

Part 2 A Definitive System of Management

Section 3 The Scope of Forest Management

Before starting to design a system of Management complying with the pointers of the Philosophy, it seems expedient to outline what Management is believed to comprise.

It is taken to include the following:-

1. The Compiling and Maintenance of a register of Acquired Land.
2. The quantitative tracking of how this land has been and is being used.
3. Preparation of programmes for the future use and development of this land over a span of several years ahead.
4. Translation of these long term blueprints into detail for one year ahead, to serve as the basis for Financial Budgets (i.e. requests for money to cover the cost of a new year's enterprise), and as detailed plans for the Forester to execute.
5. Estimation of Timber Production from accrued afforestation and replanting programmes, again in both long and short term, and the year immediately ahead.
6. Recording and gauging the progress of the work in general as it is carried out in accordance with the prescriptions of the Plan.
7. Costing the work in general, and gauging the progress of these costs relative to those Budgeted.
- 8.. Recording and gauging the progress of the production of Timber in particular, not merely in terms of work programme and cash, but to provide information for stocktaking and regulation of supplies to customers.
9. Building up a fund of information and statistics on which one can draw at any time for a variety of reasons, ranging from judging the likely relative success of further acquisitions, rate fixing and Budgeting, to providing answers to Parliamentary questions.

Of course, in practice Management is more than this. Anyone concerned with the Management of land must be essentially a skilled quantitative surveyor, able to provide accurately the necessary measurements which become the facts and figures of the job. What is being attempted here is the design of a suitable framework'- compatible with the Philosophy - in which all the surveyor's facts and figures can be assembled, co-ordinated, displayed and used.

Stocking and Destocking

Before proceeding further, one or two terms will keep cropping up which call for definition. It has been claimed earlier in this work that Afforestation is something unique and distinct from Replanting, which will become a recurring item. A common term embracing the two could be "Stocking". Indeed, this can be extended to include the contingencies of Acquiring Growing Plantations and Natural Regeneration as well. The rather ambiguous position of other items which fall under the general heading of Stocking will be discussed later in the work. They include Beating Up, Replanting after Fire or Failure (i.e. soon after Afforestation), and Underplanting.

As a **complement** to this, the term "Destocking" can be introduced to cover items such as Clear Felling, Destruction by Fire and Failure, Windblow, etc.

Historical and Non Historical Figures

The difference between these two classifications may not be very easy to follow. A Historical figure is one which is sacrosanct and should remain inviolate for all to see. If 100 acres were planted in 1935, this is a Historical Record and nothing that subsequently happens to this 100 acres can invalidate the fact. Under a Financial Regime, no doubt a separate account would be kept of the cash required to affect that planting. If 10 acres were burned soon after, and the record amended to 90 acres P.35, then, unless a similar adjustment were made to the account, anyone seeking unit costs by applying the 90 acre figure to 100 acres worth of money, is liable to turn up erroneous results. Similarly the 10 acre fire figure is Historical and, who knows, a statistic which may assume some significance later on, if kept.

In contrast, a Non Historical figure is one of only passing interest, a temporary expedient useful only until amended to produce a new. For example, if a 1,000 acre reserve of plantable ground has 200 removed for planting, then whereas the 1,000 acre figure was of some significance at one point of time, it can be discarded as out of date in favour of the 800 figure. Use of such figures will appear later - e.g. in the Land Utilisation Record, and their differentiation stressed at further length.

Design of Forms and Documents

There cannot be many who would refute that the computer in the task of collecting and storing information, has come to occupy a supreme position.

Nevertheless the outline Management Scheme which will follow, will take the form of a Manual System. This is done, on the assumption that an ideal and definitive system for the manual worker, will serve more or less as a ready made empirical computer programme too.

The "Framework" in a manual system is the Form.

Forms supplement the frailties of the human mind and memory by serving the Manager, first of all as a record of the reasoning which led to his chosen management system.

Thereafter they should never frustrate management, but should serve as an objective guide to the routine most likely to fulfill all the requirements of the system.

As with the system itself, a few simple rules must be followed in their design.

1. First of all, on the matter of physical size, foolscap need not appear sacrosanct, and bigger sizes should be accepted if they obviate the spread of a form's function on to two or more foolscap sheets.
2. Faced with so many inter-related factors, forms should be comprehensive and all embracing so that all these factors may be clarified and co-ordinated.

3. Every stage in the routine of recording information should be incorporated where possible into the system. It is thus available (at no extra cost) for future reference or audit.
4. Forms, or documents, intended to last more than one year must be capable of amendment .
5. All time and space consuming interim steps between data which is basic and that which is significant should be jettisoned unless really required. This has already been emphasised in the Philosophy.
6. Documents, which are mutual in as much as information from one is transferred to another, should be compatible in their layout.
7. Where amendment is contemplated, use of vertical space will generally prove more space saving, than the horizontal "side by side" layout.
8. Provision should be made for isolating the Afforestation phase from the Mature Forest - or Maintenance/Felling/Replanting stage, even to the use of different coloured forms.
9. Balancing may best be achieved by using Accumulative Totals to date (a Historical figure), rather than current quantities (e.g. in Timber Stock Recording).

The Management System

The stage has now been reached where a System of Management will be designed in which the Philosophy is manifest in the Documents or Forms. These remain as the guide which gives the continuity ad infinitum, humans cannot yet hope to achieve.

What should emerge is a system which should be characterised as follows. It should be sufficiently forward looking to prescribe the basis of the ultimate system to serve the Mature Forest stage. Yet on this must be grafted provision for coping with the needs of the Afforestation Phase. In time to come this section may be jettisoned once the Afforestation programme is complete.

The System should seek to encompass and co-ordinate all the many inter-related factors present in Forestry. And it should be flexible enough to make allowance for the unexpected contingencies as well. In fact, the system should automatically build up to an annual revision so that the data used is always flushed up to date.

It should as far as possible be self contained even to the point that much of the basic records should be capable of subsequent statistical analysis. It should be a built in costing system - sensitive enough to allow any work done to be costed as a matter of routine.

Lastly while it is acknowledged that part of a Manager's duty is to gather information to pass up to higher levels of Management, his system should be such that this process of collecting is simultaneously of the maximum intrinsic use to himself.

By and large, the Management System can be conveniently split into groupings as follows:-

- (1) Land Utilisation including Records
- (2) Planning - (a) General, Short and Long Term.
(b) Timber production in particular, Short and Long Term
- (3) Accounting i.e. Costing and Progressing, from Time Sheet to Pay Sheet and Progress Report.
- (4) Timber Stock Recording and Progressing.

Section 4

Land Utilisation _- The Acquisition Register (Form 1)

This form is a straight forward register of the component acquisitions of the Forest. Details are taken from the Completion Summary - an abstract of the essentials of the Legal Deeds, a copy of which is sent to the District Officer on legal completion. These details include total area involved, an index of plantable/unplantable ratio, name of vendor or lessor, indication of whether outright purchase or lease, a brief note on tenancy position, etc.

These details can be entered up in black as and when the completion summaries are received, each acquisition given a number of a series specific to the Forest. The Form as designed does not allow for a separate tally of purchase and lease, but it would not be a difficult matter to alter the design slightly to incorporate this. An index to number of separate blocks is included; this can serve as a useful guide, especially when a lot of land has been bought, a new Forest created and the task of afforestation in full swing. It can be invaluable to a new Officer taking over.

Two alternative schemes can be followed:-

- (1) the space can be predivided by design into a number of squares,
- (2) or the space can be left blank, then divided into the number representing the separate blocks comprising the acquisition.

In either case, the squares representing these blocks can be coloured with yellow crayon as completion summary details are entered. Then, when planted, the colour can readily be changed to green. This is a colour coding which will be suggested later to be used with 1 inch or 2½ inch to the mile O.S. maps. The transferring of Deed Maps to Forest Maps should also be carried out as a matter of routine at this time, but this will be dealt with under a later chapter on Mapping.

The entering of the area figures "per acquisition" and "Forest Accumulative" are straight forward. To understand the "Net Forest Remaining (Accumulative)" column, it must be made clear that the Form serves as a Register of Dispositions i.e. sales of land, as well. Details of these should also be entered as the legally completed copy documents reach the District Office. The entries in this case should be in red and the Forest Accumulative should include these red Disposition figures only, just as the black figures should only include acquisitions. The number of the Disposition should bear the same number as the Original-Acquisition of which it formed a part, and a reference in red entered in the "Other Details" column of the relevant acquisition. As a check, the Total Disposition Forest Accumulative, subtracted from the Total Acquisition Forest Accumulative (both Historical figures) should tally with the Net Forest Remaining (which is Non-Historical).

Land Utilisation - Compartment Schedule {Form 2}

The basic format of this form will be familiar to many who will have made practical use of it.

This assumes that the manager has made progress in his task of afforestation i.e. the acquisitions have been split up into smaller compartments which have been surveyed, mapped and their areas measured by planimeter. Care must be taken at this stage to ensure by rounding up or down, that the aggregate total of the areas of these compartments tally exactly with that of the parent acquisition. As this work is completed, so these compartments and their areas can be entered on to the schedule. Normally, the- compartments are given a numerical series per Forest. This may prove complicated if the timing of acquisition and resumption is such that these numbers will be scattered all over the countryside, out of any methodical, territorial sequence. One solution which may be considered especially during the early afforestation phase, is to allocate a temporary series of numbers to the 'out of sequence' compartments, reflecting the number of the acquisition. For example, if the number given to the Acquisition is 3, then the compartments forming this acquisition, or block thereof, can be numbered as a new series, commencing with 1, and prefixed 9, i.e. 9/1, 9/2, 9/3, etc.

Immediately adjoining the compartment number column, comes one for Total area. Thereafter, provision is made for an allocation of columns to cover areas which are Unplantable, Reserved for Agriculture, or already stocked with trees on acquisition, The "Agriculture" column is intended for subjects of an agricultural nature which are integrated with the compartments - e.g. one or two acres of Allotment. Other Agricultural subjects can be included, but if so, it is recommended that they should be named and not included in the compartment numbering series. The reason for this of course, is that they stand a strong chance of being sold at some later date. The balance of the area - that available for Afforestation, Is entered in columns under the appropriate Forest or Planting ("P") Year, as and when the planting takes place. This information should be available from the "Record of Afforestation: Compartment Species Summary" form. These areas are totalled to provide an area figure tallying with the total planted per "P" or Forest Year.

From the schedule, during subsequent planning, can be readily deduced any balance per compartment available for inclusion as part of the next year's programme.

The design of the form can include some refinements e.g. to allow for acquisition isolation.

This form is quite invaluable during the Afforestation phase. Its usefulness during the later maintenance and nature phases begins to decline, for the very simple reasons that:

- (a) the spread of "P" years may become too great, particularly under strict financial Rotations, and,
- (b) the intrusion of areas destroyed by fire or windblow, or premature felling ("The Impact of the Unexpected"!) is liable to create cross checking complexities in the limited space available.

However to give the form some measure of flexibility in meeting this problem, the design has been such that some extra vertical space has been allocated to each compartment. The inference of this is as follows. If a loss of area previously under Plantations has occurred, an entry should be made against the compartment and under the appropriate 'P' Year column. This entry should be in red and can in addition be prefixed minus (i.e. " - ")• Naturally any such entries must be done as small and neatly as possible. The technique of covering subsequent replanting is simple. Use two parallel columns using one in which to enter the bona fide Afforestation subjects, amending the other from "P" to "Re P" before including the Replantings. Both will of course be under the same Forest Year.

If the acquisitions are to be favoured with individual treatment, then proceed as follows:-

- (1) arrange as far as possible that all component compartments are grouped together;
- (2) ensure that all compartment boundaries coincide with acquisition boundaries. Nothing defeats this object worse than having pieces of a compartment spread over two or more acquisitions.
- (3) subtotalling for the acquisition can be allowed for by reserving a horizontal line immediately below the relevant compartments. Alternatively, these sub-totals - plus a comprehensive total planted for the acquisition, embracing the appropriate P. Years - can be entered in the end column on the right of the form, under "Name and Number of Acquisition",

This, then, is a very useful co-ordinating Form.

Control Summary of Area under Plantations (Form 3)

This form as a useful supplementary whose function is restricted to tracing the balance of areas under plantations on a Forest Summary Basis, and to serve as a useful check summary providing Historical figures for Afforestation, Destocking and replanting Subjects. If the layout seems a little strange, it is merely to facilitate the task of addition and subtraction.

It is hoped that the worked example will explain the function of the form adequately enough. Balancing is envisaged as a once per annum task - but component entries per annum can be made at the appropriate time. For example, the Afforestation and Replanting figures can be entered when the relevant records have been completed and submitted (May? or June?), whilst destockings can wait until the end of the recognised Forest Year (October). If the manager wishes to be expansive, a new line can be taken to each contingency giving rise to an amendment of balance.

Land Utilisation Record Form (Form 4)

Notes on Underlying Principle

The procedure of tracing Land Utilisation has been split into two distinct parts. Part I contains the mean reserve of land which accrues by acquisition. It holds not only the reserve from which is drawn the ground as it is planted, but the whole range of agricultural subjects as well. Thus, apart from the infusion of new figures from new acquisitions (and occasional reductions through disposition), the entries merely wait until they become absorbed into the ever increasing bulk of plantations. Apart from the Forest Grand Total, the Part I entries are not sacrosanct, in as much as they can be varied without a permanent record being kept of their "peaks". Acquisition and disposition apart, these figures can only alter amongst themselves by reciprocal movements taking place of "pluses" being balanced by complementary "minuses".

Part II is fed largely from the plan-table reserves of Part I and is historical in the sense that the entries for Stocking, Destocking and Replanting are accumulative. This means they never diminish - they behave as valves, letting figures in, but never out. Consequently there remains an ever up to date record of how much was acquired, how much afforested, how much destocked by fire, clear felling etc, and how much replanted. The significant figures of the current balance of plantations still remaining intact, or replantable awaiting treatment are obtained by a system of subtraction between the historical figures,

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Steps to be Taken

Part I

(i) Acquisitions are straight additions, and dispositions straight subtractions of figures from completion summaries, under appropriate columns. The figures can be entered (a) as one annual gross "Lump Sum" total; or (b) as and when they occur, taking a line to each. With (a) of course it means that totalling has to be done elsewhere. Under (b) a choice of procedure can be followed - figures can merely be entered (dispositions can start from lower lines and work upwards) and then comprehensively balanced at the end of the Forest year after producing the gross "pluses" and "minuses", or, a balance can be struck after each entry by using a second line with each contingency. The latter method is probably more time consuming and certainly more space consuming, but may be preferred as it allows the work to be dispersed throughout the year as and when completion summaries come through. If commencing dispositions at lower columns, leave blank the one or two lowest.

(ii) Movements can also be made between columns, but "pluses" must be balanced somewhere by "minuses" of similar value e.g. a re-assessment of unplanted, to plantable would have a + value in column 15 balanced by the same value as a minus in Col. 17; and similarly, a nursery of + x acres (column 18) reclaimed from arable fields would be balanced by -x acres under columns 14b and 14.

(iii) Note in the cases-of columns series 14 and 15, any change taking place in the component columns 14a to 14e, or 15a and b must have the same change entered under the Total or "Parent" columns 14 and 15 of the series, unless the change is merely between columns within the series, i.e. 14c to 14d or 15a to 15b etc. Also any change to the columns 14 to 19 which is not merely between one another, has to be balanced by corresponding changes in column 20. This is most likely to arise with the addition of a new acquisition (when column 22 would also have to show change), or with the subtraction of plantable to planted in Part 2 (when column 22 would not show the change).

This also applies to the series 21, a straight "swop" can take place between any column 21a to 21e on a plus and minus basis without effecting Total 21. An addition to any of these columns from elsewhere also becomes an addition to Total 21.

(iv) At the end of the Forest Year, make one annual entry to allow for the Afforestation programme. This will be by a straight deduction, or minus entry from columns 15a (or 15b) and 15, and will be balanced by a corresponding Plus entry in column 1 of Part 2.

(v) Note that unless they form part of the agricultural complexes, all plantations acquired during the Forest Year and entered under Column 16 and 20, must be deducted and carried over to the Acquired Column 1 line of Part 2, thus leaving a NIL C/F under Column 16.

(vi) For convenience and clarity in totalling and checking, certain columns (14, 15, 17, 18 and 19) may be repeated in the uppermost section of the Tube. Their totals should, of course, tally with the revised Column 20. Columns 21 can then be added to this total in the lower section of the tube, and together with certain totals brought across from Part 2, should combine to tally with the revised Forest Grand Total Column 22.

Part 2

(i) Lines 6 and 7 have space to permit more than one entry during the course of the Forest Year. This allows for the contingency of disposition, or a re-assessment of a Forest or Plantation subject back into agriculture, i.e. Part I. Note that although these figures are accumulative and historical in lines 6 and 7, they must be repeated in Part I as plus or minus qualities as appropriate. For example, a disposition of "y" acres which has been a plantation, although shown as +y under the "current" column of line 6, would be entered as -y under column 22, Forest Grand Total. Again, if "2" acres of plantation were cut as a housing site for a Farmhouse still under F.C. management, the "z" acres, though entered as +z under the line 7 "current" column, would have to be entered as +z in the Part I of columns 14e, 14 and 20.

(ii) All other entries in Part 2 need and can only be made at the end of the Forest Year. These entries will be of straight additions to the "add current" columns in lines 1, 2, 3 and 5, the accumulative column,, The "sub" lines 2a to 2d, and 3a to 3d, should, of course, agree in total with the parent lines 2 and 3. This holds true not only of current figures, but of totals brought forward and revised at end of Forest Year. If these items 2a to d etc., are not felt to be required, entries can merely be made under 2 etc., the "total" lines * Note then, that, not only are planting and replanting shown as plus qualities which when accumulated, never show any decrease, but so also are the Destocking lines, be they due for replanting or not. Line 5 does allow for the contingency of an element of not replantable remaining in Part 2 - the sort of contingency which might require this would be a clear felling for a quarry, or an Electricity Line, too integrated with the plantation complex to justify segregating it to Part I. It probably also looks far forward, to the day when Land Utilisation Recording will take place more on a Part 2 basis, with the Part I era of acquisition and agricultural subjects fading into the past.

(iii) As Lines these Stocked, Destocked and Replanted columns are accumulative, figures showing the up to date position of what is still stocked and what is replantable awaiting treatment must be obtained by a process of subtraction between columns. This done first in the Line 4 series, whereby the simple difference between lines 2 and 3, i.e. (Destocked, Replantable, minus Replanted) brings out the up to date Replantable figure, and secondly in line 9, whereby a rather complex process of manipulation, the sum totals of lines 4, 5, 6 and 7 are subtracted from line 1, to give expression to a figure for Balance of Plantations still stocked.

(iv) All the manipulation in Part 2 can be facilitated by use of a suitable mask. The totalling and transfer of the significant Part 2 figures into the Forest Grand Total is further assisted by repeating certain figures in the appropriate boxes 10, 11 and 12, and so progressing as Line 13 in the lower section of the "Tube" (Further guidance in Part 2 procedure is summarised on a separate sheet of step by step notes).

(v) The figures for Forest Grand Total in column 22 and in the "Tube" should agree, and this serves as a check that the year's Land Utilisation Recording and Balancing has been correct.

Let it now be made quite clear of the function for which the Form is designed. In fact, it can be used in two ways;-

- (1) on a comprehensive Forest basis, or
- (2) on an individual component acquisition basis.

In either case it is a form requiring annual revision. Naturally, if used per acquisition, there must be a summary to provide the overall Forest total, though this can, of course, be readily done by using an additional Form on a Forest Basis.

In other words Form 4 can serve as a Land Utilisation Record per Forest or per Acquisition and the manager very much in control will have covered both. What the form is not designed to do, is to present a summarised list of the component acquisitions comprising the Forest, plus the land Utilisation Record of each - on one Form alone.

If such a function is required of the Form, then a redesign to provide this would be necessary, though not particularly difficult.

In the meantime, the Form can be adapted to meet this requirement in some measure by the addition, in the margin, of two extra columns in which can be entered a "Planted" and a "Replantable" figure for each Acquisition. Note, however, that the Part 2 details would still be assessed on a Forest basis. Note, too, that annual amendment of the individual acquisitions would not be too easy unless sufficient vertical space was allotted to each. Where a Forest is composed of a large number of Acquisitions, even this can be difficult.

Lastly, a further refinement which can be worked in on the Form when used on an Acquisition basis, is the provision within the generous "Notes" space, of a summary schedule indicating the spread of the planting by P. Years, past and future.

((Land Utilisation Record: Part 2 Retrospective Compilation Sheet (Form 5)

The preparation of a Form 4 comes easy if a Forest has recently been created. What if the Forest is of many years standing, and the manager wishes to "bring it on" to a Form 4? If each Acquisition is taken in turn, the Part I of a Form 4 can serve as its own summary, the items being Non Historical, and can then be totalled readily, Not so, the Historical items.

This new Form 5, allows the Forest's past Part 2 activity to be listed Forest Year by Forest Year. Totals can then be struck, and balanced in Part 2 of a Form 4 - just one calculation - which saves trying to balance the figures after each and every Forest Year.

In fact the use of this form could well be extended to become a routine record of Plantation Land Movement, added to annually.

Land Utilisation: The Worked Example

A few notes of explanation may assist the understanding of the worked example which appears on Forms 1 to 6.

It deals with a forest which has had two periods of growth (p.39 to 50, then a lull until the present, represented as F.Y.65). Three acquisitions kept things going till F.Y.45 then a fourth acquisition gave further continuity until '50, and included an agricultural subject under the management of the M.A.F.F. Things proceeded in straight forward fashion apart from two fires (in '43 and '48), and the felling of a wayleave for an Electricity line. A brief clear felling of some of the acquired timber took place in '58 and windblow started to rear its ugly head in '62.

Then in 1964, acquisition became fluid again and afforestation recommenced in F.Y. 65.)

((Up to this stage, the manager(s) in charge had kept the Forms Nos. 1, 2 and 3. The example of No. 3 is supposed to be the most recent one of a set.

In F.Y.65, the manager decided to open a Form 4 for Land Utilisation purposes. To compile the Part 1 items, he used Form 4 itself - shown on the example on the attached slip of paper. The Part 2 items were listed and totalled on Form 5, and brought on to Form 4, so that it opened with the situation as at the end of F.Y.64.

F.Y.65 turned out to be one of "those" years. In addition to a return to Afforestation, the following happened: -

Early in the year windblow struck, flattening 2 acres of the remaining acquired plantation and 8 acres of P. 39.

Having concluded a good sale for the 'blow and fearing further blow the manager decided to fell more of the acquired plantations and in fact 10 more acres were felled before the end of the season.

Of all these destockings, the manager was only able to replant 7 acres - all of previous acquired plantations, including the 2 acres windblow.

The 175 acre afforestation programme was completed, but a fire destroyed 45 acres of P. 50. Plants were available for the restocking of 17 acres only.

Meanwhile, further movement on acquisition materialised in the shape of a small farm, carrying more acquired timber. Then one of the farms was sold to a sitting tenant, and a major policy decision concluded jointly with the M.A.F.F., whereby part of their management charge was sold to the sitting tenant and the rest handed back, or "resumed", for planting. Every stage of this appears on the Form 4; note that the acquired plantations comes on for record purposes then is moved to Part 2, while being carefully deducted from Column 16 at the same time.

One of the anomalies of Part 2, is that any acquired plantation which has been felled and replanted nevertheless remains in the "acquired" category. To move it across to the "Replanted" category of the Afforestation section would play havoc with the "book". Anyone interested in the Stocked Balance (line 9) of the Acquired must further qualify it by noting from line 3 how much of the "acquired" is, in fact, no longer acquired, but replanted.

At the end of the Forest Year, on balancing up, the manager was proud and relieved to find his forest Grand Totals tallying.))

Much use has already been made of this word - co-ordination. What does it imply? Does it really present great problems?

Co-ordination simply means keeping the books straight and properly balanced - keeping tabs on what has to be done, and where. Unfortunately, management, if distilled, can appear to have several functions, not all necessarily stressing the same factors. The three most important of these can be listed thus - Planning, Accounting and Timber Marketing. Ideally, the Forest Manager should be a blend of all three - his own co-ordinator. If he is not, or if he has to subsequently to redirect his already secure information to functional channels above him, then the system itself must act as co-ordinator. The task of keeping a balance between the Afforestatable and Afforested side of things can be accomplished once a year on a Forest Basis on the Form 4, Land Utilisation Record, provided, that is, basic records are available with the necessary figures. In addition, Form 5 can also cope with the Replantable/Stocked balance.

Perhaps an examination of the three functionaries' use of such information will reveal the underlying stresses and strains. To the planner, the chief concern lies with the balance of ground, plantable or replantable which remains for consideration as an afforestation or restocking subject.))

((The accountant will be interested in the cost of what has been afforested (or Restocked) so that he can satisfy everyone that the Forestry venture still seems likely to remain, businesswise on the safe side of the "red", and so that he can look ahead and give the nod of assent to other afforestation prospects under consideration for acquisition.

The Timber Salesman, will want to know what has just been planted so that he can judge the impact it is going to have on markets in the long term - i.e. perhaps 20 years ahead or more. Sheer area is of significance of course, and so is species, but at as early a date as possible he will wish an assessment of productivity so that he can predict with much greater accuracy the timing of its impact -i.e. the point when, for the first time, the plantation passes suddenly from nonproductive to productive state, and then the time at which the final grand cash in will take place with clear felling.

At this latter stage, the Salesman will wish to bring his figures up to date by deducting a now no longer productive area; the accountant will wish to review the receipt side of his calculation and set the seal on the profitability; the planner will seek to discover the area he has to bring under his wing for restocking once again.

All this must seem very simple and straight forward - if no account is taken of the impact of the unexpected.

For example, destruction of plantations by fire - one of the worst contingencies.

As far as the planner is concerned, he is merely interested in the species and area which must be treated again and ensuring his Historical figures are not falsified by the area being added twice. But the accountant is in more of a quandary for he must be faced with the problem of deciding how to cost this misfortune. Will he write off the money already spent, and make a fresh start; or should he look upon this as a quite valid and integral part of the cost of afforestation? He would probably decide in favour of the latter course, and this being so, would settle willingly for the replanting to be treated like simple Beating Up. But in doing this he runs the risk of treading squarely on the toes of the Timber "wallah".

Suppose that the disaster overtook this plantation of Sitka Spruce when 5 years old. If replanted straight away there is a 5 year differential between burnt and non-burnt. Assume now that replacement was made with the same species and grow with success, the equal of the surviving surround.

If an assessment is made when the undamaged area was 16 years old, then a 31 foot measure of Top Height indicates a Yield Class of 240. Thus the replanted crop would only have reached 19 feet, being still only 11 years old. The danger is that in the assessment the 16 year figure will be used, which would drop the Yield Class to an apparent 140.

It is true that this error is on the safe side (i.e. the burnt stand will probably yield thinnings when 15 or 16 years old, instead of something like the 23 years the assessment figures might indicate). It is also true that if the assessor averaged his height calculations the margin of error would be diminished, but would lead to distortions over a much wider area.

To the Timber Salesman, then, the true age of the plantations is of considerable importance, and thus has arisen an incompatibility between the preferences of accountant and marketing functionary. The answer probably lies in ensuring that the age, area and species are recorded properly against the year of replanting under a new name "Re-afforestation", while the cost is debited against the original P. Year.

Much has been said in this Philosophy about limiting the number of factors, and yet here has been suggested a new term Re-afforestation to add to Afforestation, Beating Up and Replanting. It would be nice to think that at least no more need be added, e.g. enriching or interplanting.))

((So far, the example of the "Uncontrollable" agency intruding has been **fire**, Before leaving fire, it would be well to consider the mechanics for providing the relevant information. A report submitted soon after a fire will probably be the only means of recording the loss. Anomalies can arise if two, or more fires occur, adjacent to the first fire. It is not always easy to be sure that the measurement of the subsequent fires does not include part of the area of the first. Therefore, it would probably be a wise procedure to delay accurate and definitive measurement until the end of a fire season (if well enough defined) and before re growth of high weeds, like bracken, begin to hamper the job. If planting is done the same season, obviously the measurement can be made earlier.

But there is a need for a recording document which serves as an annual comprehensive list of "destockings" which will be a parallel to an annual record of "Stockings" and "Restockings"

The scope of this co-ordinating problem is extensive and to do justice to it fully would be a formidable task*

If fire is an irritating factor in early years, windblow will probably be more so in later years. This is particularly the case when it occurs well before a Rotational Clear Felling scheme has become operative. It becomes that much more complex too, because the dimension of Productivity has been added, and because it frequently serves as a nucleus from which will grow extensions in subsequent years,

The question of area measurement may again prove awkward to the planner.

To the Timber Seller, the adjustments made to the records must include productivity - at the same class to which the sub-compartment was assessed before windblow. To both planner and Timber Seller, complications hover round the corner depending on whether the approach to Thinning and Felling control is by area or volume, and is probably more aptly dealt with later.

As for the Accountant, one is tempted to tiptoe past and leave him to his problem. To be strictly correct, the costs of replanting should be borne out of a fund of money built up from the profits from receipts, separate to the loan of public money which floats Afforestation. This is a case for a fresh start, but one which may be premature before an adequate fund is available,

With the idea of co-ordination firmly in mind, the Philosopher now considers the design of Basic Records.))

Land Utilisation; Record of Afforestation or Replanting:

Compartment/Species Summary - Form 6

The Forms 2, 3, 4 and 5 must be fed with information recorded in more basic documents. The format for one of the most useful of these is shown as Form 6. It is similar in layout to the sort of form which lists a finalised planting programme and the species required therefor. But this is intended to be completed once planting is over, and summarises the year's programme in terms of compartments and the species used therein. It is thus a historical record and should be filed together with a supporting plan or tracing.

The design offers a cross reference to the year's planting activity of the utmost utility. The totals of each species per "P" Year are required in the preparation of Long Term Thinning Production Forecasts. Replantings, etc. can also be recorded on the form, but it is recommended that a separate form be used for this contingency. -Similarly, a sheet per F.Y. can be opened for Beating Up, summarised on a P. Year basis making clear if the units are in thousands rather than acres.

As a refinement, the cross-referencing value can be extended if the form is brought into circulation again should any of that P. Years plantations sustain damage e.g. by fire. A simple index can be put against the compartment in question, and the area destroyed entered in red below the appropriate species "Total" figure which can be brought forward on to a newly opened form. Thus an annual adjustment of the Species Total per P. Year will always yield an up to date figure. In the example, an amendment of this nature has been marked up, but on the same form.

The Basic documents which in turn "feed" Form 6 will be discussed later.

A Form similar to Form 6, and complementary to it could readily be designed as a co-ordinating summary of the Year's Destockings too.

The use of Form 6 will gradually be superseded by a more appropriate form which carries the plantations through to the Production and finally Felling Stage. This will serve to limit the working life of the Form 6 and thus the number of P. Years (and Forms) needed in active circulation.

Section 5 Land Utilisation/Planning: The Compartment Record - Form 2

Whereas the Land Utilisation Record (Form 4) maintains area balances on a Forest (or Acquisition) level, the Compartment Record (Form 7) serves the function of tracking the balances of land within the compartment. It is built around a simple compartment schedule (Columns 5 to 9). But it has other functions too.

One could suppose that the definitive Compartment Record would be made of a cardboard robust enough to last a Rotation. But to justify its cost it would have to be capable of amendment.

The Record presented here is certainly amendable but it is not pretended that it need last a lifetime. It is designed to permit management on an intensive scale.

The use of it is visualised as follows. At Afforestation, a record of the species planted can be listed with a "set" of lines to each - i.e. a set of about 8 lines between the double cross lines. This allows for seven subsequent amendments and should, it is hoped, take these sub-compartments into the Productive stage.

Items such as Species Identity Number, subsequent Beating Up, etc., can be worked in on the generous blank space, but there are other documents on which this can take place which can be filed away for reference.

The allocating of a number or letter to each sub-compartment at this stage is not really worthwhile, unless strict Financial Rotations are to be discarded in favour of an Average regime.

Column 10 gives space for an entry for top height at a later date, and from this and Columns 4 and 12 (P. Year and Age) can be deduced Yield Glass (Col. 15). The Average Columns - Top Height (11) and Age (13) are included to facilitate averaging over a whole compartment should Indexing be necessary under an Average Rotation regime.

Any up to date information prior to thinning can be entered on a fresh line as and when it is brought in, and it is visualised that this would be a matter of routine for Foresters assisting. The information in mind would include Top Height, stocking in trees per acre, adjustments for check, failure, etc.

What happens when the various sub-compartments begin to become productive depends primarily on how many of these there are. If there are many, then it is probably better, indeed necessary, to open fresh sheets allowing sufficient space say two sets of 8 lines - for amendment. The main source of amendment will come from recording of Thinnings and the number of these depends on cycle, Rotation, etc., with 8 a fair average. For those who prefer a Volume Control approach, this is allowed for in Columns 18 to 20. Those who hanker after a number of trees per acre control can use columns 17 and 23. Provided an accurate assessment of stocking in numbers of trees per acre at the time of first thinning, and accurate records kept of trees per acre removed from thinning, simple subtraction should provide the current stocking figure.

The Basal Area fiend must work away with Column 16, but if he needs more, an expansion in the design to allow a column for Basal Area removed under "Thinnings" would not be difficult.

The factor most likely to disturb equanimity is windblow. How this is recorded, i.e. as Thinnings or Volume, depends on how scattered it has been, and how extensive an area has been eroded. The problem manifests itself most significantly where Volume Control is being practised. Touching on this only briefly, let it be explained that such control can be exercised either, on a "per acre" basis, or "per sub-compartment". It is in the case of the former that trouble may arise if a sizeable area has been blown. Amendments to both Area and Volume columns may lead to over deduction.

Then, of course, area adjustment, quite feasible in the case of the parent sub-compartment, may require the creation of a new sub-compartment on replanting,

So much for the Compartment Record - an invaluable co-ordinating form which should always be at the manager's elbow in his office.

Sub-Compartment/Area Summary - Form 8

This form is actually headed "Timber Forecasting" but it seems logical enough to discuss it at this stage because it is, in fact, a summary per "P" Year Species and Yield Class of all the Compartment Records - tabulating them in a manner likely to be of great utility and significance to the Timber Forecaster looking far into the future - and also the Planner seeking statistics from which to deduce Average Rotations.

This will represent a big investment in time to the manager whose Forest charge is large and of advanced age. But once the investment is made, annual maintenance is not likely to present any great problems provided the basic records are kept, and a routine followed. Where afforestation is still proceeding - or replanting undertaken - a new sheet can be opened and details entered from the Compartment Record, or even more conveniently, from Record of Afforestation/Replanting: Compartment -Species Summary (i.e. Form 6), using the "Unclassified" column. But there is a valid case for delaying this until establishment seems secure.

As assessments of productivity are made, so the figures per sub -compartment can be taken out of the Unclassified columns and into the appropriate yield class column. Totals can then be struck - again as Yield Class, per species, per "P"Year.

Areas subsequently felled are struck off, ensuring that the Yield Class is the same as previously assessed (not the actual if found to be different on felling). Partial fellings (e.g. windblow) of sub-compartments do give rise to problems, but if adequate space is left beneath the totals, not only can the deductions (in red) be subtracted from the total but a revised figure for the sub-compartment can be added,

By such annual amendment, a complete re- summarising of the Forest's Compartment Records can be delayed for perhaps a once in 10 years overhaul.

The introduction of this form does tend to emphasise what can become one of the Forest Manager's big headaches - in a whisper, underplantings and mixture, With enough complexity already piled high on the plate, the best advice that can be offered to those who are considering such mixture is, unless there are very pressing Silvicultural or Economic reasons, avoid then.

Suffice to say, at this stage, a system of box symbols round the sub-compartments in question can help to keep these odd subjects in focus.

With this Form, sufficient foundation has been laid, on which the Manager can proceed with his planning.

Planning: Schedule of Planting Programmes - Forms 9 and 9e

The function of these forms is essentially the same. They form a useful starting point in sketching out afforestation programmes on a broad basis. In fact the basis visualised is the Acquisition, or separate block thereof.

Both Forms can cover five years and are capable of lasting five years by allowing annual amendment to include a further four.

Form 9e is on Foolscap size and because of the lack of depth, the Plantable/ Proposed/Completed entries lie side by side, horizontally - - - observing the customary pattern with most official forms nowadays.

It is intended that against each acquisition, the total plantable area is entered on the "P'ble" line, then area to be planted in "Prop" under the next Forest Year, the Plantable entry will be the balance between these two figures, and so on until the plantable element of the acquisition is all used up.

The completed programme can in due course be entered in ink, and if the "Pble" and "Prop" entries are made in pencil, adjustments where necessary can be done after application of an India rubber,

Form 9 is on Double Foolscap, and full advantage taken of the size to include Replanting in a separate column. But this is still essentially an Afforestation Form.

The number of acquisitions still to be programmed will determine whether one or more Forests can be included on the one sheet. It is probably better to allow a sheet per Forest.

The "Plantable Left" column in this case comes between the Forest Year column, but the principle is essentially the same as with 9a, Here, however, sufficient vertical space is left under each acquisition, or Block thereof, to allow amendment without the need for a rubber. Boldly stroke out the obsolete figure and substitute the revised one immediately beneath. This can be done in pencil, and to differentiate, the actual completed area figure can be entered, again immediately below, in ink, e.g. green. Then the "Plantable Left" columns can be adjusted - in pencil -and the Proposals for future Forest Years as well.

This serves the Manager who wishes to plan ahead on broad lines without becoming bogged down in compartment detail.

The revision will probably take place soon after current year's Planting Records have been submitted, and certainly prior to the preparation of Budgets, or Estimates of money to be required during the forthcoming year.

((Plant Requirements

Meanwhile, the Manager will have been hard at work setting up the acquisitions due for imminent treatment, by creating compartments etc., and this task - tenancy permitting - should be completed before ploughing might start, and before a detailed inspection is made to select the tree species to be planted. The culmination of these labours will be the preparation of a Form on which are detailed the likely requirements of tree species - per compartment. This will be forwarded to the Nurseryman who will, in due course, use it as the basis for allocating his stocks.

Although no specially designed form is included here, something along the lines of Form 6 would suffice. Note, however, that a conflict of preference may arise because the Forester will wish an area figure included, per species, and per compartment (which is an integral step in his calculations), and an age figure (the cost of plants varying with age), while the Nurseryman is only interested in figures indicating the numbers of plants per species in thousands, and in size.))

Planning: Compartment Work Planning and Co-ordinating Schedule: Form 10

Whether or not a Form of this nature should find a place on the Planner's desk is likely to prove controversial. What is visualised is a series of Forms which list the whole of the Forest's compartments from Number 1 upwards. Against these, repeated under a series of Forest Years, is a range of key operations selected from all phases from Afforestation to Felling.

In the prototype design, 24 compartments were covered by one sheet and this was successful except that it began to be difficult to amend some of the entries under the Forest Years near the centre of the form - i.e. towards the end of the form's life.

Up to now planning has been linked with a horizon of 5 years ahead. Whether this is valid is another matter, but certainly three years should be covered. The Form in its present design has scope for only 12 compartments per sheet. This gives plenty of space for vertical amendment, but means twice the number per Forest. It is intended to cover 3 years in the first instance, and last 5 i.e. four subsequent annual amendments. It could of course cover 5 years plus 2 amendments. Should it be desired to cover 5 years and last 5 years, then the form would have to be extended in length to allow for a further 2 Forest Years. This would make it pretty big! There is probably little scope in reducing the number of operations, considered the minimum. Experiments with an endless series of extension sheets did not prove satisfactory, but may still yet prove practicable with further trial.

With Afforestation subjects (differentiated from the Maintenance to Felling phase) not yet compartmented, an extra "rag-bag" sheet can be added; also required will be a sheet to serve as a summary of the totals of the whole series.

The essence of the form is that it offers useful co-ordinating properties, not only between the key operations within a compartment but over a span of years as well,

For example, if, in the case of Afforestation, it is planned to plant a certain compartment in a specified Forest Year, then all the operations complementary to this can be sketched in, not merely for the same Forest Year, but for the preceding and subsequent years as well. The fencing can be entered the previous Forest Year, the ploughing too, perhaps, then weeding can be judged - not all the area the first year> but more the second, third - - and so on, then gradually falling off again. As a further example, areas scheduled for thinning, can have drain maintenance written in, marking and measuring too, while clear felling areas can have the replanting covered the following Forest Year and so on.

Such co-ordination becomes more and more necessary as a Forest enters the Clear Felling/Replanting, Mature state, especially if Financial Rotations are being implemented, with consequent Intensive Management.

The major revision of the Form would take place in October i.e. after the completed quantities per compartment have been returned and entered in red, but a quick minor "brush-up" could also be made prior to the preparation of the following Forest Year's Financial Budget.

Only one copy need be kept - by the Forest Manager, be he Forester or District Officer, and it should be available for check and audit if required. From this form can be eventually extracted data from which an annual Plan of Operations is compiled and issued to the executive Forester.

The task of amending Form 10 can be greatly assisted by use of an 18 inch perspex ruler.

Plans of Operations: (a) Annual Summary Sheet: Forms 11a, b, and c

Once the task of bringing up to date the Compartment Work Schedule (Form 10) is completed in October - i.e. by entering quantities achieved for the year just ended, and planning in more accurate detail the Forest Year just commenced - some means must be found to communicate these latter figures to the Forester to serve as a guide to his year's work.

Of course, he could be handed the complete Form 10, but a much more convenient arrangement is to abstract the figures appertaining to the one Forest Year on a specially designed Plan of Operations Form,

It is conceded that the ultimate in such a Form is to have one Form per Operation. However this is rejected in favour of a more comprehensive form, embracing most of the important operations, on the grounds that it is more coordinating and time saving. The resulting designs are grouped as Forms 11a, 11b and 11c.

In the original prototype design, a double foolscap size was tried on which were crammed a very wide range of operations from all phases - - afforestation, Maintenance, Production. Foresters who tried the Form seemed unanimous in preferring a smaller size - e.g. foolscap, even if it meant separating the purely Afforestation subjects from the Maintenance/Production/Replanting stages.

The designs resulting from these trials are shown as 11a (the Afforestation Plan) and 11b (the Maintenance, Production and Restocking Plan). Form 11c is essentially the same as 11a, but is on a larger scale - but still less than double foolscap. Something similar could be done for 11b. This larger Format offers more space for extra detail.

The Forms are simple enough to follow, but it must be first explained that they are bi-functional, in their conception. In their 'Plan of Operations' function, the "b" items must be deleted, thus leaving the form sub-headed (a) Annual Summary Sheet: F.Y. ...", and the first vertical column as (a) Compartment No.

The first line beneath the printed operations accommodates the Planner's choice of units. As a space saving compromise, certain columns - e.g. Fencing, Scrub Treatment, have the column split to allow coverage of different types of fencing, or different types of Scrub Treatment by using the first bracketed letter of these differences as an index. Totalling of each different category can be done separately if need be. To cover each and every different contingency would require much more space.

Such Forms can be prepared on a local basis, of course, and preferences for a particular "set" of operations can thus be catered for.

Sufficient space is left to each compartment for three neat entries vertically below each other. However at this stage the only concern is entering opposite the compartment the figures for the work to be done, under the appropriate operation heading, in the appropriate units and at the top of the space provided.

The pages are numbered - even Beats can be catered for if so desired - and when the task of entering the Forest's whole year's programme is completed, a summary sheet is added and the total number of pages written back on to each sheet - - i.e. if there are 7 sheets, then the pages are numbered 1 of 7, 2 of 7, 3 of 7 and so on.

If the Plans are made in triplicate, using carbons, as is hereby recommended, they may have to be done by hand on all copies, if carbons and clips have been removed. The moral seems to be to have plenty of carbons.

Then one copy can be kept by the Planning Officer, and two copies forwarded to the Forester.

At the end of the year, once all the quantities actually completed are to hand, the Forester should enter these in red against the appropriate compartment and operation immediately below the black planned entry, ensuring that the totals tally with other basic records, and his Progress Report. If he wishes to do two copies at once, a red carbon can be used. One copy should then be returned to the Planning Officer, as soon as possible after the end of the Forest Year.

Before he is furnished with a new Plan, he may have to manage with nothing more than his Budget proposals or carry forwards, for 3 or 4 weeks or so.

The point about leaving space for a third entry is a delicate attempt to fill in a possible "gap" and is as follows. Frequently the entries made in the plan will be estimates. For example, 950 chains of drains repairs may have been booked for a compartment. If only 800 have been completed this may mean two possibilities, the 950 was an over-estimate by 150, or only 800 were accomplished before the Forest/

Year was completed. Generally the operations likely to give rise to this sort of anomaly include Drains Upkeep, Weeding and Thinning.

What is suggested to clarify the picture is this. If the actual quantity represents a completed job, draw a horizontal stroke under the actual figure i.e. in the "third" space. If the actual quantity represents only a partially complete job, and there is a carry forward, the Forester should estimate this figure and enter it in the third space - preferably in a third colour e.g. green.

This will leave the planner in no doubt where he stands and allows him to make the necessary adjustments to the new Forest Year's Plan, encompassing the carry forwards.

Plans of Operations; (b) Current Work Record Sheet (Forms 11a, 11b and 11c)

The second of this Form's functions will now be described. It is assumed that the Forester has in his office a stock of blank Form 11's. On receipt of his Plans of Operations, he can adopt one of two procedures, depending on what time is available. Assuming time is in his favour, he should open a Form 11 (a or b as the case may be) for each and every compartment listed in the Plan. This time the (a) will be deleted, leaving the Form sub-headed "(b) Current Work Record Sheet, Compt?" and the first column headed "(b) Date or P/E".

Along the first line below the 'Unit' line, he can enter the planned programmes, preferably in green for differentiation, under the appropriate operation.

If time is not in his favour, he can delay this task until such time as he comes to work in that particular compartment. One way or the other, he will build up a pile of Forms, one set for Afforestation, and another for Maintenance etc.

His task from then on is to record how much work has been achieved in each compartment every week - entering the date first, then the quantity under the appropriate operation. In this way he can keep a running record of all work done in each compartment during the year. He can enter 'totals to date' from time to time in red immediately below a convenient entry, and he can keep an extra sheet as a Forest Summary if he wishes. Either way, there should be a tie up between the total figure claimed in a Progress Report of the same date as the sum of the compartment totals to date.

At the end of the year, he will strike final totals, assess the carry forward, and fill in one of the spare copies of his Plan of Operations Summary Sheet before returning it to his Planning Officer as described in the previous chapter.

The completed "set" of Work Records for that year may be filed away, or the final totals may be recorded on other documents before being discarded, or - the sheets can be simply kept in and used for further years as long as space is still available.

A form of this kind has long been missing from the range in Forest Management. Besides offering a means of building up authentic records of the work needed in a compartment (e.g. the chainage of drains for annual maintenance), it can fulfil the function of a Compartment Running Record even to the entering of the Age and Ident. No. of the species used in planting or Beating Up.

Furthermore, it offers the Planning Officer acting in his supervisory capacity, or any other auditor, the positive means of checking how far the work is being done according to plan.

Section 6 Accounting and Costing

It seems a logical step to move on to the thorny question of Basic accounting, i.e. building up the costs for the various operations the Forester's men undertake. It becomes a difficult problem because here, more than anywhere else, the three "functionary" images of the Manager enter the field together, and look each to himself for special, personal properties. Thus the whole costing system must be multi-functional. Furthermore it must contend with a tremendous number of factors.

It would not be difficult to design a system for payment of a man's wages. Neither would it be difficult to devise a system purely for costing operations. But to evolve one system to serve both functions - - is quite another matter.

Briefly, the following mandate has been accepted - just about the most complex that is likely to be.

- (1) The man's weekly pay figures must be extractable.
- (2) They must feed the A. 12 tax sheet with wages split into the categories Piecework, Time wages, Overtime and Sick Pay, and, Hours worked into Time and Piecework. (The A. 12 is one of the few current official forms which this treatise accepts without question).
- (3) The system should be a definitive costing system, complete and inbuilt and sensitive enough to cost any operation - even one localised by sub-compartment - without the need for any special, extraneous 'ad hoc' treatment which invariably throws extra burden on the Forester.
- (4) The system should allow the parallel accumulating of man hours as well as cash against each operation.
- (5) Provision should be made for supplying two requirements:
 - (a) the analysis of incentive work relative to Time Work.
 - (b) the analysis of a Piecework job to offer comparison of the level of incentive set with that achieved,

The former is acknowledged, being recommended by Work Study Branch; the latter is invaluable to the Forester who is beset with Trade Union trouble, or men claiming dissatisfaction with the level of incentive on piecework rates, etc.

The former - i.e. the expression of incentive working relative to time working - represents the most difficult crux in the whole complex problem. More will be said of it later.

- (6) The procedure must form an integrated whole, each step recorded for audit, and always of maximum intrinsic use to the Forester as well as the higher levels he serves.
- (7) The documents themselves must show a measure of compatibility, and the routine and layout reflect clarity.
- (8) Lastly the system here designed is a manual system.

Whilst it is acknowledged that computers could do this work, there is a distinct likelihood that the completion of basic data would represent a time consuming task not in fair proportion to the information returned and to the time this is likely to take.

But I add two points :-

- (a) Few Forest Offices will ever be able to function efficiently without a clerk, and therefore his time can be more productively accounted for by doing this task; and
- (b) A good deal of the oncost spent checking this work could be reduced if computer checks were made of the manual effort, say, once a quarter.

Accounting and Costing: The Time Sheet (Form 12)

This is one of the basic forms in the system and the format opted for here, as the most definitive, is a sheet per man. Old stagers in the Forestry Commission will spot its similarity in layout to the old Time Book.

On the stencilled example, two sizes of the same sheet are shown, there being no need to waste paper by using a large sheet if a smaller size will suffice.

How the Time Sheet is filled in depends on how detailed and sensitive the costing is intended to be. Put in another way, just how sensitive the Costing system is likely to be depends on how the Time Sheet is made out.

For example, a 'job' is a different entity if undertaken on time, or Piecework. Thus if the same operation has been performed by a man on Time and on Piecework, each contingency must be served by a separate line. The differentiation must be emphasised by noting a suitable index in the "Pay Cat." column e.g. T, for Time Work, PW or B for Incentive, be it Piecework or Bonus, OT for Overtime etc.

Each contingency should have its own entries for "Quantities" achieved and man hours. These will be totalled at the end of the week under the appropriate "Total Hour" column. As a check, the Man Hour totals for the week, computed in both sets of columns, should agree.

Then the sensitivity can be further increased if a certain compartment, or "P" year has to be costed separately. The simple solution here is that the "job" when done in this particular compartment, or "P" year, must have a line to itself, being further identified under the "Compt./P. Year" column.

The entry for Gross Area looks ahead to the day when costings will be done on an area basis, be they for drain maintenance, or thinning and so on.

One Time Sheet per man, then, only quantities of work and man hours, no money at this stage apart from rates, and the Forester should keep a carbon copy.

Preprinted Time Sheets

The most probable criticism which a Time Sheet of this design will evoke is that more writing of job descriptions will be necessary, compared with a Time Sheet which serves collectively for 5 men.

This is valid, and as a counter to this it is suggested that Time Sheets could be prepared which have jobs preprinted. This is visualised on a fairly localised scale, with a range of sheets available to cover the obvious 'regular job' squads. There is no reason why Forester and District Officer should not, at the commencement of each new year, decide on the intensity of the costing and on suitable groupings of jobs for each of a range of prepared Time Sheets. For example, one could be prepared for the bulk of a Planting Squad, to include Planting (Time), Planting (Piecework), Beating Up, Screefing, Fire Protection, Wet Time, etc. Another could cover the summer range of operations, weeding etc. Yet again - as in the example here prepared - a sheet could cover the Production Gang. It is emphasised that prepared sheets must of necessity be rather larger than normal. Blank lines can be left to allow entry of casual operations, etc. In the example a blank line has been left under each major job - such as thinning. If Thinning, Time and Piecework both figure, then there is no need to waste time rewriting "Thinning". A couple of "repeat" ticks will serve.

Thus a little bit of forethought and use of a stencil will serve to avoid wasted time in handwriting the same operation on perhaps a dozen different time sheets.

Accounting and Costing: Time Sheet Summary Operation Check List (Form 13)

This form represents the next stage in the logical build up of a well ordered routine, and though at first sight it may seem superfluous, its use has a fair measure of significance.

It comes into play when all the Time Sheets for the week have been completed.

It is little more than a fairly comprehensive check list of all the operations in which the Forest is likely to be involved over the year, each covered three ways -Piecework (or Bonus), Time and Overtime.

The clerk goes through each Time Sheet one by one and as he comes to a new operation, puts a tick in the space opposite the operation and under the appropriate pay category on Form 13. If the section listing the operations is cut off, it can be slid along and clipped for use the following week, and so on, for six weeks. If there are more than one tick under the Time, P.W, and OT columns, extra ticks must be added against the TOTALS (line 95) under the appropriate of these columns.

Once this is completed, the clerk is now nicely placed to prepare an ordered Time Sheet Summary.

Accounting and Costing; Time Sheet Summary and Wages Analysis Form - Form 14

This is one of the most important links in the chain, and if any document is to be looked upon as accountable, this should be it. Again, old stagers in the Forestry Commission may recognise an old friend - the A135 of many years back, to which its design and function is similar.

To maintain compatibility, the 'operations' are presented horizontally as in the case of the Time Sheet - and, later, the Progress Report.

To facilitate totalling along the horizontal columns, the entries of money etc. have been tilted at 45°. It should thus be as easy to add horizontally, as vertically. Because of this the space given to each operation has had to be coincidentally generous. A move to a decimal system would ease this slightly.

The limitations of the form are thus laid bare - if the Forest has a squad of more than 27, and if the week's operations total more than 24, then one Form will not cope. If the squad cannot be logically split, to allow a form for each, the only alternative solution is to fix e.g. by stapling, extension sheets in the required direction(s).

In assessing the number of operations accrued in any one week - readily obtained if the Form 13 procedure has been followed - due allowance must be made for any aggregates e.g. if a sub-total embracing Heel and Haul Plants, Planting flat, Planting Turf, Apply Fertiliser is envisaged, then an additional space must be counted for it in preparing the weekly Form 14. However, elsewhere in this treatise, the plea has been made that the fewer there are of these, the better, and nowhere does the reason become more apparent than in the preparation of a Time Sheet Summary Form. The example presupposes that no such aggregates are being kept.

The recommended procedure is as follows. List P.W. items first, preparing a line for each operation listed in standard order (i.e. as per Form 13). Remember an extra line for Total if there are more than one entry.

Proceed with the Time Operations but excluding "Sick" and again adding a line for Totals. Then list the O.T. items, plus total if necessary. In the example, O.T. only figures under one operation so it is in itself a total.

The final line is intended for Grand Total.

Once this is done, the 'working out of the moneys per time sheet i.e. per man has to be done as normally, but note that provision is made on the Time Sheet Summary for entering Quantities and Man Hours as well. If Foresters have other tie-ups of Quantity achieved per operation per week, the need to use the Quantity column is diminished, but Man Hours must be entered in the appropriate triangle. To disentangle Man Hours and Money during totalling, the use of green or pencil for the former and black for the latter is recommended. However, another solution would be the production of- perspex "mask" to serve horizontal and vertical totalling. Once the moneys have been calculated, totalling must proceed. First total the P.W. items, entering the figures in pencil. Once a cross check has been made ensuring both horizontal (i.e. operations) and vertical (i.e. Forest Worker) come to the same total in the right hand line, these P.W. total entries can be inked over in red.

Man Hours, too should be totalled.

The same procedure is repeated for Time, and Overtime items and finally Sick Pay.

Then a final balance is made by adding the Totals of P.W., T., O.T., and Sick to give a Grand Total, again checking for agreement horizontally and vertically.

An alternative layout is to provide these Total columns - P.W., T., O.T., and Sick - as the lowest columns immediately above Grand Total, but this is a matter for personal preference.

Thus the Time Sheet Summary provides a unique comprehensive summary of the week's activities - stratified to provide the basic information for the Worker's Pay Sheets and Income Tax Returns, and for the operation costing system - both in cash, and man hours.

((Pay Sheets and Income Tax Returns

This Philosophy breaks no new ground in these directions assuming their format to be outwith the jurisdiction of the local Forestry Manager.))

Accounting and Costing: Gang Working: Share of Incentive Earnings Calculation
Sheet (Form 12b)

Before moving on from the subject of calculating wages, one further contingency remains to be covered, namely the calculation of shares of the collective incentive earnings of members forming a Team or Gang.

There are really two fields of variables involved. First, the Method of Agreeing Incentive. Here the Forester does have a say in the proceedings. The incentive can be on a straight Piecework basis, or as a one of a number of Bonus systems. A fairly comprehensive range of these is listed on the form.

Secondly, the reward having been gained en bloc, comes the Method of Sharing Incentive Earnings.

If a Forester could have a free choice in deciding how the share out should be made, the matter would not present so many difficulties. Where the choice lies with the gang, however, the Forester may be faced with one of a number of alternatives.

The more important of these alternatives are listed for ready reference on the Gang Sharing Sheet itself. One obvious split lies between Piecework on the one hand, and Bonus on the other, with similar contingencies appearing under each.

This is a complex problem, it is not the intention to delve too deeply into it here. Suffice to say:

(a) one contingency not covered is where the shares have been apportioned out on quantities (better not to treat this as a gang effort).

(b) it is intended that the calculation should be effected by using a slide rule and decimals - obviously this will consolidate better if we go 'metric' •

(c) the fuller potential of the form in being able to cover two moderately sized gangs is shown on the worked example, which, the writer trusts will be self-explanatory to the enthusiast prepared to study it closely!))

Accounting and Costing: Operation Progress and Unit Costing Sheet; Form 15

Attention must now be turned to one of the most important steps - and forms, of the whole system. The Operation Unit Costing Sheet is essentially a "job card". One sheet is opened for each operation - indeed for each phase of an operation or job, if need be. And if the "focus" of costing is to be as intensive as to cost individual Forest Years or Compartments, then a sheet per operation, per Forest Year or per Compartment may be added as appropriate. Indeed, if it is required to cost Weeding (bracken), Weeding (Molinia), feeding (Bramble and coppice) and so on independently, sheets can be opened on this basis, too.

A session of deliberation between Forester and District Officer, Accountant and other Functionaries at the commencement of a Forest Year should decide on the level of costing anticipated. Indeed the same session could produce the series of operations to be embraced on the Operation Check List (Form 13), the Time Sheets (Form 12a) and the Progress Report (the last named not yet dealt with), and could even be timed to precede the preparation of the forthcoming Forest Year's Budget.

Decisions can be taken as to what jobs have to be costed separately, and which can be costed jointly. For example, the "Hauling and Distributing" of materials for fencing - can be given a sheet of its own, or included jointly under "Erection". If the latter - and it is still desired to keep separate track of "Haul and Distribute" the form is designed so that this can still readily be done by making use of the 'Other Detail' column and entering the moneys, man hours etc. separately. Of course, the most basic split up of jobs will be on the Time Sheet.

Thus will be built up, a series of sheets covering the whole compass of Forest Operations likely to be met during the Forest Year. The task of opening these sheets can, of course, be left until any particular job first figures in the Time Sheets, but the investment can be made as soon as possible at the commencement of the Forest Year. Provision is made at the foot of each sheet for the entering of the approved Budget under that operation for the Forest Year. Then, every week, details from the Time Sheet Summary are transferred to the Costing Sheets appropriate to each operation involved, with the date clearly marked. Provision has been made for making separate accumulation of Time and Incentive items, overtime being now slumped with Time. Quantities, money and Man Hours are all moved across from the 'totals' columns of the Summary. The costing Form also provides a column in which the Time and Incentive elements of the cost can be analysed. At this stage too a Unit cost can be worked out.

Any P.V.M. etc. or Contract or Hire items can be entered for the same week. No special set of columns has been allocated for Materials. The P.V.M. columns could be used for these, or - by crushing the other items of the form, or widening the Format - or both - "Materials" column could be incorporated by redesign.

Sheets will also be opened for Total Forest Expenditure, and any aggregations of operations as are deemed necessary, but elsewhere in this work, a plea has been made that these should be as few as possible.

Insurance and S.E.T. sheets could be of simpler design, and their source will not, of course, be from the Time Sheet Summary.

The following week the process is repeated,,

As soon as two weeks expenditure features under an operation, the Book-keeper can add these to produce a total to date which can be entered in red immediately below the second entry. If a third week produces further expenditure under that operation, again the total to date can be brought up, by adding the previous Total to date and this new item of expenditure. The same with Man Hours, P.V.M. etc. But, if it is preferred and expedient, there is no reason why totalling to date should not be deferred fortnightly - even monthly if it can fit in better with a Progress Report demand. The Form is as flexible as it can be kept up to date weekly, or monthly - - - even daily!

No doubt pressure of other work will dictate the routine but it is visualised here that the sooner totalling to date can be expedited, the better.

Unit Costs to date follow once the "Totals to Date" of the "Total" columns are determined. No provision has been made for separate unit cost columns under Time or Incentive, but it would not be difficult to include these by altering the design if required.

Over the Forest Year, then, will be built up a loose leaf "book" of these costing sheets, which will remain in the Forest or Accounting office as permanent working records and committed to safe keeping. In theory, the Forester should be able to look up under any operation and be able to quote some significant statistics.

For example - he can quote:-

- (1) The total amount done to date.
- (2) The unit costs to date - for Labour and P.V.M. etc*
- (3) He can calculate the ratio of Incentive and Time working by expressing the piecework element as a percentage of Total and completing column 14.
- (4) The Forester can also deduce the average price paid per man hour for the Piece-working element - and so be in a position to check on the level of Incentive relative to the agreed datum rate per hour. A statistic of this nature may be of great value in answering Trade Union queries.
- (5) He can quickly assess his expenditure and Unit Costs to date, relative to his approved Budget.

In fact, he has at his fingertips, an easy reference fund of statistics, covering almost every aspect of the job - and all built in to the system, involving no extra 'ad hoc' effort on his part.

The Ratio of Time and Incentive Earnings

No bones are made over the fact that one of the most difficult 'cruxes' in the design of the foregoing form, was this abstraction of Piecework earnings and their expression as a percentage of the Total. The writer has not met many Forest Managers (i.e. at Forester/District Officer level) who felt a serious need to know this figure. Not only are they "steeped" in basic knowledge of this kind by daily involvement, but they can sense the invalidity when so many operations or jobs - or, for that matter - workers, are "not Piecework attractive" or "Ineffective". Nevertheless, as has already been stated, it has been an accepted, albeit unwilling, mandate that the system should be able to perform this function as a matter of routine.

This Incentive Percentage can be obtained by using a choice of factors, the most usual being cash, i.e. of the total earnings - so much per cent was earned while on piecework. This can be somewhat anomalous, and a more satisfactory expression may be obtained by using man hours. Thus, of a man's total time spent, "x"% was on piecework. The system which has been described acknowledges this, and provides for the parallel tracking of Man Hours and Cash from the basic Time Sheet. In the case of individual operations, a further dimension can be added, not possible with aggregate items which embrace a series of operations probably quantified in different units. This is the dimension of quantity itself - in other words it becomes possible to claim that "x" per cent of, for example, the total acreage planted, was undertaken and paid for as Piecework.

Whichever the contingency followed, it should be defined at the outset, before column 14 is calculated.

((Accounting and Costing: The Evolution of the Costing Sheet

It may be of interest, indeed even assistance, to some to rake through the waste paper basket, smooth out and re-examine some of the forms which served as prototypes in the evolution of the Form 15 just described. Three such forms are 16a, 16b and 17. Form 16a - Costing Sheet (individual Operations) was first designed with the express purpose of costing on a compartment basis specified operations, or those which were the individual, component jobs of a more comprehensive task. For example, marking, thinning and snedding, crosscutting and extracting are component jobs of the task of "Handling Produce" to roadside. Even at this stage it had become clear that the sheet must be designed to collect the weekly current figures. Overheads allowed for in the sheet need not be considered if the totalled entries are carried over on to Form 16b, Costing Sheet (comprehensive operations). This in essence is a summary form, which could nevertheless have served the task of collecting weekly current figures too. Provision is made for adding oncosts or overheads, once the whole venture is complete with all the data collected and totalled; and for balancing the corresponding income, if, for example, the costing was being made on Produce working.))

((In point of fact, there probably still is a place for a summary form such as this .

Eventually, it registered that a more definitive solution to this 'ad hoc' costing, was to design a routine system which performed this costing function intrinsically. It may not escape notice that the expenditure side of the comprehensive form, and the 3 "Units" of the Individual Form, bear a distinct resemblance to Form 15. The latter's immediate predecessor however, is brought to light again as Form 17, which may well stand as the most basic and definitive of all.

As with Form 15, it was designed to serve on a 'One operation - one sheet' basis; but it went further in prescribing separate sheets per operation if on Time, Piecework or Contract. These three contingencies are listed beside operation on the lower right hand corner of the Form, the intention being to delete the two not applicable.

The factor which led to its abandonment in favour of a more comprehensive design embracing all three contingencies (to wit, Form 15), was in fact, the totalling problem, in particular its aspect of abstracting the Piecework Per cent. Many solutions were first explored, including extra sheets of a different colour for the Time and Piecework totals. Then it was perceived that such totalling if necessary could more readily be done on the Time Sheet summary, but that this raised problems in obtaining Gross Time/Gross Piecework figures - and so on.

The question of keeping separate track of - afforestation and Maintenance/Production records pointed towards costing sheets of a different colour. Though this could still be "on", it does give rise to head scratching vis-a-vis "Oncosts" (the apportioning thereof), and a Grand Forest Total.))

Accounting and Planning:5 Year Forecast of Programmes and Labour Requirements Form 18

It now seems expedient to step aside and trace out that that part of the system leading to the provision of the Forester's annual approved Budgeted Programme.

So far the planning aspect has been covered for quantities only. Somehow, this has to be translated into money and labour, and this is one of the functions of the 5 year Forecast of Programmes and Labour Requirement Form, No. 18. This very formidable form is intended as a working form only and is designed to cover five years and last five years, i.e. an initial preparation and 4 subsequent amendments. Provided the form is looked at on a narrow front, it is not so difficult to comprehend. In other words it is easier to use it during its annual amending, than to think about its use and amending over the whole five year span of its life.

There will be many controversial arguments over its design. Many will find the 'new sheet per annum' approach preferable to this "five year and amendable" format, despite the reams of paper it entails. There will be argument, too, about the degree of detail with which these fairly long term forecasts should be made.

The essential function of the form, is to co-ordinate a five year programme of quantities with the probable labour force required for its fulfilment. It serves as a valuable guide to the Manager as a planner and an Employer at the same time, by anticipating the trend of his labour level in relation to the work required in the Forest. This information may not only influence the planning itself, but offer a chance to co-ordinate and adjust to mutual advantage the work programmes and labour forces of several neighbouring Forests, over a span of several years ahead.

The first step in using the form is to list in chronological sequence the Forest Years being considered along the top. Next list the operations down the left hand side. These may be key operations (in as much as they consume a lot of labour) or may be allied aggregates - Prep, ground, Heel and Haul, plant, Fertilise etc. which could all be grouped under "Afforest". Now enter the quantities prescribed for each under the appropriate Forest Year.

From the costing documents, or Progress Reports thereof, calculate the Forest Labour in man years required to complete the quantity, entering the figure under the column 1, headed "Man Years" (or M/Yrs) and sub-headed "O/C Sep" which infers that Oncosts will be estimated as a separate entity, and not included within the operation. When this is completed the Man Year column - for this first Forest Year - can be/

sub-totalled and from the costing Documents (which provide the information in cash and Man Years) the Percentage of Oncosts is calculated. These oncosts must include items prescribed beforehand, but would obviously include items passing through the Forester's Account as Wet Time, Holidays, Sick Leave and Travel. Note that the figure required is the "Percentage On"; this means that the Oncosts have been expressed as a Percentage of the Rest of the Labour Expenditure Bill. If they had been expressed as a percentage of the Total Labour Expenditure Bill (i.e. which also includes these Oncosts), the result would have been a "Percentage Of" - rather a different thing. The Manager may elect to work in cash or Man Hours depending on which of these he used most in determining his Man Year per Operation figures.

Having secured a figure, it is generally valid, by applying the Percentage On to the sub total Man Years so far, to find the equivalent oncost figure with which to increase it to find the Total Man Years required.

The estimate for this first Forest Year is now completed in quantities and Man Years in the first of the two Column 1's. The next step is to reapportion the oncosts so that each of the Man Year figures appertaining to the list of operations is increased by its pro rata share. This can be done swiftly with a slide rule. The new figure is entered side by side with the old i.e. in the Man Year 1 column headed with an asterisk. This is meant to signify that the Man Year entries in the column below include their element of Oncost.

It is this figure which is now reapplied across to the quantities estimated under the succeeding four years, and if it is felt that conditions, technology and productivity are likely to remain similar, a simple proportion sum on the slide rule provides the Man Year figures relative to Quantities. There will be no entry under Oncosts, naturally, and the Manager is provided with a more significant set of figures with which to consider further action and amendment, if irregularity in labour requirements is revealed. Or, taking a different approach, the Manager will be better placed to appreciate the impact of 100 acres less planting on the Labour Force. Oncosts do tend to be overlooked in such deliberations. Jumping now a year, to when, the first year covered has now been completed, the actual quantities and actual Man Years can be entered up in the appropriate columns - immediately under the estimated entries for that first Forest Year - and in red. The appropriate column in the case of Man Years is probably "Oncost Separate", but the apportionment exercise can be done right away and the duplicate Column 1 completed in red, too.

A pencil revision can now be undertaken of quantities and an extra year added to maintain the 5 year coverage. Where the entries differ from those made previously, the design of the form allows those in a hurry to put a pencil stroke through the obsolete figure, and enter the new one, right below. It is provision for this procedure which has absorbed the space on the form and limited the number of operations to 10. A Manager with more time could use a rubber - need less depth per operation, and permit a design incorporating more of them.

This achieved, the revised Man Totals are worked out using the up to date actual column 1 Man Year figures inclusive of "Oncost". The new figures are entered in fresh columns -i.e. the Nos. 2, again inclusive of "Oncost".

And so on for 5 years!

((The 5 Year Labour Forecast Form: The Dilemma Design

Before leaving this stage in management, it may well prove expedient to consider further the dilemmas it brings. This is a department impinged upon by the Planning Manager, the Employing Manager and the Accountant alike. Its importance to the latter arises out of its use which higher levels make in requests for Public Funds from the appropriate source. They are concerned with an annual statement only, albeit covering 5 years ahead.

It has already been made clear that the foregoing form is a working form which is intended to be of intrinsic use to the planner. In covering 5 and lasting 5 years, it serves the interests of economy in paper and in time. The two points of view do thus clash over suitability of design.))

((Provided he gets the information he wants, the Accountant need not be fussy about design. This is rather hard on the Planner - but fair enough if his employers are prepared to pay the cost of his "manager hours" spent on the form. The Manager who uses a form naturally prefers that every minute spent on its use is intrinsically useful to him. The subsequent preparation of mere copy statements is far from being that.

To return to the form in question i.e. No. 18. It is intended to predict the trends of work and thus labour for a span of years ahead. It is not intended to serve as a detailed Budgeting plan, focusing on one year which is imminent. These are two separate functions and to expect one form to serve these two functions is stretching the scope of form design rather far. Form 18 covers 10 operations. It is limited to this because it allows four speedy revisions.

If the design had only to cover 3 years - the same size of form could stand 6 revisions and cover about 18 operations.

If the design has to last only one year - it can cover five years at least, and cover over 40 operations. However the task of peering into the future in such detail becomes rather invalid. Much of the validity depends on accuracy of forecasting both quantities and man years. Naturally the closer the manager stands to the years under review, the more assured will be his forecasts. He becomes more certain of carry forwards, of availability of land, of freedom from 'Unexpected' factors etc., he is more up to date with costs, level of productivity, new techniques etc., and he becomes more aware of the compatibility of one with the other - i.e. the type of land to be treated and the appropriate technique and cost thereof.

Once again let it be emphasised that no manager will grudge time spent planning intensively where he is dealing with definite and assured entities. But at a distance of five years, the beam from the torch of accuracy fades rapidly, and inspired groping - shrewd though it may be - must follow. His only compensation then, is that he should at least not waste too much time over it.

When the contingency is reached where he makes estimates in absolute detail, standing back at an extreme range i.e. covering five years while 6 away - the situation takes on a slant which can surely be regarded as incongruous.

Finally, in the quest for more operation coverage, it may well be expedient to prepare two Forms 18 per Forest, one covering Afforestation subjects and the other Maintenance and Production.))

((5 Year Programme - Shortcuts in Estimation Procedure

In an earlier chapter ("Compartment Work Planning and Co-ordinating Schedule: Form 10 on page 26), it was explained how the form could be used to predict ancillary work such as weeding after planting, compartment by compartment. From summaries on Forest scale, can be taken the figures for use on the 5 year Forecasts of Work and Labour. However, there may be many who lack the time or inclination to prepare and amend a Form 10. No doubt every Manager has his own little secret method of short cutting to arrive at quantities for five years ahead.

A short study of the case of weeding does serve to illustrate again how co-ordination is inescapable, and how invaluable Basic Records can be.

The most useful record in this case is the "Record of Afforestation or Replanting: Compartment/Species Summary" i.e. Form 6 (see page 23). If Afforestation is in full swing there will be a series of these, from which would be required those extending about 6 or 7 years back. Similarly with records covering Replanting, Reafforestation and Beating Up. Should the Manager have been keeping these up to date by faithfully marking up any Destockings under the appropriate "P" Year, he will start with accurate 'figures, not just for the total remaining per P. Year, but split into Species as well.

Then he must decide on a formula, and local experience and conditions will help him here. For every "P" Year, he might choose $\frac{1}{2}$ total planted for weeding))

((the first year, complete total 2nd and 3rd, $\frac{1}{2}$ the 4th, $\frac{1}{4}$ the 5th and final.

Then he can prepare a simple table by first writing the past P. Years and programmes in vertical column, and P. Years present and future horizontally along the top. In the example, it is now assumed to be F.Y.65 and the estimate being prepared is to cover 5 years 66 to

P.Years	Acc.	65	66	67	68	69	70	70.
61	400	100						
62	280	140	70					
63	620	620	310	150				
start 64	360	360	360	180	90			
here 65	200	100	200	200	100	50		
		1320	940	530	190	50		
Actual -		1080						
		(82%)						

(Table continued below)

After listing P.61 to P.65, start with P.65 and enter the "potential" area for weeding according to the formula. Then, working from 64 to 6, and stepping back one year each time, calculate the same small sum for these, and add the vertical columns.

Beating Up is not always easy to allow for, but one suggestion is to convert into net acres for each "P" Year, the thousands used in beating up, by dividing the latter by number of plants per acre generally used for planting. It will be circa 1,400. The results can be added to the appropriate P. Years.

At this stage it may be worth while checking on the actual area weeded in 65 - and this can be noted in red for reference. Of course, the exercise could have been extended further back in time than F.Y.65, to check on the validity of the formula. If there is no reasonable tally, either the percentage the actual bears to the potential can be reapplied, or the formula will have to be "juggled" with in some way until a more acceptable degree of affinity is reached.

Note however, that the costings of weeding must be quite specific on the subject of not booking 2nd weedings twice. Also, one possible cause of distortion must be ironed out - namely the carry forward of weeding from F.Y.64 (if any) should be deducted and any carry forward into the early months of F.Y.66 added to the '65 figure. Naturally this assumes that the preparation of the 5 year programme is taking place at some time after the first quarter of F.Y.66. Obviously, too, greater accuracy, too will be obtained if weeding by P. Year has been individually costed, or quantified. Similarity of vegetation throughout the "P" years, its tie-up with species - all can be given weight in deciding the formula.

The next step is to add the proposed planting programmes for the next 5 years and to perform the same procedure - finally adding their totals to those above.

It goes without saying that the starting point of any 5 year exercise of this kind will be the planting programme - sketched out on Form 9 or 9a (page 25).

		65	66	67	68	69	70	
		(continued from above)						
65	200	1320	940	530	190	50		
		1080						
		(82%)						
66	160		80	160	160	80	40	
67	240			120	240	240	120	
68	320				160	320	320	
69	280					140	280	
70	200						100	
Total potential		1320	1020	810	750	830	860	
weeding area		1080	836	664	615	680	704	- Suggested Weeding Estimate - 82%

Although this has been something in the nature of a diversion it does help to bring out this problem of management, that many factors in Forestry are inter-related, and that the system must clearly allow for their co-ordination. It also brings out that time spent on definitive things, such as preparing Records, is never wasted, but can always be brought into significant use. This is more than can be said for untimely abstractions and guesses - however inspired.))

Every year in the lives of Forest Managers, looms the time for the inevitable preparation of the detailed Annual Budget for the forthcoming, succeeding Forest Year. This is an exercise in the co-ordination of quantities, cash and labour. The decision as to timing will probably not rest with the Manager, because of liaison at higher echelons with the Treasury source. It is an unfortunate fact that Forest Year and National Financial Year do not coincide. Yet it is extremely difficult to visualise a more convenient working Forest Year than October to October. The next most suitable alternative would be June to June, and even this may not contain late planting, and the current year's timber increment into one appropriate Forest Year.

If left to choose his own date, the Manager would in all likelihood select a date just after planting, when its attendant record keeping had been completed - i.e. June. Whether submissions at this Date are likely to gain approval by October is another matter, but three full months does not seem too unreasonable.

With their plans, records, and unit costing sheets spread before them, and slide rule at the ready, the District Officer and Forester are well prepared to make a start transforming next year's hopes into figures,

A simple working form will suffice (Form 19) and preferably blank. If the Operation Check list is handy, it is a simple matter to ensure that little is overlooked. The basis of the programme will already be available on the 5 year labour Forecast (if its revision is recent), or on a quick pencil revision of the long -Form 10 - the Compartment Work Planning and Co-ordinating Schedule.

Once the Budgeting is complete, oncosts added and everything totalled and satisfactory, a fair copy can be typed and made ready for submission, or the details can be transferred to the format preferred by Conservancy level. Double spacing could be used to facilitate possible amendment, though this may spread the task on to more than one sheet. Preprinted summaries embracing the more obvious and important functional Object Account Heads can be prepared and can be simpler in design, omitting for example, items like Unit cost. But the prerogative for the design of these submissions must lie with the Conservator.

Once the Budget is approved, or approved after amendment, this must be set out as suitable formal instruction to the Forester.

Form 20 is a suggested design which should serve the purpose most admirably, the only omission being Materials. several important points must now be made:-

- (1) the list of operations should be compatible with the level of costing-anticipated during the ensuing Forest Year.
- (2) sufficient space should be allocated to each operation to allow entry of a second figure vertically underneath.
- (3) as a further refinement, separate forms - and separate colours of forms - may be preferred to distinguish Afforestation items from those of Maintenance and Production.
- (4) lastly, the preparation of these forms and the approved quantities and monies per operation should be undertaken on stencil. This is not a very big task, in actual fact, and can be done at District Office level.

This should be completed, and at least one copy put in the hands of the Forester, during the first week of the new Forest Year, at the latest.

He may not have his detailed Compartment Plan of Operations quite so quickly - but every effort should be made to expedite his new Annual Budget timeously. Then the Manager can turn his attention to the Annual Report for the "year that is awa".

On receipt of his Budget, the Forester can make a start opening a new set of Operation Unit Costing Sheets - at least for such operations as are likely to

figure imminently - and by transferring on to these the approved and appropriate budget.

The Progress Report

The solution to this could not be simpler and in fact has already been offered in the preceding chapter. The stencilled Approved Budget Form 20 serves as a preprinted Progress Report. This will be called for either at agreed intervals - fortnightly, or perhaps weekly during the planting season - or whenever called for. The Forester will have received a pile of these from the stencilling of his Approved Budget. The procedure is simple,, He or his clerk enters in red in the space underneath each entry per operation (i.e, under Quantities, wages, unit cost, P.V. & M., contract, etc.) the actual most recent "to date" figures from his Unit Costing Sheets (Form 15). This must tally date for date with the date specified on the Progress Report.

Thus the Progress Report does not form an intrinsic link in the costing procedure. It is merely a statement quoting the latest up to date entries as accumulated on the specialised "job costing" reference sheets.

The unit cost quoted will be the unit cost to date. This may arouse controversy, but it is hereby contended that current costs are of much less significance than is frequently claimed. They are so often sadly out of date, take little account of possible extenuating conditions, and are of less importance with the increased use of Work Study based incentive working. No, the important comparison is between the Unit Cost estimated and Unit Cost to date.

The Incentive Analysis data can be quoted if called for and it has been worked out on the Operation Costing Sheets.

With the sheets preprinted the task of completing the Progress Report is not a big task. If, halfway through the Forest Year, other operations have crept in not represented on the Progress Report, it would likewise not be a big undertaking to re-stencil it.

As for the recipient of the Progress Report, he can more or less discard the old ones when a more up to date submission arrives.

((Using the Progress Report

A Progress Report serves the District Officer not only by offering a summarised up to date picture or measure of the Forester's achievement in quantities and costs, but gives him the chance to predict where serious differences with the Estimate are creeping in. More important, it may give him the chance to do something about it. Two points arise - - obviously the more often the Reports are received the smoother the control; and the complementing at District Office level must be such that sufficient time is available to allow adequate scrutiny. Using the System as outlined, it should be feasible for any moderately sized Forest to submit on a fortnightly basis.

The Reports may not offer the District Manager sufficient detail on certain matters - planting during season, and thinning/felling come to mind. In such cases, simple preprinted slips can be prepared and the Forester asked to complete these, either to supplement the Progress Report, or, in addition, to fill the gaps by submitting them weekly. It is an easy task to stencil such slips on one common stencil. (see page 91).

One of the most important checks the District Manager must make is on the Total Forest Expenditure.

The most effective method of achieving this is by graph - on which the Expenditure in Thousand of Pounds on vertical axis, is graphed against the horizontal axis of Time in weeks. To save time and repetition, the annotated background for the above can be prepared on cartridge paper, on which is superimposed a sheet of double foolscap squared paper, a new sheet for every Forest Year.))

((On the squared paper a dotted line, can indicate the average anticipated expenditure throughout the year. Then as and when the Progress Reports are received, the actual expenditure is marked on the squared paper, and the points - be they weekly, fortnightly or monthly - joined by a firm line.

A number of Forests can be covered on one sheet, if a different colour of line is used per Forest i.e. the dotted and the firm lines of each Forest being in the same colour.

Any overspending or underspending is thus revealed by the position of the firm line relative to the dotted, and by setting a straight edge against the slope of the firm line, the likely effect at the end of the Forest Year can be gauged - unless something is done about it.

The case for such-pictorial progressing of individual operations is less valid. Thinning and Felling should be catered for, and can be done as outlined above. A second line can be added on the graph if need be to depict current stocks, extracted, unextracted, or both together.

Apart from this in the normal course of events, the only other operations which may merit such close attention might be Afforestation, Ploughing, and Lining Out.

With Afforestation, of course, the task is concentrated into a few months. Here, against the same horizontal weekly time scale, it is better to outline vertically tubes representing the total Forest programme filling the tubes in weekly up to the level achieved. Again, with a series of Forests, their weekly "tubes" or columns can be side by side and of a different colour.))

Deep Costings

Much can be gained by isolating the costs of the afforestation project of individual Forest or "P" Years. Indeed, even more can be gained by costing individual acquisitions, and more still by acquisition and "P" Year.

A policy decision must lay down the "depth" i.e. the number of years from which costs incurred against any particular P. Year and/or Acquisition will be extracted and accumulated against it. This may be laid down as 3 or 5, or perhaps up to the arbitrary time establishment is felt secure.

A Form similar to the Unit Costing Sheet (Form 15) will do this although more detail may be preferred by including columns to cover Materials, cost of plants etc. On-costs, too, will have to be included. No doubt a design based on Form 15 or I6b, which also covers revenues - could be evolved very readily. At the close of each Forest Year, the costs will be rechannelled in summary into the appropriate pigeon hole.

Obviously, the stratification of these costings - i.e. if by "P" Year and Acquisition - must be reflected in similar Unit Costing sheets being opened, and fed by similarly detailed Time Sheets.

Items like Planting - a once recurring operation on a "P" Year basis - are easy meat. The recurring items, such as weeding, are not, for the obvious reason that there may be so many of them in any one year as to place a strain on Time Sheet and especially Time Sheet Summary space.

If, however, Deep costings are envisaged, and the subsequent weeding per P. Year regarded as a costing entity, it is probably desirable to include a "total weeding" costing as well for Progress Report purposes. This, of course, seems at variance with the policy of minimising 'interim aggregates' preached elsewhere in this Philosophy. However to cover a substantial series of "P" Years for weeding would use substantial space on Progress Reports.

Two alternatives lie open:

- (1) to restrict the field to current P. Year plus the most recent two, or even three, or
- (2) keep the costing sheets in limitless detail and add the Total Sheet as well.

If the latter choice is made, the stage at which the totalling is best done is on the Time Sheet Summary stage. In other words extra lines for Total Weeding lines must be added, be it Time or Incentive. Similar allowance would have to be made on the check list.

But information accumulated and costed in depth in this way, can be of considerable comfort to the Manager, Accountant, and indeed the Acquisition Officer alike in their quest for accuracy, especially if the P. Year or acquisition can be categorised for standard of difficulty and quality into Land Types already mentioned.

Accounting and Costing: Further Thoughts

(1) Basic Pay - inevitably when one delves fairly deeply into matters one searches for the definitive, that fundamental, stable atom, as it were, which can be used without much fear of its altering in character during use. In paying a working man a wage, the unit which seems most secure for a long time to come, is the Hour. This is especially so now that the weekly hours worked are such that there need be little variation between summer and winter.

Furthermore, in the search for the most satisfactory method of isolating Incentive earnings as a prelude to expressing them as a percentage of total, a strong feeling lingers that the solution lies in payment of Time wage first, and paying the incentive as a supplement on a Bonus Basis. This seems to offer certain advantages. For example, the weekly time wage can be paid to the man as a matter of routine, while the calculation of any Bonus could proceed at a more leisurely rate, a method which may well suit computerised wage payment.

(2) Rate Fixing by Work Study Schedules - The modern manager will no doubt acknowledge with enthusiasm the rationalisation of Piecework rates which has been introduced with Work Study schedules.

For the uninitiated, these schedules are the product of the application of Time and Method studies. A job is carefully analysed to determine what appear to be the most efficient method of tackling it by the most up to date techniques. A skilled worker is then timed performing the job using such methods over a protracted period, on a piecework basis and on a wide range of conditions. From all this, the time taken to complete one unit of the job, inclusive of normal rests, is determined. This has come to be known as the Standard Time, or Standard Minutes.

From the man's weekly time wage and normal hours the Price per Standard Minute i.e. calculated i_0e_0 the man's time wage per minute.

These two factors - the Standard Time, and Price per Standard Minute - produce, when multiplied together, a price for the job per unit.

Before this price can be used as a piecework rate, certain adjustments must be made. For example, the level of incentive has to be decided, be it 25 - 30 - 40% extra, and given expression in the rate by adding on that amount, or by multiplying by 1.25 - 1.30 - 1.40 as appropriate, "R" + 25% minutes per unit is the same as "R" x 1.25 minutes per unit.

Then some adjustment to the rate must be made in respect of travel if this is involved within working time,

On a 41 hour week, allowance for this can be made as follows:-

$\frac{1}{2}$ hour per day	- add 6 $\frac{1}{2}$ % to the rate	(i.e. multiply by 1.065)
1 " " "	- add 14% " " "	(" " " 1.14)
1^ " " "	- add 22 $\frac{1}{2}$ % " " !!	(" " " 1.225)
2 " " "	- add 32 $\frac{1}{2}$ % " " «	(" " " 1.325)

Provided the technique and class of labour remain the same, "Standard Minute" schedules should remain applicable. The "Price per Standard Minute", however, will have to be recalculated if and when the basic weekly wage, or hours are altered.))

((Clearly the basis of this approach is fair cost - fair wage. Note, however, that by its very nature, piecework "fixes" the unit Labour cost for the job.

Wherein, then lies the advantages to the Employer? Broadly speaking, these are threefold:-

- (1) The man has an inducement which should keep him working with less supervision, (though measurement of the achievement must be more timely and accurate).
- (2) There should be an incidental lowering of the total unit cost inclusive of overheads. Every employee costs the employer, in addition to the wage paid for a job, something extra - for insurance stamps, sickness, holidays, Met Time, Superannuation, etc. If productivity is increased this overhead element has to be spread over a wider area, thus affecting an overall lowering of the Total Unit Cost.
- (3) If the amount of work to be undertaken is fixed, there will be a consequent drop in the number of men required, and thus further overhead savings.

Eew, then, will deny the utility of Incentive Payments, and few will deny the valuable part played by Work Study Schedules in implementing them. For all that, two criticisms are sometimes levelled at them. First, if the squad for whom the Incentives are being set are predominantly a young squad, and the Price per Standard Minute is based on the wage of a Skilled Forest Worker, there is every chance, that unit costs will increase, over those obtained by leaving the men on Time. This may be looked upon as only fair, or as the price to be paid for training and retaining promising labour. But the Forester must be left in no doubt whether this relaxing of vigilance vis-a-vis keeping unit costs as low as possible, is commensurate with approved policy.

Secondly, the task of re-examining Schedules and resetting rates for every new contingency could be criticised as somewhat time consuming „ One compromise -for no one would ever wish to return to the old "blanket rate" - is to use the Schedules of Standard Minutes as the basis for setting a range or scale of costs, embracing a fairly representative selection of local conditions. Thus the Forester and men - as long as the Price per Standard Minute remains constant - can face life with a series of Rates to choose from in the order of perhaps two or three dozen, instead of the infinite. In addition the Forester, for an invested series of calculations, has made more productive use of his time.

(3) Rate-fixing without Work Study Schedules - The Forester lacking Work Study Schedules who wishes to put his men on Piecework, must resort to other means - all of which may be summed up by the word "experience". The most conscientious Forester will, however, go through nothing less than the motions of a Time Study -even to doing a sample of the job for himself. The chances are, however, that he will do this working at what he feels is a fair Time Rate - as opposed to a piecework rate - and will add the necessary percentage more to cover the incentive to the quantity achieved. That is to say, he will eventually offer a rate, which is a percentage less than his calculated Time achievement related to the man's rate of pay. He may also consider paying a Bonus rather than Piecework.

(4) Bonus or Piecework? It is difficult to present a case quoting Bonus as a preferred system of payment to piecework.

Reference has already been made to possibility of a Bonus System's usefulness in Wages Analysis. What other attraction does it hold? It is most likely that most of the Piecework systems employed nowadays operate on a "can't lose" basis. If the man's efforts fail to earn him as much as his weekly basic, the bargain gets overlooked and the man reverts to his basic instead. This anomaly does not arise with Bonus, although the effect is just the same. The man works away assured of his Time wage at least. If his efforts carry him past his datum, the extra is fairly won, and no discomfort or embarrassment need be felt on either side.))

It will probably remain a matter for conjecture whether the psychological urge of striving to reach a datum has a significant advantage over piecework. Much depends on the type of work and how "measurable" the units involved.

The real bogey of Bonus, of course, is broken time.

The datum may have been set for a full week, or at least a stated part of a week. If wet time prevents the man from reaching the target, it is nevertheless an anomaly that he has been working at an incentive rate, and should rightly receive some extra remuneration for the extra effort. The datum in fact, has to be adjusted. If a datum "d" had been set for a 41 hour week, and the men were only able to put in 30 thanks to wet time, the datum would have to be lowered thus $d'/41 \times 30$.

In point of fact the definitive solution is to express the "datum" as a target per hour in the first place, the men receiving a bonus of so much per unit once this datum has been reached. Again much depends on nature of job and unit, but being faced with a target per hour the man will be fairly well set to gauge and control his performance from hour to hour.

One frequently used bonus scheme, sets a datum, and pays a rate once the datum has been reached for all units achieved, including the datum. Although there is some merit in such a scheme when machines are also involved, it becomes a fair rate only at datum point. No great incentive may remain for the man to go beyond this point, unless a new rate is set for what lies beyond. Furthermore measurement must be done with great accuracy, when a difference of one unit serves as the trigger for paying bonus or not. Then, in the subsequent calculating of the unit cost with this system, there comes an irrational and dramatic comparison above and below datum.

Despite the range of Bonus systems outlined on the Gang (working Sheet (Form 12b), the fairest Bonus Rate is essentially the same as a piecework rate (item "d" on that Form). For example, if a piecework rate is fixed at x pence per unit, the Bonus rate paid once a datum is reached will also be x pence per unit. Note however that what is visualised is that no bonus is paid on what has been achieved up to that datum, and that the "datum" broadly speaking is the equivalent of the amount of units at which the piecework earnings drew abreast of the Time Wage.

(5) Bonus Targets from Work Study Schedules - When a "fair" system of Bonus is used as has just been described - i.e. payment once a target has been passed on everything beyond it only - it is an easy matter to fix the Target or Datum from Work Study schedules. In fact the normal piecework rate is determined in the usual manner and will serve as the bonus rate to be paid per unit above the target.

The target per hour can be readily obtained from the Standard Minute schedules. For example if they quote 16.8 minutes for felling, trimming and crosscutting a 5 Hoppus Foot Sitka Spruce pole, then by a simple sum, 3.6 poles - i.e. 18 H. ft., should be achieved in an hour. In point of fact, this is the expected achievement of a man on piecework, and the fair Target which is visualised commensurate with Time Working would be approximately 70/72% of this i.e. 2.5 poles, or 12.8 H. ft. So the man knows what is expected of him.

Carrying on with this example, let us assume the man is paid a Time Rate of 228/6d. for a 41 hour week. This is the equivalent of 1.114 pence per minute. If the incentive level is to be 40%, then 1.114 plus 40% will be 1.56 pence per minute.

Our 5 H. ft. S.S. will thus not only take him 16.8 minutes to fell, but will cost the employer $16.8 \times 1.56 = 26.2$ pence per pole - or 5.24 pence per Hoppus Foot.

This can serve as the Straight Piecework Rate, or Bonus rate, and if travel has to be taken into account, it is this rate which should be adjusted according to the scale presented earlier (on Page 43).

The Target was already reckoned to be 12.8 H. ft. per Hour.

If the Schedules are accurate and prove compatible with conditions in the field, then to be right the man must fell 732 H. ft.)) - 45 -

((On Piecework the man will earn just about 320/- and on Bonus 228/6d. + some 210 H. ft. at 5.24 (91/6d) = 320/-.

Obviously, Bonus calculations require more work, and in any summing up of their value, this may legislate against them.

(6) The travel Element in Costing and Ratefixing - There has always been a certain amount of conjecture about the costing of travel. The chief alternatives - cost it against the job; or, accumulate it as an overhead and apportion it later against the various jobs pro rata.

In fact, a distinction can be traced between two categories of travel:-

(a) that which is common to all members of the squad should they be transported from a point outside the Forest into a central dispersal point, or should they be transported to work in another Forest altogether; and

(b) the element of walking etc. undertaken by the squad after having reached a dispersal point and before they reach the site of the actual job.

The (a) element is far better treated as an overhead, or oncost. There are reasons for this. If this travel element is high, the unit costs will be inflated, or distorted, and may not serve as a useful basis for subsequent costings and budgetings. Furthermore if men, having travelled, disperse to a number of jobs, it becomes difficult to apportion the driver's time against all the jobs, remembering, too, that a driver may work basically different hours from a Forest worker. Once accumulated as an overhead it can readily be debited against the appropriate jobs at the end of a Financial year on a Direct Labour Expenditure or Man Hour basis.

The (b) element may be costed either way. If men are paid on piecework and, they have different amounts of travel to undertake before getting down to the job, anomalies will be created. For example, during planting, men may be paired off to a compartment each for supervision purposes. Some may have no walking, some half an hour. Even if the draw has been out of the hat the anomaly is there - some men have the advantage of having more time to accumulate more wage. By adjusting the piecework rate as has been previously recommended this anomaly is compensated for to a fair extent and even the travel has been allowed for "on piecework".

Where men are on time, however, there is much to be said for isolating the travel, but under the job, for future reference. This is particularly so if a Forester looks to his Time Costings as a basis for later ratefixing and estimating. If travel has been cost with the job and a new season brings a change of scenery, the old costs may not be of much use to him. Isolating the walking element is also important in the case of machine operators, where, if all the operator's walking hours are set against the job, there is a danger that these hours may also be used for the machine and booked in the log - despite the fact that it was still sitting under covers.

Lastly, the real definitive is to have no travel at all. Perhaps a day will come, when men will transport themselves to the scene of the job at starting time.))

((Accounting and Costing : What of the Future?

The Costing System that has been sketched in the foregoing chapters embodies no new and revolutionary approach to the subject. It has been a very close study in rearranging the current factors into the most rational, most useful and most fundamental juxtaposition enabling it to do the job most efficiently.

Meanwhile the search for something spectacular must go on. All that can be done now is to try to stimulate and inspire such searchings.

But one possible solution lies in introducing a system of Standard and Effective hours. A Standard Hour is just what it says - 60 minutes of a man's time at his agreed basic Time rate.

By Effective hours the following is envisaged. An Effective hour is one of a skilled Forest Worker's rate. His achievement on Incentive is translated from))

((quantities to supplementary effective hours so that if he has achieved 30% more productivity this could be expressed as 30% more effective hours. The advantage here is that instead of two factors having to be progressed (i.e. money and man hours), now it only need be one, namely effective hours. The rates of other grades of worker would, of course, in their turn, have to be expressed as a percentage of the Skilled Forest Worker rate. Meanwhile, an easing of the Wet Time problem may lie in allowing men to go home in exchange for making hours up e.g. by Saturday working*))

Section7 Planning: Surveying and Mapping

(((a) Survrying - It is difficult to be sure of the most appropriate stage at which to interject the natters of mapping and surveying. So far much has been taken for granted, and as the ensuing sections of this work may depend on further references to mapping, this seems as appropriate a stage as any.

The work assumes that the responsibility for preparing the blueprint for the Afforestation of an Acquisition rests with the District Officer. Having allocated a space in time for its treatment within his 5 year plan, a preliminary walk must be made to size up the scope of its standard of difficulty. If a map is carried, it is a good idea to carry a series of coloured pencils - say three - and, by using symbols, mark on the plan items such as vegetation, soil type and appropriate ploughing, marked change of slope (for reading), likely selection of species etc. as one proceeds over the ground. This may come in very useful for later reference, and helps cultivate that all-seeing Forestry eye.

It is probably not essential to proceed with the detailed task of compartmenting until a year or so before the planting is due. Certainly the datum is to have it completed before ploughing starts, and before the species selection for Plant Requirements is undertaken.

The modern practice is to create a compartment layout using a combination of natural features and future road alignments as the boundaries.

The decision as to whether this basic road layout is the responsibility of District Office, or ancillary Engineers, must rest at higher levels. But there can be few satisfactory results compared with laying the responsibility on the shoulders of the District Officer, who can then refer to the Engineer for advice.

For levelling, he will require an Abney level, for surveying, prismatic compass and chain. No doubt, every manager will have his own preferred techniques, but to match British weather and Highland conditions there is little to match compass and chain traverses. Working on his own, a surveyor can manage fairly accurately by pacing, using a hand tally counter to count his paces, but even this should be checked against known chainages. One very useful instrument which could find a place at this stage would be a simple pocket rangefinder operative between say, 25 and 400 yards, but alas, no suitable small cheap instrument of this nature seems to have yet been devised.

As has already been indicated, the timing means this work will probably be fitted in during the months November to June but those with fire protection commitments may have less time - November to February perhaps. The fact that these are winter months is not all that much a drawback. Vegetation such as bracken will be flat for one thing.

Much will be said on whether the District Officer should undertake this personally. That he should be first and foremost a quantity surveyor is often overlooked nowadays. In his early years, he should undertake this work not merely to gain experience, but to prove his capabilities in this direction. Later much depends on pressure of work, level of assistance, etc. Suffice to say, if he can continue to undertake this task, not only will it enable him to enjoy a physical tonic to office work, but to keep abreast with reading and extraction techniques - and to get to know the ground much more intimately.

On large acquisitions, it will be necessary to cover more ground than just one imminent year's planting in order to sketch out a comprehensive, basic road system. But it is often possible to split the ground into different entities by))

