90 the following decade. These could be tapped with tubing to save much gathering labor. The total potential number of taps for the first decade is about 3,800 taps on the 85 acres. As can be seen in Table C17, Appendix C, 40 taps per acre will return more than $33 to labor and management. A potential net income of more than $2,800 can be realized if the owner can provide or hire about 500 hours of labor during the March-April sap season. His location in a recreational area of the state assures a ready market for quality sirup.

Unfortunately, only 74 hours of January-April labor remain after dairy chores, both in the present farm plan and the optimum farm plan, Table 51. If the son remains on the farm, or if one man can be hired, the maple sirup enterprise could pay more than $2,800 of his wages. Cropland, labor and capital borrowing ability would allow the addition of 7 new dairy cows to the herd. This would add $1,415 to net income and toward payment of wages.

Farm F - Small Mixed

This is a one-man sheep farm. The owner is a bachelor, 27 years old and in good health. One parent contributes about 1½ months of labor annually. He hopes to increase the size of his flock to 400, and is interested in a larger maple sirup operation. Unfortunately, these two enterprises compete for January-April labor. Within 10 years the number of maple taps could be doubled. This would require an additional 500 hours of January-April labor. If the sheep flock is

Table 51. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm E, Including Optimum Forest Enterprises.

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Forest 2 Maple Sirup	(C) Unused	Forest 3 Logs	(D) Unused
Row Cropland, Acres	22	17	5	---	5	---	5
Total Cropland, Acres	143	98	45	---	45	---	45
Forest Land, Acres							
Forest No. 1	18	---	18	---	18	---	18
Forest No. 2	41	---	41	5	36	---	36
Forest No. 3	44	---	44	---	44	39	5
Labor, Hours							
Jan. - Apr.	940	866	74	74	0	---	0
May - Aug.	1170	1068	102	---	102	102	0
Sept.- Dec.	900	847	53	---	53	53	0
Building Capacity							
Dairy Barn	24	24	0	---	0	---	0
Capital, $	5,900	---	5,900	755	5,145	---	5,145
Allotments							
Net Income, $		6,469		436		356	
Acc. Net Income, $			6,469		6,905		7,261

Table 51.--continued.

Resources	Forest 2 Nothing Alternative	(E) Unused	Forest 3 Nothing Alternative	(F) Unused	Forest 1 Nothing Alternative	(G) Unused
Row Cropland, Acres	---	5	---	5	---	5
Total Cropland, Acres	---	45	---	45	---	45
Forest Land, Acres						
Forest No. 1	---	18	---	18	18	0
Forest No. 2	36	0	---	0	---	0
Forest No. 3	---	5	5	0	---	0
Labor, Hours						
Jan. - Apr.	---	0	---	0	---	0
May - Aug.	---	0	---	0	---	0
Sept.- Dec.	---	0	---	0	---	0
Building Capacity						
Dairy Barn	---	0	---	0	---	0
Capital, $	---	5,145	---	5,145	---	5,145
Allotments						
Net Income, $	13		2		-4	
Acc. Net Income, $		7,274		7,276		7,272

increased by 100 head, an additional 270 hours of January-April labor would be needed. Since only 10 hours of labor for this period remains unused after present requirements for the two enterprises have been satisfied, either more labor must be obtained for this period, or one of the enterprises must be reduced to favor the other. Borrowing capacity is estimated to be zero. The three forests of 25 acres, 18 acres, and 55 acres constitute 31 per cent of the farm area and 20 per cent of total farm investment.

This is one farmer who might consider converting almost completely to forest enterprises, increasing his maple operation to about 3,000 taps and growing Christmas trees as well as selling logs from Forest No. 3. In the present farm plan, Table 52, forest enterprises can contribute $1,600 or 40 per cent of total net income. Doubling maple sirup production can increase net income from this enterprise to about $2,400 annually. Christmas trees should contribute about $50 of net income per acre annually. These two enterprises could be complementary in the use of labor.

In the present farm plan, sale of poor and good:cut logs from Forest No. 2 add more to net income than does the TSI enterprise for Forest No. 3. However, in the optimum farm plan, Table 53, annual sale of logs from Forest No. 3 contributes more net income than sale of logs from the smaller Forest No. 2. These are minor changes in comparison to those possible, should this farmer decide to favor forest enterprises.

Table 52. (Systematic Budgeting Table IV) Present Farm Plan, Farm F, Including Present Forest Enterprises.

Resources	(A) Initial Resources	Present Ewe & Lamb	(B) Unused	Forest 1 Maple Sirup	(C) Unused	Forest 2 P+G Logs	(D) Unused	Forest 3 TSI Sawtimber	(E) Unused
Row Cropland, Acres	0	---	0	---	0	---	0	---	0
Total Cropland, Acres	150	150	0	---	0	---	0	---	0
Forest Land, Acres									
Forest No. 1	25	---	25	25	0	---	0	---	0
Forest No. 2	18	---	18	---	18	18	0	---	0
Forest No. 3	55	---	55	---	55	---	55	55	0
Labor, Hours									
Jan. - Apr.	1160	900	260	250	10	---	10	---	10
May - Aug.	1890	1410	480	---	480	---	480	---	480
Sept.- Dec.	390	300	90	---	90	65	25	22	3
Building Capacity									
Sheep Barn	300	300	0	---	0	---	0	---	0
Capital, $	0	---	0	---	0	---	0	---	0
Allotments									
Net Income, $		2,361		1,214		213		173	
Acc. Net Income, $			2,361		3,575		3,788		3,961

Table 53. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm F, Including Optimum Forest Enterprises.

Resources	Initial Resources	Present Ewe & Lamb	(B) Unused	Forest 1 Maple Sirup	(C) Unused	Forest 3 Logs	(D) Unused	Forest 2 Logs	(E) Unused
Row Cropland, Acres	0	---	0	---	0	---	0	---	0
Total Cropland, Acres	150	150	0	---	0	---	0	---	0
Forest Land, Acres									
Forest No. 1	25	---	25	25	0	---	0	---	0
Forest No. 2	18	---	18	---	18	---	18	18	0
Forest No. 3	55	---	55	---	55	55	0	---	0
Labor, Hours									
Jan. - Apr.	1160	900	260	250	10	---	10	---	0
May - Aug.	1890	1410	480	---	480	300	180	58	122
Sept.- Dec.	390	300	90	---	90	90	0	---	0
Building Capacity									
Sheep Barn	300	---	0	---	0	---	0	---	0
Capital, $	0				0		0		0
Allotments									
Net Income, $		2,361		1,214		719		83	
Acc. Net Income, $			2,361		3,575		4,294		4,377

Farm G - Small Dairy-Potato

This cooperator is 50 years old and in good health. His son is 19 years old. The owner plans to favor his dairy enterprise. Borrowing capacity is estimated to be zero. This is unfortunate, since this farmer has the potential for a sizable maple sirup enterprise. With present labor unused after requirements for present dairy, present potatoes and present Christmas trees have been satisfied he could produce about 500 gallons of maple sirup from Forest No. 1 alone. This would provide about $2,000 of net income. However, about $4,000 worth of equipment is needed to initiate this enterprise.

The six forests comprise 42 per cent of the farm area and 20 per cent of total farm investment. In the present farm plan, Table 54, forest enterprises contribute $1,996, or 21 per cent of total net income. In the optimum farm plan, Table 55, forest enterprises can contribute $2,213, or 23 per cent of total net income. If equipment can be purchased for the maple sirup enterprise possible with present available labor, forest enterprises could contribute at least $4,000, or one-third of a total net income of more than $11,500.

In the present farm plan Forest No. 1 provides $422 per acre of net income from the sale of 100 board feet of poor logs and 100 board feet of good logs per acre annually while stocking builds toward the optimum level. Once optimum stocking is obtained this forest can provide about $629 of optimum net income from the sale of about 385 board feet of logs per acre annually. A maple sirup enterprise, on

Table 54. (Systematic Budgeting Table IV) Present Farm Plan, Farm G, Including Present Forest Enterprises.

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Present Potato	(C) Unused	Forest 5 Christmas	(D) Unused	Forest 2 P&G Logs	(E) Unused
Row Cropland, Acres	19	---	19	19	0	---	0	---	0
Total Cropland, Acres	199	134	65	19	46	---	46	---	46
Forest Land, Acres									
Forest No. 1	68	---	68	---	68	---	68	---	68
Forest No. 2	60	---	60	---	60	---	60	60	0
Forest No. 3	40	---	40	---	40	---	40	---	40
Forest No. 4	30	---	30	---	30	---	30	---	30
Forest No. 5	11	---	11	---	11	11	0	---	0
Forest No. 6	17	---	17	---	17	---	17	---	17
Labor, Hours									
Jan. - Apr.	1160	769	391	---	391	---	391	79	312
May - Aug.	1890	1031	859	285	574	34	540	---	540
Sept.- Dec.	2040	672	1368	608	760	55	705	89	616
Building Capacity									
Dairy Barn	21	21	0	---	0	---	0	---	0
Capital, $	0	---	0	---	0	---	0	---	0
Allotments									
Net Income, $		4,647		2,926		630		425	
Acc. Net Income, $			4,647		7,573		8,203		8,628

Table 54.--continued.

Resources	Forest 1 P&G Logs	(F) Unused	Forest 4 P&G Logs	(G) Unused	Forest 3 P:C Logs	(H) Unused	Forest 6 Nothing Alternative	(I) Unused
Row Cropland, Acres	---	0	---	0	---	0	---	0
Total Cropland, Acres	---	46	---	46	---	46	---	46
Forest Land, Acres								
Forest No. 1	68	0	---	0	---	0	---	0
Forest No. 2	---	0	---	0	---	0	---	0
Forest No. 3	---	40	---	40	40	0	---	0
Forest No. 4	---	30	30	0	---	0	---	0
Forest No. 5	---	0	---	0	---	0	---	0
Forest No. 6	---	17	---	17	---	17	17	0
Labor, Hours								
Jan. - Apr.	70	242	45	197	45	152	---	152
May - Aug.	---	540	---	540	---	540	---	540
Sept.- Dec.	100	516	48	468	51	417	---	417
Building Capacity								
Dairy Barn	---	0	---	0	---	0	---	0
Capital, $	---	0	---	0	---	0	---	0
Allotments								
Net Income, $	422		264		210		45	
Acc. Net Income, $		9,050		9,314		9,524		9,569

the other hand, could yield about $2,997 of present net income from 3,740 taps, and optimum net income of about $4,290 from 5,100 taps.

Forest No. 2 provides $422 per acre of present net income from sale of poor and good logs as the forest grows toward optimum stocking. At optimum stocking, this forest can provide about $524 per acre of net income annually from sale of logs. It can produce sap from 3,800 taps, to yield about 800 gallons of sirup worth $4,800. The net income would be about $3,000 annually, almost six times the optimum net income from log sales.

Forest No. 3 provides $210 per acre of present net income from sale of poor logs, and can provide about $310 per acre of optimum net income from sale of logs. About 45 taps per acre will be possible in about 10 years. A yield of 0.2 gallons of sirup per tap will provide 9 gallons of sirup per acre or 360 gallons for the forest. The net income would be about $1,440 annually.

Forest No. 4 is a white pine-northern hardwood stand which can provide small amounts of net income annually from sales: $210 in the present farm plan and $109 in the optimum farm plan. Or, this forest can provide lumber for a saphouse, storage sheds, and other new buildings.

Forest No. 5 is an 11-acre Christmas tree plantation of red pine, Scotch pine, and white spruce. This enterprise contributes slightly more in the present farm plan ($630) than in the optimum plan ($596) because the current stand is 3 years old, so establishment costs and several years of taxes are not deducted. Another 20 to 25 acres of adjacent permanent pasture land is classified in the same

Table 55. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm G, Including Optimum Forest Enterprises.

Resources	(A) Initial Resources	Present Dairy	(B) Unused	Present Potato	(C) Unused	Forest 5 Christmas	(D) Unused	Forest 1 Logs	(E) Unused
Row Cropland, Acres	19	---	19	19	0	---	0	---	0
Total Cropland, Acres	199	134	65	19	46	---	46	---	46
Forest Land, Acres									
Forest No. 1	68	---	68	---	68	---	68	68	0
Forest No. 2	60	---	60	---	60	---	60	---	60
Forest No. 3	40	---	40	---	40	---	40	---	40
Forest No. 4	30	---	30	---	30	---	30	---	30
Forest No. 5	11	---	11	---	11	11	0	---	0
Forest No. 6	17	---	17	---	17	---	17	---	17
Labor, Hours									
Jan. - Apr.	1160	769	391	---	391	13	378	---	378
May - Aug.	1890	1031	859	285	574	34	540	---	540
Sept.- Dec.	2040	672	1368	608	760	55	705	286	419
Building Capacity									
Dairy Barn	21	21	0	---	0	---	0	---	0
Capital, $	0	---	0	---	0	---	0	---	0
Allotments									
Net Income, $		4,647		2,926		596		629	
Acc. Net Income, $			4,647		7,573		8,169		8,798

Table 55.--continued.

Resources	Forest 2 Logs	(F) Unused	Forest 3 Logs	(G) Unused	Forest 4 Logs	(H) Unused	Forest 6 Sawtimber	(I) Unused
Row Cropland, Acres	---	0	---	0	---	0	---	0
Total Cropland, Acres	---	46	---	46	---	46	---	46
Forest Land, Acres								
Forest No. 1	---	0	---	0	---	0	---	0
Forest No. 2	60	0	---	0	---	0	---	0
Forest No. 3	---	40	40	0	---	0	---	0
Forest No. 4	---	30	---	30	30	0	---	0
Forest No. 5	---	0	---	0	---	0	---	0
Forest No. 6	---	17	---	17	---	17	17	0
Labor, Hours								
Jan. - Apr.	100	278	34	244	29	215	---	52
May - Aug.	---	540	---	540	---	540	---	540
Sept.- Dec.	140	279	130	149	100	49	---	46
Building Capacity								
Dairy Barn	---	0	---	0	---	0	---	0
Capital, $	---	0	---	0	---	0	---	0
Allotments								
Net Income, $	524		310		109		45	
Acc. Net Income, $		9,322		9,632		9,741		9,786

capability class as the area now planted. Presumably this land can be used for the Christmas tree enterprise. To supply the feed lost when this permanent pasture is converted to Christmas trees, part of Forest No. 2 can be converted to hay land. The soils under this forest are the best on the farm, so should produce at least 2.1 tons of hay, the average production on current hay fields. The permanent pasture provides feed equivalent of about 0.8 ton of hay per acre or about 40 per cent of the potential of Forest No. 2 acreage if converted.

On a 10-year rotation, the Christmas tree enterprise can yield an average annual net return of about $60 per acre. Crops for one dairy cow require 6.4 acres of cropland. The net income from one unit (cow) of the dairy enterprise is $221.27. Therefore, the crops produced by one acre are worth less than $35. Poorer cropland can be converted to the Christmas tree enterprise if this provides more net income than the hay enterprise, and if the loss of hay production on the poorer land can be replaced by higher production on other fields.

Forest No. 6 is a 17-acre stand of 15-year-old pine. A possible budget for this forest is presented as Table C19, Appendix C. The net income per unit (acre) of $2.66 is obtained by discounting net returns to the present and assuming 5 per cent of the discounted value as the annual net income.

Farm H - Small Poultry

This small poultry farm is a one-man operation. The owner is 33 years of age, a bachelor, and in good health. Borrowing capacity is estimated to be zero. The two forests of 49 acres and 9 acres are one-fourth of the farm area and 8 per cent of the total farm investment.

In the present farm plan, Table 56, forest enterprises contribute one-third of total net income from sale of logs. In the optimum farm plan, Table 57, forest enterprises contribute 15 per cent of total net income.

Lack of investment capital prevents initiation of the most profitable forest enterprise: maple sirup. Forest No. 1 has sufficient larger sugar maple trees for an average of 70 taps per acre during the first decade, and 115 taps the second decade. Estimated net income from this enterprise is $68.86 per acre, or $3,374 annually from this enterprise. Of course, this enterprise would be in competition with the poultry enterprise for January-April labor. The poultry enterprise now utilizes 1,020 hours of the 1,130 hours available for those months. The maple sirup enterprise would require over 500 hours during the same period. Equipment to initiate the maple sirup enterprise would cost about $5,780. Sale of poor:cut and good:cut logs other than sugar maple in both forests would provide about $2,300. Harvesting would require about 720 hours. With 340 hours unused after poultry enterprise requirements are supplied, two years of logging would be required to harvest the logs. If 1,800 fewer pullets were purchased the second year, the owner could purchase the necessary building and equipment.

Farm I - Medium Potato-Beef-Hog

This potato-livestock farm is a 2½-man operation: the father contributes 10 months of labor, one son works full time, one son helps during summer months while completing university education, and about 3.5 months of hired labor is used. The owner's health is poor, but

Table 56. (Systematic Budgeting Table IV) Present Farm Plan, Farm H, Including Present Forest Enterprises.

Resources	(A) Initial Resources	Present Poultry	(B) Unused	Forest 1 P&G Logs	(C) Unused	Forest 2 P:C Logs	(D) Unused
Row Cropland, Acres	0	---	0	---	0	---	0
Total Cropland, Acres	145	---	145	---	145	---	145
Forest Land, Acres							
Forest No. 1	49	---	49	49	0	---	0
Forest No. 2	9	---	9	---	9	9	0
Labor, Hours							
Jan. - Apr.	1130	1020	110	100	10	10	0
May - Aug.	1130	1020	110	100	10	---	10
Sept.- Dec.	1080	960	120	104	16	11	5
Building Capacity							
Poultry house	3500	3000	500	---	500	---	500
Capital, $	0	---	0	---	0	---	0
Allotments							
Net Income, $		2,691		1,070		249	
Acc. Net Income, $			2,691		3,761		4,010

Table 57. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm H, Including Optimum Forest Enterprises.

Resources	(A) Initial Resources	Present Poultry	(B) Unused	Forest 1 Logs	(C) Unused	Forest 2 Cut Logs	(D) Unused
Row Cropland, Acres	0	---	0	---	0	----	0
Total Cropland, Acres	145	---	145	---	145	----	145
Forest Land, Acres							
Forest No. 1	49	---	49	49	0	----	0
Forest No. 2	9	---	9	---	9	9	0
Labor, Hours							
Jan. - Apr.	1130	1020	110	100	10	10	0
May - Aug.	1130	1020	110	---	110	4	106
Sept.- Dec.	1080	960	120	96	24	24	0
Building Capacity							
Poultry House	3500	3000	500	---	500	----	500
Capital, $	0	---	0	---	0	----	0
Allotments							
Net Income, $		2,691		447		38	
Acc. Net Income, $			2,691		3,138		3,176

the two sons, 30 and 27 years of age, are in good health. The owner hopes to increase the acreage of potatoes grown and to increase the size of his beef herd. He owns a pulpwood loader and a new 2½-ton pulp truck. He wants to harvest 150 cords of pulpwood annually. At current rates of growth, he can harvest 190 cords. Borrowing capacity of this farmer is estimated to be zero. The three forests of 49 acres, 180 acres, and 160 acres represent 57 per cent of the farm area and 19 per cent of total farm investment. Forest enterprises contribute 17 per cent of total net income in the present farm plan, Table 58. They contribute 35 per cent of total net income in the optimum farm plan, Table 59. The increase results primarily from the change in product sold from Forest No. 3, from pulpwood to sawlogs.

If the owner can borrow investment capital he can increase his beef herd by 12 animals or increase his potato enterprise by 4 acres with present unused resources. Net income from a unit (acre) of a new potato enterprise is $127.14. The budgets for a unit of the cut and deliver pulpwood enterprise, Tables C20 and C21, Appendix C, shows the net income from one acre of potatoes to equal that from 47 units (acres) of the present pulpwood enterprise or 41 units of the optimum pulpwood enterprise. So, the net income from 4 additional acres of potatoes would equal the net income from about half of the total forest acreage in a cut and deliver pulpwood enterprise.

This ends the presentation of farm plans prepared for nine Michigan farms using the systematic budgeting technique. In all but one of the farm plans forest enterprises are included solely on the basis of their comparative contribution to total net income.

Table 58. (Systematic Budgeting Table IV) Present Farm Plan, Farm I, Including Present Forest Enterprises.

Resources	(A) Initial Resources	Present Potatoes	(B) Unused	Present Hog	(C) Unused	Forest 3 Deliver Cut Cords	(D) Unused	Forest 2 Deliver Cut Cords	(E) Unused
Row Cropland, Acres	38	31	7	---	7	---	7	---	7
Total Cropland, Acres	204	31	173	56	117	---	117	---	117
Forest Land, Acres									
Forest No. 1	49	---	49	---	49	---	49	---	49
Forest No. 2	180	---	180	---	180	---	180	180	0
Forest No. 3	160	---	160	---	160	160	0	---	0
Labor, Hours									
Jan. - Apr.	1150	---	1150	352	798	---	798	---	798
May - Aug.	2700	465	2235	320	1915	---	1915	---	1915
Sept.- Dec.	3270	992	2278	140	2138	560	1578	630	948
Building Capacity									
Beef Barn	28	---	28	---	28	---	28	---	28
Hog House	12	---	12	12	0	---	0	---	0
Capital, $	0	---	0	---	0	---	0	---	0
Allotments		31 acres							
Net Income, $		5,245		770		699		486	
Acc. Net Income, $			5,245		6,015		6,714		7,200

Table 58.--continued.

Resources	Present Beef	(F) Unused	Forest 1 Deliver Cut Cords	(G) Unused
Row Cropland, Acres	3	4	---	4
Total Cropland, Acres	67	50	---	50
Forest Land, Acres				
Forest No. 1	---	49	49	0
Forest No. 2	---	0	---	0
Forest No. 3	---	0	---	0
Labor, Hours				
Jan. - Apr.	342	456	---	156
May - Aug.	692	1223	---	1223
Sept.- Dec.	294	654	172	287
Building Capacity				
Beef Barn	28	0	---	0
Hog House	---	0	---	0
Capital, $	---	0	---	0
Allotments				
Net Income, $	296		152	
Acc. Net Income, $		7,496		7,648

Table 59. (Systematic Budgeting Table IV) Optimum Farm Plan, Farm I, Including Optimum Forest Enterprises.

Resources	(A) Initial Resources	Present Potato	(B) Unused	Forest 3 Logs	(C) Unused	Present Hog	(D) Unused	Forest 2 Deliver Cut Cords	(E) Unused
Row Cropland, Acres	38	31	7	---	7	---	7	---	7
Total Cropland, Acres	204	31	173	---	173	56	117	---	117
Forest Land, Acres									
Forest No. 1	49	----	49	---	49	---	49	---	49
Forest No. 2	180	----	180	---	180	---	180	180	0
Forest No. 3	160	----	160	160	0	---	0	---	0
Labor, Hours									
Jan. - Apr.	1150	----	1150	---	1150	352	798	---	798
May - Aug.	2700	465	2235	---	2235	320	1915	---	1915
Sept.- Dec.	3270	992	2278	1072	1206	140	1066	756	310
Building Capacity									
Beef Barn	28	----	28	---	28	---	28	---	28
Hog House	12	----	12	---	12	12	0	---	0
Capital, $	0	----	0	---	0	---	0	---	0
Allotments		31 acres							
Net Income, $		5,245		2,594		770		563	
Acc. Net Income, $			5,245		7,839		8,609		9,172

Table 59.--continued.

Resources	Present Beef	(F) Unused	Forest 1 Deliver Cut Cords	(G) Unused
Row Cropland, Acres	3	4	---	4
Total Cropland, Acres	67	50	---	50
Forest Land, Acres				
Forest No. 1	---	49	49	0
Forest No. 2	---	0	---	0
Forest No. 3	---	0	---	0
Labor, Hours				
Jan. - Apr.	342	456	206	250
May - Aug.	692	1223	---	1223
Sept.- Dec.	294	16	---	16
Building Capacity				
Beef Barn	28	0	---	0
Hog House	---	0	---	0
Capital, $	---	0	---	0
Allotments				
Net Income, $	296		204	
Acc. Net Income, $		9,468		9,672

CHAPTER VI

CONCLUSIONS

Farm forests in the United States contain almost one-third of the forest resources of the Nation. These forests must contribute a major share of the timber to meet future wood requirements. Recent studies have shown these farm forests are less productive than forests in public and industrial ownerships. Improved management of farm forests has been encouraged through increased public and forest industry assistance and educational programs. However, one element of the problem has received surprisingly little attention, yet would appear to be the crux to the solution: integration of management of the farm forest resources and enterprises with management of other farm resources and enterprises.

Astonishingly little has been published on farm forest management as a part of farm management. The three studies which have been concerned with the coordinated management of the farm forest with the rest of the farm business were reviewed and were described in some detail. In two of the studies forest enterprises are combined with other farm enterprises after independent selection of optimum alternatives for forest and other farm resources. Linear programming is used in the third study to apply simultaneously all resources to all enterprises to compute an optimum combination of enterprises. In this dissertation, another technique is studied; a method which lies between those used in the previous studies. It is termed simplified programming or systematic budgeting. This method for systematically integrating all farm resources and enterprises into a farm plan has been developed by Clyde R. Weathers of the North Carolina Extension Service. Farm forest resources and enterprises of nine Michigan farms were included in farm plans prepared by this systematic budgeting technique. The farms are located throughout the Lower Peninsula, in six different type-of-farming areas. All three general economic sizes of farms are represented. The farms include feeder-beef, dairy, sheep, dairy-potato, poultry, and potato-livestock. The farms range in size from 201 acres to 685 acres. Two to six forests on each farm represented 22 to 57 per cent of the farm areas and 4 to 20 per cent of total farm investments. The forests ranged in size from 11 acres to 180 acres. Forest types included were upland hardwood, mixed conifer swamp, northern hardwood, aspen-paper birch, and white pine. The forests were inventoried using the Bitterlich technique and stand-stock tables were prepared using an IBM 1401 computer.

Budgets were prepared for units of agronomic, livestock, and forest enterprises which would be considered in preparing two farm plans for each farm. One was a 'present' farm plan which would include only those forest enterprises from which an income could be received within the next 10 years. Among the forest enterprises considered for present farm plans were 'timber stand improvement', 'sell poor:cut stumpage', 'sell poor:cut logs', 'sell poor:cut + good:cut logs', 'deliver cut cords', 'clearcut', 'Christmas trees', and 'maple sirup'. A 'nothing alternative' was included to represent

disinterest on the part of the owner. The other was an 'optimum' farm plan which includes forest enterprises possible when a forest reaches some optimum level of stocking, has grown to a size which allows some special enterprise (e.g., maple sirup), or is converted from one use to another (e.g., a severely understocked stand of low-quality hardwood to a Christmas tree plantation). Among the forest enterprises considered for optimum farm plans were 'sell stumpage', 'sell logs', 'sell cords', 'deliver cut cords', Christmas trees', 'maple sirup', and 'interplanted black walnut'.

The farm plans were prepared by a sequence of repetitive steps. The initial step consisted of applying available resources to each enterprise as though it were the only enterprise being considered. Inevitably one resource would be exhausted for each enterprise; i.e., would limit the further expansion of the enterprise. When all enterprises had been expanded to the limit set by an exhausted resource, the net income provided by each enterprise was determined. The enterprise which provided the largest net income was selected as the first enterprise to be entered into a farm plan. Next, the unused resources were listed.

The second step was a repetition of the first. The remaining resources were applied to each remaining enterprise as though it were the only enterprise being considered for second place in the farm plan. Again, resources were applied to each enterprise until exhaustion of one resource limited further expansion of the enterprise. Net incomes were determined and compared. The remaining enterprise having the largest net income was then added to the farm plan.

These repetitive steps were continued until all enterprises had been entered into the farm plan or until insufficient resources remained for inclusion of another enterprise. A 'present' farm plan and an 'optimum' farm plan was prepared for each of the nine farms.

Systematic budgeting assures the use of all the resources of a farm, including the forest resources, toward maximization of total net income. This is the only consideration foresters may reasonably ask for forest resources and enterprises: that they be considered along with other resources when farm plans are prepared. In this study forest resources and enterprises were systematically budgeted into farm plans with other farm resources and enterprises. Some forest enterprises were never entered into farm plans because the supply of labor or investment capital (if available) was exhausted by more profitable enterprises. Some forest enterprises were included in farm plans because they could utilize labor any time of the year. And some forest enterprises were included in farm plans because they could utilize resources more profitably than other enterprises.

Preparation of enterprise unit budgets such as those in Appendix C is the essential first step of systematic budgeting. It is also the most difficult and most frustrating step, because physical yield data, resource and labor requirements, and price information for forest enterprises are meager at most. Data for livestock and agronomic enterprises are vastly more voluminous and detailed. Data for the budgets in this study were compounded from a limited number of studies in Indiana, Michigan, Minnesota, New York

Tennessee, and Wisconsin. Collection, analysis and publication of information for forest enterprises is a fertile and relatively untrod field for any interested research forester. More information is needed on the production of rapid, lucid and reliable periodic physical yield estimates using aerial photographs, the Bitterlich inventory technique, and electronic computers. Mensurational techniques for small forests need further study and refinement. What volumes and values justify the costs of inventories? Can periodic farm forest inventories be incorporated into computerized business analysis programs being initiated in many states? The relationships between silvicultural maturity and economic maturity for all forest types should receive priority in management studies. The alternative rate of return of 6 per cent used to determine the optimum stocking level would find antagonists among silviculturists and economists.

The writer searched diligently for resource and labor requirement data for farm forest enterprises. In the end, he was forced to use mostly the same few sources used by previous authors. Where are the studies on costs and returns of silvicultural practices, of home-use of timber products? Where are the studies of price trends for forest products of the Lake States?

This profound paucity of reliable information notwithstanding, conclusions can be drawn concerning the incorporation of forest enterprises into plans for the farms in this study, and the contributions of these enterprises to the total net incomes of the farms. The farm plans prepared in this dissertation provide evidence of the feasibility of including forest resources and enterprises when

preparing farm plans. In all except one of the farm plans, income from forest enterprises can pay ownership costs, operating costs, and leave a positive contribution to total net income. Individually, the plans illustrate the wide variation in contributions by forest enterprises to net income. Under present conditions, forests on the study farms can contribute from less than nothing to 40 per cent of total net income. The real value of net income from present forest enterprises ranges from $-113 to $2,056. When forests are optimally stocked and the most profitable continuous enterprises can be incorporated into farm plans, forests could contribute from 3 per cent to 46 per cent of total net income. Real value of net income from optimum forest enterprises ranges from $485 to $3,361. For one of the study farms, total net income would more than double if the owner converted entirely to forest enterprises. If investment capital or additional capital were available for several farms, maple sirup enterprises could increase total net income by several thousands of dollars.

The amount of total net income, relative or real, contributed by forest enterprises varied with the size of total net income, value of forest crops harvested, labor supply, and/or available investment capital. The relative contribution can represent considerably different real contributions from farm to farm. For example, under present forest conditions the $1,600 which can be contributed to net income by forest enterprises of Farm F represents 40 per cent of the total net income of $3,961. For Farm B, the $1,457 which can be contributed to net income by forest enterprises represents

only 6 per cent of the total net income of $25,178. Solely from the economic point of view, one would assume the owner of Farm F to have more intense interest in farm forest management. Apparently he has more interest in intensive forest management because he sells logs, pulpwood, and maple sirup, and carries timber stand improvement annually; while the owners of Farm B have sold stumpage periodically and do not presently carry on timber stand improvement. Foresters must be cognizant of the relative as well as the real contributions of forest enterprises to net income. A forester should have sufficient information about possible forest enterprises for a farm to provide the owner with realistic estimates of costs and net incomes from an acre or some other unit of each of the enterprises. If the forester can include an estimate of the hours of labor required, the owner can then decide which enterprise or enterprises to include in his farm plans on the basis of real or relative contribution to net income, return per hour, return on investment, or some combination of these.

Sizable increases in relative contributions to total net income by optimum forest enterprises over present forest enterprises usually were associated with changes to more profitable crops or enterprises. For example, the contributions from Christmas tree enterprises in the optimum farm plans for Farms A, C, and D would be considerably greater than those from the relatively long-rotation, low-value hardwoods of present farm plans. Likewise, the contribution from optimum forest enterprises of Farm I would be more than from

present forest enterprises because logs instead of pulpwood could be harvested from one of the forests after it had reached optimum stocking.

For all the farms in the study, the more profitable enterprises were those for which considerable labor would be applied to growing and harvesting high-value crops. Enterprises can be grouped in order of decreasing profitability in this study: Christmas trees and maple sirup, logs, cut cords, and sawtimber stumpage. The comparative profitability of enterprises becomes evident when the enterprise unit budgets and systematic budgeting tables are prepared for a farm.

Limited labor supplies allowed inclusion of some forest enterprises on some farm plans and excluded others. All forest enterprises except maple sirup, Christmas trees, and interplanted black walnut were assumed to be unrestricted by seasonal labor requirements. This assumption allows forest enterprises to be included in plans for three farms. When limited September-December labor prevents further expansion of the present dairy of Farm B, remaining labor for other seasons allows the addition of sawlog and stumpage enterprises. When limited September-December labor prevents addition to the dairy of Farm E, sufficient labor remains to add several forest enterprises. A few hours of January-April labor allow the addition of a small maple sirup enterprise in one forest. Labor for other seasons allow the addition of sawlog and stumpage enterprises. Likewise, when limited labor prevents further expansion of the poultry enterprise of Farm H, the unused labor can be applied to sawlog enterprises.

Thus, the complementary nature of these forest enterprises favors their inclusion in several of the farm plans.

Limited seasonal labor can restrict or exclude forest enterprises as well as agronomic and livestock enterprises. For two farms maple enterprises are restricted and for another farm a potentially profitable maple enterprise is excluded because of insufficient January-April labor. The restriction or exclusion of a maple sirup enterprise can result in considerable loss of net income because this enterprise can contribute from $35 to $80 of net income per acre annually. On one farm especially, Farm F, the owner must soon decide whether to continue to apply his January-April labor to lambing or apply it to a growing, competing and potentially more profitable maple sirup enterprise. Choosing the maple sirup enterprise would preclude the sheep enterprise. A Christmas tree enterprise could be established on present hay land and could be an excellent complement to the maple enterprise in the use of labor. Ten years hence another farm plan may identify the maple sirup enterprise as the most profitable for the farm.

If profitability of enterprises included in farm plans is compared on the basis of net return per hour of labor, the sale of high-quality logs from Farms B and H as part of present forest farm plans provide the highest returns, $8.41 and $11.86 per hour, respectively. Next most profitable would be the Christmas tree enterprises at $5.32 to $7.35 per hour, then maple sirup enterprises at $4.86 to $5.89 per hour. Sale of logs from other forests return $1.27 to $3.53 per hour. Cut and delivered pulpwood returns $.80 to $.98 per hour, and cordwood at the road returns $.18 to $.20 per hour.

Lack of investment capital probably restricts expansion or initiation of many potentially profitable farm enterprises. Certainly current inability to borrow capital prohibits the initiation or expansion of maple sirup enterprises on three of the study farms. For Farm G, an investment of $4,000 for a saphouse and equipment should return about $2,000 of additional net income annually. Investment of about $5,800 for a saphouse and equipment for Farm H should return about $3,700 of net income annually. These propitious conclusions presume use of modern gathering and evaporating techniques and a dynamic marketing program.

In summary, the nine pairs of farm plans prepared in this dissertation illustrate the allocation of farm resources among combinations of enterprises on the basis of most profitable use of each resource. The forest resources and enterprises of these farms have not been ignored; neither has their economic importance been exaggerated. The amount of each forest resource which can be expended without impairing productivity of the forest was determined. These controlled amounts of forest resources were applied to enterprises systematically along with all other farm resources. Each of the forest enterprises which was considered for the farm plans was included or excluded on the basis of whether or not it could contribute more to net income than some other forest, agronomic, or livestock enterprise. The forest enterprises can contribute positive net incomes to all farm plans except one. They can provide three to forty-six per cent of total net income.

APPENDIX A

FIELD INVENTORY FORM,

AND FOREST PRODUCT PRICES

WOODLAND ENTERPRISE STUDY
10 BAF Point Sample Sheet

Date:___

State(02-03):__________ County(04-05):__________ Farm(06-07):___

Woods(10):__________ Stand(11):__________

Point No. (12-13)	Tree No. (14-15)	Species (16-17)	DBH Class (18-19)	Number 8-Foot Logs (20)	Number 8-Foot Bolts (21)	Tree Condition Class (22)	Mortality Cause (23)

Figure 4. Forest Inventory Field Form

Table A1. Forest Product Prices Adjusted to Species, Volumes and Quality to Provide Unit Prices by Condition Classes, Study Farms, 1963*

		Condition Classes	Stumpage		At Road	
Farm	Forest	Included**	Bd. Ft.	St. Cd.	Bd. Ft.	St. Cd.
A	1	Poor:cut+	$ 35	$	$	$
	2	Poor:cut+	68		83	
B	1	Poor:cut+	57			
		Poor:leave+	64		79	
		Poor:cut	32		47	
	2	Poor:cut+	87			
		Poor:leave+	125		140	
		Poor:cut	30		45	
C	1	Poor:cut+	13	1.35	31	7.20
		Good:leave+	15	1.20	25	6.90
		Good:cut+	13	1.40		7.75
		Good:cut			31	
		Poor:cut	6	1.20	22	6.80
	2	Poor:cut+	17	1.30		7.05
		Good:cut+	20	1.15	29	7.05
		Poor:cut		1.15	23	6.70
D	1	Poor:cut	16	1.35	29	6.50
		Good:cut+	19		39	
		Poor:cut	14		25	
	2	Poor:cut+	22	1.30	38	6.50
		Good:cut+	30	1.30	49	6.50
		Poor:cut	14	1.30	25	6.50

Table A1.--continued.

Farm	Forest	Condition Classes Included**	Stumpage Bd. Ft.	Stumpage St. Cd.	At Road Bd. Ft.	At Road St. Cd.
E	1	Poor:cut+	$ 4	$ 1.25	$	$ 7.25
		Good:leave	12	1.25	30	7.25
	2	Poor:cut+	20	1.10	42	7.40
		Good:cut	25	1.00	53	7.50
		Good:cut+***	24		51	
		Poor:cut	10	1.15	24	7.30
	3	Poor:cut+	19	1.20	43	7.90
		Good:cut+***	24	1.20	49	7.80
		Poor:cut	10	1.05	24	7.56
F	1	Poor:cut+	20	1.35	43	8.05
		Good:cut+	21	1.35	45	8.05
		Poor:cut	8	1.35	19	8.05
	2	Poor:cut+	35	1.40	54	8.25
		Poor:leave+	36	1.40	55	8.30
		Poor:cut+leave	27	1.40	42	8.25
		Poor:cut+good:cut			51	
	3	Poor:cut+	12	1.45	29	8.50
		Poor:leave	15	1.50	34	9.00
		Poor:cut+	11	1.30	28	7.50

Table A1.--continued.

Farm	Forest	Condition Classes Included**	Stumpage		At Road	
			Bd. Ft.	St. Cd.	Bd. Ft.	St. Cd.
G	1	Poor:cut+	$ 21	$ 2.00	$ 45	$ 7.65
		Poor:cut+#	24		51	
		Good:cut+	26	1.05	54	7.75
		Poor:cut	9	1.00	21	7.50
	2	Poor:cut+	19	1.05	40	7.55
		Poor:cut+#	23		48	
		Good:leave	24	1.00	51	7.50
		Poor:cut	10	1.10	22	7.60
	3	Poor:cut+	14	1.15	31	7.70
		Poor:cut+#	17	1.15	39	7.75
		Good:cut+	21	1.25	46	7.85
		Poor:cut	11	1.00	24	7.50
		Poor:cut#	15		32	
	4	Poor:cut+#	29	1.95	42	8.65
		Poor:cut+	31	2.00	45	8.75
		Good:cut+	34	2.25	46	9.15
		Poor:cut	13	1.25	27	7.70
H	1	Poor:cut+#	23	1.35	49	8.00
		Poor:cut+	25	1.35	53	8.00
		Good:cut+	25	1.45	53	8.10
		Poor:cut	13	1.15	28	7.70
	2	Poor:cut+	7	1.35	24	7.65
		Good:cut+	8	1.50	27	7.55
		Poor:cut	5	1.10	16	7.75

Table A1.--continued.

Farm	Forest	Condition Classes Included	Stumpage Bd. Ft.	Stumpage St. Cd.	At Road Bd. Ft.	At Road St. Cd.	Delivered Bd. Ft.	Delivered St. Cd.
I	1	Good:cut+	$ 21	$ 1.45	$ 40	$ 7.95	$	$ 14.90
	2	Good:cut+	16	1.25	35	7.20		14.10
	3	Good:cut+	20	2.40	37	9.10		15.85

*Price for one or more condition classes = (species volume x price per unit), with prices for 'poor' trees 25 per cent reduced below the average price for the species, and prices for 'good' trees raised 25 per cent above the average.

**Condition classes are described on page 33. A price includes volumes in the class noted and better. For example, 'cull' indicates all stand volume is included. 'Poor: leave+' indicates 'cull' and 'poor:cut' volumes are not included. 'Poor:cut' without '+' indicates a price for this class only.

***Includes sugar maple, yellow birch, white ash, and hemlock in poor:cut and poor: leave classes.

#Elm in poor:cut class not included; poisoned during timber stand improvement.

APPENDIX B

LIVESTOCK AND AGRONOMIC ENTERPRISE UNIT BUDGETS

Table B1. Beef Enterprise Budget,* Farm A.

Purchased 400 lbs. steer calf, fed a liberal roughage ration with silage; 600 lbs. grain, 300 days on the farm.

I. INCOME:		
Sold 1,000 lbs. @$25.00 cwt.	$250.00	
Less 1.5 per cent death loss	3.75	
Total Income		$246.25
II. OPERATING COSTS:		
Purchase cost 400 lbs. @$28.00/cwt.	$112.00	
Corn (ear) 40 bu. @$ 1.00/bu.	40.00	
Protein 360 lbs. @$ .045/lb.	16.20	
Mineral 16 lbs. @$ .03/lb.	.48	
Grinding & mixing 1.58 tons @$3.00/ton	4.74	
Hay .75 ton @$20.00/ton	15.00	
Silage 2.50 tons @$6.50/ton	16.25	
Straw .4 ton @$12.00/ton	4.80	
Misc.: vet., medicine, elect., supplies	5.00	
Interest on cost of cattle x per cent of year on farm 100 x 5%	5.00	
Total operating costs		$219.47
"Present beef" enterprise, net income		$ 26.78
III. OWNERSHIP COSTS:		
Taxes, insurance and maintenance of buildings and equipment	$ 75 x 3%	$ 2.25
Depreciation, buildings, new cost	60 x 3%	1.80
Depreciation, equipment, new cost	15 x 10%	1.50
Interest on ½ bldgs. and equip. cost	37 x 5%	1.85
Total cost (excluding labor)		$226.87
"New beef" enterprise, net income		$ 19.38

Hours required per unit - 17 for present beef
15 for new beef

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*Department of Agricultural Economics, University of Wisconsin, "5.500 Series - Livestock Enterprise Budgets," (Madison, 1963), p. 5.532 (Mimeographed).

Table B2. Wheat Enterprise Budget,* Farm A.

One Acre, 47 bushels per acre.

I.	INCOME:		
	47 bushels per acre @$1.60 bu.		$75.20
II.	OPERATING COSTS:	$25.23	
	"Present wheat" enterprise, net income		49.97
III.	OWNERSHIP COSTS:		
	Taxes, insurance & maintenance of buildings & equipment	3.13	
	Interest on land	10.74	
	Total costs	$ 39.10	
	"New wheat" enterprise, net income		$36.10

Hours required per unit = 6.0 for present wheat
5.4 for new wheat

*Brake, et al., *op. cit.*, p. III A 4.

Table B3. Dairy Enterprise Budget,* Farm B.

Dairy cow - Grade A, 12,000 lbs. milk annually, 25 per cent replacement rate.

I. INCOME:

11,800 lbs. milk x unit price $3.80	$448.40	
Other income: Beef, 20% milk sales	89.68	
Total Income		$538.08

II. OPERATING COSTS: (raised replacements included)

Corn 29 bu. @$1.00/bu.	$ 29.00	
Oats 38 bu. @$ .52/bu.	19.76	
Protein 810 lbs. @$4.50/cwt.	36.45	
Mineral 80 lbs. @$3.00/cwt.	2.40	
Grinding & mixing 2.07 tons @$3.00/ton	6.21	
Hay 3.6 tons @$20.00/ton	72.00	
Silage 3.8 tons @$6.50/ton	24.70	
Pasture (hay eq.) 2.0 tons @$10.00/ton	20.00	
Straw 1.0 tons @$12.00/ton	12.00	
Misc.: breeding, vet, medicine, elect., supplies	26.00	
Interest on breeding stock, 400 x 5%	20.00	
Total operating costs		$268.52
"Present dairy" enterprise, net income		269.56

III. OWNERSHIP COSTS:

Taxes, insurance and maintenance of buildings and equipment	$660 x 3%	$ 19.80
Depreciation, buildings, new cost	480 x 2.5%	12.00
Depreciation, equipment, new cost	180 x 10%	18.00
Interest on ½ bldgs. & equip. cost	330 x 5%	16.50
Total cost (excluding labor)		$334.82
"New Dairy" enterprise, net income		203.06

Hours required per unit - 110 for present dairy
99 for new dairy

*Department of Agricultural Economics, University of Wisconsin, *op. cit.*, p. 5.520.

Table B4. Sheep Enterprise Budget,* Farm B.

Ewe and lamb - 160 lbs. Ewe - Early Lambing (Feb.) 150% lamb crop - 95 lbs. lamb - 20% replacement.

I.	INCOME:			
	Sold 124 lbs. @$.20/cwt.		$24.80	
	Other income Cull Ewe 160 lbs. x .05 x 20%		1.60	
	9 lbs. wool x .60		5.40	
	Total Income			$ 31.80
II.	OPERATING COSTS: (raised replacements are included)			
	Corn	2.5 bu. @$1.00/bu.	$ 2.50	
	Oats	4.3 bu. @$ .52/bu.	2.24	
	Protein	25 lbs. @$ .045/cwt.	1.12	
	Mineral	20 lbs. @$ .23/cwt.	.60	
	Grinding & mixing	.15 ton @$ 4.00/ton	.60	
	Hay	.50 ton @$20.00/ton	10.00	
	Silage	.13 ton @$ 6.50/ton	.84	
	Pasture (hay eq.)	.49 ton @$ 5.00/ton	2.45	
	Straw	.09 ton @$12.00/ton	1.08	
	Misc.: breeding, vet, medicine, elect., supplies		2.50	
	Total operating costs			$ 23.93
	"Present ewe & lamb" enterprise, net income			$ 7.87
III.	OWNERSHIP COSTS:			
	Taxes, insurance and maintenance of buildings and equipment		$27 x 3%	$ .81
	Depreciation, buildings, new cost		24 x 4%	.96
	Depreciation, equipment, new cost		3 x 10%	.30
	Interest on capital investment		40 x 5%	2.00
	Total cost (excluding labor)			$ 28.00
	"New Ewe & Lamb" enterprise, net income			$ 3.80

Hours required per unit - 7 for present ewe & lamb
6 for new ewe and lamb

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*_Ibid_., p. 5.540.

Table B5. Wheat Enterprise Budget,* Farm B.

One Acre, 47 bushels per acre.

I.	INCOME:		
	40 bushels per acre @$1.60 bu.		$64.00
II.	OPERATING COSTS:	$25.23	
	"Present wheat" enterprise, net income		38.77
III.	OWNERSHIP COSTS:		
	Taxes, insurance and maintenance of buildings and equipment	$ 1.79	
	Interest on land	10.09	
	Total costs	$37.11	
	Net Income		$26.89
	Hours required per unit = 6.0 for present wheat 5.4 for new wheat		

*Brake, et al., op. cit., p. III A 4.

Table B6. Dairy Enterprise Budget,* Farm C.

Dairy cow - Grade A market, 8,100 pounds milk annually, 25 per cent replacements rate.

I. INCOME			
7,800 lbs. milk @$3.80 cwt.		$296.40	
Other income: Beef, 25% of milk sales		74.10	
Total Income			$370.50
200 lbs. milk fed to calf			
II. OPERATING COSTS: (raised replacements included)			
Corn	18 bu. @$ 1.00/bu	$ 18.00	
Oats	22 bu. @$ .52/bu.	11.44	
Protein	420 lbs. @$ .045/lb.	18.90	
Mineral	50 lbs. @$ .03/lb.	1.50	
Grinding, Mixing and hauling	1.22 tons @$ 3.00/ton	3.66	
Hay	3.6 tons @$20.00/ton	72.00	
Silage (corn)	8.8 tons @$ 6.50/ton	24.70	
Pasture (hay eq.)	2.0 tons @$10.00/ton	20.00	
Straw	1.0 tons @$12.00/ton	12.00	
Misc.: breeding, vet., medicine, elect., supplies		22.00	
Interest on breeding stock, 300 x 5%		15.00	
Total operating costs			$219.20
"Present Dairy" enterprise, net income			$151.30
III. OWNERSHIP COSTS:			
Taxes, insurance and maintenance of buildings and equipment		$660 x 3%	$ 19.80
Depreciation, buildings, new cost		480 x 2.5%	12.00
Depreciation, equipment, new cost		180 x 10%	18.00
Interest on ½ bldgs. and equip. cost		330 x 5%	16.50
Total cost (excluding labor)			$285.50
"New Dairy" enterprise, net income			$ 85.00

Hours required per unit - 114 for present dairy
102 for new dairy

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*Department of Agricultural Economics, University of Wisconsin, _op. cit._, p. 5.522.

Table B7. Dairy Enterprise Budget,* Farm D.

Dairy cow - Grade A market, 8,500 lbs. milk annually, 25 per cent replacements rate.

I. INCOME:			
8,300 lbs. milk @$3.80/cwt.		$315.40	
Other income: Beef, 25% of milk sales		78.85	
Total Income			$394.25
II. OPERATING COSTS: (raised replacements are included)			
Corn	19 bu. @$1.00/bu.	$ 19.00	
Oats	23 bu. @$ .52/bu.	11.96	
Protein	446 lbs. @$.045/lb.	20.07	
Mineral	53 lbs. @$.03/lb.	1.59	
Grinding, mixing and hauling	1.30 tons @$ 3.00/ton	3.90	
Hay	3.8 tons @$20.00/ton	76.00	
Silage (corn)	4.0 tons @$ 6.50/ton	26.00	
Pasture (hay eq.)	2.1 tons @$10.00/ton	21.00	
Straw	1.1 tons @$12.00/ton	13.20	
Misc.: breeding, vet., medicine, elect., supplies		23.00	
Interest on breeding stock, 300 x 5%		15.00	
Total operating costs			$230.72
"Present Dairy" enterprise, net income			$163.53
III. OWNERSHIP COSTS			
Taxes, insurance and maintenance of buildings and equipment		$660 x 3%	$ 19.80
Depreciation, buildings, new cost		480 x 2.5%	12.00
Depreciation, equipment, new cost		180 x 10%	18.00
Interest on ½ bldgs. & equip. cost		330 x 5%	16.50
Total cost (excluding labor)			$297.02
"New Dairy" enterprise, net income			$ 97.23

Hours required per unit - 110 for present dairy
99 for new dairy

*Ibid.

Table B8. Beef Enterprise Budget,* Farm D.

Beef cow and calf to 1,000 lbs., 20% replacement rate:
90% calf crop: calf fattened on a liberal roughage ration.

I. INCOME:

Sold (slaughter steers)			
1,000 lbs. @$22.00/cwt. x 45%		$99.00	
Other income (slaughter heifer)			
850 lbs. @$21.00/cwt. x 25%		44.62	
Cull cow			
1,000 lbs. @$15.00/cwt. x 20%		30.00	
Total Income			$173.62

II. OPERATING COSTS: (raised replacements are included)

Corn (ear)	35.4 bu.	@$1.00/bu	$35.40	
Oats	7.4 bu.	@$ .52/bu.	3.85	
Protein	299 lbs.	@$ .043/cwt.	12.86	
Mineral	44 lbs.	@$ .03/lb.	1.32	
Grinding & mixing	1.50 lbs.	@$ 3.00/lb.	4.50	
Hay - legume	1.8 tons	@$20.00/ton	36.00	
Corn fodder	.90 tons	@$ 4.00/ton	3.60	
Silage	1.37 tons	@$ 6.50/ton	8.90	
Pasture (hay eq.)	1.8 tons	@$ 5.00/ton	9.00	
Straw	.78 tons	@$12.00/ton	9.36	
Misc.: vet., medicine, elect., supplies			13.20	
Bull cost - (1/25 x $50.00)			2.00	
Interest on value of breeding stock, 295 x 5%			14.75	
Total operating costs				$154.74

III. OWNERSHIP COSTS:

Taxes, insurance and maintenance of buildings and equipment	$107 x 3%	$ 3.21
Depreciation, buildings, new cost	92 x 3%	2.76
Depreciation, equipment, new cost	15 x 10%	1.50
Interest on ½ bldgs. & equip. cost	53 x 5%	2.65
Total cost (excluding labor)		$164.86
"New Beef Cow & Calf" enterprise, net income		$ 8.76

Hours required per unit - 49 for new beef cow & calf

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*Ibid., p. 5.531.

Table B9. Dairy Enterprise Budget,* Farm E.

Dairy cow - Grade A, 12,000 lbs. milk annually, 25 per cent replacement rate.

I. INCOME:

11,800 lbs. milk @$3.80/cwt.		$448.40	
Other income: Beef, 20% milk sales		89.68	
Total Income			$538.08

200 lbs. milk fed to calf

II. OPERATING COSTS: (raised replacements are included)

Corn	29 bu. @$1.00/bu.	$ 29.00	
Oats	38 bu. @$ .52/bu.	19.76	
Protein	810 lbs. @$.045/lb.	36.45	
Mineral	80 lbs. @$.03/lb.	2.40	
Grinding & mixing	2.07 tons @$ 3.00/ton	6.21	
Hay	3.6 tons @$20.00/ton	72.00	
Silage	3.8 tons @$ 6.50/ton	24.70	
Pasture (hay eq.)	2.0 tons @$10.00/ton	20.00	
Straw	1.0 ton @$12.00/ton	12.00	
Misc.: breeding, vet., medicine, elect., supplies		26.00	
Interest on breeding stock, 400 x 5%		20.00	
Total operating costs			$268.52
"Present Dairy" enterprise, net income			$269.52

III. OWNERSHIP COSTS:

Taxes, insurance and maintenance of buildings and equipment	$660 x 3%	$ 19.80
Depreciation, buildings, new cost	480 x 2.5%	12.00
Depreciation, equipment, new cost	180 x 10%	18.00
Interest on $\frac{1}{2}$ bldgs. and equip. cost	330 x 5%	16.50
Total cost (excluding labor)		$335.86
"New Dairy" enterprise, net income		$202.22

Hours required per unit - 116 for present dairy
104 for new dairy

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*Ibid., p. 5.520.

Table B10. Sheep Enterprise Budget,* Farm F.

Ewe & lamb - 160 lbs. Ewe - Early Lambing (Feb.)
150% lamb crop - 95 lbs. lamb - 20% replacement

I. INCOME:			
Sold 124 lbs. @$.20/cwt.		$24.80	
Other income Cull Ewe 160 lbs. x .05 x 20%		1.60	
9 lbs. wool x .60		5.40	
Total Income			$31.80
II. OPERATING COSTS: (raised replacements are included)			
Corn	2.5 bu. @$1.00/bu.	$ 2.50	
Oats	4.3 bu. @$ .52/bu.	2.24	
Protein	25 lbs. @$ .045 cwt.	1.12	
Mineral	20 lbs. @$ .23 cwt.	.60	
Grinding & mixing	.15 ton @$ 4.00/ton	.60	
Hay	.50 ton @$20.00/ton	10.00	
Silage	.13 ton @$ 6.50/ton	.84	
Pasture (hay eq.)	.49 ton @$ 5.00/ton	2.45	
Straw	.09 ton @$12.00/ton	1.08	
Misc.: breeding, vet., medicine, elect., supplies		2.50	
Total operating costs			$23.93
"Present ewe & lamb" enterprise, net income			$ 7.87
III. OWNERSHIP COSTS			
Taxes, insurance and maintenance of buildings and equipment		$27 x 3%	$ .81
Depreciation, buildings, new cost		24 x 4%	.96
Depreciation, equipment, new cost		3 x 10%	.30
Interest on capital investment		40 x 5%	2.00
Total cost (excluding labor)			$28.00
"New Ewe & Lamb" enterprise, net income			$ 3.80

Hours required per unit - 9 for present ewe & lamb
8 for new ewe and lamb

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*<u>Ibid</u>., p. 5.540.

Table B11. Dairy Enterprise Budget,* Farm G.

Dairy cow - Grade A market - 10,500 lbs. milk, 20 per cent replacement rate.

I. INCOME:

Sold 10,400 lbs. @$3.80/cwt.	$395.20	
Other income: Beef, 20% of milk sales	79.04	
Total Income		$474.24

200 lbs. milk fed to calf

II. OPERATING COSTS: (raised replacements included)

Corn	24 bu. @$1.00/bu.	$24.00	
Oats	32 bu. @$ .52/bu.	16.64	
Protein	689 lbs. @$ .045/lb.	31.00	
Mineral	64 lbs. @$ .03/lb.	1.92	
Grinding & mixing	1.71 tons @$ 3.00/ton	5.13	
Hay	3.8 tons @$20.00/ton	76.00	
Silage	4.0 tons @$ 6.50/ton	26.00	
Pasture (hay eq.)	2.1 tons @$10.00/ton	21.00	
Straw	1.1 tons @$12.00/ton	13.20	
Misc.: breeding, vet., medicine, elect., supplies		25.40	
Interest on breeding stock, 380 x 5%		19.00	
Total operating costs			$259.29
"Present Dairy" enterprise, net income			$214.95

III. OWNERSHIP COSTS:

Taxes, insurance and maintenance of buildings and equipment	$660 x 3%	$ 19.80
Depreciation, buildings, new cost	480 x 2.5%	12.00
Depreciation, equipment, new cost	180 x 10%	18.00
Interest on ½ bldgs. and equip. cost	330 x 5%	16.50
Total cost (excluding labor)		$325.59
"New Dairy" enterprise, net income		$148.65

Hours required per unit - 110 for present dairy
99 for new dairy

*Ibid., p. 5.521.

Table B12. Potato Enterprise Budget,* Farm G.

One acre, non-irrigated, follow recommended practices.

I. INCOME:		
Sold 213 cwt. @$1.50/cwt.		$319.50
II. OPERATING COSTS:		
Fertilizer	$53.98	
Seed potatoes	48.72	
Rye - cover crop	4.48	
Spray material	24.68	
Fuel and oil	7.06	
Custom hire	5.60	
Misc.	21.00	
Total operating costs		$165.52
"Present potato" enterprise, net income		$153.98
III. OWNERSHIP COSTS:		
Taxes and insurance	$ 7.28	
Depreciation, interest	31.98	
Total ownership costs	$39.26	
Total costs (excluding labor)		$204.78
"New potato" enterprise, net income		$114.72

Hours required per unit - 48 for present potato enterprise
43 for new potato enterprise

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*C.R. Hoglund and K.T. Wright, "Economic Analysis of the Michigan Potato Enterprise," The Quarterly Bulletin of the Michigan Agricultural Experiment Station, Article 42-61 (May, 1960), p. 698.

Table B13. Poultry Enterprise Budget,* Farm H.

Commercial laying flock (over 1,000) average 1,000 laying hens.

I.	INCOME:		
	Sold 19,000 doz. eggs @$.30/doz.	$5,700	
	Other income: 936 cull hens @$.40	374	
	Total Income		$6,074
II.	OPERATING COSTS: (12% death loss included in costs)		
	Purchase cost: 1,064 pullets @$1.75	$1,862	
	Feed (5 lb. feed per doz.)		
	47.5 tons @$60.00/ton	2,850	
	Electricity	76	
	Medication	57	
	Misc. (litter, supplies, oyster shells, etc.)	285	
	Interest on ½ pullet cost	47	
	Total operating costs		$5,177
	"Present Poultry" enterprise, net income		$ 897
III.	OWNERSHIP COSTS:		
	Taxes, insurance and maintenance of buildings and equipment, new cost	$3,750 x 3%	$ 112
	Depreciation, buildings, new cost	2,250 x 5%	112
	Depreciation, equipment, new cost	1,500 x 10%	150
	Interest on ½ bldgs. & equip.	1,875 x 5%	94
	Total cost (excluding labor)		$5,645
	"New Poultry" enterprise, net income		$ 429

Hours required per unit - 1,000 for present poultry
900 for new poultry

*Department of Agricultural Economics, University of Wisconsin, *op. cit.*, p. 5.561.

Table B14. Beef Enterprise Budget,* Farm I

Beef cow and calf to 1000 lbs., 20% replacement rate, 90% calf crop: calf fattened on a liberal roughage ration.

I. INCOME:

Sold (slaughter steers)			
1000 lbs. @$22.00/cwt. x 45%		$99.00	
Other income (slaughter heifer)			
850 lbs. @$21.00/cwt. x 25%		44.62	
Cull cow			
1000 lbs. @$15.00/cwt. x 20%		30.00	
Total Income			$173.62

II. OPERATING COSTS: (raised replacements are included)

Corn, equiv. oats & barley	69.4 bu.	@$ .63/bu.	$43.72	
Oats	7.4 bu.	@$ .52/bu.	3.85	
Protein	299 lbs.	@$ .043/lb.	12.86	
Mineral	44 lbs.	@$ .03/lb.	1.32	
Grinding & mixing	1.5 lbs.	@$3.00/lb.	4.50	
Hay - legume	1.8 tons	@$20.00/ton	36.00	
Corn fodder	.90 tons	@$ 4.00/ton	3.60	
Silage	1.37 tons	@$ 6.50/ton	8.90	
Pasture (hay eq.)	1.8 tons	@$ 5.00/ton	9.00	
Straw	.78 tons	@$12.00/ton	9.36	
Misc., vet., medicine, elect., supplies			13.20	
Bull cost - (1/25 x $50.00)			2.00	
Interest on value of breeding stock 295 x 5%			14.75	
Total operating costs				$163.06
Present "Beef cow & calf" enterprise, net income				$ 10.56

III. OWNERSHIP COSTS:

Taxes, insur. & maint. bldg. & equip. new cost	$107 x 3%	$ 3.21
Depreciation - buildings - new cost	92 x 3%	2.76
Depreciation - equipment - new cost	15 x 10%	1.50
Interest on ½ bldg. & equip. cost	53 x 5%	2.65
Total cost (excluding labor)		$173.18
"New beef cow & calf" enterprise, net income		.45

Hours required per unit - 47 for present beef
43 for new beef

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*_Ibid_., p. 5.531.

Table B15. Hog Enterprise Budget,* Farm I

One sow and two litters - raising and finishing market hogs - average efficiency - 7 pigs weaned per litter - sows hand fed 40% annual sow replacement.

I. INCOME:				
Sold 2,992 @$14.00			$418.88	
Other income: 500 lb. cull sow @$11.00/cwt. x 40%			22.00	
Less 1.0 per cent death loss-weaning to market			4.41	
Total Income				$436.47
II. OPERATING COSTS: (raised replacements are included)				
Corn (equiv. oats & barley)	317 bu.	@$ .63/bu.	$199.71	
Oats	47.7 bu.	@$ .52/bu.	24.80	
Protein	1302 lbs.	@$ .05/lb.	65.10	
Mineral	160 lbs.	@$ .03/lb.	4.80	
Grinding & mixing	6.6 tons	@$ 4.00/ton	26.40	
Hay	.65 tons	@$20.00/ton	13.00	
Straw	.5 tons	@$12.00/ton	6.00	
Misc.: breeding, vet., medicine, elect., supplies			28.00	
Interest on breeding stock, 90 x 5%			4.50	
Total operating costs				$372.31
"Present Hog" enterprise, net income				$ 64.16
III. OWNERSHIP COSTS:				
Taxes, insurance and maintenance of buildings and equipment			$384 x 3%	$ 11.52
Depreciation, buildings, new cost			327 x 4%	13.08
Depreciation, equipment, new cost			57 x 10%	5.70
Interest on ½ bldgs. and equip. cost			192 x 5%	9.60
Total cost (excluding labor)				$412.21
"New Hog" enterprise, net income				$ 24.26

Hours required per unit - 65 for present hog
58 for new hog

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*Ibid., p. 5.550.

Table B16. Potato Enterprise Budget,* Farm I.

One acre, non-irrigated, follow recommended practices.

I.	INCOME:		
	Sold 231 cwt. @$1.50/cwt.		$346.50
II.	OPERATING COSTS:		
	Fertilizer	$57.84	
	Seed potatoes	52.20	
	Grain cover crop	4.80	
	Spray material	26.40	
	Fuel and oil	7.56	
	Custom hire	6.00	
	Misc.	22.50	
	Total operating costs		$177.30
	"Present Potato" enterprise, net income		$169.20
III.	OWNERSHIP COSTS:		
	Taxes and insurance	$ 7.80	
	Depreciation, interest	34.26	
	Total ownership costs	$42.06	
	Total costs (excluding labor)		$219.36
	"New Potato" enterprise, net income		$127.14

Hours required per unit - 48 for present potato
43 for new potato

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*C.R. Hoglund and K.T. Wright, Loc. cit.

APPENDIX C

FOREST ENTERPRISE UNIT BUDGETS

Table C1. Present Forest Budget for Forest 1, Farm A, One Acre. Nothing Alternative

I.	Income:		
	Inventory increase .054 MBM @$35.00		$1.89
II.	Operating Costs:		
	None		
III.	Ownership Costs:		
	Taxes	$1.56	
	Interest on Forest, $107 x 5%	5.35	
	Total Costs (except labor)		$6.91
	Return to Labor and Management		-$5.02
	Hours required per unit - 0		

Table C2. Optimum Forest Enterprise Budget for Forest 1, Farm A, One Acre.

Underplant Christmas Trees, 1000/acre, 2-2 White Spruce

I. Income:		
720 Christmas trees @$1.25		$900.00
II. Operating Costs:		
Release 1300 inches dia. x $.005 ÷ 10 = $6.50 x 1.629	$10.59	
Site preparation, 10 lb. amazine @$.30/lb. = $3.00 x 1.629	4.89	
White spruce transplants, $60.00 x 1.629	97.74	
Hand planting	-----	
Brush control, 3rd yr. @$5.00 x 1.407	7.04	
Brush control, 7th yr. @$5.00 x 1.158	5.79	
Hand weeding, annually from 4th year	-----	
Shaping, annually from 4th year @$1.00 x (.304 ÷ .05)	6.80	
Marketing, final year @$.05 per tree	36.00	
Total Operating Costs		168.85
III. Ownership Costs:		
Taxes, $1.56 x (.629 ÷ .05)	19.62	
Interest on Forest $107 x 5% x (.629 ÷ .05)	67.30	
Total Costs (except labor)		$255.77
Return to Labor and Management		$644.23
$644.23 discounted 5 yrs. = $504.88		
$504.88 ÷ 10 =		$ 50.49/yr.
Hours required per unit = 104 ÷ 10 = 10.4 hrs./yr.		

Table C3. Present Forest Budget for Forest 2, Farm A, One Acre.

Nothing Alternative

I.	Income:		
	Inventory increase .082 MBM @$68.00		$ 5.58
II.	Operating Costs:		
	None		
III.	Ownership Costs:		
	Taxes	$ 1.56	
	Interest on Forest, $107 x 5%	5.35	
	Total Costs (except labor)		$ 6.91
	Return to Labor and Management		-$ 1.33
	Hours required per unit - 0		

Table C4. Optimum Forest Enterprise Budget for Forest 2, Farm A, One Acre.

Interplanted black walnut seedlings @680 per acre, 60 year rotation.

I.	Income:		
	6.7 MBM black walnut @ $800/MBM		$5,360.00
II.	Operating Costs:		
	Site preparation @ $7.50 x 18.68	$140.01	
	Brush control, 5th yr. @ $5.00 x 14.64	73.20	
	Brush control, 10th yr. @ $5.00 x 11.47	57.35	
	Equipment @ $1.00/yr. x 18.68	18.68	
	Black walnut seedlings @ $50/M = $34 x 18.68	635.12	
	Total Operating Costs		924.36
III.	Ownership Costs:		
	Taxes (charged to remaining stand)		
	Interest on Forest (charge to remaining stand)		
	Total Costs (except labor)		$ 924.36
	Return to Labor and Management		$4,435.64
	$4,435.64 discounted 55 years = $302.98		
	$302.98 x .05 =		$ 15.15
	Hours required per unit - 37 (first decade)		

Table C5. Present Forest Enterprise Budget for Forest 1, Farm B, One Acre.

Sell 1.388 MBM P:C Stumpage x 5% + ACP Cost-Sharing + Inventory Increase

I.	Income:		
	1.388 MBM stumpage @$32/MBM x .05	$ 2.22	
	ACP Cost-Sharing @$6.80 + 10	.68	
	Inventory increase .238 MBM @$64/MBM	15.23	
	Total Income		$ 17.87
II.	Operating Costs:		
	Poisoning 262 inches dia. @$.005 + 10		.13
III.	Ownership Costs:		
	Taxes	.90	
	Interest on Forest $261.50 x 5%	13.08	
	Total Costs (except labor)		14.11
	Return to Labor and Management		$ 3.92
	Hours required per unit - 0.2		

Table C6. Optimum Forest Enterprise Budget for Forest 1, Farm B, One Acre.

Sell .235 MBM Stumpage Per Year @$64/MBM

I.	Income:		
	.235 MBM Stumpage @$64/MBM		$15.04
II.	Operating Costs:		
	None		
III.	Ownership Costs:		
	Taxes	$ .90	
	Interest on Forest $256 x 5%	12.80	
	Total Costs (except labor)		13.70
	Return to Labor and Management		$ 1.34
	Hours required per unit - 0.2		

Table C7. Present Forest Enterprise Budget for Forest 1, Farm B, One Acre.

Sell .170 MBM Poor:Cut Logs + ACP Cost-Sharing + Inventory Increase

I.	Income:		
	.170 MBM logs @$47/MBM	$ 7.99	
	ACP Cost-sharing @$6.80 ÷ 10	.68	
	Inventory increase .238 MBM @$64/MBM	15.23	
	Total Income		$23.90
II.	Operating Costs:9		
	Poisoning 262 inches dia. @$.005 ÷ 10	.13	
	Chain saw 0.6 Hr. x $.18/Hr.	.11	
	Tractor 0.6 Hrs. x $1.01/Hr.	.57	
	Total Operating Costs		.81
III.	Ownership Costs:		
	Taxes	.90	
	Interest on Forest, $261.50 x 5%	13.08	
	Interest, Depreciation on buildings & equipment	.40	
	Total Costs (except labor)		$15.19
	Return to Labor and Management		$ 8.71
	Hours required per unit - 1.7		

Table C8. Present Forest Enterprise Budget for Forest 1, Farm B, One Acre.

Sell .170 MBM P:C logs + .100 MBM G:C logs + ACP Cost-Sharing + Inventory Increase.

I. Income		
.170 MBM logs @$47/MBM	$ 7.99	
.100 MBM logs @$79/MBM	7.90	
ACP Cost-Sharing $4.20 + 10	.42	
Inventory increase .117 MBM x $64	7.50	
Total Income		$23.81
II. Operating Costs:		
Poisoning 262 inches dia. @$.005 + 10	.13	
Chain saw 1.0 hrs. x $.18 Hr.	.18	
Tractor 0.9 hrs. x $1.01/Hr.	.90	
Total Operating Costs		1.21
III. Ownership Costs:		
Taxes	.90	
Interest on Forest $230.40 x 5%	11.52	
Interest, Depreciation on buildings & equipment	.63	
Total Costs (except labor)		$14.26
Return to Labor and Management		$ 9.55
Hours required per unit - 2.6		

Table C9. Optimum Forest Enterprise Budget for Forest 1, Farm B, One Acre.

Sell .235 MBM Logs/yr.

I.	Income		
	.235 MBM logs @$79/MBM		$18.56
II.	Operating Costs:		
	Chain saw .9 hrs x $.18/Hr.	$ .16	
	Tractor .8 hrs x $1.01/Hr.	.81	
	Total Operating Costs		.97
III.	Ownership Costs:		
	Taxes	.90	
	Interest on Forest $256 x 5%	12.80	
	Interest, Depreciation on buildings & equipment	.56	
	Total Costs (except labor)		$15.23
	Return to Labor and Management		$ 3.33
	Hours required per unit - 2.3		

Table C10. Present Forest Enterprise Budget for Forest 2, Farm B, One Acre.

Sell 2.322 MBM P:C Stumpage @$30/MBM + ACP Cost Sharing + Inventory Increase.

I.	Income:		
	2.322 MBM stumpage @$30/MBM x .05	$ 3.48	
	ACP Cost-Sharing $10.10 + 10	1.01	
	Inventory increase .392 MBM @$125/MBM	49.00	
	Total Income		$53.49
II.	Operating Costs:		
	Poisoning 327 inches dia. @$.005 + 10	.16	
	Total Operating Costs		.16
III.	Ownership Costs:		
	Taxes	.90	
	Interest on Forest $649.63 x 5%	32.48	
	Total Costs (except labor)		$33.54
	Return to Labor and Management		$19.95
	Hours required per unit - 0.2		

Table C11. Present Forest Enterprise Budget for Forest 2, Farm B, One Acre.

Sell 400 MBM P:C Logs + ACP Cost-Sharing + Inventory Increase

I.	Income:		
	.400 MBM logs @$45/MBM	$18.00	
	ACP Cost-Sharing $10.10 + 10	1.01	
	Inventory increase .392 MBM @$125/MBM	49.00	
	Total Income		$68.01
II.	Operating Costs:		
	Poisoning	.16	
	Chain saw 1.5 hrs. x $.18/Hr.	.27	
	Tractor 1.3 hrs. x $1.10/Hr.	1.33	
	Total Operating Costs		1.76
III.	Ownership Costs:		
	Taxes	.90	
	Interest on Forest $649.63 x 5%	32.48	
	Interest, Depreciation on buildings & equipment	.93	
	Total Costs (except labor)		$36.07
	Return to Labor and Management		$31.94
	Hours required per unit - 3.8		

Table C12. Present Forest Enterprise Budget for Forest 2, Farm B, One Acre.

Sell .400 MBM P:C Logs + .200 MBM G:L Logs + ACP Cost-Sharing + Inventory Increase.

I.	Income:		
	.400 MBM logs @$45/MBM	$18.00	
	.200 MBM logs @$140/MBM	28.00	
	ACP Cost-sharing $10.10 ÷ 10	1.01	
	Inventory increase .138 MBM @$125/MBM	17.25	
	Total Income		$64.26
II.	Operating Costs:		
	Poisoning	.16	
	Chain saw 2.2 Hrs. x $.18/Hr.	.40	
	Tractor 2.0 Hrs. x $1.01/Hr.	2.00	
	Total Operating Costs		2.56
III.	Ownership Costs:		
	Taxes	.90	
	Interest on Forest $524.50 x 5%	26.23	
	Interest, Depreciation on buildings & equipment	1.40	
	Total Costs (except labor)		$31.09
	Return to Labor and Management		$33.17
	Hours required per unit - 5.6		

Table C13. Optimum Forest Enterprise Budget for Forest 2, Farm B, One Acre.

Sell .480 MBM Stumpage per year @$125/MBM

I.	Income:		
	.480 MBM stumpage @$125/MBM		$60.00
II.	Operating Costs:		
	None		
III.	Ownership Costs:		
	Taxes	$ .90	
	Interest on Forest $990.50 x .05	49.52	
	Total Costs (except labor)		$50.42
	Return to Labor and Management		$ 9.58
	Hours required per unit - 0.2		

Table C14. Optimum Forest Enterprise Budget for Forest 2, Farm B, One Acre.

Sell .480 MBM Logs at Road

I.	Income:		
	.480 MBM logs @$140/MBM		$67.20
II.	Operating Costs:		
	Chain saw 1.8 hrs. x $.18/hr.	$ .32	
	Tractor 1.6 hrs. x $1.01/hr.	1.60	
	Total Operating Costs		1.92
III.	Ownership Costs:		
	Taxes	.90	
	Interest on Forest $1012.50 x 5%	50.62	
	Interest, Depreciation on buildings & equipment	1.12	
	Total Costs (except labor)		$54.56
	Return to Labor and Management		$12.64
	Hours required per unit - 4.5		

Table C15. Present Forest Enterprise Budget for Forest 1, Farm C, One Acre.

Clearcut and Sell at Road 9.9 Cds./A. (Allotment: 3 Acres)

I.	Income:		
	9.9 cds x $7.20/cd.		$71.28
II.	Operating Costs:		
	Chain saw 19.8 hrs. x $.18/hr.	$ 3.56	
	Tractor 9.9 hrs. x $1.01/hr.	9.09	
	Total Operating Costs		12.65
III.	Ownership Costs:		
	Taxes 21 acres x $.39	8.19	
	Interest on Forest 21 acres x $.95	19.95	
	Interest, Depreciation on buildings & equipment	11.68	
	Total Costs (except labor)		$52.47
	Return to Labor and Management		$18.81
	Hours required per unit - 69		

Table C16. Optimum Forest Enterprise Budget for Forest 1, Farm C, One Acre.

Clearcut and Sell at Road 14.9 Cds/yr. (Allotment: 3 Acres)

I.	Income:		
	14.9 Cds. x $7.20/cd.		$107.28
II.	Operating Costs:		
	Chain saw 29.8 hrs. x $.18/hr.	$ 5.36	
	Tractor 14.9 hrs. x $1.01/hr.	15.05	
	Total Operating Costs		20.41
III.	Ownership Costs:		
	Taxes 21 x $.39	8.19	
	Interest on Forest 21 x $.95	19.95	
	Interest, Depreciation on buildings & equipment	17.58	
	Total Costs (except labor)		$ 66.13
	Return to Labor and Management		$ 41.15
	Hours required per unit - 104		

Table C17. Present Forest Enterprise Budget for Forest 2, Farm E, One Acre.

Maple sirup, tubing, 40 taps/acre @ 0.2 gal sirup/tap

I.	Income:		
	Maple sirup 8 gals. x $6.00/gal.		$48.00
II.	Operating Costs:		
	Tractor 8 x $.08	$ .64	
	Fuel 8 x $.40	3.20	
	Miscellaneous and repairs 8 x $.06	.48	
	Marketing 8 x $.34	2.72	
	Total Operating Costs		7.04
	"Present maple" enterprise, net income		$40.96
III.	Ownership Costs:		
	Taxes	.37	
	Interest on Forest	.65	
	Insurance	.50	
	Interest, Depreciation on buildings & equipment	5.86	
	Total Costs (except labor)		$14.42
	"New maple" enterprise, net income		$33.58
	Hours required per unit - 6.0 for present maple sirup and 5.4 for new maple sirup		

Table C18. Present Forest Enterprise Budget for Forest 2, Farm E, One Acre.

Sell .100 MBM P:C logs

I.	Income:		
	.100 MBM logs @$42/MBM	$4.20	
	Inventory income	1.42	
	Total Income		$ 5.62
II.	Operating Costs:		
	Chain saw 0.4 hrs. x $.18	.07	
	Tractor 0.3 hrs. x $1.01	.33	
	Total Operating Costs		.40
III.	Ownership Costs:		
	Taxes	.37	
	Interest on Forest	1.37	
	Interest, Depreciation on buildings & equipment	.29	
	Total Costs (except labor)		$ 2.43
	Return to Labor and Management		$ 3.19
	Hours required per unit - 0.9		

Table C19. Optimum Forest Enterprise Budget for Forest 6, Farm G, One Acre.

Sell Cordwood Thinnings + Sawtimber at 55 years.

I.	Income:		
	At 25 yrs: 5.6 cds x \$3.50 x 4.322	\$ 84.71	
	At 35 yrs: 7.5 cds x \$3.50 x 2.653	69.64	
	At 45 yrs: 8.5 cds x \$3.50 x 1.629	48.46	
	At 55 yrs: 14.7 MBM x \$40/MBM	588.00	
	At 55 yrs: 18. cds. x \$3.50	65.10	
	Total Income		\$855.91
II.	Operating Costs:		
	None		
III.	Ownership Costs:		
	Taxes (\$.65 x 6.040) + .05	78.83	
	Interest on Forest (\$4.00 x 6.040) + .05	483.20	
	Total Costs (except labor)		\$562.03
	Return to Labor and Management		\$293.87
	Hours required per unit - Discounted 35 yrs. = \$53.28 x .05 =		\$ 2.66

Table C20. Present Forest Enterprise Budget for Forest 2, Farm I, One Acre.

Cut and Deliver 0.5 cd./acre

I. Income:		
0.5 cd. x $14.10/cd.	$7.05	
Inventory increase	.06	
Total Income		$7.11
II. Operating Costs:		
Chain saw 1.0 hr. x $.18	.18	
Tractor 0.5 hr. x $1.01	.50	
Hauling 0.5 cd. x $1.65	.82	
Total Operating Costs		1.50
III. Ownership Costs:		
Taxes	.36	
Interest on Forest $40 x 5%	2.00	
Interest, Depreciation on buildings & equipment	.55	
Total Costs (except labor)		$4.41
Return to Labor and Management		$2.70
Hours required per unit - 4.2		

Table C21. Optimum Forest Enterprise Budget for Forest 2, Farm I, One Acre.

Cut and Deliver 0.55 cd./acre

I.	Income:		
	0.55 cd. x \$14.10/cd.		\$7.76
II.	Operating Costs:		
	Chain saw 1.1 hrs. x \$.18	\$ .20	
	Tractor 0.55 hrs. x \$1.01	.56	
	Hauling 0.55 cd. x \$1.65	.91	
	Total Operating Costs		1.67
III.	Ownership Costs:		
	Taxes	.36	
	Interest on Forest \$40 x 5%	2.00	
	Interest, Depreciation on buildings & equipment	.60	
	Total Costs (except labor)		\$4.63
	Return to Labor and Management		\$3.13
	Hours required per unit - 4.2		

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