REPORT ON
LABOUR PRODUCTIVITY AND WORK-STUDY REQUIREMENTS IN SPGS SPONSORED PLANTATIONS IN UGANDA

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Introduction

It was noticed by SPGS staff that labour productivity in the plantations in Uganda was poor, and that there was little – if any – historic productivity data upon which to base expected labour productivity or daily task levels for labourers. With the increasing professionalism of forestry contractors, so comes the need to budget with increasing accuracy labour requirements over longer periods. This cannot be done without data on labour productivity or expected mandays to perform jobs in the forest environment. It also became apparent to SPGS staff with experience in the 130yr old South African forestry industry, that there were inefficiencies and unacceptable amounts of ineffective or lost time being accepted as normal practice in the fledgling Ugandan plantation forest industry.
SPGS decided to invite an outside consultant with experience in plantation productivity to inspect some operations in Uganda and pass comment on issues seen, and recommendations on how improvements can be made.

In addition, the consultant was require to train two members of SPGS staff in workstudy techniques, in order that SPGS would be able to measure productivity and set production standards for the many tasks encountered in a plantation forestry operation.

As a result, the following report is split into two parts.

PART 1 – GENERAL PRODUCTIVITY ISSUES

Executive Summary

There are many factors affecting the productivity of work in the plantations visited and the consultant can think of no good reason why these reasons cannot be extrapolated to include the whole of SPGS sponsored plantations, their clients and contractors. It is worth noting that the generally poor labour productivity cannot be blamed on one single factor but rather a web of factors, all of which have an influence on each other and productivity generally.

Of the biological factors, by far and away the rate of weed growth was the one most detrimental to productivity both in terms of tree growth and mandays per hectare expended on weed control. Lack of pre planting and post planting chemical weed control lead to very high labour requirements for subsequent slashing operations.

Of the remaining factors, poor time keeping and supervision are the most influential on labour productivity and, should these be rectified, productivity should increase dramatically, with a subsequent reduction in costs per hectare to both the SPGS clients and their contractors. The poor time keeping is ingrained in the rural workforce and it is anticipated that breaking this pattern of behavior will present challenges to employers, but working a full day is a prerequisite for any successful business.

The good news is that all the human factors and the productivity of workers can be rectified with the application of good management and perseverance, and it is hoped that this report will give guidance as to possible solutions to the problems witnessed by the author.

A presentation was given to 40 SPGS staff; contractors and landowners on the consultant's findings, where all of the topics in the report were discussed in an open forum. Many of those present recognized parallels with their own activities and left the event with ideas on how to improve productivity within their operations.

1.1 Length of Working Day and Timekeeping

There is no consistency regarding the length of a working day. Attendees at a meeting for SPGS clients and contractors gave answers varying from 6 hours > 9 hours and no set working time. Observations in the field lead the consultant to conclude that no set working times are the most common modus operandi. In most cases workers make their own way to the workplace and start work when they arrive, then finish when they consider that they have done enough for the day. In most cases workers are paid on a piecework basis and are content to

work short hours and receive short pay. There appears to be a general acceptance of this practice by management and supervisors.

The consultant does not believe that – with a few notable exceptions – contractor management has considered the implications of slow piecework with no minimum daily output. It is certainly true that in-field supervision does little to control timekeeping, and labourers come and go as they please. This makes proper 'team' jobs such as marking and pitting on a chain, or efficient herbicide application virtually impossible to achieve, as there is seldom a 'core' of workers present to form the team.

The subject of a daily task is dealt with later in this report, but workers on piecework should have set start times and those who start late should be disciplined. No-one should stop work and leave the field without both having achieved a specified quantity of output (to a pre-set quality) and reporting to the supervisor who should then - having checked the output – grant or deny permission.

There is also a tradition of taking long lunch breaks, frequently from 12.00 > 3.00pm. During this time, the worker walks home (or back to his camp) prepares food, consumes it, then walks back to the workplace. Whilst the consultant realizes that this practice avoids working during the hottest time of the day, it is not always too hot to work, and the practice is extremely wasteful of time and energy, particularly if the home or camp is some distance from the workplace. In many instances, the worker fails to return to work at all, and thus has done a short day.

Recommendations:

1. That contractors be made aware of the inefficiencies of poor time keeping and be persuaded to ensure that their workers keep to set working times.

2. It is suggested that 8 hours be set as a standard working day, and that SPGS staff use this when setting daily task rates. Note that this is productive time, and excludes any breaks for meals, transport etc. It is suggested that work starts at 0700Hrs. Breakfast 0900>0930. Lunch 12.30>1.00pm. 4.00pm finish. By adhering to these times, a supervisor or manager will know that any idleness outside of the designated meal times must be due to either poor discipline or systems, more of which anon.

3. Workers should be encouraged to take food to the workplace to avoid the lunchtime peregrination, although this does fly in the face of tradition. The subject of nutrition is dealt with elsewhere in the report, but workers performing hard physical labour need to take meal breaks for their own wellbeing and skipping meals to save time should be discouraged.

4. Employers should consider transporting labour to the workplace. Not only does all the labour arrive at the same time – thus allowing true teamwork to commence immediately – workers arrive fresh, rather than tired after a walk of up to several kilometers. Transport will also permit the carrying of food containers and water to assist good performance throughout the day. The provision of transport will also discourage early departure from the workplace. Before investing in a dedicated vehicle, employers should consider it's alternative uses during the working day. A tractor and trailer unit, for instance could be used for transporting forest products to depots or local markets.

1.2 Supervision

Supervision of workers infield was generally poor, and in some cases non-existent. The key role in productivity, production and quality played by supervisors seems to have gone unnoticed by many contractors.

The importance of supervision infield cannot be over emphasized. Supervisors are the 1st tier of management, and time should be spent recruiting the correct person for the job, and they should be paid accordingly. At present supervisors do little but record – none too accurately – the daily production of workers on piecework. At no time during the visits did the consultant witness a supervisor correcting blatant poor practice by workers in the field both in terms of quality and quantity. In short, they were not seen supervising.

The purpose of supervisors is to ensure discipline is maintained at the workplace, ensure the correct level of production by the workforce and ensure that the correct standards of quality are adhered to. The supervisor is also the interface between labourer and management and should be able to communicate management's needs and requirements to the worker and also visa versa. The supervisor should have enough gravitas for his opinions and judgments to be heeded and reacted to by employers, and he should be sufficiently confident to bring problems to management's attention.

Supervisors require a sound education to deal with the complexities of their job. The calibration of spraying equipment, by way of an example cannot be performed accurately without education to at least O' level standard, and the efficient planning of a workteam on a day to day basis again requires thought capacity above those of average attainment. Like many other jobs, the work of a forestry supervisor can be extremely rewarding for the right individual with enough energy and enterprise to make the job a success. In many instances the Supervisors met by the consultant were supervisors in name only, and in actual fact were labourers who could write, showed little interest in the job, and even less in productivity.

Frequently the employer himself was seen acting as a supervisor (when present) which is scarcely making good use of his time which would be better spent

arranging new work and communicating with the client /landowner. In his absence, supervision melts away and the workforce are left to their own devices.

The consultant fully realises that there is a lack of production level (task) information in Uganda, and that steps are being taken to rectify this deficiency. In the meantime, Supervisors should be provided with a minimum expected daily output per worker (or team if the work – such as marking and pitting – is a pure team effort) and every worker should be encouraged to produce this minimum. This encouragement should be given early and regularly through the day to ensure that slow production is spotted early and redressed in good time

Supervisors should also be familiar with the required specification of the job in hand. If the landowner is an SPGS client, specification should be as per SPGS requirements. Even if the landowner is not an SPGS client, the SPGS quality standards are a good indication of the correct quality and should be adhered to. Supervisors should carry (and use!) simple gauges to measure the output of the workers under his command. A simple stick cut to the correct height will enable a pruning operation to be checked, or a metal bar will enable the supervisor to check the tillage depth of a planting pit. Workers should be told that poor quality will not be accepted and a sub-standard unit of output will not be credited to that days work, and should be rectified.

It has been found that explaining the reasoning behind a job is of great assistance in ensuring the maintenance of quality standards. Workers performing a job merely because they have been told to do it is likely to lead to corners being cut and a drop-off in quality. However, once workers understand the reason for the job being done and the part they are playing in the whole enterprise, both interest in the job and quality of output improve. Again, supervisors have a key role to play in communicating these facts to the workers

Of great assistance would be contractor management insisting on short interval time controls. This is a simple way in which the supervisor checks production in terms of quantity and quality throughout the day every 2 hours. See appendix 1. By this method the supervisor will know early on during the working day how an individual (or team) is performing and can take the necessary steps to ensure that the expected daily output is achieved, rather than find out at the end of the day that it has not.

The short interval controls should be collated at the end of the week and the Weekly Productivity Report See appendix 2 submitted by the supervisor to his manager. Thus the employer can see persistent poor performance by individuals, and take appropriate action. Persistent poor performance by the entire team should lead the manager to question the accuracy of the task set, or length of working day, or other fundamental factors. Persistent over achievement of task is not necessarily an indication that the task level is set too low, but could show that a good bonus scheme is encouraging workers to produce and thus earn more.

Weekly productivity reports should be studied by management, who should discuss the figures and ask questions regarding positive and negative deviations from planned output. There is nothing more soul destroying than producing information that is ignored, and a supervisor will soon become disheartened if his control papers or suggestions are not acted upon.

Recommendations:

1. Contractors should be encouraged to employ properly educated supervisors, recruit the right people and give them authority over their workers. Whilst supervisors should not be given the power to hire and fire, they should have control over workers pay when on piecework, and have the strength of character to veto pay for poor quality work.

2. The use of production and productivity reports as mentioned should be encouraged as these give workers an early indication of their performance throughout the day and thus enable them to alter their rate of working to achieve a set daily task.

3. Supervisors should also be given a sign of authority – a different coloured tunic or hard hat to distinguish them from the ordinary labourer. A supervisor should not have more than 15 labourers beneath him – unless the work is in a permanent location (such as a nursery) and should not perform the work himself, as this will distract him from his supervisory duties.

1.3 Training

There was plenty of evidence that proper training had not been given to infield labourers and supervisors. It could be argued that little training is required for simple silvicultural jobs, but this is not so. Training not only imparts to the worker the correct skills for the job, but also gives an idea of the correct quality of output and the correct quantity. It also indicates to the worker that the job being done is important and – if the training is done correctly – why it is important, what part in the forestry business the worker's role plays: e.g. how pruning affects the quality of the final sawlog and why a properly tilled pit is important for root development.

During the course if his visit, the consultant saw plenty of evidence of poor training, from jobs being done well below the accepted quality to work done well above accepted quality – which in turn effects quantity of output. In some instances workers were observed essentially excavating a 1metre hole around pine seedlings, when they were supposed to have been ring cleaning; using the hoe to skim the top of the soil, thus cutting the weeds. Whilst there was no denying the effort being expended by the worker, the extra time and energy did not result in a better job. Indeed, is likely that the tilled soil round the seedling would act as an ideal seedbed for more weeds. It is estimated that the worker spent 2 hours (or 25% of his working day) in activities that did not add one iota to

the quality of the end product. This is a tremendous waste of time and effort, and could have been prevented with proper training.

In a similar vein, spraying was seen to be done in an inefficient manor, with sprayers and their ‘shield men’ working in pairs, rather than as a team, which again results in extra manpower being used. The consultant understands that in this case proper training was received but that, due to poor supervision, the ‘team’ approach to spraying had been abandoned, and the simpler to manage, but much less efficient individual method adopted. In fairness, the end result of the spraying was acceptable, but the cost in terms of mandays was some 200% more than it could have been.

It is hoped that the above anecdotes give some idea of the cost of lack of training combined with a lack of correct supervision.

The consultant was informed that in many cases training had been given to both supervisors and workers but, due to high labour turnover, these skills had been lost. The subject of labour turnover is dealt with elsewhere in this report, but this is typical of how overall productivity is affected by a network of overlapping problems. Employers should be mindful of the fact that until they can keep workers loyal, there will be a constant requirement for basic training of the workforce.

At present, the SPGS and its clients are primarily involved with silviculture where, by and large, tools are not overly dangerous or expensive. However, with the passage of time, many contractors will naturally wish to progress to harvesting, where the tools used are both extremely expensive and potentially lethal. To do so in a culture of poor training and supervision would be to court disaster.

As well as learning the practical skills involved, supervisors should be given additional training in basic management. Mention has been made of short interval time controls, and training should be given in their completion, and the reasons why this information is important. As the first level of management, supervisors should be trained and treated accordingly. Courses in herbicide application and selection can be arranged (through suppliers?) for minimum cost and keep the supervisor up to date with the latest chemicals and techniques. Such courses help supervisors network with their peers and feel motivated.

Recommendations:

1. SPGS has contacts with training organisations from South Africa. It is understood that there is no forestry training specialists in Uganda. It is recommended that SPGS invites the South African training specialist to Uganda, and provides training courses for supervisors of the various contractors throughout the country. The supervisors then pass on their skills to their workforce. Not only does this give the supervisor knowledge of the job

in terms of both quantity and quality, it will also enable him to train new employees as and when they are recruited. Due to the comparative simplicity of the jobs, it is not felt that importing a specialist to directly train the labour force would be cost effective. Please also note the earlier remarks about the quality of supervisors. Training will be wasted if the supervisors themselves are not up to scratch.

2. When the time comes to train workers in harvesting and extraction techniques, it is recommended that training be given directly to the workers due to the more hazardous nature of the tools, jobs and environment. However the supervisors should be given the same training as all those individuals on their teams.

1.4 Workplace Layout and Team Organisation

This is primarily a function of supervision, timekeeping and training. Only on the most well run operations were workers seen working as a team. Whilst it is impossible to perform the job of marking out without teamwork, many other jobs are most effectively performed when the workforce work as a team. Pitting should be performed at the same time as marking, not some time afterwards. This has been proven as the most time – effective method. Yet despite training in the correct method, workers were seen pitting individually after marking and in a slow and unproductive manner. Not only does this way of working lower productivity, it also makes supervision difficult and quality of work difficult to check.

Inefficient use of sprayers has already been mentioned. To the casual observer it seems as though everyone is busy and working well. However, taking time to study what was going on revealed that, with a modicum of thought and the sprayers working as a team sharing ‘shield men’, production could be increased by some 200%. Again at a spraying operation, the consultant witnessed sprayers travelling a great distance to refill their knapsacks, taking in excess of 20 minutes to perform the task – during which time their ‘shield men’ could not work. Whilst no time studies were performed, if it takes approximately 20 minutes to apply the contents of a knapsack, the sprayer would spend about 50% of his time fetching herbicide – which is scarcely a productive use of his time, and his ‘shield man’ would spend 50% of a working day idle due to no fault of his own.

Busy, but not productive,

Whilst on the subject of spraying, the consultant saw sprayers refilling by means of a jug dipped into an open barrel of pre-mixed herbicide. Not only does this task get progressively more awkward as the barrel empties, it is also slow and wasteful of chemical. A barrel on a stand with a tap would be more efficient. The reader should note that none of the above suggestions are sophisticated answers to complex questions, merely the application of thought to the situations that presented themselves. Again the subjects of training and supervision arise. Would a properly trained and motivated supervisor have allowed such inefficient work methods?

Recommendations:

1. Supervisors should constantly be aware of the consequences of lost time and inefficient methods of working. Whilst correct training will cover many issues, it cannot cover all eventualities and supervisors should always have in mind making the best use of the assets at their disposal for the conditions prevailing at the time: e.g. weed free flat land would allow the use of more workers on a planting chain

1.5 Concept of Task and Piecework

A task within the context of this report refers to a quantity of work which it is reasonable for a qualified worker to perform during the course of an 8 hour working day with an output of the required quality. Tasks that are set should give the worker a clear target, expressed in as simple terms as possible. (Number of pits cleaned or number of trees pruned).

Again with notable exceptions, there appears to be little idea of the concept of a set task for the day. Those tasks that were set, are based on historical output, and thus cater for quantities of lost time and inefficiencies. In short, contractors plan for poor productivity. Put another way, if a worker can achieve his daily task and still spend a large amount of time on unproductive activities, there is evidently something wrong with the set daily quantity of output. This is unacceptable.

A proper task is based on workstudy data, having timed qualified workers performing the job in the conditions prevailing in the field, adjusted the level of performance to the 100% level, then added in extra time per unit of output depending on the nature of the work.

It is confidently anticipated that great resistance will be shown to the introduction of scientifically based task levels. Workers used to working short hours or with no prescribed levels of output will very likely baulk at task levels which are set way above what they are used to. However contractor management must be steadfast, and insist that these levels of production be met – without sacrificing quality.

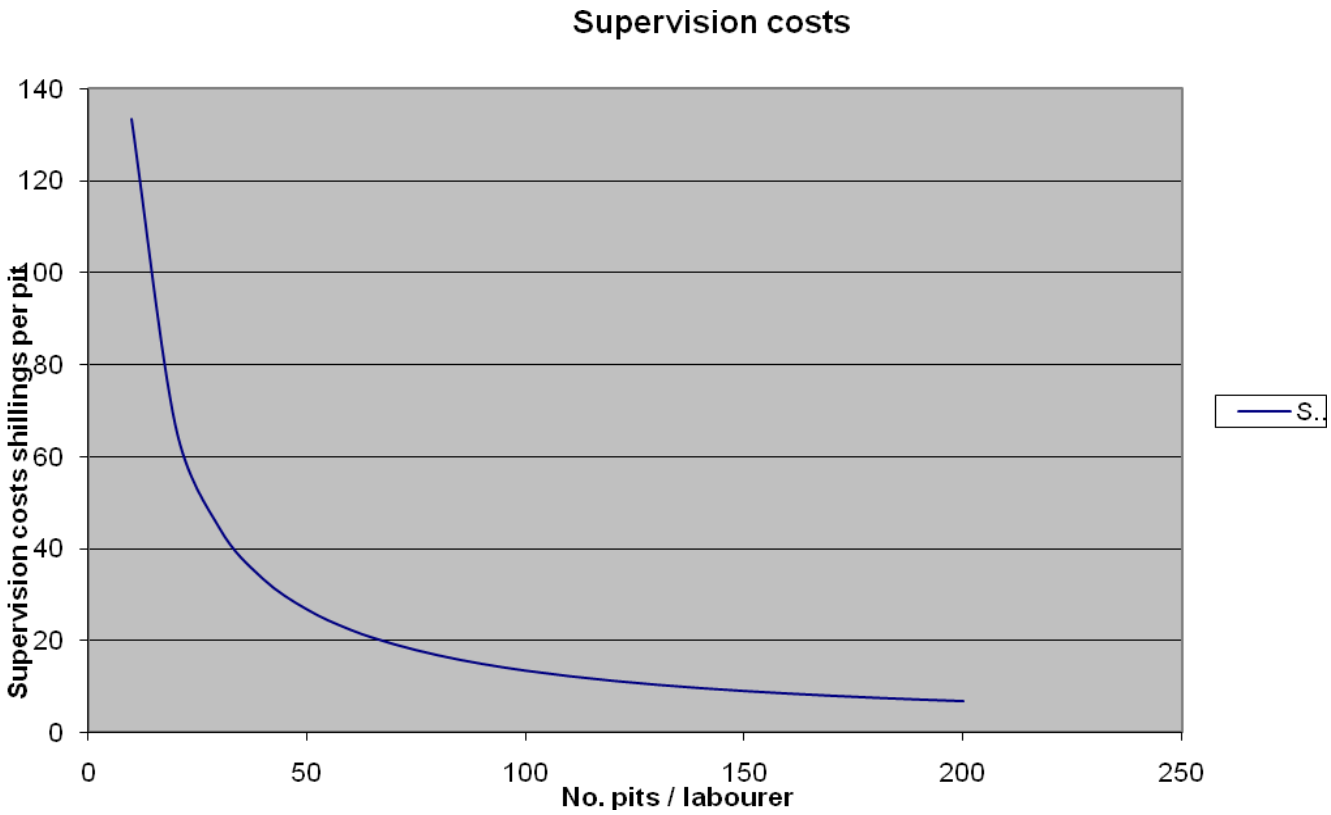
During the course of the Consultant's visit, several time studies were conducted for training purposes. In the vast majority of cases, the observed rate of working was faster than that which Workstudy would deem to be a reasonable rate. Thus (and this is a great over simplification, but a useful comparison) the worker who states 'I can't do that' can be told 'yes you can, we have seen you doing it'. This harks back to the beginning of this report. The biggest problem with labour productivity in the plantations in Uganda is not so much how hard the labourers work, it's how long they work for.

Contractor management need to understand that a non - productive team working on a piecework regime (so many shillings per unit of output) are, due to overhead costs and slow production, a consistent bleed on his profitability. Whilst the Consultant has no problems with the concept of piecework, it has to be done with the understanding that a minimum level of production is expected by labourers.

By way of example, a supervisor earning UGS400,000 per month supervising a team of 15 labourers expected to ring clean 150 trees per day @UGS 35 per pit.

If the team works at the prescribed rate, the cost of supervision alone is UGS8.88 per pit. Let the production drop to 100 trees per labourer, and the supervisory costs are UGS 13.33 or 28% of the pit cost. Add in other overhead costs (transport, housing, food, tools, Personal Protective Equipment (PPE), administration etc) and that 28% soon climbs.

Bearing in mind the above, it would be worth employer's while to introduce a stepped bonus system to encourage good productivity and reward the labourers who exceed a prescribed level of performance. Using the example above, the employer has already decided that his team of 15 labourers have to ring clean 2250 pits per day. Taking into account the cost of supervision, the employer has already decided that a fair cost to him is (400,000 / 20 day week) /2250 +35 = 43.89 UGS per pit cleaned, assuming the desired level of 150 pits per person per day is achieved. Any pits over and above the 150 are only costing the employer UGS 35 each. Therefore the employer has a saving of UGS 8.89 per pit if the expected level of performance is exceeded. In order to encourage the high level of performance, the employer should split the savings with the labourer. In the example above, the employer could pay labourers UGS 40 per pit for every pit cleaned over the 150 task. Thus the labourer earns more, yet the employer saves per unit of output. A win - win situation.



Graph of increasing supervision costs.

Whilst it is debatable, the consultant is of the opinion that bonuses should be won and 'banked' on a daily basis. That is to say, good production by a worker today cannot be offset by poor production tomorrow. Poor production should lead to disciplinary proceedings. It is also important that workers be kept up to date with their earnings on a daily basis, as this keeps the rewards of good performance to the fore in their minds.

A word of caution: The above assumes that the task of 150 trees is a well set task, correct for the conditions prevailing in the plantation at the time. Should the task be set too high, workers will soon become disillusioned, because the bonus earning threshold can never be achieved. If it is set too low, labourers will have large pay packets, the employer will have incurred extra expense and the advantage will be to the labourers who have benefitted from the employer's lack of knowledge of the job, and his previous acceptance of poor performance.
Workstudy will show the correct level of output a labourer is expected to achieve over a working day at a fair rate of exertion. Should a worker decide to exceed that fair level; to push himself in order to earn more money; he should be both encouraged and rewarded.

Recommendation:

1. That employers set minimum levels of production for piecework and labourers working on a daily wage, regardless of production. (This does not apply to nursery workers)

2. That SPGS workstudy personnel provide a service in setting fair task levels for various jobs in individual compartments. By recording conditions, this data can be used in the preparation of production graphs, for the future benefit of the industry as a whole. Whilst scientifically flawed, this practice will also enable supervisors to make judgments about other compartments, using the workstudy derived figures as a base.

3. Where the quality of supervision permits, employers should adopt a bonus system to reward good production. This can be applied to workers on piecework and daily wages.

1.6 Labour Turnover

Labour turnover was cited as a major cause of low productivity. No sooner is a labourer trained in a job and becoming skilled, than he leaves. The question contractor management should ask themselves is: 'Why?'

Undoubtedly a major factor is the conditions in which some worker live. Many stay in camps that are primitive to say the least, with poor quality makeshift tents and limited – if any – water supplies.

In a great many cases, workers are men staying away from home and they are unable to feed themselves properly. Most forestry work is physically demanding and workers are simply not taking in enough food to compensate them for the energy expended doing the job. This, allied to uninviting housing would drive workers away from the plantations.

Poor accommodation. Unpleasant to return to after a hard day's work. The water tank in the background was empty.

Where the plantation size is large enough to support a permanent workforce, the consultant was heartened to see that in some instances acceptable permanent housing was being provided, either for families or weekly housing for a workforce returning home at weekends. These compounds varied from brick built structures with water supply, to more traditional huts. Where possible it is recommended that compound be provided with a cook / cleaner to ensure that the workforce is properly fed and the compound kept in a habitable state.

Two types of suitable housing

Which leads to the thorny subject of food provision for labour. As stated above, many labourers are men away from home during the working week. Many will disregard their nutritional needs and rather that buying food, will succumb to the temptations of alcohol. It is not the consultant's place to discuss the morals of this, but the result is that a man who has not eaten properly, but has had a surfeit of alcohol cannot be expected to perform well as a labourer. If the worker is either unable or unwilling to provide himself with food, then it should be provided. At present some contractors deduct a set amount from their labourer's wages for food. This is probably the fairest way of funding food provision, providing the rations provided are commensurate with the amount deducted. What the employer should avoid at all costs is including a fixed ration provision (so many gms of meat, posho, beans, etc per week) in the weekly wage.

Assuming an average age of 25 years and body mass of 80 kg, the Schofield Equation indicates that a worker would need a calorific daily intake of approximately 4000 calories to maintain body mass and strength bearing in mind the high levels of physical exertion experienced during a working day. The staple foods vary throughout Uganda, and it is of paramount importance that the employer utilizes foods that are acceptable to the palate of the workers employed. Failure to do this will result in wasted food and a disgruntled workforce that has insufficient nutrition.

This could well end up with the employer becoming more of a grocery supplier than a forestry contractor. A daily – or weekly – deduction for food keeps the worker aware of the cost of the food provided and that this is a service provided by the employer. It also means that, should a workers circumstances change and he need not avail of this service, it is a simple matter to revert to a normal wage, with no discussion on the value of a fixed ration provision.

The consultant fully realises that many of the SPGS sponsored plantations are too small to warrant permanent labour housing or a permanent labour force, and that temporary labour camps will be with us for some time. This being the case, employers should invest in good quality tents, place them in shaded positions near the workplace, ensure that the camp is kept clean and habitable, and provide a cook and water. In short the employer should be prepared to look after his workers.

The consultant heard stories of workers not being paid by unscrupulous 'contractors'. Clearly this is not acceptable and landowners or SPGS clients should ensure that labourers are paid correctly and on time. If a client's plantation gets a reputation for not paying for work (regardless of the rights and wrongs of the situation) it will become increasingly difficult to recruit labour to work in that area.

Some contractors engaged by SPGS clients are little more than labour brokers, employing casual staff by the day. These brokers may have their place, but not in the forestry industry. SPGS clients should assure themselves that both the broker and his workforce have experience in forestry work. Inexperienced and unskilled labourers can be a costly mistake. If work is not up to spec, the client will not receive their SPGS grant, and if it is not up to spec, the trees will likely be suffering, thus reducing the clients overall return in investment by reducing MAI. One unskilled swing of a hoe can destroy a seedling, possibly necessitating a blanking operation – an extra unnecessary expense.

In some of the more professional contractors, worker moral was noticeably higher than others. Not only had these workers been in long term employment, and housed to an acceptable degree, their employer also organised inexpensive treats and days out. A trip to Entebbe Zoo was organized by one contractor, and thoroughly enjoyed by the employees. These tokens of thanks are much appreciated by labourers whose days consist mostly of hard work, and instill loyalty and an '*esprit du corps'*. Their value cannot be underestimated.

It is also felt that labour turnover can be reduced by the individual workers signing a renewable 1 year contract, with a bonus payment upon completion of the term. The size of the bonus would be up to the individual employer, but should be large enough to act as an inducement. An annual bonus is cold comfort to someone at the beginning of a contract period. For this reason it is suggested that progress to this bonus be reported each pay day, so that the worker is kept informed and can see how his bonus payment is getting closer, and is not an empty promise.

Recommendations:

1. That employers treat their workers with care and dignity. If work circumstances dictate that the worker is away from home, employers should provide suitable housing so that the worker will enjoy returning to work after a weekend at home. Housing should be maintained by the employer

2. Food should be provided to workers working away from home, and prepared by the employer. The worker should have money deducted from earnings to pay for this service.

3. Water should be provided to all workers in the field, and an adequate supply made available at worker accommodation

4. Workers should be encouraged to sign contracts of I year, with a bonus or bounty payable upon completion of that period.

1.7 Chemical Weeding and Timing of Operations

It became obvious early on in the consultant's visit that weed growth was impressive, that delays in dealing with that weed growth were costing clients more than necessary, and doing little to improve growth of the main crop. For lack of pre-planting chemical weed control, growth of grasses and other annual weeds were increasing the mandays per hectare to unacceptably high levels. Whilst time available to the consultant did not permit looking into the matter in great detail, lack of pre-plant spraying certainly adds greatly to the man-days required for ring cleaning, at least doubling the labour required. The consultant observed 3 month old weed growth in an unsprayed stand costing 11 mandays / hectare to slash.

11 mandays per hectare to slash

Such is the rate of weed growth, that the consultant witnessed ring cleaning being performed at a rate of over 8 mandays per hectare (at an acceptable performance level) To put that in perspective, the labour rate for the job was 'off the scale' when compared to the labour rate for the job when done in South Africa. This was on a site which again had not been pre plant sprayed, and was seen some 2 months after planting.

8 mandays per hectare to ring clean. This would have been much reduced by pre-plant spraying.

Whilst the above anecdotes are hardly conclusive, the consultant is firmly of the opinion that lack of pre plant spraying is costing landowners very dear in terms of post planting weed control. Not only that, but late post planting weed control is again adding unnecessary considerable labour expense to the silvicultural bill.

In a similar vein, SPGS staff with a view to discovering the most cost-effective regime, should investigate the effects of delayed slashing. Whilst the consultant appreciates that there are practical considerations and constraints regarding the frequency of slashing, what is the optimum? Will frequent slashing at approximately 2 mandays per hectare reduce the need for less frequent 11 m.p.ha.? Certainly from the purely silvicultural perspective, the more frequent the slashing the better. Or should chemical weeding be insisted on from the very beginning of a plantation – even if it is expensive at the first? With the training of SPGS to perform time studies, these fundamental questions can be answered.

Still on the subject of weed growth and timing, the consultant was informed of occasions when sites were prepared for planting too far in advance of planting, with the result that all pre-planting operations had to be repeated. Such wastes of manpower and money are entirely due to poor planning and should be avoided at all costs

Recommendations:

1. It is proposed that, with the co-operation of a landowner, and contractor a trial be instigated to answer the questions of cost / benefit regarding chemical versus manual weed control, and the effect of delayed weed control. As well as demonstrating the tangible silvicultural effects of various treatments, the trial should also accurately record the manday cost of these regimes and hence the total financial cost. See appendix 3

PART 2 – WORKSTUDY ISSUES AND TRAINING

2.1 Terms of Reference

The brief of the Consultant was to:

1. To review methods and labour productivity of establishment operations in Uganda's commercial forest sector and compare with other (developing) countries commercial plantation industries.

2. To identify (in conjunction with SPGS) and train key people in basic work-study techniques.

3. To compile brief guidelines for undertaking further work-study in Uganda.

2.2 Executive Summary

This report should be read in conjunction with part 1 by the same author in order for the reader to understand the full picture of factors influencing productivity in the Ugandan forestry industry.

The techniques seen used infield for establishment operations were seen to be tried and proven procedures (in many cases work methods not being ideal due to poor supervision and / or training), as used throughout the developing world where labour is comparatively cheap and plentiful. There was no indication of mechanization for site clearing or ripping and / or ridging. There was no mention of hard pans or other impenetrable layers, so such techniques are likely unnecessary from the tree growth perspective. However, the use of chainsaws for stump removal would allow the use of tractors for pre-plant spraying with associated benefits.

The weed growth seen in Uganda is significantly more vigorous than the Consultant has witnessed in Southern Africa, which in turn means that not only will more mandays be spent in weed control, but that the effects of poor weed control on tree growth will be greatly magnified. It should also be noted that this intense weed growth will influence all subsequent operations within the plantations.

Two SPGS personnel were selected for training in basic workstudy techniques. The individuals chosen (Charles Odeke and Peter Wangugi) both have forestry training, experience and knowledge which is of great benefit when performing time studies in a plantation. Both swiftly grasped both the theory and practical techniques, but currently lack experience in the field of workstudy.

With there being a complete lack of workstudy derived task levels in Uganda (and the conditions in plantation areas making the use of proven data from the South a dubious practice) there is much scope for improving productivity of workers in the country. Such daily tasks as are given are based on historic achievement hand thus cater for inefficiencies . (See part 1) Workstudy derived tasks are proven to be fair to both the worker and the employer. The period of the consultancy was too short for the consultant to be involved in the making of any production graphs, but the required skills have been passed on to SPGS staff.

A meeting was held at SPGS offices in Kampala with SPGS staff, landowners and contractors. The principles of workstudy techniques were explained by the Consultant in order that future users of results have a basic understanding of the principles involved. (It was by no means a training session) and appreciation of the use of scientifically derived daily tasks. Also discussed were other factors influencing productivity. Similar talks were held infield and many left these meetings with ideas on how they could increase their workers productivity, and reduce lost or ineffective time. A demand for workstudy information has been created.

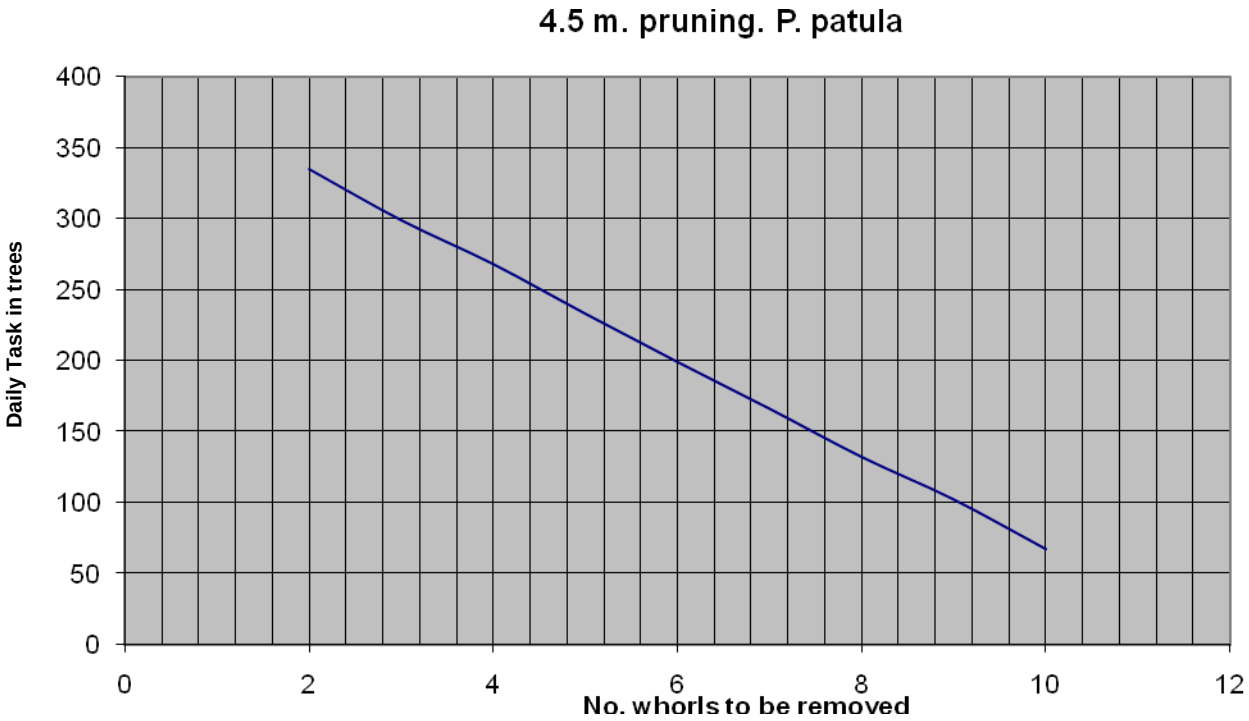
2.3 Goals of SPGS Workstudy

The ultimate goal of workstudy for SPGS should be to provide an addendum to the Tree Planting Guidelines for Uganda that includes production graphs for all techniques mentioned and all conditions likely to be encountered. This is likely to be both time consuming and impossible!

A production graph – an example of which is shown below - enables a supervisor to alter the daily task (expected daily output per worker) according to the conditions experienced in the plantation. In the example below, the expected daily production of the worker varies according to the ‘branchiness’ of the trees. To set the task, the supervisor simply cuts a pole 4.5 meters long, and, setting this beside a representative sample of trees, calculates the number of whorls of branches to be removed. Using the graph and a calculated mean of 4.5 whorls, the daily task is read off the vertical scale as 250 trees per worker per day.

If sufficient data are collected from time studies performed around the country, it should be possible to collate that data and plot required daily production against a measurable variable to produce a production graph or chart. Of course, it will never be possible to cater for all eventualities, but such charts provide a very good base for field staff to set fair daily production tasks for individual workers or teams. The data can be collected by providing an ‘on demand’ service for clients or their contractors to set task levels for individual jobs in various compartments. This not only provides the employer with a fair task level (and basis for stepped bonus – see other report) but also contributes to the database from which the proposed graphs will be derived.

Supervisors should be trained in the use of production graphs or charts, as it is they who have responsibility for the setting day-to-day task levels and hence the productivity of the workforce. Incorrect interpretation can result in chaos and be an expensive mistake for a workforce on piecework with a bonus system in place.



Graph of 4.5 meter pruning no.whorls against daily task

Much work of this nature has been done by the larger forestry companies in Southern Africa. However, it is debatable whether much of this information would be applicable to Uganda where the conditions, particularly due to weed growth, (which affects ALL operations detrimentally – besides hindering crop growth) are so different. Certainly during his visit, the consultant applied some South African derived figures to predict the daily task in a (delayed) ring cleaning operation, to find that such was the infestation level that the South African figures would not allow for a small enough daily production per worker or, viewed from another angle, high enough mandays per hectare.

It should be noted that workstudy is an extremely useful tool for management, but it is not a substitute for poor management. Workstudy will show what levels of production are reasonably achievable by a qualified worker in a given set of circumstances, and will also indicate to management what factors are effecting production and productivity, but it is up to management to react to recommendations. Management should do all that is reasonably practical to

enable workers to perform at a higher level. Providing files (or better still, a supply of sharpened blades) workers in a pruning operation, or ensuring that refills for backpumps are close at hand for spraying operations are two examples that spring to mind. Simple things can make or break an operation's efficiency.

2.4 General Use of Workstudy Personnel

As the benefits of using workstudy derived task levels become more widely accepted, it is envisaged that workstudy trained personnel should be made available to contractors and clients for no cost. Workstudy staff should be seen as honest brokers, being able to set fair work levels for all jobs in the plantation, until such times as production graphs are produced, when demand should drop off to just extraordinary compartments. This should be seen as a service both to the employer and the worker, with the fair task level of benefit to both. If the employer uses these task levels as the basis of a bonus scheme, so much the better. (see part 1))

Whilst not a priority, it is felt that the production of a pruning graph giving daily task set against number of whorls of branches to be removed, would be a straightforward and easily achieved goal. It would provide a useful document with a minimum of delay. (A very brief time study showed a distinct correlation between the time spent to prune *P. caribea* and the no. of whorls of branches). To produce such a graph, time studies are conducted on workers pruning pine trees, and concurrently the number of whorls of branches removed is noted. The mean standard time for removal of each number of whorls is noted and added to the recurring work element of moving between trees and the occasional elements such as sharpening and changing line to give a complete standard time for pruning a tree with that number of branches. These standard times are divided into the working day (8 hours or 480 minutes) to produce a daily task. The daily task can then be plotted against number of whorls, and a regression line drawn.
To set the daily task, the foreman calculates the number of whorls to be removed and reads the daily task off the graph.

Much workstudy personnel time should be spent in researching methods of predicting mandays required to slash weed growth. Until the invention of a weed-o-meter, the great difficulty is in establishing weed density and size with any degree of accuracy. Photographs on their own do not do not tell a great deal about the weediness of a compartment. Any attempts seen by the author at providing a weed infestation scale are usually very open to interpretation. It is proposed that SPGS workstudy personnel use photographs showing the conditions with a stick painted alternately red and white at 5cm intervals to help the reader gauge the scale and infestation of the weeds. It is envisaged that, individual plots to be photographed with the painted staff, then time studies performed on ring cleaning. Once sufficient studies have been performed, it should be possible for a reader to estimate the weediness of a compartment by comparing photographs, and so set a fair task for his workers.

Another means of estimating the weediness of a compartment worth investigation is measuring the time it takes a worker to safely walk 30 meters into the compartment at 100% rating. Obviously the more weeds present the longer the journey will take. This would certainly be a straightforward means of testing, and this idea should certainly be investigated

2.5 Proving the Value of Workstudy

In order to demonstrate the value of workstudy in increasing productivity in forestry operations, there is no substitute for a practical demonstration. With this in mind, it is proposed that SPGS select one contractor, measure his productivity, perform time and method studies, recommend and enforce changes in work practice and measure productivity when the improvements have been made.
The consultant fully realises that this is a lot easier to say than do, but a practical demonstration is worth countless theoretical graphs or talks.

If this plan is adopted, it will require total commitment from SPGS, as it will absorb many – often unproductive – manhours by dedicated SPGS staff.

It is envisaged that SPGS select one compliant contractor and record that contractor's activities for a month. It is important that all activities be observed and recorded by SPGS personnel, thus removing the possibility of false recording by the contractor staff under scrutiny. The recorded data should include start and finish times of labourers, their jobs, their output and the quality of the work. Interviews with the employer could reveal costs of tools, food, transport, supervisor pay etc to provide an overhead cost to the level of supervisor. It should be stressed that this is only an observation phase, and the SPGS personnel should not advise, criticize or interfere in any way. They will however perform time studies in order to ascertain the observed rate of work and calculate theoretical task levels for comparison purposes

The next phase would be to perform time and possibly method studies on the jobs being performed, with a view to setting fair task levels, and efficient ways of working.

Then comes the period where the revised task levels and methods are introduced.

This is will certainly be the most difficult phase of the experiment. The co-operation of the workforce and supervisors is vital. A workforce unused to starting at a set time, or bringing food to work (to avoid the traditional long lunch break) could well become disgruntled by the likely changes. For this reason it is proposed that the workers be provided with daily allowance of UGS 1000 per day for complying with the SPGS working regime. Their ordinary piecework wages will be paid by their employer. The employer should also consider the

introduction of the stepped production bonus scheme mentioned in the other report, as this will provide an incentive for workers to exceed the set task level.

The workforce will then work to SPGS timings and production standards and their activities recorded.

SPGS then compares the ‘before’ and ‘after’ productivity both in terms of output per manday and cost per hectare. Care must be taken to ensure that like is being compared to like. For this reason, time studies should be performed during the observation phase, and output expressed as a percentage of the workstudy derived task. This enables a 5 mandays per hectare job to be compared to a 10 manday per hectare job.

To give a practical example of comparing a ring cleaning job with pruning:

Ring cleaning observed production = 97 pits
Workstudy task = 159 pits

Efficiency = 97/159 X 100 = 61%

Pruning observed production = 255 trees
Workstudy task = 270 trees

Efficiency = 255/270 X 100 = 94%

Thus it can be seen that the pruning work is being more efficiently performed than the ring cleaning.

Whilst the author is reluctant to portend numerical values to the results of this trial, it is confidently predicted that the mandays per hectare expended on most operations will drop markedly, with associated befits in both costs per hectare, and volume of work done or hectares covered. Besides making the business more profitable, using workstudy should enable employers to plan their operation better (as they will be better able to predict the outcome of a day’s work for a team) and thus make more efficient use of the workers in their employ. Employers will also be able to predict their correct manning levels for the workload to be performed throughout the year.

Before selecting a contractor for this trial, SPGS should satisfy themselves of the 100% commitment from the contractor, and the wholehearted engagement of the workforce. Workers should be ‘sold’ the theory behind the trial not as a trick to make them work harder, but as an experiment to ascertain what is a fair level of production which could lead to the potential for higher wages in the long run. It should also be mentioned that a more profitable employer is in a better position to help his workforce with PPE, higher wages and the expectation of longer term employment etc.

2.6 Training of Workstudy Specialists

SPGS employees Charles Odeke and Peter Wangugi were trained in workstudy techniques, covering both the theory and practicalities of time studies and rated and non-rated activity sampling. No practical training was given on method study, but the subject was covered theoretically.

With theoretical training given at the SPGS office in Kampala, practical training was given at Ferdsult and Green Ishamba pine plantations near Kampala. Field visits were made to plantations at Namwasa en masse with SPGS clients and their contractors. Whilst these visits were not conducive to conducting time studies, they did give the Consultant opportunities to discuss workstudy techniques with Messrs Odeke and Wangugi, and productivity in general with all those assembled. All left these field trips – and subsequent discussions – with much clearer ideas about worker productivity and how to achieve it.

The consultant passed on practical tips from his experience of performing studies in plantations in Southern Africa. See appendix 4

Whilst both men showed an understanding of the subject, and both a willingness and ability to learn, they also had other duties to attend to and a shortness of time limited the number of training studies that could be performed and worked through.

However, there is no substitute for experience, and both personnel should be allowed sufficient time to perform studies, in order to retain and hone the skills taught.

The consultant will endeavour to establish if it is possible for SPGS to undergo further training in the RSA or elsewhere. Whilst it is unlikely that the data gained will be of much use in Ugandan circumstances (see elsewhere in this report) the experience will be invaluable.

2.7 The Future of Workstudy at SPGS

There is certainly a need for workstudy in the Ugandan forestry industry, on both a strategic and a tactical level.

To deal with the strategic level, it is hoped that the trials mentioned in this report will demonstrate not only the effects of differing weed control regimes, but also the value of the application of thought and control to forestry operations in general.

The preparation of production graphs for silvicultural operations is also of paramount importance. As mentioned elsewhere, the remarkable rate of weed growth experience in the country will render production figures from other parts

useless, as the weeds impinge on all aspects of all subsequent operations. Although beyond the scope of this report, the consultant predicts that production figures for harvesting will be affected too due not only to weeds interfering with access, but the branchiness of the trees. So again production charts form other regions will be of limited use, and indigenous Ugandan figures will have to be compiled.

On a more tactical level it is hoped that the trial mentioned (Section 2.3above) will demonstrate the value of the practical application of work-study techniques to a contractor operation. Assuming this works well, any contractor worth his salt will ask for assistance with his own operation, and it is recommended that this be provided by SPGS personnel whilst compiling data for the more strategic production graphs. A single time study can provide a contractor with the answer to his immediate daily task question, but also provide facts and figures for the compilation of a production graph or table.

As mentioned the consultant trained 2 SPGS personnel in basic work-study techniques. There is such potential to benefit the Ugandan forestry industry and such a need, that these personnel should not be expected to attend to other duties. With transport time taken into account, 2 straightforward 90 minute time studies can take an entire working day to perform and work through, and that is before the study man gets involved in examining the data and measurements with a view to the compilation of a production graph. It is the consultant's experience that the demand for time studies to be performed will never diminish as there will always be anomalies or quirks in a forest environment where the productivity minded employer will wish to set a scientifically reliable daily task for his workers. Indeed, if employers become productivity minded, the demand should increase, and SPGS should give thought to the possibility of training more work-study personnel.

Appendix 1

Short Interval Time Control

Date		**Supervisor Name:**				
Species:				**Compt. No:**		
Plantation name:				**S.P.Ha:**		
Operation:						
Tools used:						
Expected daily production (team)				**Units**		
Expected daily production (individual)				**Units**		
Units per hour (team)		**Units per hour individual**				
	7:9AM	**9.30:11**	**11:1PM**	**1.30:3PM**	**3:4PM**	**Total**
Expected output						
Worker name						

Short Interval Time Control

Date	12th July 2010	**Supervisor Name:** Eriya Mbwa				
Species:	P. caribea			**Compt. No:** H117		
Plantation name:	Kampala			**S.P.Ha:** 1111		
Operation:	Ring cleaning					
Tools used:	Silviculture Hoe					
Expected daily production (team)				**Units**		
Expected daily production (individual)			240	**Units**	Trees cleaned	
Units per hour (team)		**Units per hour individual**			30	
	7:9AM	**9.30:11**	**11:1PM**	**1.30:3PM**	**3:4PM**	**Total**
Expected output	60	45	60	45	30	240
Worker name						
Joseph	59	47	61	47	30	244
John	63	45	63	45	31	247
Moses	45	50	60	46	29	230
Ronald	67	45	57	39	27	235
James	51	45	61	48	33	238
Alex	66	45	69	39	31	250
Peter	60	37	58	49	32	236
George	70	50	63	51	27	261
Julius	27	53	60	43	31	214
Yasani	64	41	59	41	30	235
Patrick	55	48	60	41	35	239
Lukalo	66	43	63	46	31	249
David	65	42	61	39	33	240
Henry	70	40	59	50	37	256

Appendix 2

Weekly productivity report

Week starting		**Supervisor Name:**					
Plantation name:					**Compt. No:**		
Operation:				**SPHa**		**Species**	
Tools used:							**Expected**
Expected daily production (team)					**Units**		**Weekly**
Expected daily production (person)					**Units**		**Total**
Team or		**Actual production**					
Worker name.	**Mon**	**Tues**	**Wed**	**Thurs**	**Fri**	**Total**	**%**

Weekly productivity report

Week starting 12th July 2010		**Supervisor Name:** Eriya Nbwa					
Plantation name: Kampala					**Compt. No:** H 117		
Operation: Ring cleaning				**SPHa** 1111		**Species** P. Carib	
Tools used: Silvicultural Hoe							**Expected**
Expected daily production (team)					**Units**		**Weekly**
Expected daily production (person)				240	**Units**	Trees	**Total**
Team or		**Actual production**					1200
Worker name.	**Mon**	**Tues**	**Wed**	**Thurs**	**Fri**	**Total**	**%**
Joseph	244	258	241	240	239	1222	102
John	247	255	240	230	271	1243	104
Moses	230	260	247	239	242	1218	102
Ronald	235	251	250	250	250	1236	103
James	238	233	252	247	259	1229	102
Alex	250	247	241	240	239	1217	101
Peter	236	239	238	251	255	1219	102
George	261	263	255	257	261	1297	108
Julius	214	238	242	245	250	1189	99
Masani	235	240	247	231	258	1211	101
Patrick	239	261	250	241	255	1246	104
Lubalo	249	242	247	243	244	1225	102
David	240	243	244	239	241	1207	101
Henry	256	250	249	256	259	1270	106

Appendix 3

The objective of this trial is to demonstrate the effect and costs of various weed control methods in Uganda. An even sloped and aspected compartment with uniform soil type should be selected for the trial. One half given a total pre – plant spray, the other half slashed.

The entire compartment should then be pitted and planted in the normal fashion, and as quickly as possible using a uniform source of seedlings.

If possible, sample plots should be 5 rows wide, and orientated uphill if the trial compartment is not level. This will minimize the effect of treatments on adjacent plots with each other, with data taken only from the middle 3 rows of any plot. Thus the central 'trial' area of any plot has 1 row to insulate it from any effect of the neighbouring treatment such as spray drift, or 'edge effect'. Plot treatments should be replicated throughout the trial area.

On the sprayed side, various treatments should be tried per plot:

1) No further weeding
2) No further chemical weeding but ring cleaning at one month post planting
3) No further chemical weeding but ring cleaning after 2 months
4) No further chemical weeding but ring cleaning after 3 months
5) No further chemical weeding but total slash after 1 month
6) No further chemical weeding but total slash after 2 month
7) No further chemical weeding but total slash after 3 month
8) Spot spray after 1 month
9) Spot spray after 2 months
10) Spot spray after 3 months
11) Total spray after 1 month
12) Total spray after 2 months
13) Total spray after 3 months

On the slashed side, the following treatments should be used:

1) No further weeding
2) Ring clean after 1 month
3) Ring clean after 2 months
4) Ring clean after 3 months
5) Total slash after 1 month
6) Total slash after 2 months
7) Total slash after 3 months
8) Spot spray after 1 month
9) Spot spray after 2 months
10) Spot spray after 3 months.

(Please note that the above treatments are suggestions only and SPGS staff should feel free to alter them following consultations with silviculture experts.)

These treatments should be continued until canopy closure or the trees are deemed above serious weed competition.

At each treatment, the mandays per hectare and chemical costs are measured and recorded. The survival rate in each experimental plot should be recorded. Total costs per treatment should be presented in an easy-to-read tabular form

Appendix 4

Notes for work-study observers

What is Work-Study?

It is a generic term for those techniques - particularly method study and time study – which are used in the examination of human work in all its contexts, and which lead systematically to the investigation of all the factors which affect the efficiency and economy of the situation being reviewed, in order to effect improvement.

In the context of forestry in Uganda, this will most often mean the performing of time studies to ascertain a fair and equitable daily task for a worker to achieve during the course of a working day, at a defined level of performance. This will vary according to the job being done, and the prevailing conditions. It is this great variety of conditions that is likely to be the greatest challenge to the work-study practitioner.

By systematically and accurately noting the activities of a labourer, it is possible to build up a picture of how his day is spent, and not only his actual output, but also his rate of output.

This will often lead to surprising results, as management is frequently unaware of exactly how labourers spend their time.

If time studies show how a worker spends his time, method study is the critical examination of the way the work is done; with a view to improving productivity. Are the correct tools being used? Is a worker working individually? Should he be part of a team? Does the job need done at all? These are all questions that should be asked and answered. A simple time study can frequently lead on to a method study if the study man notes unacceptable amounts of forced idleness in the subject of the study. A sprayer standing idle due to lack of water or a planter running out of seedlings (or spending an inordinate amount of time fetching them) should lead the study man to question why this is so, and devise a way of solving the problem. It is strongly advised that these organisational problems – and their solutions – be passed on to management in order that they be made aware. Frequently the method of working in the field will not be as management expects it to be, and they should be informed.

Rating

‘Rating is the assessment of the worker’s rate of working relative to the observer’s concept of the rate corresponding to standard pace.’

In other words, rating is the comparison of the observed rate of working with a standardised rate of working held in the study man's mind. Overleaf is shown the standard rating scale set against walking speed and the time to cover a distance of 30 meters. The study man should practice rating himself and others covering a 30 meter course, and get to know what the various rating levels feel like and look like. With practice, the study man can then carry this concept of rating over in his mind to the job under scrutiny. This is a **VITAL** skill for the study man to master, and time spent practicing it is never wasted. The writer had 2 markers set in the ground outside his office, and would rate passers-by as they went about their business.

Rating %	Walking Speed KPH	Time to Walk 30 m	
130	8.32	0.22	
125	**8**	**0.22**	Very fast. Operative exhibits a high degree of assurance, dexterity and
120	7.68	0.23	co-ordination of movement well above that of the average trained worker
115	7.36	0.24	
110	7.04	0.25	
105	6.72	0.27	
100	**6.4**	**0.28**	Brisk, business-like performance, as of an average qualified worker on
95	6.08	0.29	piecework. The necessary standard of quality and accuracy is achieved with
90	5.76	0.31	confidence.
85	5.44	0.33	
80	5.12	0.35	
75	**4.8**	**0.37**	Steady, unhurried performance, as of a worker not on piecework, but under
70	4.48	0.40	proper supervision. It looks slow, but time is not being wasted whilst under
65	4.16	0.43	observation.
60	3.84	0.47	
55	3.52	0.51	
50	**3.2**	**0.56**	Very slow, clumsy fumbling movements. Worker appears half asleep with
45	2.88	0.63	no interest in the job.
40	2.56	0.70	
35	2.24	0.80	
30	1.92	0.94	
25	1.6	1.13	
20	1.28	1.41	
15	0.96	1.88	
10	0.64	2.81	
5	0.32	5.63	

When performing a time study the study man looks at the worker and compares his rate of performance against that of the rates listed above, that he has in his mind. Rating is accurately depicted in numerical form above, but the concept must be carried in the studyman's head and applied to the job under scrutiny. He must be able to carry the objective principles tabulated above to more subjective estimating of the rating of the worker being observed.

In practice, the study man is probably wasting his time observing a worker working at a rate of less than 75%. Such workers are probably not trained well and have little interest in the job.

In theory, the rating of the worker ensures that, when comparing observed times for a particular task, the effect of differing energy outputs of the worker is cancelled out.

observed time x rating (expressed as a decimal) = a constant at 100%

In factory conditions, this is the case, where the number of outside variables is limited. In forestry it is very seldom true because no two trees are exactly the same or no set of conditions underfoot are similar.

Who is studied?

The study is carried out on a **Qualified Worker.** This is defined as a worker who is accepted as having the necessary physical attributes, who possesses the required intelligence and education, and who has acquired the necessary skill and knowledge to carry out the work in hand to satisfactory standards of safety, quality and quantity.

In practice, before conducting a study, the Study man should look at the workers available and select a worker who is working well and consistently, and to the correct quality standard. He should also be using the correct equipment and wearing the required PPE. An enquiry with the Supervisor or the worker himself will reveal whether or not the worker has been trained. (If the job is simple, on-the-job training would probably suffice) The study man should introduce himself to the worker and explain that, although he intends to study this particular worker, it is the job, not the individual which is being studied. For this reason it is best not to ask the worker's name or company number, lest he fear that he personally is the subject of scrutiny.

The study man should then ask the worker to continue working at his normal pace to his normal quality and ignore the presence of the study man.
When the study is complete, the study man should thank the worker before taking his leave.

Conducting a Time Study

Upon arrival at the site of the study, introduce yourself to the supervisor and fill in the details on the field cover sheet. Don't assume you will remember them and do the job later in the office.

Before starting a study, take a few minutes to look at the job in hand and the workers available. Having selected the worker to be studied (see above) look at the way he works. Is it correct? Is it to the correct standard? Decide into which

elements you will break the work down. When deciding on the elements, be reasonable. Think if you are able to time them individually, decide on your **break points** before the study starts, and make a note of them in the cover sheet.

When conducting the study it is important that the study man empathises with the worker as much as possible, but does not chat with him. Should the study man not be alone, do not talk unnecessarily with the assistant and then only on the subject of the job in hand. Do not laugh and joke. Do not wear dark glasses as they will make the worker uneasy (Which is why they are favoured by members of the constabulary!) Stand as close to the worker as possible, without getting in the way or putting himself in danger. If the study is likely to be a long one, by all means carry refreshment, but do not partake unless the worker himself is taking a break. Do not stand in a cool shady spot if the worker is toiling in the hot sun. In short, the study man should be sensitive to the feelings of the worker. It would be very easy for the study man to become unpopular if he is seen as having an easy time whilst the worker is working hard.

When the study is underway, be sure to judge the rating whilst the element is being performed, and do not allow your judgment to be swayed by the observed time it took the worker to perform the element.

When performing the time study be sure to note whether or not the unit of output (tree pruned, pit dug or whatever) is to the required specification. Make notes in the comments column of the continuation field sheet.

If there was a peculiarity with an observation, make a note in the comments column. Maybe a tree had extraordinarily heavy branches and thus took a long time to prune. Make a note of it at the time. Do not assume you will recall the anomaly later.

If the unit is not to the required specification, it is not the studyman's job to interfere and call the worker's attention to the fact.

Keep focused on the job. As the study progresses, the study man should devote all his concentration to the job in hand and ask himself how the operation can be improved.

The study length should be long enough to include all the repetitive elements and the occasional ones. It is assumed that the study man knows sufficient about the job to know what these occasional elements are. A panga will need sharpened from time to time, a chainsaw sharpened and refueled etc. In addition, the study man should note the conditions in the field. Is his study going to be of sufficient duration to take into account the differing conditions and be truly representative of the area? There is a cumbersome formula for calculating the length of a study to the 95.45 confidence level.

$$n = \left(\frac{40\sqrt{n^1 - \sum_{x^2} - \left(\sum x\right)_2}}{\sum x} \right)^2$$

Where n. = sample size to be determined

n^1= number of readings taken in a preliminary study

∑ = sum of values

x = value of the readings

As a rule of thumb, a study in plantation conditions should never last less than 90 minutes

Equipment for the Study

1) Clipboard
2) Stopwatch calibrated in 1/100 minute. Many stopwatches are calibrated in seconds. Beware of this trap.
3) Sufficient cover sheets and continuation sheets for the study or studies
4) A notebook
5) A means of testing whether or not the unit of output is within specification.
6) A measuring tape of at least 30 meters length
7) A digital wristwatch - for study start and finish times
8) 2 x ballpoint pen. Check they work correctly before leaving for the field.
9) PPE as required for the job.

Working Through the Study

Work through the study as soon as possible after the field observations.

Check the total OTs against the Elapsed time of the study (from the wristwatch readings) if there is discrepancy of more that 2% the study should be discarded. If a study is not sufficiently accurate, check through the OTs carefully. Has a decimal place been put in the wrong place? If there are no obvious errors the study must be discarded.

When calculating the basic time for an element, do not forget to discard those elements which did not result in a unit of output to the desired specification. If, for instance, the job being studied is 2 meter pruning, and every now and then – for no good reason – the worker prunes to a lesser height, those times must not be considered. The reason is that we hope to obtain the standard time for 2 meter pruning, not a lesser specification. If the time for the incorrect specification were included, the result would be a lesser standard time, which would be unfair on the worker. Similarly – but more rarely – the study man should beware of the

worker spending too much time on the job and allowing his output to be over specification.

Pay attention to **occasional elements**, and ensure that the correct proportion of the occasional element is allocated to each work cycle. It is a simple mistake to allocate too large a proportion, particularly if some of the elements of output have been discarded.

Relaxation Allowances

A relaxation allowance is an addition to the basic (100% effort) time intended to provide the worker with the opportunity to recover from the physiological and psychological effects of carrying out specified work under specified conditions and to allow attention to personal needs. The amount of allowance will depend upon the nature of the job.

These should be calculated using the table below – which is derived from ILO data. The study man should exercise care when allocating relaxation allowances, and carefully consider the job in hand and the conditions prevailing at the time of the study. The relaxation allowances are added by element, so each element should have its relaxation allowance calculated separately. Also note that the allowances should never be less than 10%.

		%
Personal needs:		5
Energy output		
Light bench work, seated etc	no load load	0
Very light load, walking	5kg	4
Light shoveling	10kg	8
Using file or hacksaw	15kg	12
Felling trees with an axe	20kg	16
Swinging a heavy hammer	24kg	20
Swinging timber	28kg	24
Carrying timber	30kg	28
Handling bark bundles	35kg	32
Handling very heavy loads, heavy pushing	45kg	40
Posture		
Sit	sedentary work	0
Stand	Erect on feet only	2
Crouch	On feet or knees, but body bent	4

Motions

Unrestrained	work easily accessible	0
Limited	restrained manual movements	2
Awkward	work above eye level or below knee level	4
Confined	working with spanner under a motor car	6

Atmospheric conditions

Normal ventilation, clear air, no fumes	0
Unpleasant, with little dust, smoke or fumes, and air circulating	2
Little air circulation with noticeable dust or smoke fumes and hot and humid	4
Dusty, hot, humid with very little air circulation	6
Very bad conditions, such as working with furnaces or very dirty work	10

Lighting

Sheer light does not appreciably affect work	0
Where light conditions impair speed of performance	1
Where poor light or flash lamp only is available for carrying out tasks such as maintenance checks on bearings, or the finer points of mechanical or electrical equipment.	3
Where good light is necessary for effective performance of the task, but the actual lighting is extremely poor	5

Eye strain

Little or no attention necessary	0
Taking occasional readings or measurements	1
Continuous figure work, precision machine work	3
Detailed and accurate measurement or inspection work	5

Aural strain

Occasional indirect noise	0
Intermittent infrequent noise	1
Fairly frequent loud low-pitched noise or occasional high pitched noise	2
Continuous loud noise or vibration, or intermittent high pitched noise	4

Mental strain

Little danger likely of collapse of work or injury	0
Lack of attention liable to spoil work or cause possible slight injury	2
Lack of frequent attention liable to cause injury or collapse of work	6
Lack of continuous close attention liable to endanger life	8

Tediousness

Work of a varied nature	0
Light work of a repetitive nature with little change in muscular effort	2
Continuous light muscular strain or concentration without breaks in routine	4
Highly repetitive or monotonous work, where the physical effort involved requires a continuous muscular strain	6

Presentation of results

The results of a time study should be presented in a way most useful to the party commissioning the study. A thorough description of the method of working and the tools used should be included. Do not assume that the reader will know how a job is performed. In addition, such information will be of use in the future, particularly when comparing different techniques.

It is useful to include not only the calculated standard time for the job, but also the observed rate of working. Where understanding of productivity is low, it is sometimes the case that the studyman's results are not believed. In this instance it can frequently be useful to say 'Well, the worker was seen working at this rate for period of so many hours during the study.'