

**CSIR COMMERCIALIZATION
PRICING, JOB ESTIMATING
AND JOB ACCOUNTING**

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1 0 EXECUTIVE SUMMARY

In an effort to reduce the recurring draw of funds from the annual government budget, the Council on Scientific and Industrial Research (CSIR) of Ghana has been given the mandate by the Government of Ghana to develop private and other sources of funding to support their research institutes (RIs). The Government has informed the CSIR that by the year 2001, the government will reduce its share of the cost of funding these institutes to approximately 70% of the 1995 funding levels, and that the CSIR and the RIs themselves need to assume responsibility for providing the remaining 30%. The CSIR has been encouraged to be creative in finding the necessary funds, and this funding can come from donor grants, from foundation sponsored research as well as from the sale of products and services to private clients. The process of changing the environment of the CSIR and its RIs from being fully subvented organizations to being partially self-supporting has been termed "Commercialization", and the CSIR and its RIs have developed business plans and have been asked to establish Business Development Units (BDUs) to drive this process and assist with the commercialization efforts.

This consultancy was the fourth in a series of recurring consultancies supported by USAID and the Sustainable Finance Initiative (SFI) which are aimed at providing technical assistance to the CSIR and its RIs as they make the transformation into the competitive marketplace. Being primary research institutions which historically have been fully supported with national funds, very few of the staff members have had experience with the issues involved in competing for funds in the open market, and the organizations themselves have not previously had to develop the internal infrastructure required to conduct competitive business affairs. The concepts of having to be concerned with revenue generation, marketing, developing customer relationships, establishing prices for products and services, identifying and estimating costs for future work and accumulating historical cost information about individual projects are new to the organizations. The internal infrastructure needs to be built, the internal knowledge and skills developed, and the employment environment needs to adapt to this significant cultural change.

During earlier SFI consultancies, the issues of historical job cost accounting, cost estimating and pricing were regularly raised by the staffs of the Research Institutes as being recurring problems. At the request of the CSIR Secretariat, this consultancy was commissioned to provide assistance in these key areas, including introducing the concepts of cost identification and control and the impact this will have on all employees in an environment where the principal cost is employee wages and related expenses. Additionally, as visits to 9 of the RIs was planned, the opportunity was present to assess the current status of the progress being made towards commercialization at the individual RIs and also to review and reinforce marketing concepts, principals and ideas with senior managerial staff at each of the institutes.

1 1 Status of Commercialization

Meetings with the management, accounting staffs and BDU members of the nine RIs visited indicated that, with several exceptions, the Research Institutes have made significant

progress over the past year in the process of accepting the need for Commercialization and actively preparing to deal with its implications, and are doing so in a positive manner. The RIs have devoted much thought to the changes that are required, and the business development groups that most RIs have now formed have been actively and seriously thinking about ways to increase revenues and to determine costs and prices.

It was clear that because of the historical purpose of the Research Institutes and the training of their professional staffs, the RIs are lacking practical knowledge about the marketing and accounting methods normally used to promote an organization, to identify and develop markets and customer bases, to prepare job cost estimates, to set prices, and to control costs, and that the Institutes have been struggling with these issues. It was also clear that the visits by outside consultants over the past year have provided valuable information to the staffs, and that the periodic nature of these visits has had a reinforcing effect in helping the staffs become familiar and comfortable with commercial practices and how they can be put in place at the RIs.

The problems facing the institutes are similar at all nine, and yet very different at the same time. Some of the institutes, such as WRRI, are dealing with technologies that are relatively easily marketed, and others, such as SRI, are working in areas where it will be very difficult to find significant viable commercial opportunities. Several of the RIs have already had significant successes with their revenue generating activities, while others have had no success to date. WRRI and FRI have been able to penetrate the international contract research and consulting markets and FORIG has had considerable success writing and winning grant awards from international sources. OPRI has developed an international network of opportunities, but has not yet determined how to turn this into a significant and continuing revenue source.

The institutes that have had some successes don't seem to recognize the importance and value of the market contacts they have established, and that if they are to be able to repeat and sustain these successes, these market contacts need to be systematically developed and pursued. Additionally, these contacts appear to have been developed by only a limited number of individual staff members, and the institutes are vulnerable to losing these opportunities when and if these staff members leave. Those institutes that have had some successes need to study their experiences in order to gain a thorough understanding of what happened so that they can learn how to systematically develop these activities and make them repeatable in the future. Furthermore, these experiences and the lessons learned need to be shared among the other institutes so that this knowledge and similar market contacts can be developed throughout all of the RIs. This is especially true of FORIG's grant writing expertise because a number of the Institutes, especially SRI, CRI, ARI and SARI, may find the grant writing 'market' to be a productive source of future revenues.

1.2 Cost Accounting, Cost Estimating and Pricing

Upon arrival, the consultants learned that a new, computerized accounting system is to be introduced into the CSIR and its RIs in the near future. This system, which was described as

being a fully integrated system, complete with job cost accounting, will replace the current manual accounting system, and is planned to be phased in at all RIs over the next 12 to 15 months, starting in March, 1998. It is unclear whether employee time accounting will be part of this system. In the interim period, until the new accounting system is fully operational, there is a clear need for the RIs to pursue commercial activities and to prepare job estimates and pricing proposals, and, even after the new system is running, this need will continue - a historical job cost accounting system will not perform these functions. The most pressing need of the RIs was defined as assistance with the concepts and processes involved with developing Job Estimates for future work and establishing sales prices.

It quickly became apparent during the consultancy that there has been confusion about and a blending of the terms 'cost accounting,' 'cost estimating' and 'pricing,' and that there has been a general expectation that prices of products and services are determined by a formula that is established through the data collected by a historical cost accounting system. The consultants spent time at all institutes defining these three different activities and discussing their separate purposes. Additional emphasis was put on describing pricing practices, describing how costs are only one element to be considered when setting prices, and emphasizing that the most important element of price setting is the process of trying to estimate the value that the customer will place on the product or service being offered for sale, and trying to determine the competitive market value.

The consultants worked with the staffs at the Research Institutes on the procedures that are followed when trying to estimate the costs that will be involved with a future job (Exhibit IV). Job Estimating is a team effort, requiring both the managers who will be responsible for having the work performed and cost accountants. The project managers need to work up a detailed listing of all cost elements, both direct, out-of-pocket costs and the detailed labor inputs, and they need to establish time schedules for when the work will be performed. The accountant's role is to assign costs to these inputs, and also to develop estimates of the Institute's overhead costs that should be assigned to the project. Putting costs to the direct, out-of-pocket expenses and the labor inputs is straightforward, and the staffs at the Research Institutes were familiar with doing this. The principal problem was with defining overhead expenses, and attempting to assign them to specific jobs and projects.

1.3 Time Keeping

On average, 70% of all monies spent by the Research Institutes goes to Salaries and Employment Expenses (Exhibit I), and it is therefore obvious that detailed information about this most important expense is necessary if the institutes are to gain an understanding of their costs, if they are to be able to prepare reasonably accurate cost estimates for future jobs, and if they are going to be able to control expenses and run their operations in a professional manner. It is also clear that a great deal of the overhead expense of the RIs is Salaries and Employment Expenses (Exhibits III), and that any attempt to determine the amount of overhead expenses must include an analysis of how employees spend their time.

Currently, the costs of all salaries are lumped together in one account, and there is no information accumulated about how much time is direct labor, assignable to specific projects, and how much time is indirect, or assignable to overhead activities. The accounting system goes to great lengths accounting for the smallest expenses and out-of-pocket costs, but makes no provision at all for the accumulation of detailed information about the Institutes' single largest expense, namely employee cost and how employees spend their time. This emphasis needs to be changed.

Several years ago, *INFORM*, a computer based system for accumulating employee time information, was given to all Research Institutes so that they could plan their labor inputs. However, *INFORM* is not currently in active, daily, use at any Institute, and from the time it was first introduced to the institutes, it was not intended by CSIR management to be used as more than an informal estimating guide, rather than as a precise measuring tool. Responsibility for operating and maintaining *INFORM* was not assigned to the accounting departments, and in the cases of those Institutes that do use *INFORM*, it is typically used only occasionally during the year, and the time data fed into it is estimated.

From the experience with *INFORM*, and from discussions with senior management at CSIR, it is evident that CSIR management has not been committed to the need to maintain accurate employee time keeping records. This commitment will have to be developed if the Institutes are to be able to maintain good cost records and to be able to prepare accurate job cost estimates for future projects. Time keeping is not an activity that employees like to do, and many will resist efforts to install a time keeping system. Senior management must be fully committed to the need for a time keeping system and must demand that all employees maintain and submit time sheets.

The installation of a universal time reporting system (daily or weekly time sheets, maintained and submitted by all employees) is essential to the professional management of the Institutes and to their ability to accurately determine their costs and properly manage their operations, and should be given the highest priority of management. It is the keystone of any cost accounting system. Failure to install and effectively manage a universal time accounting system will severely interfere with the ability of the Institutes to properly determine, budget and control their single largest cost, and will prevent any efforts at cost identification from being successful. Without a time sheet system, the new computerized accounting system will only be capable of producing the same information that is currently produced by the existing manual system.

1.4 Overhead Expenses

When preparing job cost estimates for future work, the staffs at some institutes have been adding 20% of total costs to the estimates in order to cover overhead expenses. This figure was thought by them to be a reasonable estimate, but it was based on information from an accounting system that does not have a time sheet system and which ignores the accumulation of accurate time allocations between time spent on projects and time spent on overhead activities. A closer look at the expenses of the Institutes shows that the overhead expenses are actually more in the range

of 250% to 500% of the total labor costs on a job (Exhibits III) This is a startlingly high number, and it comes about primarily because of the high percentage of paid employee time that is not devoted directly to projects An individualized version of Exhibit III was prepared for seven of the nine institutes visited by the team, in consultation with the Institute's staffs A time keeping system is required to more accurately determine these numbers, but even the rough estimates made show that the overhead expenses are very high, and that they will need to be brought down if the Institutes are going to be able to compete in the outside world Since the overhead expenses are primarily employment related expenses, the reduction of overhead expenses will come about through either a reduction in the total number employees being paid (Exhibit III, Line 4) or an increase in the amount of paid employee time which is actually spent working on projects (Exhibit III, Line 9)

1.5 Controlling Outside (Private) Consulting

The practice of employees doing 'private' work for outside customers has developed over the years at several of the Research Institutes, and has been tolerated At some institutes, the employees actually perform the work on Institute property, using Institute equipment and supplies and on Institute time This practice is a form of theft, and must be brought under control

Since the Institutes are now charged with raising some of their own funds, this type of work activity can be the type of revenue producing opportunity that the Institutes need to develop in order to meet their own financial needs, and which the BDU's are working to achieve If employees are permitted to select which work they bring into the institute and which work they do on their own, the Institutes will be faced with the problem that the employees will tend to keep the most profitable jobs for themselves and only bring the less attractive jobs to the Institute The practice of permitting employees to privately conduct the same work that the Institute conducts is detrimental to the viability of the Institute, and needs to be stopped The employees in question have to make a choice between working for the Institute or working for themselves They cannot be permitted to be in direct competition with their employer

1.6 CSIR Secretariat Policy Issues

There seem to be differences of opinion within the CSIR Secretariat about the goals of Commercialization, and the direction this activity should take Meetings with the Commercial Director reflect his operating posture that Commercialization should be an aggressive activity, with an objective not limited to raising only 30% of the budget from Commercialization, but going for 60%, and in time 100%, doing away entirely with the government subvention and becoming a limited liability company Under this vision, the Institutes should not be focusing on selling consulting services or contract research or advising others on how to produce new methods and products, but rather should be focusing on developing the unique new products and processes for themselves, and then exploiting these products for significant added value on the open market This vision calls for the CSIR and its Institutes to become an aggressive, for profit business entity

On the other hand, at meetings with the Deputy Director for Agriculture and in CSIR guidance documents, the goals of Commercialization were described as being limited to raising only 30% of the Institutes' budgets, and gradually achieving this level of revenue generation by the year 2001. Should the amount exceed the required 30%, it could be used to supplement salaries and to provide other employee benefits. Consulting, contract research and training services would all be acceptable and preferred activities for meeting this goal. Under this vision, commercialization represents only 30% of the Institute's activities, and it should therefore play only a 30% role in defining policy objectives. The other 70% of the objectives and activities of the CSIR and the Research Institutes would remain pretty much as they have existed up to now.

These two versions of the goals for the CSIR are very different from one another and are in direct conflict. As they are both coming from individuals with managerial responsibility within the CSIR, they produce confusing signals and they need to be reconciled so that the objectives are clear to everyone, and so that the agreed upon objectives can be properly pursued.

2 0 ACCOUNTING SYSTEMS AT THE RESEARCH INSTITUTES

Currently, all books of account at the RIs are manually prepared. The accounting system in use was designed solely for historical financial accounting. Most, but not all, accounting departments of the individual RIs have access to a personal computer (usually a 286), which is used primarily for the preparation of the monthly payroll. *Quattro Pro*, a spreadsheet program similar to *Lotus 1-2-3*, is employed for this purpose. Additionally, some of the RIs use a computer and *Quattro Pro* for the preparation of miscellaneous spreadsheet analyses.

The efficiency with which the individual Research Institutes maintain their books of account varies widely. Currently, the most significant accounting reporting requirement of the RIs is to prepare and submit audited annual financial statements to the CSIR Secretariat. Timeliness in meeting this requirement is very lax. Many of the institutes take more than one year to fulfill this requirement - that is, the audited financial statements for 1995 for many RIs were not received by the Secretariat until well into 1997. This is verifiable by the dates of the auditors' opinions which accompany the statements. There appears to be little negative consequence to being late in reporting the annual statements.

Under the existing system, the direct, out-of-pocket expenses for specific research projects are identified and segregated, but there is no provision for allocating salary and employment expenses to individual projects, or even to separating them into direct labor and overhead categories. All employee salaries and employment related expenses are lumped together in one general heading "Employment Expenses," which is broken down only into the general categories of Salaries, Social Security, Superannuation and various allowances.

The *INFORM* program, built using the flat-file *Reflex* database, was made available to the RIs several years ago to be used as a tool to perform manpower budgeting and time estimating for the management of research projects. In addition to being an estimating tool, *INFORM* is capable of keeping and managing the necessary information required to perform cost analysis of manpower inputs (labor costs), but to do so requires the preparation of daily time sheets by all staff, and this was never implemented at any RI. *INFORM* is not under the administration of the accounting staffs at the RIs, and it is used only occasionally by a small number of the RIs. Rather than being an integral part of the accounting system, *INFORM* is used only as rough estimating tool when it is used at all. Oil Palm Research Institute (OPRI) is one RI which makes annual use of this program and finds it helpful in planning its activities and attempting to determine overhead levels, but many of the other RIs do not use the program.

Several years ago the Canadian aid organization CIDA financed the installation of the commercially available computerized accounting package *DAC Easy* at the Crops Research Institute (CRI). The system was installed, and the accounting staff trained in its use. During the fall of 1995, CRI accounting staff received word that the NARP project was going to install a new computerized accounting package at CRI, and that the use of *DAC Easy* was not favored by the CSIR Secretariat. The Secretariat sent an accounting consultant to CRI to analyze CRI's

accounting needs, and use of *DAC Easy* was discontinued. There has been no further interaction on this subject between CRI and the Secretariat since the initial consultant visit in 1995.

During 1997 one of the RIs, Savanna Agricultural Research Institute (SARI) received funding from the German donor GTZ for the installation of a computerized accounting system. Jecty & Co, a consulting firm from Accra, has been hired to oversee the installation of the accounting software "SCALA 3.1" which is a PC DOS based accounting package developed by a Swedish company in the mid 1980's and modified in 1993 and marketed by a British firm. As of 2 November, 1997, the basic chart of accounts had been installed, and the SARI accounting department had started to input monthly accounting data, starting with the books for September, 1997. The system is being run in parallel with the already in place manual system. It is planned that all of 1997's accounts for SARI will be on the new system, and to achieve this, the staff had, as of 2 November, back-posted the books of January, February and March, 1997. The package has a cost accounting module and a payroll module, but at this time these two modules have not been enabled. The package is capable of running on a PC based network, but the system is currently running in single user mode, and it is not known whether a multi-user system is planned by GTZ or the consultant. Refer to the section below on SARI for further discussion.

Upon arrival at the CSIR Secretariat offices it was learned by this consulting team that CSIR has initiated a project to acquire and install, with World Bank funding, a uniform, integrated, computerized accounting system throughout all of the research institutes. We were advised that this system will provide both financial accounting and job cost accounting, and that it will be designed so that the individual RIs will be able to deliver monthly financial reports to the Secretariat in electronic format for consolidation and the preparation of management reports, although it is likely that the reporting requirement will be quarterly rather than monthly. We were told that the specifications call for a system that can produce comparative financial statements, presenting both budget and actual, and also period to period comparisons. The consultants were advised that this project has been tendered and bids received, and that a preliminary review of the bids has been made. Evidently, the SCALA system being installed at SARI was one of the systems that was bid. Final selection of the winning bid and the awarding of the contract is expected to take place shortly. Current plans call for the chosen system to be installed at all RIs over the next 12 to 15 months by an independent accounting firm, and installation of the system will include training of the accounting staffs at each RI. Pilot installations at up to 4 RIs may start as early as March, 1998. It is unclear whether the introduction of employee time accounting will be part of this system.

3 0 PRICING, JOB ESTIMATING AND JOB COST ACCOUNTING

Management at the CSIR Secretariat as well as managers at the individual research institutes all expressed a serious need for cost accounting and pricing assistance. After further discussions, it became clear that, because of the lack of commercial experience, there was not a clear understanding of how prices are arrived at and there was a rather consistently expressed opinion that if the institutes had good cost accounting, then prices could be determined. Many individuals equated pricing with costing, and thought that prices would automatically be produced by a cost accounting system. Further exploration disclosed that most of the Institutes could reasonably accurately determine their direct, out-of-pocket expenses for most of their new work, and they felt comfortable with their ability to estimate employee time requirements, but

- 1) the institutes were putting a lot of distracting effort into trying to determine an actual cost and corresponding profit on the sale of small products that are produced by the institutes as a by-product of their research. (For example, if you are undertaking a research project on chickens which involves a large amount of scientist time and other research related expense, and the chickens happen to lay eggs that you can sell, how much do the eggs cost, how do you know what to charge for them, and what is your profit on their sale?) This same type of cost accounting conundrum, using plant seedlings, seedlings from 50 year old trees that are used in research projects, or other by-products, was brought up repeatedly at different RIs as examples of the types of pricing and costing problems they are having. (The answer to the egg question is that there is no answer. It is an accounting riddle. Any cost you assign is completely arbitrary. The most sensible answer is that the cost is zero, that 100% of the sales price is "profit", and you should sell them for what they are worth on the open market.)
- 2) since there is no employee time recording at any Institute and since there is no analysis of how employee time is spent, there is no basis for determining direct, job related employment expenses or for determining indirect, non-job related employee expenses and accounting for these expenses in overhead allocations,
- 3) the institutes were having difficulty determining a basis for allocating overhead expenses to job estimates, and
- 4) the institutes were looking for a plug-in formula that would determine prices once costs were established

3 1 Definitions and Purposes

From discussions with senior managers, managers and BDU staffs at the Research Institutes, it became apparent that there was a blending together and mixing up of the concepts of a) job cost accounting, b) job estimating and c) pricing, and that this confusion was creating

difficulty in preparing job estimates and setting prices. These three activities, although related to one another, are separate activities, and have different purposes and different procedures.

Job Cost Accounting is the activity of separating and recording historical costs by job or project. Historical job cost records are useful as a reference when trying to estimate what a future job will cost, and they are important if there is a tax, an incentive or a fee that has to be paid based upon profits. If a job estimate or budget was prepared for a job before it started, then the historical job costs can be compared with the original estimate to both refine the estimating process and to look for efficiencies that might be achieved if a similar job is undertaken in the future. Historical job cost accounting does not establish pricing. Job cost accounting is normally performed by accountants.

Job Estimating, also referred to as Job Budgeting, is the process of attempting to identify all costs that will be incurred when undertaking a job in the future. Job estimating is not the same thing as Job Cost Accounting - job cost accounting deals with known history, while job estimating deals with the unknown future. Job estimating is useful when preparing pricing, but it does not establish the price.

Job estimating is usually done by a team. The managers or scientists who will be responsible for carrying out the work must assemble a detailed estimate of the quantities of all of the identifiable cost elements that will be required to perform the work, including direct, out-of-pocket expenses and employee time requirements broken down by individual employee or job class. A cost accountant can then take this list of items and apply estimates of what each will actually cost. In order to reflect the other costs of running the institute, the cost accountant should also allocate a share of all of the other costs of the institute (known as indirect costs, or overheads, or burden) to the job estimate so that the final total reflects the project's share of the indirect expenses of running the institution. Finally, the managers or scientists responsible for the job also need to make estimates of the calendar time that will elapse while the job is in progress. Dates should be established for interim check points and final completion.

Pricing is the process of deciding what price to put on a product or service when it is offered for sale. While the Job Estimate or Job Budget is important to consider when establishing the price, it does not determine the price unless a deliberate marketing decision has been made to price a product or service on a "cost plus profit" basis. The decision to price based on cost plus profit is a marketing decision and should not be made merely because it appears to be easy. Establishing an offering price is a marketing decision, and, given the RI's lack of experience with pricing, it would be wise for pricing decisions to be worked out by a group of people, probably the BDU, who bring a variety of perspectives to the problem.

The process of establishing the offering price should focus attention on the customer, and a serious effort needs to be made to attempt to determine the value that the customer will

place on the product or service and also the customer's ability to pay. Basing a price on costs, when the customer sees little value in the product, or has little or no money to pay for it (i.e. the small farmer) accomplishes nothing, because the customer won't pay. Likewise, if the customer places great value on the product or service (for example a diamond) it only means that a good opportunity has been lost if the price was set based upon cost.

Many of the products produced during the RIs' research activities are marketable food, plants, seeds or seedlings. Many of these items are "accidentally" produced - their production was not the principal objective of the operation that brought them into existence, research was. Many of these items already have a market price established for them. They already exist on the marketplace, and attempting to figure out what it cost the RIs to produce them, and then pricing these products based upon this cost is not realistic. These products should be sold at the going market prices, and their cost should be recorded as zero. Attempting to do otherwise is a waste of time.

Other products, such as specially developed seeds or seedlings, or varieties that offer special properties not normally available elsewhere, require special consideration, and can usually be priced above the normal market, unless a marketing decision is made to set a low price because a) it might be desirable to have a low introductory price in order to establish a market for a new item or b) the RI deliberately sells certain products or services at low prices to specific markets because of the public service mandate given by the Government. Here again, it is necessary to try to make an assessment of the value of these products to the customer as well as the customer's ability to pay. A determination of the historical cost is only a small factor to consider when making this decision, and not too much attention should be devoted to determining these costs (if any attention is given at all).

On the other hand, when pricing services, it is important to know the costs, and it is equally important to know what similar services sell for. For example, if you are attempting to sell a contract research project, to whom are you selling and what labor rates does this customer normally expect to see on proposals? Are you competing in the local community, elsewhere in Ghana or internationally? Each of these markets expects different rates. What are the competitive rates? Who are your competitors and how much do they charge per person-day for similar work? Careful analysis of the targeted customer and the market they are in greatly influences the price that should be placed on a product or service.

3.2 Estimating the Cost of Products versus the Cost of Services

When thinking about the issues of cost accounting, job estimating and pricing, it is important to keep in mind the objective and the potential size of the sale. The Director-General indicated that the production of products for resale is not a priority of the CSIR and its Institutes,

and that the focus of attention should be on the delivery of research services. The sale of products produced while conducting research is incidental and many of the products sold by the Institutes are by-products of the research process, and therefore can be considered to have no cost, and pricing should be set by market conditions. Little or no effort should be devoted to determining the costs of products unless the production of these products becomes a deliberate activity, performed in volume, with the objective of producing significant revenue.

If the purpose of the sale is to supply the small farmer with a needed improvement in a crop or process, an activity which is a major part of what the 70% government subvention is intended to achieve, then, while it is important to identify and control the costs of this activity, the costs are only a very small element in establishing the price.

The cost accounting and job estimating energies should be devoted to determining the costs, both historical and future, of the principal activity of the Institutes, namely conducting research, and to discretionary projects undertaken such as consulting and contract research.

3 3 Calculating 'Profits' and Sharing with the CSIR Secretariat

While the commercialization mandate says that the RIs are to raise, on average, only about 30% of their annual budgets through commercial activities and the solicitation of outside grants, a great deal of the attention of those assigned with the responsibility for commercialization has been centered on determining profits, especially for products, and trying to come up with precise definitions of costs so that the profits can be stated and shared and so that prices can be set based on cost. At some RIs these deliberations about cost appear to consume a significant amount of staff time that could be better used developing new customers, exploring new business opportunities and trying to determine the value the customers will place on the institute's work. If only 30% of the total annual costs need to be covered, on average, it is a significant diversion of attention to focus on profits and to get involved in arcane accounting debates about how costs and profits are to be determined, especially from the sale of items that are incidentally produced as by-products to the central activity.

There have been two reasons the RIs have been attempting to calculate costs and profits of products they produce: 1) the belief that the 'proper' sale price can be determined by totaling up the costs, which is not true, and, more importantly, 2) a misunderstanding between the Secretariat and the RIs about the method to use when calculating the fee to be paid to the CSIR Secretariat on commercialization proceeds. This second reason has been the primary reason for these costing efforts. The Institutes' understanding is that they are to pay CSIR 10% of the 'profits' earned on all commercial activities. Thus, they need to determine what the costs and profits are. Plant Genetics Resource Center has gone so far in pursuing this problem that it intends to have the BDU operate as an independent entity with its own cost accountant who will keep separate books for the BDU and determine internal "sale" or transfer prices from the Center to the BDU, all for the sole purpose of being able to come up with a profit calculation so that they can remit 10% of this to the Secretariat.

The publication *CSIR Guidelines for Research Commercialization* calls for the RIs to pay a fee to the Secretariat that is based upon the success of the RI's commercialization activities. Section 4.3 of this booklet discusses the need to identify all costs for the sale of products and services, and Section 8 discusses the need to determine profit in order to calculate incentives and make a fee payment to the CSIR Secretariat BDU. The booklet indicates that it is necessary for the RIs to calculate costs and profits on everything they sell - products, by-products and services. However, in discussions with the CSIR Director-General, he stated that the Secretariat does not intend for the RIs to assign any cost to by-products sold, and that the entire sale price of the goods should be considered "profit" for the purposes of calculating the fee to be paid to CSIR. The booklet does not appear to accurately reflect the intentions of the Secretariat, and it needs to be revised.

RECOMMENDATION It is recommended that the Secretariat review the policy regarding how the fee to the Secretariat is to be calculated, and change it from the current system of a royalty that is based upon a calculation of profits, to being a simple commission on all outside revenues received by the RIs. The only exclusion from total revenues should be for reimbursable expenses that are itemized and billed separately to the customer such as travel expenses, fees paid to outside organizations, special printing, special equipment rental and the like. The fee paid to the CSIR should be a commission on gross receipts, period. No need to get into profit debates, and equally importantly, the RIs will know in advance what the amount to be remitted is, and will be able to factor this cost into all of their prices and quotations. The commission due the Secretariat can be seen as a known cost of doing business, and can be planned for. If this change is put in place, then the RIs can cease trying to calculate profits, and can get on with the process of trying to generate revenue.

To facilitate this change, all use of the word "profit" should be eliminated from the *Guidelines*, and the discussions about costs should be de-emphasized. The guidelines should be revised to clearly state that the basis for the commission on the sale of goods is the total sale price, and that the basis for the commission on contract research is the gross revenue, less reimbursable expenses separately invoiced to the customer. Additionally, the word "fee" should also be replaced with the word "Commission".

3.4 Accounting for Staff Time

Employment costs are, by far, the single largest cost item incurred by the RIs. Between 50% and 80% of the entire annual operating costs of each institute is spent on Employment Expenses. (See Exhibit I). Yet, while the accounting system goes to great lengths to account for the smallest expense items - incidental purchases made on the open market must be signed off by the internal auditor, and the lowest paid employees, the day laborers, must be accounted for with time sheets - the most significant cost of all, the expensive salaries, those of the researchers, managers, administrators and all salaried staff, are ignored and are all lumped together in one account. There are no procedures established to account for this, the largest expense incurred by the institutes or to assign this expense to individual jobs, to projects or to overhead categories.

If the CSIR and its RIs are to have a meaningful job cost accounting system, and if they are to be able to have any possibility of accurately estimating the costs of future jobs and allocating overheads to those projects, they will have to institute a universal system of time reporting. The introduction of systematic time accounting, by which is meant the regular preparation and submission of time sheets by all employees on which they record the amount of time in each day that has been spent on individual jobs, (See Exhibit II for example), is a central requirement in putting in place a cost accounting system and a system for estimating the costs and expenses related to future jobs so that they can be quoted and priced.

The suggestion was made that it is only necessary for staff to keep account of the time spent on commercialization activities, and that the rest of their time need not be reported. The problem with this theory is that it ignores the issues surrounding overhead expenses. Since employment expense averages 70% of all expenses, a large portion of the overhead expenses are employment based, and it is essential that these expenses be identified so that they can be accumulated and allocated to projects. Overhead expenses include not only the salaries of the administrative staff, but also all of the salaries paid to the regular staff for time they spend on non-project related, or overhead activities such as annual leave, holidays, attending meetings and doing administrative tasks. Without a system of time reporting, it is not possible to determine these expenses, or to determine the full costs of any activities in the RIs, commercially based or otherwise.

Instituting time sheets and time accounting will not be easy. Some employees will see this as an intrusion into their work life, and others will assume that the need for time keeping is being imposed on them because the employer mistrusts them. Additionally, many employees will say that it is impossible - they do so many things that any effort to record them all will be meaningless, and they will come up with examples of how they are working on multiple jobs at a time, and so forth.

Time accounting will be a significant cultural change in the workplace of the institutes, and it will not effectively happen unless all members of senior management accept that it is necessary, and unless they prepare time sheets themselves and demand that everyone else prepare them as well. The purpose is to obtain a good understanding of where the costs of the institute are going, and the employees should be encouraged to keep reasonable records of how much time they invest in individual projects.

The economic realities of the modern world require the implementation of time accounting and the preparation of time sheets throughout all organizations, especially those employing expensive researchers, managers and other professionals. These employment grades, in particular, are the most resistant to this activity, but because of the magnitude of the costs involved, they are the most important individuals to include. If the Research Institutes fail to install and properly enforce a universal system of mandatory time sheets, they will be unable to properly account for their largest cost item, and will end up with an ineffective cost accounting system and will have difficulty preparing competitive quotes for outside work.

RECOMMENDATION A universal system of time accounting, complete with time sheets, should be implemented throughout all RIs, and it should be equally applicable to all employees. Management must demand that time sheets be submitted on a regular basis (preferably weekly), and there should be significant consequences (withholding of pay until the time sheet is submitted) for failure to do so. It is further recommended that, in order to gain experience with this procedure and to increase the credibility of the policy change, all senior managers and all members of the BDUs at the individual RIs start preparing time sheets now. Without an effective and comprehensive time reporting system in place, the CSIR and its RIs will not be able to identify costs or be competitive in the commercial marketplace.

3.5 Definition of Cost Elements

When trying to estimate what it is going to cost to perform a project at the Research Institutes, the costs can be separated into 3 basic categories:

- 1) **Identifiable, direct, out-of pocket costs** - that is, the cost of those items that will have to be purchased or consumed from inventory in order to perform this project. Another way to define direct costs is those costs that you will not incur if you do not do this project. These costs include not only special chemicals, feed, and seed, but also transportation expense, fuel, lodging, photocopy expense, directly identifiable telephone expense, day labor and so forth. The BDU members at all institutes were quite knowledgeable about these items and appear to have no difficulty with the definition or with preparing estimates of these costs for future jobs.
- 2) **The labor costs** - that is the number of man-hours that will be required to perform the work, separated by individual employee or labor class, multiplied by the salary rates of the different employees.
- 3) **Overhead expenses, also called indirect expenses or burden**. Overhead expenses are all of the other costs of the RI that cannot be specifically identified as belonging to a specific job, project or product. These include not only the General and Administrative expenses and depreciation, and the like, but most importantly they also include all salaries and employment expenses that are not directly attributable to specific jobs, projects or products. Thus, not only should the salaries of the accounting staff, the secretarial staff and senior management be included as overhead expense, but also all of the salaries paid to the regular staff for time that they are not working on specific projects should be included.

One of the problems caused by the fact that time sheets are not currently kept and the employment costs are not separated into direct and indirect categories, is that the overhead expenses at the RIs are greatly underestimated. The expense category "General and Administrative" that appears on the Institutes' financial statements does not include any costs related to salaries and other employment expenses, and therefore these employment

costs are overlooked when estimating overhead expenses. At some institutes there are almost as many, if not more, employees employed in indirect, overhead, related jobs as there employees who perform direct, output related, work. (See Exhibits III attached for several examples)

Additionally, the lack of time accounting prevents an analysis of the time of the employees who do perform direct, output related work, and the separation of their time into the time actually spent on jobs, and the time they spend on overhead related activities. This individual personal overhead includes time spent in meetings, time spent reading or studying current literature, time spent with general administrative issues, vacation time, holiday time, time spent trying to solicit new business, sometimes it includes time spent traveling between jobs, and so forth. In most work environments there is usually a pretty large amount of this individual employee overhead time, and this time is usually larger for the more highly paid individuals than it is for the lower ranking staff. This time needs to be paid for, and in order to include it in the cost estimates, it needs to be determined and accounted for.

3.6 Allocation of Overhead Expenses and Establishing Standard Costing Rates

As discussed above, the activity of estimating the costs of conducting research projects involves 1) the identification of the direct, out-of-pocket costs for the items to be consumed (direct costs), 2) the identification of all of the people who will be performing the work and how much time each of them will put into the project, and 3) the assignment of a portion of the Institute's overhead costs to the job. Since the Institutes spend, on average, approximately 70% of their total costs on employment expenses (Exhibit I), it is clear that what drives all of the other costs of the Institutes is this employment expense. Likewise, since the principal activities of the RIs are organized around the production of the human thought processes, namely research, allocating overhead costs to projects based upon the content of employee salary costs appears to be a reasonable approach to the problem.

Therefore, we need 1) a method of determining and accumulating all of the overhead expenses, (non-billable expenses) of the Institute and 2) a method of allocating these expenses to the employees' salary rates so that we can have full cost identification and full cost absorption when we total up the costs.

- 1) Determining and Accumulating Overhead Expenses** With the exception of the salary and employment related costs (of both pure overhead personnel as well as the personal employee overhead expense discussed above), identification of the other overhead expenses is straight forward. Simply looking at the annual financial statement lays them out. Because of the method of funding of the RIs and the accounting system used to account for it, the direct costs of research, that is the cost of chemicals and other out-of-pocket job related expenses, are not charged to the income statement, rather they are accounted for through separate fund accounting, and do not flow through the income statement.

Therefore, with the exception of Employment Expenses, all of the other expenses shown on the income statement are overhead expenses. Furthermore, the Employment Expenses themselves contain all of the employee related overhead expenses such as pure overhead salaries, personal overhead expense (non-producing time), superannuation, Social Security and allowances. This means that all of the overhead expenses and all of the labor expenses can be simply allocated by using the figure for Total Expenses which is shown on the annual income statement. Typically, this is the largest number on the Income Statement.

2) Allocating Overheads using Salaries The process for doing this is very simple, and examples for 5 of the Research Institutes are given on Exhibits III attached.

Lines 1, 2, and 3 of Exhibit III come directly off the annual financial statement and show total expenses, employment related expenses and salary expenses. The ratio shown on Line 3 indicates the ratio of salary expenses to total expenses, and means that, if all paid employees worked 100% of their time on direct job related expenses, this would be the ratio of their salaries to total expenses.

There are many employees who are paid by the RI who do not work on direct project activities. Lines 4 through 7, which are counts of personnel, are readily obtained from the personnel department and from the accounting department's payroll records. A comparison of Line 7 with Line 4 shows a simple comparison of how many people are being paid versus how many people are engaged in the direct production of the Institute's activity. The salaries of the people who actually work on projects need to be multiplied by this ratio in order to cover the salary costs of the people who work on overhead related activities.

Additionally, not all of the time of those employees who do work on specific jobs is actually spent on those jobs. Line 8 is an estimate of the amount of time that can be allocated to specific projects by those employees who actually work on projects. Because the RIs do not currently have a time reporting system, this number has to be estimated at each Institute, and it is recommended that a group of individuals, knowledgeable about the issues of how the staff spends its time, work up this estimate together. With the implementation of universal time sheets and a time accounting system, however, this number will be more precisely known. We can, however, make some reasonable estimates now. For example, annual paid leave is 8 weeks, and there are 2 additional weeks of paid holidays, so there are 10 weeks out of 52 that are paid for but during which no work is performed, so we are at 80% efficiency before we even start. Additionally, there is administrative time, meeting time, personal time, and so forth, and it would not be unreasonable to estimate that the real "production" time of the staff probably represents only 60% to 70% of the time actually paid for.

Line 9 is the resulting figure of how many person-years of full-time work is actually devoted to, and chargeable to, specific projects of the Institute. All of the overhead

expenses of the Institute, including employment related expenses, need to be allocated to the projects based upon this number of actual working person-years. Lines 10, 11, 12 and 13 make this allocation.

The final number, line 13, is the labor rate factor that needs to be used to determine full costs. Taking the salary rate of a specific employee, or class of employees, multiplying by how many of their hours will be spent on a job, and then multiplying by the factor on Line 13 will yield the actual cost of doing the job, fully 'loaded' with overhead expenses. To this must be added the direct, or out-of-pocket, expenses of the job as discussed above.

3.7 Cost Control

The final number on Exhibit III, the Labor Rate Factor on Line 13, is a startling number. It is very high. The reasons for this are several, and include the large amount of employment expenses that are not salaries (the difference between Lines 2 and 3), the large number of purely overhead people on the staff (Lines 5 and 6), and the estimated percentage of time the actual producers spend on non-producing activities (Line 8).

The quickest and most effective way for the Institutes to address this problem and to lower the Labor Rate Factor on Line 13, is to increase the efficiency of the overhead staffs, and to seriously attempt to reduce the number of people that are included in Lines 5 and 6. If employees are not involved in the direct production of the institute's work, their costs have to be paid for by the work being performed by those employees who are doing direct work.

RECOMMENDATION The management at each Institute needs to examine what work the non-direct employees are doing, whether it needs to be done, and if so, how it can be done more efficiently so that fewer non-direct employees are required and the number of overhead employees can be significantly reduced. Perhaps some jobs being performed by multiple employees can be combined into one.

3.8 The Process of Job Estimating - Preparing the Job Budget

All of the pieces of preparing a job estimate have been discussed above. All that remains is to put them together. Exhibit IV attached is a summary worksheet that can be used, together with Exhibit III, for this process.

The individuals who will be responsible for organizing and managing the work need to prepare a detailed list of all of the different cost elements that will go into performing the work (Exhibit IV). These cost elements should be broken out into Direct Expenses (Lines 6 through 24) and Labor inputs (Lines 25 through 32). Additionally, the Direct Expenses should be separated into two categories - those that can be separately billed to the customer and which are reimbursable based upon actual costs (such as travel), and those that cannot be reimbursable. The labor should be broken down as finely as possible, showing who will work, and how many hours.

each individual employee will spend on the project. Additionally, the project manager should establish the elapsed calendar days, including providing dates for interim check points and completion (Line 5 and Line 37)

After this cost element identification is complete, the form should be given to an accountant who should then apply the specific costs to each cost element, and then multiply the labor by the labor cost factor determined by Exhibit III. The end result is a detailed job estimate with a full cost assessment.

The preparer, the accountant, and a higher level manager should sign off, and no work on any project should start until the necessary signatures have been obtained. The approving signature of a high level manager, other than the researcher responsible for the project, should be required before work can start.

3.9 Establishing Sales Prices

As discussed above, the setting of a price for a product or a service should be based primarily on an assessment of what value the customer will place on the product or service, and what the competitive, or market, conditions suggest is acceptable. It is also necessary to factor in an assessment of who the customer is and what is the customer's ability to pay. The commercialization process at the Institutes is aimed at raising only 30% of the Institutes' annual budget, not at turning the Institutes into profit making organizations. As a result, the Institutes can have a variety of pricing policies (that is a tiered pricing structure) some products and services will be given away to some customers at no price, some will be sold at very low prices, some will be sold at market prices, regardless of cost, some will be sold at a price covering direct costs only, some will be sold above full cost, and some will be in between.

It is important, however, to set some guidelines. If jobs are to be sold at only 30% of their full costs, then 100% of the Institute's jobs will have to be priced this way. On the other hand, if 50% of the work of the institute is to be done for no fee, then the remaining 50% of the work will have to be sold at prices that return, on average, 60% of the total cost, including overhead. Likewise, if 30% of the work can be sold at prices that cover 100% of their full costs, including overhead, then the balance of the work can be delivered at no sales price.

The prices set need to reflect the status of the customer, and why the Institute is doing the work. Much of the work of the Institutes is not done on a contract basis. All of this work is being done "at no sales price." Similarly, the delivery of special seeds or seedlings to small farmers and the conduct of special field trips to small farmer sites is considered to be part of the mandate of some of the Institutes, and the price will have to be low. On the other hand, if the customer is a larger, for-profit business, a developer, or an international donor, and if the work is being conducted primarily for that customer's benefit, then that customer should pay for the project, and should pay at or close to going market rates. The Institutes will face resistance when they attempt to charge customers for services that the customers have previously been getting for

free. On the other hand, before conducting work for a private individual or company, the Institute needs to ask "why is it the responsibility of the Ghanaian taxpayer to finance the cost of traveling to a site and conducting a study for a private developer?" At a minimum, such work should not be done unless the customer pays enough to cover the direct costs plus the direct labor, and, over time, the prices charged should be increased so that these jobs also pay for their share of the costs of running the institution.

4 0 CONTROLLING OUTSIDE (PRIVATE) CONSULTING

One of the more complex problems facing several of the institutes is that over the years it has become acceptable for individual staff members to develop their own private consulting businesses, where they do the same, or similar work, that the Institute performs, and do it for a fee, but do not bring the revenue received for this work to the Institute. Much of this moonlighting work is the exact type of work that the Institute needs to be doing in order to meet its commercialization goals and to help defray overhead expenses. The problem is not easily defined into one simple category. While some of this work is done completely off premises and only during the annual leave of the individual doing the work, in other instances the work is actually costing the institute money in direct expenses because the work is done with the use of Institute facilities, equipment and supplies and sometimes it is performed during Institute time. Because of the history of these practices, some researchers have become dependant on the revenues, and the practice has become relatively entrenched.

The accountant at one institute complained that there is no system in place for approving the pricing of work for private firms, and that the individuals who approve the work are the same ones responsible for preparing the quotations and doing the work. This results in work being done without anyone else knowing about it, and sometimes the only way the accounting department is aware of the work is if the customer mails in a check at the end of the job. This lack of system opens the door to tremendous abuse, because there is no control over pricing, and there is no assurance that payment for the work isn't being sent directly to the individual who performed it. Without a system of job estimates and budgetary approvals before work can start on a project, and a system of job numbers and time accounting where all employees account for their time and charge it to pre-approved jobs, it is not possible to control this practice or to know its extent.

The forms of this practice are varied, and as a result, the consequences to the RIs differ depending upon the type of work and how it is conducted. At one extreme, there is the instance of the staff member who is offered a foreign consultancy, and who is very careful to isolate this work from the Institute and to not make use of any Institute facilities or time, and who performs the consultancy completely off the premises of the Institute and does the work while taking time from his personal annual leave. In this instance the staff member is attempting to be honest and the only cost to the institute is the lost opportunity. At the other extreme is the instance of the staff member who performs routine lab analysis, tests or certifications for private customers, does it on the Institute's premises and uses Institute equipment and supplies, but considers this to be his own 'private' consulting practice and has the customer pay him directly. This example is obviously dishonest and a form of theft.

One of the insidious consequences of this practice is that if a staff member who is known to do private work happens to bring a job into the Institute's commercialization system, other employees are immediately suspicious as to why that work was brought in and not done privately. Is the job a loser? Are costs being loaded onto this job so that a second job that the staff member

is privately performing for the same customer will be more profitable to the staff member? Is this job a cover for another private job the staff member is doing? Is the staff member also getting paid on the side for this job? This practice can and does have poisonous consequences among the staff of the Institutes, because it reflects negatively on the ethical character of those who practice it, and it must be controlled

Even those consultancies where the employee is very careful to keep the consultancy completely separate from the Institute and that are performed completely off the premises and while on personal leave from the Institute need to be brought into the Institute's revenue system. With the introduction of the need for the Institutes to raise part of their own funding, all of the employees of the institute become, to some degree, dependant upon the success of these efforts. If employees are permitted to pick and choose between which jobs they bring in and which jobs they do privately, they will be encouraged to 'skim the cream from the top,' only bringing in the least attractive jobs while keeping the best jobs for themselves. This practice is not fair to the Institute or to the other staff members. Those individuals who have these opportunities must make a choice between working for the Institute, or being in business for themselves. If those individuals wish to keep the business they generate for themselves, then they should resign from the Institute and go into private practice - they shouldn't be permitted to have it both ways.

Altering the culture in those institutes where this practice is tolerated will take time, but it must be done if the other employees of the Institutes and the Ghanaian taxpayers are to be fairly treated. All employees of those Institutes where this practice is taking place must be made aware that by taking those jobs away from the Institute, the staff members are hurting the Institute and affecting the livelihood of the rest of the staff. This is especially true when Institute facilities and time are used when conducting the work, but it is also true for the case of the individual who is very careful not to use Institute facilities or time.

While a universal system of time keeping coupled with a job estimating approval procedure will help control this practice, probably the most effective means of controlling it will be pressure from the other employees. The environment within the Institute has to be changed so that the employees who are not the beneficiaries of the practice become knowledgeable about how it negatively impacts them, and where they, in turn, change the culture of the work environment so that those who continue the practice are forced by the culture within the institute to change or leave.

4 1 Incentives and CSIR Guidelines Proposed Consultancy Fee Allocations

If a staff member who makes \$2,000 per year on the Institute's payroll is offered a week-long, private consulting job at a fee of \$1,000 per day along with international travel opportunities, why should that staff member bring the job into the Institute? While this is a purely theoretical problem at some institutes, at others it is a very real issue. The problem takes a different form at some other institutes - it is the controlling of a regular stream of small testing or consulting jobs being done 'on the side' by staff, frequently using Institute facilities and time.

In an attempt to deal with the problem of private consulting and to provide financial incentives to staff members to bring work into the Institute system rather than keeping it for themselves, several of the Institutes have worked out revenue sharing policies whereby the net proceeds of the consultancies are divided between the consultant and the Institute, usually on a 70% to 30% basis, with the larger share going to the party that 'sold' the work. These incentive policies are not identical at all institutes, but then neither are the problems. Also, because of the lack of a long history of dealing with the problem of outside consultancies, the policies are still in the formative stages, and are still being experimented with.

In Section 8.6 of the *CSIR Guidelines for Research Commercialization*, the CSIR Secretariat defines a proposed allocation for consultancy fees, in which the Secretariat attempts to establish a uniform policy regarding Consultancy fees among all RIs. In discussions with staff members who do have outside consulting opportunities, they indicated disagreement with the policy stated in Section 8.6, as it is felt that if each staff incentive payment that is to be made under 8.6(I) has to be sent to the Secretariat and approved by either the Council or the Director-General, then the system is unworkable, and the amount of any incentives actually paid to the consultants will be slow in coming and small in size. Additionally, there is no set policy on how much these incentives will be, and this needs to be established up-front, before the work is solicited.

RECOMMENDATION It is recommended that the second paragraph of Section 8.6(I) of the *CSIR Guidelines for Research Commercialization* be amended to read

"Bonus for exceptional contribution to revenue. An amount to be paid to individual staff members in accordance with the bonus policy established at each Research Institute. Each Research Institute should prepare a written policy regarding Staff Incentive Bonuses, and this policy should be submitted to the Council or Director-General for approval."

5 0 OTHER ISSUES FOR THE CSIR SECRETARIAT

5 1 Goals of Commercialization

There seem to be differences of opinion within the CSIR Secretariat about the goals of Commercialization, and the direction this activity should take. Meetings with the Commercial Director indicate that Commercialization should be an aggressive activity, with an objective not limited to raising only 30% of the budget from Commercialization, but going for 60%, and in time 100%, doing away entirely with the government subvention and becoming a limited liability company. Under this vision, the Institutes should not be focusing on selling consulting services or contract research or advising others on how to produce new methods and products, but rather should be focusing on developing the unique new products and processes themselves, and then exploiting these products for significant added value on the open market. This vision calls for the CSIR and its Institutes to become an aggressive, for-profit business entity. Capital funds required to develop these products and processes would be raised, among other places, by selling shares in the organization to employees through regular wage withholdings.

On the other hand, at meetings with the Deputy Director for Agriculture, the goals of Commercialization were described as being limited to raising only 30% of the Institutes' budgets, and gradually achieving this level of revenue generation by the year 2001. Should the amount exceed the required 30%, it could be used to supplement salaries and to provide other employee benefits. Consulting, contract research and training services would all be acceptable and preferred activities for meeting this goal. Under this vision, commercialization represents only 30% of the Institute's activities, and it should therefore play only a 30% role in defining policy objectives. The other 70% of the objectives and activities of the CSIR and the Research Institutes would remain pretty much as they have existed up to now.

These two versions of the goals for the CSIR are very different from one another and are in direct conflict. As they are both coming from individuals with managerial responsibility within the CSIR, they produce confusing signals and they need to be reconciled so that the objectives are clear to everyone, and so that the agreed upon objectives can be properly pursued.

5 2 Plant Genetics Research Center

In September, 1997, a World Bank financed peer review study of PGRC "very strongly" recommended that PGRC not be subject to the commercialization process. The study felt that the commercialization activities are in conflict with and detrimental to PGRC's mission. The publishing of this recommendation puts the PGRC's commercialization activities in question, and it is important that the CSIR address this issue and promptly make a decision as to PGRC's involvement in commercialization activities.

5 3 Employment Promotional Policy

As has been noted in earlier reports, CSIR's written policy stating the basis for evaluating employee performance is heavily weighted towards the publication of scientific articles. No credit is given for the commercialization efforts that may be made by employees, and as Commercialization is now a clearly stated policy directive, the employment policies need to be revised to reflect this objective. Until the policy is changed, there will be a reluctance among employees to devote time to the commercialization activities, and this policy change should be made quickly. Additionally, because of the efficiencies gained through specialization, the commercialization efforts will not be equally distributed among all employees, and the weighting system needs to reflect that some of the staff will, and should, devote more time to commercialization activities than will others.

5 4 Seed Pricing for CRI

As has been noted in earlier reports, CRI is required to deliver seed to the Ministry of Agriculture at very low transfer prices which are established by the Grain Development Board. This is a significant activity for CRI, and the artificially low price imposed upon the seed reflects poorly on CRI's results. The CSIR should actively work to have the internal pricing policy adjusted so that the transfer pricing policy is transparent, and accurately reflects the market value of the seed.

6 0 MARKETING OPPORTUNITIES

It was the general observation of the consulting team that much of the marketing thought process at many of the RIs has been devoted to trying to figure out how to raise funds from the provision of products and services to their historical clientele, the small farmer, and from the sale of relatively small quantities of products to local businesses. It is the assessment of this team that, in general, and with some exceptions, it will be difficult for the RIs to raise significant amounts of money from these markets, and, while these traditional markets should not be ignored, more productive markets might be found and developed for the provision of contract research services and contract training services to large industrial firms, to large consulting firms and to institutional providers in the agricultural arena. Additionally, the rates will probably be higher and the customers will be more willing to pay reasonable fees if the targeted customers are businesses or organizations based outside of Ghana.

The real assets of the Research Institutes are the specialized knowledge and skills of their professional staffs. If the RIs are to be able to charge a fair price for their output, they need to be selling what they are best at doing, namely specialized research and training, and they need to be focusing their marketing efforts towards those potential customers who can afford to pay. A number of the technical staff members regularly participate in international conferences, seminars and publications. Typically, the other people present at these gatherings have interests in the same activities being conducted by the RIs and are trying to solve similar problems. These gatherings and publications represent an identifiable and qualified source of people and organizations that could possibly be interested in contracting with the Institutes for research or training services, and they might know other people who are also interested. These sources need to be cultivated. Discussions with these potential sources need to be initiated, and the dialogue needs to be maintained over time with follow-up correspondence and repeat visits. All staff members attending seminars and conferences should be encouraged to develop these contacts, and to be on the lookout for possible sources of referrals.

All of the RIs have contacts within the international donor community, most frequently with FAO. While these organizations may, from time to time, have projects for the RIs, equally and perhaps more importantly, the people within these donor agencies have wide contacts with a large number of other people and organizations throughout the world in related fields who may be in need of the services of the Research Institutes. The RIs are encouraged to periodically meet or correspond with the people they know in these agencies, to keep them advised as to what the RI is doing, what it is capable of doing, and to let them know that the RI is interested in and capable of performing contract research work or training. A great deal of the normal commercial activity in the scientific community is obtained through referrals from contacts of this nature, and it is important for these contacts to be kept informed about the RI and to keep the name of the RI fresh in the minds of the contacts.

Another potential source of profitable business can be what might be considered as the RI's competitors, namely other consulting firms, especially international consultants. If a consulting opportunity is found, and if it is a competitive bid situation, rather than bidding for the job directly, the RI might be better advised to approach another bidder, and offer to perform a major piece of the work as a sub-contractor to that firm. This has the advantage of establishing a relationship with that bidder, and that firm may have other jobs in the future on which they might use the services of the RI. Additionally, the fact that the international consultant has chosen the RI as a working partner on a job lends credibility to the RI's reputation as being a quality source of work, not only to that consultant, but also to the bid recipient and to other consultants making bids. Frequently, international consultants will bid for a job for which they do not have all of the required skills, and in the process of putting the job together, they go looking for associated firms. If the RI's name has appeared on the bid list of a known qualified consultant, the RI's name will accrue credibility. This can be a very successful marketing strategy.

Every staff member of every RI that has the potential of meeting other professionals outside the Institute should be equipped with business cards, and they should be encouraged to hand them out whenever they meet someone professionally. The cost of business cards is small, and this is an important marketing expense that all of the RIs can afford to make. Failure to have this small item reflects poorly on the level of professionalism of the staff member's employer.

7 0 STATUS OF COMMERCIALIZATION at RESEARCH INSTITUTES

7 1 Animal Research Institute (ARI)

The consulting team met with the working group which functions as the BDU for ARI. The group consists of the Public Relations Officer, the Institute's accountant, and several scientists. The working group is headed by the Institute's director. Although it would be beneficial to have a full time Marketing Officer on staff, ARI has very limited financial resources and asked whether this position could be funded by CSIR. The BDU has invested considerable thought in its commercialization efforts and the fact that several researchers are on the team can be seen as a strength. They understand what they are selling, but they need to learn more about marketing. The fact that the Director is actively involved in the BDU is a clear signal to everyone that commercialization is a high priority at ARI.

The ARI BDU team is having difficulty finding paying clients and finding opportunities on which to bid. They were very sensitive to their perceived weaknesses, such as the fact that they serve a large number of small farmers who cannot pay them. To date, ARI has only prepared one quotation for outside services, this to a private entrepreneur who wanted a study performed for a cooperative farming venture. Even though ARI presented a proposal to the client which would charge the client only for the out-of-pocket costs of doing the job (travel expenses), and the proposal did not contain any charges for the labor inputs, their proposal was rejected by the client. The BDU was somewhat dismayed by this rejection, and was at a loss as to what to do next. Upon detailed review of the proposal, the consultants could see that the bid was rejected by the client principally because the client has no money, and suggested to the group that they were much better off finding this out before the job was started than they would be if they didn't learn this until after the work was done. The consultants suggested to the BDU that some jobs, such as when the customer does not even want to buy at cost, or when the customer has no money, are best left alone.

The consultants suggested that perhaps ARI would find more success looking beyond its normal 'customer' base for paying clients, looking instead to international sources. The Director indicated that he does attend international seminars, and at a recent meeting he was approached by a Togolese farmer who sells livestock in Ghana and who is looking for a more orderly way of importing and distributing the cattle in the somewhat disorganized cattle markets of Ghana. The farmer suggested a partnership with ARI. While this specific activity may or may not be a realistic activity for ARI, it does reinforce the concept that there are opportunities and markets that can be developed through increased networking and by developing a generally higher profile for the institute. The Director agreed that much of ARI's knowledge and expertise could have value within the greater region of West Africa. ARI should spend time exploring opportunities with the people it knows in the international agricultural field, such as contacts at FAO and other donors.

The staff at ARI has not had any experience with cost accounting or job budgeting, and they expressed a clear need to have good training when the new accounting system is installed. As with the other RI's, the consultants reviewed the procedures that are followed when preparing job

estimates and quotations including preparing a detailed list of all cost elements, assigning costs to them, and working up a detailed budget of employee time requirements (Exhibit IV) Additionally, in order to identify and allocate overhead expenses, the consultants, with input from the accounting staff, prepared an estimate of ARI's overhead costs using their 1995 financial statements This is shown in Exhibit III ARI

7 2 Food Research Institute (FRI)

The meeting with FRI management was attended by over 20 senior operating staff members and included managers from all disciplines of the institute including the Director, the different research divisions, administration, accounting, public relations, and all members of the BDU including the marketing manager The discussion was lively and covered a range of pertinent topics including pricing, costing, cost accounting discipline, the need for time accounting and time sheets, incentive bonus programs, building customer relations, grants, building FRI's customer image, prospecting, required CSIR purchasing procedures and FRI'S experiences to date with commercial activities As noted in APAP III Research Reports Nos 1015 and 1026, FRI staff is not unfamiliar with the issues that must be addressed in running the institute in a competitive commercial environment, and is aware of the importance of addressing them thoroughly and carefully The breadth and quality of the discussion of this meeting indicates that FRI has taken the SFI mandate seriously, and has spent considerable time exploring its ramifications and is preparing itself to deal with it in a positive, and aggressive fashion The group also seems to be fully aware that they will be receiving little in the way of outside support, and they appear to be preparing to solve the problem of reduced government subventions themselves

FRI has established a BDU using internal staff resources, and has assigned to it an accountant, a marketing manager, a public relations officer and has given the responsibility for heading the BDU to an experienced research director Both the marketing manager and the public relations officer are working for the BDU full time, and the accountant devotes a large portion of his time to the BDU

The group recognizes the difference between pricing and costing, and also recognizes the need for preparing detailed cost estimates in preparation for making pricing decisions There also appears to be a clear recognition and agreement that different pricing tiers are appropriate for different customer groups, depending upon their circumstances Some FRI clients, by their nature, will continue to receive FRI assistance at no cost, some will be charged the out-of pocket costs, some will be charged low salary costs, and some will pay international rates The institute's mandate to be a public service research organization is clearly recognized, and there is also a recognition that a balance must be maintained between commercialization needs and the need for serving the public

The management group expressed their desire for a more comprehensive accounting system so that they can have more easily obtained cost information, both for bidding and for managing

They stated that they are currently able to adequately track costs and to prepare job budgets, but it is only done with a great amount of work. They were pleased to learn that the Secretariat has undertaken a project to acquire and install a comprehensive, integrated job-cost accounting system in all RIs.

The following commercialization pricing example offers a demonstration of the state of commercialization skills at FRI. Because of prior good experience with FRI, an individual at FAO recommended FRI to a Norwegian financed consortium as a source for quality lab work. A request for proposal was received by FRI for a substantial contract research job that was estimated to take 2 years. The proposal was systematically analyzed within FRI by multiple disciplines. The required work program was laid out, time budgets were explored, and realistic completion dates established. Cost estimates, including both out-of-pocket and labor were worked up, and the labor was broken down by salary class. Once the anticipated costs were identified, an examination of competitive labor rates was made, and a decision was made to price the proposal using international labor rates, but to use the low end of the scale because of FRI's lack of track record in the international market. Even so, the labor rates used represent a more than 15 times mark-up of FRI's labor costs. FRI's bid proposal was accepted by the customer, and work on the project has begun. Current experience on the project to date indicates that the job will be completed under budget and that it will be delivered to the customer well before the deadline date.

The second meeting at FRI was attended by the members of the BDU plus the FRI accountant, and the meeting concentrated on job-cost accounting issues. The accounting staff appears to have a good understanding of the principals of job cost accounting, but lacks practical experience and needs exposure to common solutions to application issues. The need to establish a job numbering system in order to facilitate standard record keeping was discussed, as were time keeping procedures and accounting for miscellaneous consumables such as routinely used laboratory chemicals. The need for the accountants to establish practical job cost systems that strike a reasonable balance between tracking costs and paperwork load was also explored. The cultural impact that these changes (such as time sheets and vehicle logs) will have on the institute's staff and the corresponding need to get started introducing them now was also discussed. The accountants voiced concern that they be properly trained on the new system when it is introduced to their institute.

Unfortunately, FRI was one of the first RIs visited by the consulting team, and therefore did not have the benefit of the consulting team's experiences with other institutes. Specifically, Exhibits II, III and IV were not presented to FRI's accounting staff, and FRI's BDU members and other senior managers are encouraged to review these exhibits closely. FRI's BDU is encouraged to work up Exhibit III using FRI's own numbers.

While FRI is currently able to accumulate and project costs, the introduction of a new, comprehensive job-cost accounting system will impose a substantial number of changes on the working practices of all employees, and the institute's accounting staff is encouraged to start

introducing some of these changes now, so that the staff has time to acclimate to the changes. Specifically, a job numbering system, employee time sheets and time accounting system, vehicle logs, and laboratory chemical accounting system should be developed and put in place.

FRI should examine how it was able to obtain the contract work it has achieved to date so that it gains an understanding of how business relationships are built and maintained. Past contacts with individuals throughout the world are a strong source for future business, and these contacts need to be continually reminded of FRI's existence and capabilities. After being referred to a customer, the institute should be sure to follow-up with the referring source and offer the institute's appreciation for the referral.

7.3 Water Resources Research Institute (WRRI)

The status of commercialization activities at WRRI has been pretty stable since they were described in APAP III Research Reports Nos. 1015 and 1026. The internally staffed BDU has been expanded to include four part-time members - a Research Scientist with experience managing long-term projects, the Scientific Secretary, an Accountant and a member of FRI's Administration staff, but no marketing experience is represented within the BDU. However, the Director and one or two of the other senior research staff have developed significant external and international contacts, and these have produced a number of international research contracts for the institute, to the point that they are now providing approximately 20% of the institute's revenue.

These international contacts are an extremely valuable resource to the institute, and with proper attention, they could be developed into a substantial source of on-going business. The institute is encouraged to either assign or hire an individual with a combination of scientific credentials and marketing knowledge into the BDU and place upon them the responsibility to help the scientists who have these contacts develop and grow them more fully. Additionally, the more senior scientists should take responsibility for introducing the younger scientists into the international arena and encouraging them to develop additional networks of contacts so that these sources are not lost with the departure from the institute of any given individual. If an existing scientific staff member is given this responsibility, then the institute should find and fund suitable training for that person in the marketing of scientific services.

As an aid to making the development of international contract research a priority, the BDU and senior management should set for themselves realistic goals and time frames for achieving this. These goals should be quantified, and should include not only targets for the amount of business to be developed, but also, and perhaps more importantly, targets for numbers of new customers. This type of business can be built into a strong, long-term business source, but it will only happen if it is deliberately made to happen, and the setting of goals and targets will give this a focus.

The discussion at the meeting turned to job-cost accounting issues, including time accounting, accounting for sundry laboratory chemicals and accounting for and controlling

telephone expenses. The need to install a job numbering system so that all time and all expenses can be charged to a cost center and the need to establish a time reporting system complete with time sheets was explored in some detail, and this was then flagged to be followed up with the accounting department. To account for and allocate the costs of commonly used laboratory chemicals, it was suggested that the total annual expenditure for these chemicals be determined, and that this then be divided by the total number of scientists and the average number of lab-days per scientist-year so as to determine an average sundry chemical cost per scientist lab-day. Then, when preparing job quotations, this number can be inserted into the calculations so that these costs are covered.

If the current honor system on the telephones is not working and the phone bill is getting out of control, then the institute may have to change to a system whereby all long-distance calls are blocked and can only be placed by a central operator who will maintain a log of the calls, duration, caller and cost center to be charged.

A small meeting with the staff accountant of WRRRI and the Personnel Director was held where the procedures for determining a reasonably accurate overhead rate were discussed. Exhibit III (WRRRI) was prepared at this meeting, and its ramifications were discussed in detail. Currently, WRRRI has been using a cost multiplier of 1.2 to account for overhead allocations on job estimates, rather than the 6.23 that Exhibit III calculates as being necessary (based upon 1995 figures and rough estimates of employee time allocations). This discrepancy was caused primarily because of the lack of recognition of salary based overhead expenses. Readers are referred to earlier sections of this report for further discussions about the significance of this multiplier.

7.4 Crops Research Institute (CRI)

Apparently the notice of the visit by the consultants to this institute was mislaid at CRI until the day immediately prior to our visit, and as a result the meeting was not adequately publicized and was only sparsely attended. The meeting attendants varied between 6 and 9 people at different times, and included the Senior Administrative Officer, the accounting staff, the Chairman of the interim BDU, the Assistant Administrative Officer and several individuals involved with farm management. Only one scientist from the research staff attended, and she was present for only a limited portion of the meeting. As a result, much of the planned discussion involving the need for the senior staff to be concerned with and involved in the issues surrounding commercialization (especially time keeping) was not pertinent, and the opportunity to discuss these issues with this audience, and to reinforce the importance to each of them was not available.

To date, CRI has not entered into any significant commercial activities other than the sale of by-products from its field stations. Those present at the meeting indicated that the research staff has shown little interest in working on possible solutions to the problems that will be generated by a reduced subvention from the Government, and that to their knowledge, no effort at generating contract research or other professional activities that might produce revenue has been

undertaken. Therefore, the subject of pricing was of limited interest, and there were no concrete examples to use as a model.

The accounting staff, however, was eager to explore issues related to cost accounting, and was thoroughly sympathetic to the need to include the cost of personnel time into their responsibilities.

CRI operates 8 field test stations, or farms, and the accounting issues surrounding farm management can be difficult, especially when dealing with a number of remote sites. The accounting staff appears to have a good working relationship with the farm management staff, and there appears to be a good understanding of and respect for accounting issues among the farm management individuals present at this meeting. This past spring, in an effort to 1) develop this positive relationship further, 2) increase the farm managers' understanding of the accounting information needs of the accounting department, 3) improve the quality and timeliness of the information sent from the field stations in to the central accounting office, 4) enhance the value of this information to the farm managers themselves and 5) increase the accounting department's ability to provide accurate cost information, the accounting staff developed a two-day course on accounting management issues, complete with a number of internally designed forms, and presented it to the senior farm managers. This effort appears to have been quite successful, and the farm managers present at our meeting were most supportive of the concept of understanding well all of the costs of any project, even if the project is to be given to the beneficiaries at no charge, and to view their responsibilities to obtain and report accounting information in a positive manner.

As with all of the research institutes, the bulk of CRI's books of account are manually prepared. The accounting department has two personal computers, and since 1991 has been using a spreadsheet developed with Quattro Pro (a spreadsheet similar to Lotus 1-2-3) to calculate the payroll on one of them. The second PC is used primarily for miscellaneous analyses and for the maintenance of physical inventory records (quantities only).

CRI has had a long-term working relationship with CIDA, the Canadian aid agency. Several years ago, in an effort at institutional strengthening of CRI, CIDA funded the development and installation of a computerized accounting system based upon the commercial accounting package *DAC Easy*. The chart of accounts was set up, the staff was trained, and the system was used for a short time. In the fall of 1995, however, the accounting staff learned that CSIR was undertaking a project to computerize all of the accounts of the RIs, and that the *DAC Easy* system was not favored by the Secretariat. A consultant was sent to CRI by the NARP project office of the Secretariat to study the accounting needs of the Institute, and CRI ceased using *DAC Easy*. The CRI accounting staff has seen no further activity on this project since the consultant's 1995 visit.

The bulk of the meeting focused on the accounting and job budgeting issues that were presented to all institutes, including preparing a job numbering system and assigning job numbers.

to activities, the need for gathering time keeping information from all staff, the difficulties that this will present to the accounting staff in the future because of staff resistance to this change, the presentation of a sample time sheet, the suggestion that those present at the meeting start keeping time sheets for themselves, and the presentation of a simple method of allocating overhead expenses through standard hourly labor rates. As CRI has had little opportunity to prepare quotations for commercial work, and as the meeting attendants indicated that prospects of having quotations to prepare do not appear to be likely in the near future, only limited time was devoted to the issues related to setting prices once the cost estimate has been prepared.

7.5 Forestry Research Institute of Ghana (FORIG)

FORIG is well endowed with modern facilities and equipment, and its financial condition is currently among the strongest of all of the institutes. Over the past several years FORIG has generated a significant amount of outside revenues from writing and winning grant proposals. FORIG is currently fulfilling the terms of 10 active grants which have been received from almost as many different organizations. On the other hand, while much thought has gone into other ways to increase outside revenues, such as the sale of consulting services, contract research, products and by-products, FORIG has not yet been able to generate a significant amount of funds from these activities.

Historically, much of the push behind grant writing has come from the Institute's Director. The Director just retired, however, and the Institute's Deputy Director has been appointed to the job of Acting Director. Effective the first of November, 1997, the Acting Director organized a BDU made up of 5 individuals with different backgrounds - the Accountant, the Administrative Officer, the Scientific Officer and two from the technical staff. While no marketing person has been assigned to the BDU, the Acting Director indicated that he understands that the CSIR Secretariat has been working towards obtaining individuals with marketing skills for the RIs, and he is waiting to see what results from this effort will be offered by the Secretariat.

Grant writing doesn't automatically come to mind when the term "Commercialization" is used, and it would be very easy for the BDU to overlook including this important source of funds in its description of the activities for which it is responsible. This would be a serious mistake. Writing and winning grants requires a significant, continuing effort at identifying, organizing, developing and maintaining contacts among organizations providing this type of funding. The active effort of obtaining grants and cultivating donors must be continually pursued if the Institute is to maintain and maximize its contacts in this important area, and, since the Institute already has a number of active contacts for which it is working, the BDU should put the pursuit of grants first on the list of its priorities. The Institute has already achieved a great deal of success in this area, and if this activity is properly organized and conducted, it could continue to be the Institute's principal source of outside funding.

The meeting at FORIG was held in the Institute's auditorium, and was attended by almost 30 staff members. Even though the setting was formal and the room does not easily lend itself

to a lot of 'audience' participation, the discussion was lively and broad based. From the discussion it was clear that the staff at FORIG understands completely the need to accept the responsibility of generating a portion of its own revenues, and that they have been actively thinking about it and have been making efforts to do so. The discussion covered a variety of potential marketing opportunities that have been explored by the staff, for both products and services, and the problems the staff has experienced with trying to establish prices for these products and services.

These issues led the meeting into a discussion of the procedures that are used when estimating future jobs and setting prices. The differences between historical job cost accounting, the process of estimating the costs of future jobs and the issues to be considered when setting prices were discussed in detail, and the discussion also dwelt at length on the need for and the importance of maintaining individual time sheets and putting in place a system for time accounting. A sample time sheet was presented, and the need for the staff to be realistic and reasonable in their time assignments was reviewed. There appeared to be general agreement among the staff that time keeping is an essential requirement if the Institute is to be able to properly identify and control its largest single expense.

The meeting then turned to the methods used in preparing job estimates, including the identification of direct costs and labor inputs. This led to a discussion of the need to identify and allocate overhead expenses, and, most importantly, to the fact that there are significant amounts of employee costs that are actually overhead expenses and which are not accounted for separately by the Institute's accounting system, and that these need to be identified and allocated to the cost of the work performed by the Institute. A detailed work-up of this procedure was presented using FORIG's own financial information. (See Exhibit III, FORIG)

The staff at FORIG appeared to appreciate the efforts of the consulting team, and from the discussions it was clear that presentations on time keeping, job budgeting, overhead calculations and pricing were meaningful to the participants, and that they will be helpful in providing a framework for preparing future job estimates and for setting prices.

7.6 Soil Research Institute (SRI)

The meeting was attended by 16 senior staff members including the Deputy Director, an accountant and several members of the BDU. While SRI seems to have accepted the inevitability of commercialization, they did not sound confident of their own prospects. This RI's commercialization potential revolves around three areas: the market for contract research, testing and consultancies, the market for soil maps produced by SRI, and the 'market' represented by grant writing and funding. Research and consultancies are difficult to sell to local farmers due to the fact that the benefits, although real, only become apparent in the longer term. Maps on the other hand are more tangible and might therefore bring in revenue sooner.

It became clear during the meeting that when assessing their market potential, SRI managers tend to think and act locally. They see their market consisting mostly of small farmers. There has not been a lot of outreach to international or private business markets although they have considered offering consulting services to the mining industry. The potential of developing grants from international agencies has not been given adequate attention, and could be a viable source of funds for this institute. Additionally, SRI's services are complementary to the services of several other RIs, including FRI, SARI, WRI and CRI, and the group was encouraged to explore the possibility of entering into joint efforts with these Institutes.

SRI is the only institute to have hired a BDU marketing person from outside the institute. While this individual has studied marketing at the undergraduate level, she does not actually hold a degree in the field. Consequently she is more junior than one would expect a marketing officer to be - her official title is Marketing Assistant. The Marketing Assistant and the Scientific Secretary appear to be the driving force behind the BDU. The lack of a senior level marketing official may make it difficult for the BDU to be a strong influence on the senior staff. The BDU has identified some additional potential sources of business, notably the mining sector for environmental impact analysis and the Ghanaian Investment Promotion Board. The BDU cites lack of funding as an impediment to their outreach efforts.

SRI expressed the confusion between pricing, job costing and job budgeting typical of most RIs. In addition, their potential for sales of maps and soil surveys present an unusual job costing problem. While there is considerable expense involved making the first copy of a map, from research, soil analysis and composition of the maps, there is very little cost associated with producing additional copies. The recommended method is to estimate the number of copies to be sold and spread the total cost over that number. The consultants presented the need for time accounting and time sheets, and also, in detail, worked up the overhead cost allocations for SRI using SRI's own numbers for 1995.

After the main meeting, a follow-up meeting was held with the BDU team. They expressed concern that many local farmers, large and small complain that SRI's prices are too high. It was pointed out that this is a market segment accustomed to receiving CSIR services free, and that SRI would probably have to look to different markets if it is going to be able to develop paying customers. The BDU expressed a desire to explore new marketing ideas but did not feel terribly confident in their ability to do so. They were very concerned about budget cuts and lack of money hindering their efforts. Ultimately, the SRI BDU and the rest of the SRI management team will have to adopt the mind set of many other RIs that the commercialization is a necessity, and that it's largely up to them to make it work.

7.7 Savanna Agricultural Research Institute (SARI)

As noted in APAP III Research Report No. 1026, SARI has assembled a Business Development Unit comprised of approximately 12 individuals with a variety of job responsibilities within SARI including a number of group leaders and operational managers. Additionally, in the

interim period since that report was written, SARI has actively looked for a person with marketing skills and has interviewed individuals for the permanent position of Marketing Manager. SARI's Director has made a tentative selection from the people interviewed and has forwarded this person's CV to the Commercial Director of the Secretariat BDU for comment and approval. SARI is prepared to hire this person if approval is received.

Most of the Business Development Unit members were present at our meeting. While commercialization is going to be difficult for this institute because of the clientele served and its limited ability to pay for services, the quality of the discussion indicated that the BDU has been actively thinking about commercialization issues, and that the group has faced and wrestled with many of the problems that commercialization brings before them. While the BDU may not be eagerly looking forward to commercialization, they have come to the point where they acknowledge that it has to be done, and they are the ones that have to do it. This is an important and positive step in the process of change.

SARI has, for many years, received long-term support from the German donor GTZ. This support is scheduled to end in December, 1999. A project review is scheduled for February, 1998, and SARI management hopes to be able to arrange for this support to be continued at a reduced level for the following several years rather than being abruptly terminated, but it is not known at this time whether this will be possible. Therefore, with the Ghanaian budget subvention being reduced and the GTZ level of support being either reduced or eliminated, it is clear that SARI must find significant additional sources of revenue.

The Director indicated that AGSIP, a World Bank funded project involving agricultural research work, may start up in March, 1999, and SARI is hoping to actively participate in this program and has been participating in preliminary planning. Additionally, SARI has participated in the writing of several small international collaborative research grant proposals, and the Committee has been evaluating the possibility of doing research or consulting work for a regional soybean oil processing company. Furthermore, SARI went to the 10 regional cotton companies as a group and explained the budgetary pressures being planned, put forth a statement of SARI's value to these companies, and got them to agree to support SARI at a combined level of \$38,000 over the next 3 years. To date, only 3 of the 10 companies have agreed to this commitment, but the process has been initiated, and some positive results have been achieved. Other activities being considered by the Committee are the possibility of instituting a cotton breeding program and a cotton testing program, instituting small user fees on its pamphlets and continuing to offer its vehicle repair capabilities to the public. SARI recently provided training, for a fee, to employees of a local industry, but as they were uncertain how to charge for this activity, they have not yet worked up a price, but intend to do so. From the above, it is evident that the Committee is actively exploring options, and that its horizons have been expanded since these consultancies started approximately a year ago. However, many of the activities have a relatively small potential return, and SARI will have to turn up a number of these activities unless it can find some projects with larger returns.

During 1997, SARI received funding from GTZ for a computerized accounting system. Jecty & Co, a consulting company from Accra, has been hired to oversee the installation of the accounting software "SCALA 3.1" release 5 which is a PC DOS based accounting package developed by a Swedish company in the mid 1980's and modified in 1993 and marketed by a British company. The package has a cost accounting module and a payroll module, but at this time these two modules have not been enabled. The package is capable of running on a PC based network, but the system is currently running in single user mode, and it is not known whether a multi-user system is planned by GTZ or the consultant. If a network is not planned, then only one person at a time will be able to access the system, and a lot of the detailed information will probably have to be summarized by hand prior to entry, which is the way the system is currently being operated. This problem will be aggravated as additional functionality is added to the system such as payroll and full job-cost accounting. Currently, the computer is placed on a very small table in a corner of a small room that is nearly filled with two computers and printers. There is no work space at or adjacent to the keyboard and monitor, and it will be difficult to perform data entry efficiently unless more work space is provided so that input documents and other papers can be spread out while information is being entered.

The SARI accounting staff first started entering information into the SCALA system effective with September, 1997 data. They plan on putting all of 1997's accounts on the system, and as of November 2, 1997, had so far back-posted January, February and March, 1997 data. The system is being run in parallel with the existing manual accounting system, and therefore represents a considerable increase in the workload of the accounting department. The accounting department's other computer is still being used to prepare the payroll using the Quattro Pro spreadsheet based system that has been in use at most of the RIs for some time. The chief accountant stated that it is his understanding that eventually the payroll module of the SCALA system will replace the Quattro Pro system, but a time schedule for this is not known. The accountant indicated that the implementation plans for the system are being managed by the consultant, and that the consultant was due to return to SARI in the near future to review the progress and perhaps enable further features of the system. The accounting staff has been so busy with trying to keep up with running two systems in parallel that they have not been able to devote much attention to just how far the SCALA system will go in implementing additional accounting features such as job-cost accounting. As the salaried staff of SARI does not keep time sheets, this important element of cost accounting has not yet been addressed, and in our discussions it was clear that the need for time keeping had not been discussed with anyone at SARI.

The new computer running the SCALA system, a Pentium 133 with 16MB, was equipped with an Uninterruptable Power Supply, but a means for backing up the data on the system was not apparent. Once the system becomes fully functional, SARI management must satisfy themselves that adequate backup procedures are in place to recover the system should there be a corruption of data or other failure and that these procedures are diligently followed.

The meeting with the Business Development Unit was focused on issues concerning the three separate but closely related activities of job-cost accounting (historical costs), job estimating

(projecting future costs), and to some degree, pricing. It was pointed out to the BDU members that of SARI's total expenses for 1995 of 1,151 million Cedis, 554 million Cedis, or approximately 50% of the total, went to staff salaries and other employment related expenses. Unless detailed information is available about how this money is spent on individual projects and non-project activities, it will not be possible to have the information necessary to assign costs to jobs.

The need to put in place a system where all employees keep track of and report how they spend their time was discussed in detail, and a sample time sheet was presented. The thought of professional staff filling out time sheets was met with some scepticism by some, but others seemed willing to give it a try. One researcher thought it would be difficult to record his wide variety of activities such as visits to farms, work done at night and travel to offsite meetings, another thought that time sheets should apply only to 'commercial' activities. On the other hand, one scientist likened the process to keeping a diary, and found it acceptable on that basis. The employees at the meeting were encouraged to experiment with the problems associated with keeping time sheets by starting to keep track of their own time and preparing time sheets.

The need to develop job numbers or cost centers was also discussed, and the chief accountant indicated that this had been discussed with the consultant installing the new accounting system, and he expected that a cost center numbering system would be offered by the consultant.

The procedures to be followed in preparing job estimates, that is budgets for future jobs, were outlined. Preparing job estimates is a collaborative effort involving both the accountants and the job managers. The accountants can assign cost amounts to the different job elements, but the project managers are the only ones who can identify all of the different requirements of the job and the staff times that will be required to carry out the work including the out-of-pocket, or direct expense items and the labor inputs and the total elapsed calendar time. After all of the pieces are identified, the accountant can assign cost estimates, as well as overhead allocations. Please refer to the job estimating section of this report for a more full description of the elements of this process.

The meeting then worked up a simplified way to generate labor rates that include a full allocation of overhead costs. This was done using SARI's 1995 financial statements and estimates from the staff present as to the number of employees being paid and the number of employees who are on paid leave. (Please refer to the job budgeting section of this report for more detail. See also Exhibit III SARI.)

SARI's principal customer base is the small farmer who cannot afford to pay much, if anything, for SARI's advice and products. Additionally, the government of Ghana is subventing SARI for the expressed purpose of supporting these small farmers. Not only is it not possible for SARI to charge this customer base for its services, it is not expected to do so. What is necessary is for SARI to develop a tiered pricing system, where the targeted market segment is identified, and the pricing is established after factoring in the targeted segment's ability to pay. The smaller

farmer will simply do without rather than paying for much of SARI's input, and if SARI fails to provide these 'customers' with its products, it will fail to live up to its mandate. Therefore, in order for SARI to continue servicing its principal, and historical, customer base, it must look to other market segments that have a greater ability to pay, develop products for them that they perceive as valuable, and charge these customers accordingly.

The meeting members asked advice on how to market the institute. SARI's remote locations was seen as a liability, and there is concern that the institute loses contracts to more prestigious researchers in Accra and Kumasi. The consultants suggested that they consider their location a strength. SARI could create an identity which stresses their practical, on-the-ground expertise and proximity to farms.

7.8 Plant Genetic Research Centre (PGRC)

During September, 1997, a World Bank financed peer review study of PGRC "very strongly" recommended that PGRC not be subject to the commercialization process. This study felt that the commercialization activities are in conflict with and detrimental to PGRC's mission. PGRC's commercialization activities are in question until this issue is resolved, and the motivation of the staff to pursue commercialization has been undercut.

PGRC appears to be the poorest funded of the institutes visited, with very limited assets and no excess funds. The Center has no funds available for investing in commercialization, and will need assistance if it is to actively pursue outside revenue sources. The consultants met with a group of 8 staff members of PGRC including the accountant, the auditor, a farm manager and 4 scientific staff members. The BDU at PGRC currently consists of only two members, the accountant and the Scientific Secretary. The group is waiting for the Secretariat to supply a Marketing Director, and to provide funding for commercialization activities.

The BDU is still in the formative stages, and has been attempting to identify commercial activities including the propagation of seedlings, the growing of spices, vegetable seed production, developing medicinal plants and offering training and consulting services to farmers. As much of what the Center currently sells is seeds and seedlings, the accountant has been very concerned about establishing costs for these by-products so that the required payment to CSIR on outside 'profits' can be made. Because of the difficulties surrounding determining costs by-products to the normal activities of the Center, the accountant proposed a scheme whereby the BDU would operate as a separate business, independent from PGRC, and that internal sales prices for by-products would be established, and the PGRC would sell these seeds and seedlings to the BDU. In this way, the internal sale price would be the 'cost', and therefore a profit could be determined and the fee to CSIR calculated and paid.

The consultants encouraged the group to not devote a lot of time and effort on determining the costs of by-products, and that, instead, the group might find it more productive to consider wider markets, markets beyond Ghana's borders including grant funding and international

consulting The need for accounting for the salary expenses and employee time was reviewed, and a sample time sheet was presented The steps for making job estimates was also gone over, and the problem of allocating overhead costs was discussed and the procedures for doing this were presented using PGRC's on numbers from its financial statements

PGRC has not had opportunities to bid for consulting work, so they have no experience in job budgeting, and this, coupled with the pending recommendation that PGRC not commercialize, meant that the discussions of pricing and overhead cost allocation were more academic than practical

7 9 Oil Palm Research Institute (OPRI)

The meeting at OPRI was attended by nine members of the senior staff including the BDU team OPRI's BDU consists of a committee of six staffers, including two assistant accountants and an assistant administrative officer The search for a Marketing Officer is just beginning OPRI, however, seems inclined to rely on its own people to lead the marketing effort

OPRI has developed an international reputation as experts in oil palm, and has developed a number of working relationships with oil palm producers in Malaysia, Philippines, Indonesia and Sri Lanka At the time of the team's visit to OPRI, there was an Indonesian scientist spending one year at OPRI on a training program, and OPRI's Director and the Director-General of CSIR left on a working trip to Southeast Asia However, despite this active involvement, it is unclear whether OPRI has been able to capitalize on these relationships and to make any significant money from its international activities Discussions with the staff indicated that to date OPRI has been trying to earn outside revenue primarily from sales of germinated seeds, rather than from its international work The institute seems to be focusing its on seed and product sales, rather than focusing on the real strength of the Institute which is its knowledge and many years of experience

OPRI has an important opportunity because its expertise is in a product area that is a widely used commodity in which there is considerable international interest At the time of our meeting, OPRI had limited experience pursuing research and consulting opportunities although the team expressed an interest in this type of work OPRI is looking for guidance concerning how to break into the field of consulting and contract research They cited a recent case in which a local office of Unilever, a large international firm with operations in Ghana, hired a European consultant to solve a problem in an area in which OPRI has the leading state-of-the-art expertise, even though the European consultant had no relevant experience with the problem On his way to work on the problem for Unilever, the consultant visited OPRI and gathered much of the information he needed to address the problem A staff member at OPRI had bid for the job, and even though he had published technical articles on the specific problem being addressed, the client chose a different consultant, one they had worked with before, even though that consultant was not expert in the specific problem being addressed

Clearly one of the challenges OPRI faces is that they are not known as a player in international consulting and have not tapped into the international network of referrals and recommendations that propels most consulting businesses. In the previous example, a job was lost largely because the client chose to work with someone who they knew, from prior experience, would get the job done for them, rather than taking a chance with someone with whom they did not have previous experience. Most consulting assignments come through personal relationships that have been built over time so that trust is established. In order to break in to this circle of relationships, OPRI might consider subcontracting with a well known consultant, providing the specific knowledge that consultant needs on a specific job, and getting exposure at the same time.

Another challenge facing OPRI is an institutional one. Large, usually foreign-owned growers known as development estates are major players in the palm oil industry in Ghana. According to OPRI, the government has agreements with these development estates which cause them to favor international consultants over a local entity such as OPRI. This is the only time the consultants were told of such a situation. It could be an impediment to OPRI's commercialization effort and may need to be looked at by the appropriate decision makers in government. OPRI is encouraged to take this matter up with the CSIR Secretariat, and to request their help in pushing a resolution of this problem through the higher levels of the government. This support of an institute at the government level is exactly the kind of role that the Secretariat should be playing.

The meeting turned to accounting, costing and pricing issues. While OPRI does not have a time keeping system in place, OPRI staff seemed to understand the need for time keeping better than the staffs at other institutes. OPRI makes a serious effort toward associating costs with jobs, including employee time, primarily through the use of the *INFORM* project management software. However, instead of having a permanent time reporting system in place, employees are asked, once per year, to keep track of their time for a short period, approximately a month, and from that to project how they spend their time over the course of a year. These time estimates are then entered into *INFORM* and the results are used for the rest of the year as a guide for planning. (One of the limits faced by the staff is access to computer time. The Institute has one computer, a very slow 286.) While the staff seemed more accepting of the idea of continually maintaining daily or weekly time sheets than most institutes, a concerted effort will be required to make time sheets part of everyday life.

The procedures for costing for produce and products seems to be well understood by the accountants and management of OPRI. They were less comfortable, however, with their ability to cost and price consulting and other professionally based services. They expressed problems with overhead determination and allocation, and the consultants suggested they circumvent these problems by using a top down, or macro, approach such as the one described in earlier sections of this report. This method, and the resulting work-up of overhead rates, was presented to the meeting, and Exhibit III was worked up using OPRI's own figures.

While the OPRI seemed to have a sophisticated understanding of costs and cost structures, they seemed to have difficulty separating pricing policy from costing. Pricing is an area of

considerable concern for OPRI. Their tendency is to price based on cost plus a markup or “profit margin.” The consultants stressed the need for OPRI to recognize that many of its offerings are unique and should be priced according to their value in the market, rather than according to their cost. When encouraged to think this way the OPRI group became much more creative in its thinking, suggesting a number of pricing schemes--some better than others. For example, because this institute has a potential market which is quite diverse, a multi-tiered pricing approach which offers favorable prices to small farmers seems appropriate. It was noted, however, that much of their germinated seed is sold to large growers known as development estates. These estates sell some of what they buy to small farmers, which would complicate a pricing scheme that charged higher prices to the estates. Nevertheless, the group adopted a more constructive thought process which should lead to prices that more closely reflect the value of their work. OPRI is also concerned that potential customers are claiming that their prices are too high. This suggests the need to strengthen negotiating skills within the institute.

Employment Expense and Salary Expense Compared to Total Expenses

| | 1995 | | | | | |
|----------------------|-----------------------|---------------------------|------------|----------------------|-----------------------|--|
| | <u>Total Expenses</u> | <u>Employment Expense</u> | | | <u>Salary Expense</u> | |
| Crops | 1,267,296,745 | 914 902,220 | 72% | 523,700,641 | 41% | |
| SARI (Note 3) | 1,151,868,280 | 554,159 704 | 48% | 452,788,715 | 39% | |
| Oil Palm | 1,035,576,177 | 669,019 767 | 65% | 560,799,093 | 54% | |
| Forestry | 711,226,966 | 513,670 515 | 72% | 467,462,086 | 66% | |
| Soil | 649,086,397 | 518,859 744 | 80% | 395,548 758 | 61% | |
| Animal | 557,664,151 | 441,000,384 | 79% | 334,429,498 | 60% | |
| Food | 490 368 012 | 360 668 804 | 74% | 278,880 464 | 57% | |
| Water | 469,043 551 | 350 609 192 | 75% | 263 044 789 | 56% | |
| PGRC | 197,368,953 | 127,896,883 | 65% | 97,859,855 | 50% | |
| Total | <u>6,529,499,232</u> | <u>4 450,787 213</u> | <u>68%</u> | <u>3,374,513,899</u> | <u>52%</u> | |

- Notes 1) Salary Expense is one component of Employment Expense
Other components include Superannuation Social Security Taxes
and various allowances
- 2) Direct, out-of-pocket research expenses such as chemicals day
labor, etc are not included in Total Expenses but are charged to
the Development Fund and are not reflected in the Income Statement
- 3) SARI operates an active vehicle maintenance facility which is open
to the public Total Expenses include 187 132,408 Cedis in non-salary
expenses for this operation

If these expenses are excluded, then SARI's numbers change to

| | | | | |
|-------------|-------------|-----|-------------|-----|
| 964 735 872 | 554 159 704 | 57% | 452 788 715 | 47% |
|-------------|-------------|-----|-------------|-----|

And the combined total becomes

| | | | | |
|---------------|---------------|-----|---------------|-----|
| 6 342,366,824 | 4 450,787,213 | 70% | 3,374,513,899 | 53% |
|---------------|---------------|-----|---------------|-----|

WEEKLY TIMESHEET

Exhibit II

EMPLOYEE NAME _____ WEEK ENDING _____

| Job Name | Job Number | Mon | Tues | Wed | Thurs | Fri | Sat | Sun | Total |
|-------------------------|---------------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Feasibility | WB-001 | 1 | 6 5 | 4 | 2 | 2 | | | 15 5 |
| Tests | FA-001 | 6 | 1 5 | 3 | 3 | 5 5 | | | 19 |
| Admin | 000 | 1 | 0 | 1 | 3 | 0 5 | | | 5 5 |
| | | | | | | | | | |
| <i>Sick Leave</i> | <i>S-001</i> | | | | | | | | |
| <i>Vacation Holiday</i> | <i>VH-001</i> | | | | | | | | |
| <i>National Holiday</i> | <i>NH-001</i> | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Total | | 8 | 8 | 8 | 8 | 8 | 0 | 0 | 40 |

EMPLOYEE SIGNATURE _____

MANAGER SIGNATURE _____

Procedure for Calculation of Overhead Rate (Salary Multiplier)

(ARI s 1995 Figures used for demonstration)

| | | | |
|----|---|-------------|------------------------------|
| 1 | Total Annual Expenses (Generally this is the largest number on the Income Statement It does not include direct (out-of-pocket) research costs) | 565 044 862 | |
| 2 | Total Annual Employment Expense per Income Statement | | N/A |
| 3 | Total Annual Salaries per Income Statement | 334 429 499 | 59% |
| 4 | Total Number of Paid Employees | 300 | |
| 5 | Number On Paid Leave | -8 | |
| 6 | Number of Pure Overhead Employees (Not charging time to actual jobs or projects) | -67 | |
| 7 | Number of Producing Employees | 225 | |
| 8 | Estimated Average % of Time Actually Producing | 60% | |
| 9 | Actual Productive Man Years Available | 135 0 | (Line 7 times Line 8) |
| 10 | Average Annual Salary per paid employee | 1 114 765 | (Line 3 divided by Line 4) |
| 11 | Total Annual Cost per Actual Productive Man Year | 4 185 517 | (Line 1 divided by Line 9) |
| 12 | Overhead Markup - Multiplier of Salary Rate required to cover total costs | 3 75 | (Line 11 divided by Line 10) |
| 13 | Divide by 9 for CSIR Secretariate Commission (10%) | <u>4 17</u> | Final Labor Markup |

Procedure for Calculation of Overhead Rate (Salary Multiplier)

(WRRRI s 1995 Figures used for demonstration)

| | | | |
|----|---|-------------|------------------------------|
| 1 | Total Annual Expenses (Generally this is the largest number on the Income Statement It does not include direct (out-of-pocket) research costs) | 469 043 551 | |
| 2 | Total Annual Employment Expense per Income Statement | 350 609 192 | 75% |
| 3 | Total Annual Salaries per Income Statement | 263 044 789 | 56% |
| 4 | Total Number of Paid Employees | 138 | |
| 5 | Number On Paid Leave | -6 | |
| 6 | Number of Pure Overhead Employees (Not charging time to actual jobs or projects) | -70 | |
| 7 | Number of Producing Employees | 62 | |
| 8 | Estimated Average % of Time Actually Producing | 75% | |
| 9 | Actual Productive Man Years Available | 46.5 | (Line 7 times Line 8) |
| 10 | Average Annual Salary per paid employee | 1 906 122 | (Line 3 divided by Line 4) |
| 11 | Total Annual Cost per Actual Productive Man Year | 10 086 958 | (Line 1 divided by Line 9) |
| 12 | Overhead Markup - Multiplier of Salary Rate required to cover total costs | 5.29 | (Line 11 divided by Line 10) |
| 13 | Divide by 9 for CSIR Secretariate Commission (10%) | <u>5.88</u> | Final Labor Markup |

Procedure for Calculation of Overhead Rate (Salary Multiplier)

(FORIG s 1995 Figures used for demonstration)

| | | | |
|----|---|-------------|------------------------------|
| 1 | Total Annual Expenses (Generally this is the largest number on the Income Statement It does not include direct (out-of-pocket) research costs) | 711 226 966 | |
| 2 | Total Annual Employment Expense per Income Statement | 513 670 515 | 72% |
| 3 | Total Annual Salaries per Income Statement | 467 462,086 | 66% |
| 4 | Total Number of Paid Employees | 283 | |
| 5 | Number On Paid Leave | -10 | |
| 6 | Number of Pure Overhead Employees (Not charging time to actual jobs or projects) | -66 | |
| 7 | Number of Producing Employees | 207 | |
| 8 | Estimated Average % of Time Actually Producing | 60% | |
| 9 | Actual Productive Man Years Available | 124.2 | (Line 7 times Line 8) |
| 10 | Average Annual Salary per paid employee | 1 651 809 | (Line 3 divided by Line 4) |
| 11 | Total Annual Cost per Actual Productive Man Year | 5 726 465 | (Line 1 divided by Line 9) |
| 12 | Overhead Markup - Multiplier of Salary Rate required to cover total costs | 3.47 | (Line 11 divided by Line 10) |
| 13 | Divide by 9 for CSIR Secretariate Commission (10%) | <u>3.85</u> | Final Labor Markup |

Procedure for Calculation of Overhead Rate (Salary Multiplier)

(SRI s 1995 Figures used for demonstration)

| | | | |
|----|---|-------------|------------------------------|
| 1 | Total Annual Expenses (Generally this is the largest number on the Income Statement It does not include direct (out-of-pocket) research costs) | 649 086 397 | |
| 2 | Total Annual Employment Expense per Income Statement | 518 859 744 | 80% |
| 3 | Total Annual Salaries per Income Statement | 395 548 758 | 61% |
| 4 | Total Number of Paid Employees | 670 | |
| 5 | Number On Paid Leave | -15 | |
| 6 | Number of Pure Overhead Employees (Not charging time to actual jobs or projects) | -156 | |
| 7 | Number of Producing Employees | 499 | |
| 8 | Estimated Average % of Time Actually Producing | 69% | |
| 9 | Actual Productive Man Years Available | 343 7 | (Line 7 times Line 8) |
| 10 | Average Annual Salary per paid employee | 590 371 | (Line 3 divided by Line 4) |
| 11 | Total Annual Cost per Actual Productive Man Year | 1 888 526 | (Line 1 divided by Line 9) |
| 12 | Overhead Markup - Multiplier of Salary Rate required to cover total costs | 3 20 | (Line 11 divided by Line 10) |
| 13 | Divide by 9 for CSIR Secretariate Commission (10%) | <u>3 55</u> | Final Labor Markup |

Procedure for Calculation of Overhead Rate (Salary Multiplier)

(SARI s 1995 Figures used for demonstration)

| | | | |
|----|---|---------------|------------------------------|
| 1 | Total Annual Expenses (Generally this is the largest number on the Income Statement It does not include direct (out-of-pocket) research costs) | 1 151 868 280 | |
| 2 | Total Annual Employment Expense per Income Statement | 554 159 704 | 48% |
| 3 | Total Annual Salaries per Income Statement | 452 788,715 | 39% |
| 4 | Total Number of Paid Employees | 312 | |
| 5 | Number On Paid Leave | -13 | |
| 6 | Number of Pure Overhead Employees (Not charging time to actual jobs or projects) | -69 | |
| 7 | Number of Producing Employees | 230 | |
| 8 | Estimated Average % of Time Actually Producing | 78% | |
| 9 | Actual Productive Man Years Available | 179 3 | (Line 7 times Line 8) |
| 10 | Average Annual Salary per paid employee | 1 451 246 | (Line 3 divided by Line 4) |
| 11 | Total Annual Cost per Actual Productive Man Year | 6 424 251 | (Line 1 divided by Line 9) |
| 12 | Overhead Markup - Multiplier of Salary Rate required to cover total costs | 4 43 | (Line 11 divided by Line 10) |
| 13 | Divide by 9 for CSIR Secretariate Commission (10%) | <u>4 92</u> | Final Labor Markup |

ANIMAL RESEARCH INSTITUTE

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|----------------------|----------------------------|------------------|
| Dr Osei Somuah | Acting BDU Chairman | 40% |
| Prince Avortri | Scientific & BDU Secretary | 20% |
| Mr F Homenya | Public Relations Officer | 50% |
| Mr Matthew Kotorwole | Accountant | Part Time |
| Mr Mike Acquaye | Agric Economist | 40% |

Although it would be beneficial to have a full time Marketing Officer on staff, this BDU has invested considerable time and energy in its commercialization efforts. The fact that several researchers are on the team can be seen as a strength. They of course have a strong technical understanding of what they are selling, they simply need to learn more about marketing. The Director is actively involved in the BDU. This is a clear signal to everyone that commercialization is a high priority for this RI. A bit of a concern is the fact that no one, not even the Public Relations Officer devotes more than half of his time to marketing or other BDU activities. The BDU/ARI would benefit from a strong marketing officer to show them how to aggressively pursue paying clients.

FOOD RESEARCH INSTITUTE

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|-------------------|--------------------------|------------------|
| Agnes Osei-Yaw | Head of BDU | 50% |
| Ben Awortwi | Marketing Officer | Full Time |
| Tutu Coffi Aikins | Cost Accountant | Full Time |
| Augustine Andoh | Public Relations Officer | Full Time |

In addition to the BDU, FRI has established a BDU Advisory Committee consisting of several senior staff members. The committee's purpose is to support the BDU's marketing efforts and ensure that the BDU's activities are consistent with the mission of the institute. Together, these two groups provide a strong blend of business and technical skills. The BDU has shown a high level of energy and enthusiasm and is making a deliberate effort to market its capabilities. They are pursuing grants as well as contract research for local and foreign organizations.

WATER RESOURCES RESEARCH INSTITUTE

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|------------------|------------------------|------------------|
| Dr Opoku-Ankomah | Chairperson | Part Time |
| Mr Kofi Agbogah | Scientific Secretariat | Part Time |
| Mr Anyen | Accounts Division | Part Time |
| Mr Owusu | Administration | Part Time |

While the WRRRI is clearly interested in pursuing commercialization, the BDU team has not yet begun an active marketing campaign. Much of the contract work that has come to WRRRI has been the result of either the Director's considerable international network or simply the nature of this institute's activities which puts them in a position to attract contracting work.

CROPS RESEARCH INSTITUTE

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|-------------------|----------------------------------|------------------|
| J K Aidoo | Sr Admin Officer | Part Time |
| V M Andhirinah | Scientific Officer | Part Time |
| Francis Adjei | Accounts Officer | Part Time |
| K A Amparisah | Accounts | Part Time |
| N K Amengor | Assistant Farm Manager | Part Time |
| Eric Acheampong | Farm Manager | Part Time |
| Lawrence K Mensah | Assistant Administrative Officer | Part Time |
| Isaac S Baniing | Scientific Secretary | Part Time |

The BDU/CRI has not engaged in significant marketing efforts thus far. Their commercialization activities have focused primarily on product sales (seeds) and on local small scale farmers.

The BDU has shown an understanding of cost accounting and job budgeting is somewhat more advanced than many institutes.

FORESTRY RESEARCH INSTITUTE OF GHANA

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|----------------|--------------------------|------------------|
| K Adjei-Kusi | Sr Admin Officer | Part Time |
| A Oteng-Amoako | Public Relations Officer | Part Time |
| Samuel Adu | Accountant | Part Time |

The FORIG BDU has just recently been formed and thus has not yet established a regular meeting schedule nor formulated a marketing strategy. A Marketing Officer has not yet been assigned.

Since FORIG has in the past been successful in obtaining grant money, it would make sense to keep up the momentum by ensuring that grant writing skills are present in the BDU.

SOIL RESEARCH INSTITUTE

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|--------------|---------------------------|------------------|
| Joyce Yeboah | Marketing Assistant | Full Time |
| E O Adjer | Scientific Secretary | Part Time |
| K Anto-Gyan | Sr Administrative Officer | Part Time |
| R A Labi | Senior Clerk | Part Time |

This BDU has focused its efforts primarily on Ghanaian farmers both large and small. They are having considerable difficulty convincing farmers to accept their pricing. This is partly due to the fact that the benefits of their work tend to be long term and not easily identified. The BDU has identified some additional potential sources of business, notably the mining sector for environmental impact analysis and the Ghanaian Investment Promotion Board. The BDU cites lack of funding as an impediment to their outreach efforts.

SRI is the only institute to have hired a BDU chairperson from outside the institute. While she has studied marketing at the undergraduate level, she does not actually hold a degree in the field. Consequently she is more junior than one would expect a marketing officer to be--her official title is Marketing Assistant. The Marketing Assistant and the Scientific Secretary appear to be the driving force behind the BDU. The lack of a senior level marketing official may make it difficult for the BDU to be a strong influence on the senior staff.

SAVANNAH AGRICULTURAL RESEARCH INSTITUTE

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|--------------|------------------------------|------------------|
| Dr K O Marfo | Chairperson, Deputy Director | Part Time |
| Steven Akins | Convener of BDU | Part Time |
| S H Selifu | CSIR Internal Audit | Part Time |
| Bowah M Ford | SARI Storekeeper | Part Time |
| J K Jimah | Farm Manager | Part Time |

SARI has established a Business Development Committee which currently functions as the institute's BDU. The BDU is lead by the Deputy Director of the institute. SARI has recruited a candidate to head its BDU and has strongly recommended that he be hired by the Secretariat. The Commercial Director has indicated that this person will be included on the list of candidates to be considered for BDU Marketing Directorships.

The BDU members all hold senior positions in addition to their BDU responsibilities. The BDU/SARI is preparing for commercialization, trying to get a better understanding of what is expected of them and what they need to do to achieve their objectives. Their last meeting was October 31 in anticipation of our meeting with them. Upon arrival of a Marketing Director to head the BDU, they will begin intensive marketing efforts.

PLANT GENETIC RESEARCH CENTRE

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|------------------|----------------------------|------------------|
| Forson K. Ajensu | Seed Technologist, BDU Sec | Part Time |
| J Mintah | Accountant | Part Time |

PGRC's BDU, which meets occasionally, has not committed itself to a full marketing effort. They are instead devoting a lot of attention to detailed cost accounting. They are waiting for the Secretariat to supply them with a Commercial Manager and a Marketing Director, in addition to funding for their commercialization effort.

It also became clear that PGRC saw the BDU as a separate and unique activity--to the point where their business plan called for hiring an accountant strictly for cost accounting within the BDU, in addition to the accountant already on board. They also discussed separate financial statements for commercialization activities.

OIL PALM RESEARCH INSTITUTE

BDU PROFILE

| NAME | TITLE | % OF TIME IN BDU |
|-----------------------|----------------------|------------------|
| K Baidoo-Addo | Science Officer | Part Time |
| K O Karkam | Assistant Accountant | Part Time |
| J K Conwona-Agyemang | Sr Clerk | Part Time |
| David Hayford Ahiasor | Assistant Accountant | Part Time |
| Samuel Anargi | Driver | Part Time |

OPRI seems inclined to rely on its own people to lead the marketing effort. Thus, while there are plans to recruit a marketing officer, the BDU is prepared to forge ahead without one. Still this BDU could use some assistance, especially in pursuing research and consulting opportunities. While it is rather unusual to list the driver as part of the BDU, this is just an indication that part of the driver's time includes BDU associated trips.

ITINERARY
Visit of Gary Griffis and Darnley Howard
26 October - 14 November, 1997

| DATE | TIME | ACTIVITY |
|------------|-----------|--|
| 26 October | 7 00 p m | Arrival in Accra |
| 27 October | 9 00 a m | Meetings with Deputy Director, Finance Officer, and Commercial Manager |
| | 10 00 a m | Additional meetings with Finance Officer, Commercial Manager, and other staff |
| | 2 00 p m | Meeting with Director-General, CSIR |
| 28 October | 9 00 a m | Additional meetings with Secretariat staff |
| | 2 00 p m | Meet with Director, senior staff and BDU of Animal Research Institute |
| 29 October | 9 00 a m | Meet with Director, senior staff and BDU of Food Research Institute |
| 30 October | 9 00 p m | Meet with Director, senior staff and BDU of Water Research Institute |
| 31 October | 10 00 a m | Follow-up meeting at Animal Research Institute |
| 2 November | 7 00 a m | Leave for Tamale |
| 3 November | 9 00 a m | Meet with Director, senior staff and BDU at Savannah Agricultural Research Institute |
| | 3 00 p m | Leave for Kumasi |
| 4 November | 2 00 p m | Meet with Director, senior staff and BDU of Soil Research Institute |

ITINERARY
Visit of Gary Griffis and Darnley Howard
26 October - 14 November, 1997

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| 5 November | 9 00 a m | Meet with Director, senior staff and BDU of CRI |
| 6 November | 8 00 | Leave for Kusi |
| | 2 00 | Meet with Director, senior staff and BDU of Oil Palm Research Institute |
| 7 November | 8 00 a m | Leave for Bunso |
| | 11 00 | Meet with, senior staff and BDU of Plant Genetics Resources Centre |
| | 4 00 | Leave for Accra |
| 8-14 November | | Compiling Data, develop evaluations and recommendations |
| 10 November | 9 00 | Meetings with Commercial Manager and Director General Briefings on work status and preliminary evaluations |
| | 2 00 | Follow-up visit, WRI |
| 12 November | 10 00 | Meet with Director, senior staff and BDU of FORIG, Kumasi |
| 14 November | 9 00 | Follow-up visit, FRI |
| | 10 00 | Meet with Fenton Sands, USAID |
| 14 November | 1 30 | Follow-up meeting with Animal Research Institute |
| | 4 00 | Meet with Deputy Director, Agriculture, Fisheries & Forestry Sector |
| | 8 55 PM | Leave Accra |