Return to Walt Keller

NORTH CAROLINA AGRICULTURAL EXTENSION SERVICE

ANNUAL REPORT

AGRICULTURAL PRODUCTION
MANAGEMENT AND NATURAL RESOURCE USE PROJECT (III)
Title of Project

Forestry
Section

1966
Annual Year

Name and Title of Worker	Percentage of Time Devoted to Entire Project by Each Worker
W. M. Keller In Charge, Forestry Extension Project Leader	100 %
Extension Forest Management Specialists	%
J. C. Jones, Head	100 %
E. M. Jones	100 %
F. E. Whitfield	100 %
Leonard Hampton 1/	100 %
W. M. Stanton	100 %
Ross S. Douglass	100 %
William B. Stuart	100 %

1/ On study leave 1/1/66 - 2/1/66

Signed _____
Project Leader

Date Submitted _____

ANNUAL REPORT

FARM FORESTRY EXTENSION WORK

NORTH CAROLINA

January 1, 1966 - December 31, 1966, Inclusive

Walter M. Keller, In Charge, Extension Forestry
J. C. Jones, Head, Extension Forest Management Section

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ANNUAL REPORT

FOREST MANAGEMENT SECTION

AGRICULTURAL PRODUCTION, MANAGEMENT AND NATURAL-RESOURCE USE (III)

1966

Walter M. Keller, In Charge, Forestry Extension
J. C. Jones, Head, Forest Management Extension Section

I. Program Accomplishments

A. Expansion in industry has resulted in an increased demand for raw materials from North Carolina's forests. These demands are being met through increased harvesting of merchantable wood from commercial forest lands in the state, owned primarily by small individual landowners. It is on these individual woodland ownerships that the Extension forest management staff has concentrated their efforts to increase production and quality of wood fiber on a unit basis.

The application of good forest management practices, such as the control of insects and diseases, timber stand improvement, efficient harvesting techniques and good utilization of wood products removed from the stump are taught. For the landowner to receive instruction, advice, and information, the staff has conducted training meetings

with Extension agents, industrial foresters, held demonstrations and used all methods of mass media communications. Individual assistance has been given to woodland owners whenever it was possible to do so.

This report will deal with the following major objectives:

1. Developing new techniques for, and efficiency in, the harvesting of all forest products and implementing a safety program with the logging industry

A one-half-hour logging safety television Uni-Lesson, "Gambling with Your Life," was completed during 1966. The show deals with common errors made by laborers which ultimately result in serious accidents. It is hoped that the net effect of this program will be seen in fewer lost-time accidents in the industry.

The current trend in the logging industry of substituting capital for labor has increased the need for better production information for use in planning and control of these operations. During 1966, the department has worked on problems encountered in adapting recording devices used in other industries for use in the log woods. These devices are simple to use and have

found wide acceptance in the industry. The primary uses have been for documenting idle time on heavy equipment caused by ineffective planning or laxity on the part of the operator. (See Exhibit A.)

A cooperative study with Albemarle Paper Company in the summer of 1966, demonstrated the efficiency of these devices as an aid in estimating production and costs on logging equipment.

An 8 mm movie camera was adapted for time-lapse photographic techniques. This camera, in conjunction with the recording devices, is a highly efficient tool for collecting work-sampling information and as a training device for labor and supervisors.

A look has also been taken at the risks and returns involved in hauling loads in excess of the state highway load limits. The results of the study will be published in 1967.

The cooperative program with Albemarle Paper Manufacturing Company was continued through 1966, and resulted in valuable information concerning new equipent; namely, hydraulic timber shears and self-loading

skidders. This information is being used by the department in advising wood producers outside the Albemarle organization in making equipment decisions.

The information developed in the 1965 cooperative program with Albemarle on log loading systems has been used to advise loggers state wide. The decisions made using this information have been highly successful, and the study has received wide acceptance throughout the industry.

The department has cooperated with the American Pulpwood Association in their program to train company foresters to do extension-type work in logging within the company. The students from these programs will provide excellent liaison for future Extension programs.

Recent social pressure for "preservationist" treatment of natural resources has pointed to the need for an explanation of the role of timber harvesting in the conservation of these resources. Three television programs, two radio programs, and one local meeting dealt with this topic during the year.

Cooperative programs with Williams Furniture Company of Sumter, South Carolina, discussed in the 1965

annual report, are being continued.

This phase of the program was given leadership by Mr. W. B. Stuart.

2. The production of quality hardwood through better management practices

There has been a continuation of the work on the hardwood demonstration areas along the Roanoke River, as well as the establishment of several new demonstration plots.

Some of the most significant demonstrations are the deer exclosures which were installed three years ago. The results from these exclosures indicated that most of the hardwood regeneration problems experienced by landowners along the Roanoke River were due to the overpopulation of the deer herd in these areas. Because of the dramatic differences inside and outside the exclosures, plus condition of some of the deer themselves, the North Carolina Wildlife Commission has become vitally interested.

The prediction of a dangerously high overpopulation of deer has been borne out by the severe crop damage to landowners along the river.

A cooperative effort between foresters and the wildlife specialist of the Extension Service and personnel of the state Wildlife Commission was made to educate landowners and hunt-club members along the Roanoke River on the desirability of reducing the deer herd by means of either-sex deer hunts. In some areas this was quite successful. The Wildlife Commission collected data from most of the animals harvested this year. Another source of information regarding this subject will be the results obtained by Mr. Hugh Fields, Extension wildlife specialist, who is making a study of the effects deer have on the regeneration of bottomland hardwoods.

Another cooperative phase of the hardwood work has been the effort to have the North Carolina Forest Service nurseries grow more hardwood seedlings. These will mainly be bottomland hardwood species and in many cases grown on consignment for companies that are members of the cooperative hardwood research program at North Carolina State University, School of Forestry.

Assistance was given the hardwood management forester of Georgia-Pacific Corporation with the planning

and establishment of a 150-acre hardwood-site preparation and regeneration study. These large areas will be used to determine the best method to be used by this company in future hardwood management programs.

Leadership in this phase of the program was taken by Mr. E. M. Jones.

3. Developing outdoor recreational enterprises where the criteria for successful operations can be met

Forestry Extension's efforts in the area of outdoor recreation have been user-oriented as well as supplier-oriented. In our educational role, Extension has an obligation to promote the appreciation and wise use of our outdoor recreational resources. We also have an obligation to inform the public where outdoor recreation opportunities exist. Five educational, consumer-oriented television programs with state-wide coverage were presented during the year. Over 300 requests were received for a park brochure which was offered to the viewers watching one of the programs.

Individual counseling and technical advice were given to potential outdoor recreation enterprise entrepreneurs in Jones, Bladen, Beaufort, Currituck, Jackson,

Transylvania, Dare, and Onslow Counties. Specific requests ranged from backyard putting-green establishment to a waterfront marina, swimming and picnic complex.

The basic resource, managerial and capital needs were explained to the interested landowners. An effort was made to first analyze the market situation and to take a good, realistic look at the opportunities and risks in an outdoor recreation enterprise. The final decision making was left solely with the interested landowner. He was provided with all available material and information which would help in reaching a decision before venturing into the recreation business.

Since outdoor recreation covers such a wide range of activities and resources and involves many disciplines, a close relationship is maintained with other agencies and individuals with interests in this field.

Big business is forever conscious of its public image. Often, adverse publicity directed toward an expanding industry is not justified. To counteract the unfavorable elements, many industries expend much effort and money. Texas Gulf Sulphur, with a multi-million-dollar operation in eastern North Carolina is

attempting to provide multiple opportunities for outdoor recreation for the public's use.

Forestry Extension personnel provided the company's land manager with counsel and technical advice in the establishment of a roadside rest area, a municipal recreation complex, and a waterfront swimming, boating and picnic area.

This phase of the department program was given leadership by Mr. W. M. Stanton.

4. <u>The relationship between soil quality, tree growth, and a sound business approach to forest management</u>

Beginning about 1950, a great deal of effort has been exerted to stimulate private landowners to do forest improvement work. Because of this, many landowners now accept as good forestry those management practices designed to improve the forest stand. Many have failed to realize that the sizable investments necessary for some of these practices cannot be justified from an economics viewpoint on some soils. That is, the low capacity of some soils to produce timber renders some management practices not economically feasible. The efforts begun in previous years by

Extension foresters to acquaint landowners, and especially professional agricultural workers, with these facts, have been continued during this year.

Emphasis has been placed on considering the soils' productive capacity and calculating the costs of forest improvements in a businesslike manner. Total costs, including all interest charges, should be weighed against expected dollar-value returns. Several television programs were presented on this approach to forest management. Soil physical characteristics and their relationships to tree growth and dollar value of expected growth were explained. The emphasis has been on the fact that trees will grow on many different types of soils. The rate of growth may vary a great amount, and is directly related to soil characteristics.

Last year, a children's home asked for help in determining the profitability of growing trees on approximately 250 acres of land no longer used for agricultural purposes. It seemed desirable to retain ownership. A soil-site-quality survey was made, and costs and returns were calculated. During this year

they had this area planted to pines by a contractor.

Training sessions, tours, and field days for agricultural workers, Extension agents, and landowners were held to explain the meaning of the term site index and its significance in the economics of forest production.

In cooperation with the North Carolina Forest Service, a three-day workshop was conducted at Lexington, May 17 - 19, for their service foresters and forestry aids in the upper Piedmont area. (Exhibit B) The program was designed to acquaint them with the relationship between soil-site quality based on soil physical characteristics and tree growth. One day was spent in the field with the class doing practice soil-site-index surveying. Through this exercise they learned to distinguish the soil physical characteristics by doing, and to observe their effect on tree growth. Another day was spent in the classroom learning to calculate the economics of forest production based on site index.

During 1965, in cooperation with another staff member, a two-day workshop on the soil, economic,

disease and insect problems of timber production was conducted for the county Extension workers of the East Central District. The reactions from the county workers were very favorable. Consequently, plans were made to conduct similar four-day workshops in each of the other five Extension districts during 1966. The county workers were very much involved during 1966, with the formulation of long-range plans for Extension work. For this reason, these agent workshops were postponed. Tentative plans call for these to be conducted during 1967.

The main emphasis of the educational program to inform timberland owners concerning soil quality and its relationship to the economics of forest management continues to be placed on training the professional agricultural workers. It is believed that a greater number of forest landowners can be reached in this manner. With over 200,000 forest owners in North Carolina, it is easy to see that a few people cannot reach many of them. This information can put money into the bank account of the timberland owner if he will properly ust it. Therefore, we believe a great amount of effort

to diffuse the correct information out to the individual owner can be justified.

Considerable time was spent in continuing the Christmas-tree fertilization tests established in previous years and in collecting data from them. There are yet many unanswered questions concerning the fertilization of these plantations. Many of the most successful growers believe that fertilizer helps to produce a better-quality tree. There are, however, many differences of opinion about how much fertilizer can be profitably applied, what analysis to use, etc. There is a great need for more information about the effect of each fertilizer element on tree growth.

This phase of the department program was given leadership by Ross S. Douglass in cooperation with other staff members.

5. Increasing production of quality Christmas trees and developing Christmas-tree marketing techniques

Assistance was given the research committee of the North Carolina Christmas Tree Growers Association in preparing a report for their organization concerning research needed on growing Christmas trees.

Assistance was given to them in the form of a prepared statement of the problems, such as selecting a suitable species for various parts of the state, soils and fertilizer problems, and other aspects of Christmas-tree production. The approach was to point out some of the problems involved and, consequently, some of the answers that are needed that are not presently available from research that has been done in the past. This information was incorporated into the committee's report and was adopted by the Association. They are planning some action toward getting some research on some of the problems started.

At the summer meeting of the North Carolina Christmas Tree Growers Association in Ashe County on August 23, information was presented to show chemical control of competing vegetation. Field trips featured management from planting stock to harvest size. The feature of the summer meeting was an address by Dr. H. Brooks James, Dean of the School of Agriculture and Life Sciences, North Carolina State University, on the potential in the business management of a farm enterprise such as Christmas trees.

Work was continued on the five fertilizer demonstrations begun in the spring of 1962, and also on several

other demonstrations on weed control and methods of establishing Christmas-tree plantations, both in cut-over land and in open land. As a part of this educational program, the use of the mist blower in applying herbicides to reduce competing vegetation in Christmas-tree plantations and to control blackberry briars which so frequently thrive in old fields and cleared areas has been demonstrated and explained repeatedly. Result demonstrations have also been established to show solution of these problems.

Assistance was given to Tommy Beutell in Jackson County in the sales promotion of his Fraser fir planting stock. This privately owned commercial nursery sold about 500,000 3-2 stock during this past season. This is quite a valuable supplement to the North Carolina Division of Forestry nursery, whose available stock was not nearly adequate to fulfill the growing demand by Christmas-tree producers.

Continued assistance was given another nursery operator in the production of planting stock for sale. This operator plans to reach a production of a million Fraser fir annually, plus other Christmas-tree planting stock to a limited extent.

If North Christmas-tree producers are to compete at the retail markets, they must take full advantage of their strong points. Quality must be stressed. To emphasize this, meetings were held in Avery, Burke, Caldwell, Cherokee, Clay, Henderson, Jackson, Macon, Mitchell, McDowell, Swain, Transylvania, Yancey, and Watauga Counties. Interest in this phase of Extension is shown by the fact that the meetings were very well attended. Even one was well attended in the rain.

To promote the use of fresh, high-quality trees, newspapers, radio and television were used. A special program was presented on the university educational channel, and four other programs were presented on commercial television channels. Two of the commercial programs were presented on programs during prime time.

This phase of the program was given leadership by Mr. F. E. Whitfield, with assistance from other members of the staff.

B. Case Histories

The twelfth annual 4-H Forestry Camp, co-sponsored by Southern Bell Telephone and Telegraph Company and the North Carolina State University, Agricultural Extension Service was held in June. A program of evaluation was

developed to help improve the camp instruction, courses and motivation of delegates attending.

Two 4-H Forestry Project Manuals were prepared for publication. These manuals will provide several new projects for 4-H Club members to take. Three additional leaflets, "How Trees Grow," "Tree Identification by Leaves," and "Mounting Tree Leaves," were prepared.

An accounting system for Christmas-tree and forest-related enterprises was developed and prepared for publication by Mr. L. A. Hampton.

The 4-H Camp evaluation program and 4-H publications were given leadership by Mr. L. A. Hampton, with cooperation of other staff members.

Exhibit A

GUESSTIMATES? ESTIMATES? OR FACTS!!

W. B. Stuart and W. T. Huxster
Extension Forestry Department
North Carolina State University
Raleigh, North Carolina

How many hours during a year is your equipment available for work and not used?

How long does it take your tractor to hook a trip?

Is your truck driver stopping along the road?

Were your air filters and oil cleaners changed when the manufacturer recommends?

How much of your machine cost is the result of working and how much is due to overhead when the machine is idle?

How long does it take the tractor to make a 1,000-foot pull, or the truck a 30-mile haul?

Is your driver getting the most out of your equipment?

If your truck gets in an accident tomorrow, can you prove the driver wasn't speeding?

Do the questions sound familiar? If they do, this may be of interest to you.

You don't have time to follow the equipment with a stop watch, and you don't have time to dig through the bookkeeper's books to find the right answers. Well, don't operate on guesstimates! Back up your estimates with facts! Mechanize your record keeping and do it painlessly.

Methods for Getting the Facts

You have several choices of methods and equipment which you may use. The two major ones are:

1. Hour meters
2. Chart recorders

There are several types of recording devices in each category.

These must be looked at closely before you choose the one that will do the job best for you.

Hour Meters

There are several types of recorders produced by a number of manufacturers which may be used for this purpose.

These devices usually come in three types:

1. Those operating from a drive cable connected to the power train. This type is commonly found on farm tractors and in combination with tachometers. These usually record engine hours at a set RPM.

2. Those operating on an electrical current and activated by either a connection through the ignition system or by a pressure switch in the oil line of a diesel motor. These record engine running hours.

3. Those activated by vibration. These record machine moving hours.

Applications: These recorders can be used to evaluate the operating time vs. idle time for a piece of equipment. By keeping a record of the day-to-day increase in hours from the meter and comparing this with the labor payroll hours (or on-the-job hours if labor is paid for traveling), the supervisor can make general comparisons between operators and between tracts, or he can use it to develop hourly operating costs on the equipment and as a measure of equipment utilization.

Advantages: The recorders are compact. They may be mounted in a variety of positions and moved from machine to machine readily. The vibration-driven recorder is the most easily moved because it only requires physically attaching the meter to the machine, while the cable and electrical types may require some adaptation and preparatory work.

The analysis of information gathered is simple. Depending on how the information is used, the analysis usually requires only addition and division and can be done by field personnel.

Disadvantages: The greatest disadvantage is that the recorders read only in elapsed time and give no indication of how the time

was spent. This leaves much room for slippage if the operator desires.

On the cable and electrical-driven models, the operator may increase his operating-time percentage by leaving the engine running while he is killing time. The vibration type can also be affected by "joy riding."

On the other hand, the hours can be decreased by removing or disconnecting the recorder. This has been done in truck applications where the driver wished to use the truck after hours.

Case 1. Digital Hour Meter

Logger had questions concerning:

1. Utilization of skidder.
   a. What proportion of the time the machine was available was it actually moving?
   b. What was the relationship between payroll hours and machine hours?
2. Were the maintenance records in accord with the manufacturer's recommendation?

He installed a vibration-type hour meter on the tractor. The foreman was instructed to record the reading from the meter in the time book at the end of each workday. In addition, he was to note any periods the machine was unavailable because of moving, maintenance, or repair. All maintenance records, fuel and oil consumption and repair records were to be keyed to recorder reading.

A sample of a few days' information looked like this:

Day 1 -

Meter start	276.0
Meter stop	281.9
Hours run	5.9
Payroll hours	8.5
Warm-up period (assumed average)	½ hour
Machine unavailable - None	

Percentage $\frac{\text{Machine hours}}{\text{payroll hours}} = \frac{5.9}{8.5} = 69\%$

Percentage $\frac{\text{Machine hours}}{\text{Machine available hours}} = \frac{5.9}{8.0} = 74\%$

Day 2 -

Meter start	281.9
Meter stop	286.7
Machine hours	4.8
Payroll hours	8.5
Machine unavailable hours	
Warm-up	0.5 hours
Repair	0.5 hours
Total	1.0 hour

Percentage $\frac{\text{Machine hours}}{\text{Payroll hours}} = 57\%$

Percentage $\frac{\text{Machine hours}}{\text{Machine available hours}} = \frac{4.8}{7.5} = 64\%$

Day 3 -

Meter start	286.7
Meter stop	291.5
Machine hours	4.8
Payroll hours	7.5
Machine unavailable hours	
Warm-up	0.5 hours
Total	0.5 hours

Percentage $\frac{\text{Machine hours}}{\text{Payroll hours}} = \frac{4.8}{7.5} = 64\%$

Percentage $\frac{\text{Machine hours}}{\text{Machine available hours}} = \frac{4.8}{7.0} = 69\%$

Comments:

These percentages alone are not as important as the implications involved. On a long-term study the supervisor can gather information concerning:

1. The consistency of the operator's work patterns. If there are wide fluctuations in percentage of machine-worked hours to machine-available hours which cannot be attributed to weather, site, or stand factors, there is a strong possibility that the holdup is in the system or the operator and should be investigated for correction.

2. The percentage of machine hours to payroll hours can be used as an index of the amount of time the skidder is effectively employed. If the percentage appears too low or fluctuates widely, it can be an indication of:

   a. The crew is taking too long in normal maintenance or scheduling unnecessary maintenance stops.
   b. The machine requires a more comprehensive preventative maintenance program to reduce the time it is unavailable during the workday.
   c. The availability of equipment should be given more intensive consideration in repair or replace decisions in the future.

The meter will serve several purposes, but the three most important in an application similar to this are:

1. It provides a quick index of machine utilization.
2. It helps in quantifying the costs of downtime and other stoppages.
3. By co-ordinating maintenance scheduling and clock hours according to manufacturer's recommendations, you can decrease maintenance cost.

Chart Recorders

Chart recorders can be purchased which record a single or a series of facts concerning the equipment.

The simplest form is the single-channel recorder which records by means of a swinging pendulum and has the chart turned by a spring-driven clockworks.

Operation: These recorders rely on a pendulum being swung by machine motion to move a stylus and scribe a mark on a paper disc coated with an emulsion and usually white surface coating. The disc is graduated by hours and minutes. The smallest unit on the chart depends on the speed of the clock drive which rotates the disc past the stylus.

The chart records developed bear a visual record of the operating pattern of the equipment. The heavy dark areas signify the machine was moving at that time, while the single fine line results from the machine standing still.

Some recorders are also equipped with event-marking stylii which may be used to record information, such as engine on or off, or the operation of a part of the machine, such as winch, blade, or forks.

Advantages: The recorders are compact, and easily moved from machine to machine with very little preparatory work. In the case of those using the event marker in conjunction with the pendulum, some work is necessary to attach this to the ignition system, to an oil or hydraulic line or mounting a microswitch on the control to activate the stylus.

The charts also provide a convenient place to record pertinent information, such as mileage (for trucks), gasoline and oil consumption, route or tract, date, operator's name, and other information concerning repairs, number of trips, etc., on the face.

The charts can be stored indefinitely and thereby provide a permanent day-to-day record for future reference.

The recorder can be installed so that it cannot be removed from the vehicle, and it locks so that unauthorized personnel can not tamper with the recording mechanism or chart.

Disadvantages: The charts must be changed regularly.

The charts must be analyzed by hand to develop the necessary information. Depending on how the information is to be used, the time required for this can be minimal or quite extensive.

For general use, the totaling of the moving times can be done in a few minutes using a reading device made by the recorder manufacturer. To pinpoint the various moving and idle times as to time of day and length, however, requires much longer.

Case 2. Developing Information from Recorder Charts

The information used in this example was obtained from service recorder discs from a model DS Servis Recorder which was attached to a Garrett C5B Tree Farmer used to prehaul loaded pallets on a skidding pan from a hydraulic loader on a crawler-type tractor. This loader was working on a thinning operation, where it traveled through the woods loading 5' pulpwood from piles at the stump into a 1.8-cord pallet on a skidding pan pulled behind the loader.

The pulpwood producer was interested in determining the amount of time the tractor spent at each of the various stages in its operating cycle, and the amount of non-productive time the tractor and operator had while operating on the tract. Since this was an average length of prehaul distance for the tracts the crew usually cut, these question were of particular importance in determining what further changes could be made in the system to allow this crew to work tracts which would require longer prehaul distances.

Since no provisions could be made to have an observer on the operation, the Servis Recorder was used to develop this information. An observer did stay on the operation long enough to determine the normal operating cycle of the prehaul tractor, however. This cycle can best be outlined as follows:

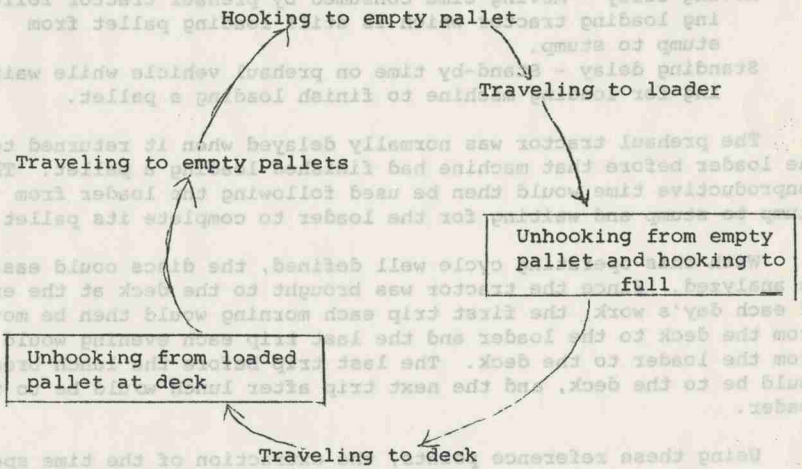

Figure 1. Outline of operating cycle of prehaul tractor. Note: The elements enclosed in block are those during which the tractor is standing.

In the above diagram, the shaded areas denote moving time and the unshaded areas denote standing time on the tractor. Each part of the cycle could be defined more fully as follows:

Hooking at deck - Time spent at deck positioning skid pan beside empty pallet and loading the pallet on skid pan.

Traveling to woods - Moving time, beginning when empty pallet is on the pan and stopping when tractor arrives at loader.

Unhooking and hooking in woods - Time consumed in dropping pan with empty pallet and hooking to the pan carrying the full pallet.

Travel to deck - Moving time, beginning when tractor starts moving with pan and full pallet and stopping when pallet and pan are in position to be dropped at deck.

Unhooking at deck - Time spent sliding full pallet off the pan at the deck.

Moving delay - Moving time consumed by prehaul tractor following loading tractor which is still loading pallet from stump to stump.

Standing delay - Stand-by time on prehaul vehicle while waiting for loading machine to finish loading a pallet.

The prehaul tractor was normally delayed when it returned to the loader before that machine had finished loading a pallet. This nonproductive time would then be used following the loader from stump to stump and waiting for the loader to complete its pallet.

With this operating cycle well defined, the discs could easily be analyzed. Since the tractor was brought to the deck at the end of each day's work, the first trip each morning would then be moving from the deck to the loader and the last trip each evening would be from the loader to the deck. The last trip before the lunch break would be to the deck, and the next trip after lunch would be to the loader.

Using these reference points, the extraction of the time spent in each sector of the cycle could begin. The dark areas on the disc denote the time the machine was moving, and the light areas with a single line denote the time machine was idling. The alternating light and dark areas could then be measured and their values recorded on a worksheet, as follows:

Worksheet for Extracting Data from Servis Recorder Disc

Example used: Disc from recorder mounted on Garrett C5B Tree Farmer prehauling pallets on skid pan, April 1965.

Moving	Standing
5 Returning to woods	2 Hooking at deck
1 Following loader	1 Waiting
2 Positioning to unhook and hook	1 Waiting
9 to deck	3 Unhooking and hooking in woods
2 To get empty pallet	2 Unhooking at deck
8 To loader	2 Hooking at deck
4 Following loader	2 Waiting
9 To deck	6 Unhooking and hooking in woods
	3 Unhooking at deck

By traveling around the disc from 8:00 A.M. to 5:00 P.M. and recording each moving and standing time element in order of occurrence, a breakdown of the operating time for the tractor was obtained. Using the reference points mentioned above, definitions could be attached to each of the time elements. Since each sector in the operating cycle had to be repeated in the order stated above, the defining of the elements was uncomplicated. However, it is a good idea to check with the equipment operator at the end of each day to find out if he has had to use his equipment for some job other than the normal during the course of the day. This will avoid unidentifiable time elements popping up on the analysis of the recorder disc.

When the worksheet is completed, the data can then be transferred by cycles to a summary sheet similar to the one attached, and this summary can then be used in the analysis.

For example, a partial analysis of the information contained on the recorder disc shown above would be:

Summary Form: Data Extracted from Service Reocrder Disc: C5B

Prehauling Pallets on Skid Pan April 1965

Pallet #	Hooking**	Traveling to woods	Unhooking and hooking in woods	Travel to deck	Unhooking at deck	Moving delay	Standing delay	Total Time/ pallet
1	4	5	5	9	2	1	2	28
2	4	8	6	9	3	4	2	36
3	4	7	3	9	1			24
4	2	6	2	10	1	4	6	31
5	2	8	2	10	3			25
6	2	9	2	8	2			23
7	6	6	3	7	2			24
8	3	5	2	7	1	2		20
9	2	5	2	9	1	6	12	37
10	1*	5	3	11	1	5	25	25*
11	5	8	2	10	1			26
12	3	6	3	11	1			24
13	3	8	2	10	1			24
14	4	6	3	11	1			25
15	5	10	2	11	1			29
16	3	5	5	10	2	2	8	35
17	3	12	3	10	2	5	7	42
18	5	7	4	4		1	1	22

* Part of hooking time included in lunch break.

** Hooking time at deck, including time spent moving to empty pallets.

Tractor moving time:

To loader:
Total = 121 mins.
Av./pallet - 6.7
To deck
Total - 168
Av./pallet - 9.3
Unhooking time at deck
Total - 26
Av/pallet - 1.4
Hooking at deck
Total - 60
Av./pallet - 3.5
Unhooking and hooking in woods
Total - 43
Av./pallet -2.4
Delay time (attributable to imbalance in system)
- 93
Productive time
Tractor and driver - 81.8%

Productive moving time on tractor - 56.1%

Summary

To make the most effective use of the service recorder-type de vices without an observer on the operation, the following conditions must be met:

1. The machine must have a regular operating cycle easily defined by moving and standing time.
2. The machine operator must co-operate by reporting any variations from the normal operating cycle.
3. Several reference points should be used during the day, such as the first element of the cycle performed in the morning, the last at the end of the working day, and perhaps spot checks by supervisors during the day.

4. In extracting the data from the disc for the worksheet, checks should be made in both directions from the reference points to assure the accuracy of the data.

The service recorder is also useful in gathering data on two or more machines simultaneously or in determining the effect of the other elements of a system on the element under close observation - for instance, the effect of skidding and trucking on loading. If this is the case, and these machines can be equipped with a service recorder and distance measuring device, an observer on the operation can collect a great deal of information with a minimum of effort.

If this is to be done, then the observer must:

1. Record the hour and minute each machine begins at least one element of its cycle.
2. Record the reading on the measuring device at approximately the same physical location during each cycle.
3. Check with drivers and operators for any variation in normal travel pattern or operating cycle.

Case 3. Single-Channel Recorder - Trucking Application

The recorder was placed in the cab of a truck tractor pulling a single-bunk logging trailer between the mill and a tract of timber 43.5 miles from the mill. The information desired from the recorder included:

1. The travel time loaded and unloaded.
2. Loading time.
3. Unloading time.
4. Time truck was delayed in the woods or at the mill.
5. Any unnecessary road stops.

Supplemental information to be kept included:

1. Daily mileage - from truck odometer.
2. Daily fuel consumption - from pumps.
3. Daily volume hauled - from scaler.
4. Long-term maintenance costs - from shop records.

Data for March 22 - from disc

Clock time	Event	Elapsed time
6:55 A. M.	Operator picked up truck at mill yard	7 min. - incidental moving
7:02 A. M.	Truck at pumps for fueling	13 min. - fueling and maintenance
7:15 A. M.	Truck left for woods	80 min. - traveling empty
8:35 A. M.	Truck arrives at deck	5 min. - delayed at deck
8:40 A. M.	Truck moved under loader	35 min. - loading
9:15 A. M.	Truck left for mill	85 min. - traveling loaded
10:40 A. M.	Truck stopped on route	25 min. - unauthorized delay on route
11:05 A. M.	Truck moves to mill	10 min. - traveling loaded
11:15 A. M.	Truck arrives at mill	25 min. - unloading
11:45 A. M.	Truck stopped (idling)	5 min. - delay
11:50 A. M.	Truck moving	10 min. - traveling empty
12:00 M.	Truck stopped (idling)	5 min. - delay
12:05 P. M.	Truck moving	60 min. - traveling empty
1:05 P. M.	Truck stopped	5 min. - delay
1:10 P. M.	Truck moving	25 min. - traveling
1:35 P. M.	Truck stopped	20 min. - delayed at deck
1:55 P. M.	Truck moved under loader	25 min. - loading
2:20 P. M.	Truck left deck	90 min. - traveling loaded
3:50 P. M.	Truck at mill	20 min. - unloading
4:10 P. M.	Truck parked	

Start to stop hours	9 hrs. 15 min.
Minus warm-up time	15 min.
Minus driver's lunch hours	30 min.
Truck available	8 hrs. 30 min.
Minus truck traveling time	6 hrs. 5 min.
Truck idle time	2 hrs. 25 min.

Normal delays

Loading	1 hour
Unloading	45 minutes

Other delays	40 minutes
Delayed at deck	25 minutes
Driver delays	15 minutes

Average speed

$$\text{Empty} \quad \frac{43.5}{\frac{80 \text{ min.} + 100 \text{ min.}}{60 \text{ min.} \times 2 \text{ trips}}} = \frac{43 \text{ miles}}{1.5 \text{ hours}} = 28 \text{ mph}$$

$$\text{Loaded} \quad \frac{43.5}{\frac{90 \times 95}{60 \times 20}} = \frac{43 \text{ miles}}{1.54 \text{ hours}} = 28 \text{ mph}$$

Fuel consumption

$$\frac{176 \text{ miles traveled}}{36.8 \text{ gallons fuel}} = 4.8 \text{ m.p.g.}$$

This information can be used in a variety of ways. Some of the most pertinent questions which it can help answer are:

1. What is the increase in transportation costs per M ft. of logs as we move farther from mill?
2. What is the break-even point on log transportation?
3. What are the operating costs on per mile or per thousand on these trucks?
4. What improvements in truck scheduling or in the logging system or unloading system at the mill could be made to increase truck utilization?
5. Is the truck being maintained properly?

Recording Speedometers and Tachometers

These types of recorders are commonly found on over-the-highway trucks and other equipment of this nature. They usually record:

1. Travel speed or engine RPM by time of occurrence.
2. Distance traveled by time of day.
3. Engine on or off times.

The recorder may be attached to the speedometer or tachometer

drive. If this is done, the recorders are equipped with a built-in speedometer-odometer or -tachometer dial. Other models may be mounted remotely and connected to a separate drive assembly and the truck's speedometer or tachometer remain intact.

Applications: Recorders are especially useful in trucking applications to determine driver performance, effect of route on travel time, and for improving scheduling. These recorder charts have also been used in accident cases and have proved valuable aids to a good preventative maintenance program if well used.

The recorder can be adapted with a minimum of effort to other equipment, such as skidders and forklifts.

Advantages: This recorder has the advantages mentioned earlier for the pendulum type; and, in addition, the combination of information allows more detailed information to be developed. For trucks, stops or slowdowns can be pinpointed as to location as well as time. Equipment abuse by overrevving or lugging can be spotted easily. Speeding can be spotted. It is much easier to co-ordinate mileage and speed to develop average travel times by road types and routes.

For skidding tractors, the recorder can be adapted to record engine running time, engine speed winching and traveling and machine moving time.

Long-term charts (drives up to a week) are available which record on strips and allow longer records to be developed on more readable scales.

Disadvantages: The recorder is not very portable. On trucks, time is required to install mounts and adapt the speedometer and tachometer drives to the record. On skidding tractors, forklifts and other similar equipment, adapters must be designed to connect the drive to wheels, camshafts, or other available drive.

The charts must be changed regularly, and the analysis is somewhat more detailed than for the other types.

Comments: These recorders have been used extensively by the trucking industry and other industries, such as large sawmills, which maintain a fleet of over-the-road trucks. The records serve as protection for the firm from accidents, speeding drivers, improper driving habits, and unauthorized use of the equipment.

By recording fuel and oil consumption, tire repair and replacement, and maintenance and repair costs on the charts, the owner has a ready source of information concerning operating and maintenance costs, and information needed for making replacement or purchase decisions.

Summary

The following table summarizes some of the more important factors to be considered when choosing a recorder. The same decisions must be made here that are pertinent to choosing any piece of equipment:

1. WHAT is the problem?
2. HOW MUCH is the solution worth?
3. WHICH machine will do the job?
4. WHO will be responsible?

For more information contact your state Extension forester.

	Recorder Type		
		Digital Hour Meter	
Operating Information Gathered:	Tachometer type drive	Electrical	Vibration
Engine on-off time	No (unless activating RPM is low	Yes	No
Machine moving time	No	No	Yes
Engine RPM	Approximation	No	No
Machine speed	No	No	No
Accumulated machine hours	Yes	Yes	Yes
Accumulated distance	No	No	No
Machine available hours	No	No	No
Operator Information Documented:			
Percentage Work time / Available time	Yes	Yes	Yes
Work patterns	No	No	No
Length and time of operation	No	No	No
Time and length of stops or delays	No	No	No
Route relationships to delays	No	No	No
Other Factors:			
Transferable from machine to machine	No	Yes	Yes
Record keeping	Must be read	Must be read	Must be read
Purchase cost		$20 - 30	$15 - 30
Operating cost	None	None	None

Exhibit B

NORTH CAROLINA FOREST SERVICE

SERVICE FORESTERS SOILS - ECONOMICS SEMINAR

May 17, 18, & 19, 1966

Lexington, N. C.

May 17	
9:00	Soils of N. C. & Soil Forming Factors
	The Soil Profile
	Drainage & Areation
	S. I. By Soil Physical Characteristics
1:30	Field Trip - Soil Physical Characteristics
May 18	
8:00	Field Problems - Soil Site Survey
May 19	
8:00	Compound Interest in Forest Management
	Costs & Returns
	Financial Maturity
1:30	Classroom Problem - Economic Analysis of Proposed Forest Investment