

EFFECT OF COMMERCIALISATION POLICY ON THE PERFORMANCE OF CSIR-FORESTRY RESEARCH INSTITUTE OF GHANA

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ABSTRACT

In 1996, the Government of Ghana restructured the Council for Scientific and Industrial Research (CSIR) to make it more responsive to private sector needs and to promote demand-driven research. To ensure that research institutions were partly self-financing, a "Commercialisation Policy" was incorporated into the activities of the CSIR by an Act of Parliament (Act 521 of 1996). The Act sought to promote the commercialisation of research. This study was carried out in 2010 to assess the effects of the commercialisation policy on the performance of CSIR-Forestry Research Institute of Ghana (FORIG). Specific areas of interest investigated included the extent of commercialisation activities at FORIG and a comparative study of the Institute's performance before and after the policy. A sample size of 50 workers (out of a total of 256 staff members) was chosen for the study. Convenience and purposive sampling technique was employed for the study using the available staff list. The list consisted of research grade staff as well as senior and junior members of staff. The study revealed that majority of respondents (62%), were aware of the policy, they could not accurately state the tenets of the policy. Commercial product and services at the Institute increased significantly from seven prior to the implementation of the policy to approximately twenty after the policy. Generally, the financial performance of the Institute over a twelve-year period (1996 – 2008) after the introduction of the Commercialisation Policy in 1996 recorded a significant increase of over 1000%. Various set-backs such as a weak marketing strategy and obsolete equipment accounted for the slow implementation of the policy. Based on the findings of the study, practical steps have been recommended to improve the situation. These include vigorous education and sensitization of staff to embrace the policy, as well as improvement in the Institute's current marketing strategies.

Keywords: Commercialisation policy, CSIR-FORIG, products and services, marketing strategy

INTRODUCTION

The Economic Recovery Programme (ERP) of 1983 has brought in its trail significant opportunities and challenges to many government

subvented institutions in Ghana. One of the challenges has been the restructuring of key institutions to make them vibrant and self-sustaining with the view to reducing the financial burden on the central government.

Commercialisation of research has been on the drawing board of many governments over the years (Kumar and Jain, 2003). The primary output of research is the knowledge generated and disseminated for socio-economic development. In recent times however, there has been the need to derive direct and immediate economic benefits from research outputs. Notwithstanding the importance of commercialising research, only a few products and services emanating from research could suitably be packaged into commercial products for public consumption.

The Council for Scientific and Industrial Research (CSIR) was established by the National Liberation Council Decree (NLCD) 293 of October 10, 1968 and amended by NLCD 329 of 1969. According to the Decree, the original mandate of the Council for Scientific and Industrial Research was to organize and coordinate scientific research in Ghana and disseminate research findings. One of the key functions of the Council was “*to advise the Government on scientific and technological advances likely to be of importance to national development and in particular to advise government and its agencies on scientific and technological matters affecting the utilization and conservation of the natural resources of Ghana and on how best scientific research may be coordinated and employed for socio-economic development*” (CSIR-Handbook, 1995). Thus, the original mandate of CSIR did not include commercialisation of research outputs.

To make research institutions semi-autonomous and partly self-financing, a “Commercialisation Policy” was incorporated in Act 521 of 1996 stating the function of the Council to include the promotion of commercialisation of research results. Although the policy was enshrined in Act

521 of 1996, its implementation started in 2003 and all CSIR institutes were tasked to:

- Cover at least 30% of their operational costs from internally generated funds (sources of income), and
- Offer improved value for money by providing quality products and services to justify expenditure.

Since the introduction of the policy, commercialisation pace has been quite slow for almost all CSIR institutions. The average performance of most of the institutes has been under 5.0% (CSIR-CCID Task Team, 2002). Although implementation of the Commercialisation Policy by institutes under the CSIR will be of significant value, there are deep-seated challenges that hinder the efforts of various institutes including CSIR-FORIG from achieving the perceived benefits. Furthermore, many technologies have been developed but have yet to be commercialised. A series of platforms have been used to deliberate on the strategic implications associated with the commercialisation drive and the need to reinforce managerial initiatives that will enhance the successful implementation of the drive at CSIR and enable all research institutes perform accordingly (Yawson, 2003).

Considerable debate has also arisen among members of staff of CSIR since the introduction of the “Commercialisation Policy”; the emphasis being that the performance of individual institutes is low mostly because functions of the Council as established by NLC Decree 293 of October 10, 1968 and amended by NLCD 329 of 1969 among others included the coordination of all research activities in Ghana; and to undertake or collaborate in the collation, publication and

dissemination of the results of research and other useful technical information.

This paper evaluates the effects of the “Commercialisation Policy” on the performance of CSIR-FORIG with respect to internally generated revenue. The objectives of the paper are to examine the performance of the Institute before and after the policy, determine various set-backs of the policy and recommend ways to improve the implementation process.

Performance in simple terms refers to the way in which something functions. It can also be defined as the success in meeting pre-defined objectives, targets and goals (Kouzman, 2009). Different performance measures are used for many different purposes by a variety of organizations. Broadly speaking, performance measures can be divided into three main categories namely business, service and environmental (Humphreys, 2002). Service measures consider the day to day operations of an organization coupled with service and products quality from a qualitative and quantitative perspective.

Policy of commercialisation of research

A perception in Europe is that the continent has failed to benefit from its substantial investments in public research, in contrast to the American experience, where university research results are believed to lie behind the creation of several globally competitive firms and blockbuster products ranging from pharmaceuticals to computer hardware and software (Arundel and Bordoy, 2006). European governments have responded by introducing policies to promote commercialisation, such as university courses on entrepreneurship for future academics and a range of other programmes to encourage technology

transfer by promoting formal contractual relationships between the business sector and public science. These include subsidies for the establishment of technology transfer offices responsible for Intellectual Property Rights (IPR) regulations. The aim is to encourage universities and other tertiary institutions to patent and license inventions, with the view of (and requirements for universities too) obtaining higher share of their transferable technologies (Arundel and Bordoy, 2006). The major drivers for the researcher to be involved in commercialisation of research findings are the possibility of getting a share of licensing revenues and becoming engaged in well-paid consulting work. The drivers behind research commercialisation initiatives are similar in many countries: to increase national competitiveness, to generate funds for more research and development, to optimize the return on taxpayer’s investments and to use research (Karlsson, 2004).

Historically in most countries, a heavy reliance was placed on the state in the area of research, innovation and entrepreneurship. A study conducted by the Irish Council for Science, Technology and Innovation, Ireland (2001) indicates that commercialisation of research results is now a policy in universities and institutions of technology as a result of increasing opportunities to derive economic benefits from enhanced commercialisation of research.

In India, the development and commercialisation of new technologies has become very important in the research agenda. Even though India started development of its scientific infrastructure in a planned way immediately after independence, commercialisation of technology attracted the attention of policy makers only in the 1980’s. According to Kumar and Jain (2003), Venture Capital Funds was established in the mid 1980’s

and a technology policy statement was also introduced in 1983 to provide risk-sharing funds as well as the managerial expertise for technology development and commercialisation. A survey of 175 units of technology institutions revealed that many of the technologies developed in Indian laboratories have remained unexploited as they have not been tested on prototype or pilot scale (Kumar and Jain, 2003).

In Southern Africa, the commercialisation of Non Timber Forest Products (NTFPs) often results in trade-offs between subsistence use and the preservation of traditions, cultures and social norms, and the benefits derived from increased income. A typical example is Marula (*Sclerocarya birrea*), a traditional food plant in Africa. This plant has the potential to improve nutrition, boost food security and foster rural development. Marula constitutes an essential part of livelihoods; however it brings on board a number of challenges and threats for subsistence users, for the resource base and for traditional cultures and customs (Wynberg *et al.*, 2003). A popular opinion is that steps need to be taken by political institutions to translate rhetoric into reality, through concrete research, marketing and legal initiatives that promote and do not hinder the commercialisation and sustainable use of marula.

For many years, Tanzania has undertaken significant scientific research in relatively few areas. However, these research results have not been translated into tangible products and services for developmental purposes. The National Science and Technology Policy for Tanzania (NSTP, 2000) is well-articulated to address the challenges of technological innovations, ensure that research undertaken in the country is directed towards generating knowledge, and building skills deemed to be of lasting benefit to the country. This policy

further emphasizes on innovation and commercialisation of research results which are key in bringing about economic growth while at the same time solving societal problems.

CSIR-FORIG's commercialisation drive

CSIR-FORIG's commercialisation process emanated from a decision by the Government of Ghana in 1996 to cut down on its yearly subventions to all government research and development agencies from one hundred to seventy percent. This decision was as a result of the fast changing environment in most developing countries; which eventually led to the privatization of many government agencies around the world (Calabrese, 2008). The government's expectation in this respect was that such agencies must acquire the requisite competence that could enable them to self-generate the remaining thirty percent (PSD, 1996). As a result, Commercialisation and Information Divisions were created in all CSIR Institutes in response to the Government's directive. These Divisions were entrusted with responsibilities to monitor output criteria like number of contracts, clients and nature of requests, job delivery schedules, staff performance, revenue accruals, review strategies to enhance commercialisation and discuss the Institutes' Commercialisation and Information Division programmes.

Towards this end, a variety of products and services related to CSIR-FORIG with income generation potentials were identified and classified. In 2005, CSIR-FORIG published a brochure containing products and services available for commercialisation. These included: Forest products (seeds, seedlings and timber), Extractives (chemical) products (gums, tannins, dyes and prekesse syrups), Wood products

(furniture, doors and other products for construction) and Non-timber forest products (mushrooms, snails and honey production). Services identified for commercialisation included: Consultancy, Contract Research, Ecotourism and Technology transfer through training in the area of mushroom cultivation, snail farming, seed processing, rural wood preservation, plantation establishment and nursery development (FORIG Brochure, 2007, 2008 and 2009).

METHODOLOGY

Study site

The research was undertaken at CSIR-Forestry Research Institute of Ghana. The institute consists of nine Divisions namely: Biodiversity and Land-Use; Ecosystem Services and Climate Change; Forest, Livelihoods and Sustainable Development; Forest and Wildlife Management and Governance; Forest Products and Marketing; Wood Industry Development and Trade; Commercialisation and Information; Administration and Finance. The sampling frame consisted of 256 staff members who were at post as at December 2010. A sample size of 50 was chosen from the total list for the study as presented in Table 1.

The number fifty is an accepted sample size, far exceeding Stutely's (2003) advice of a minimum number of 30 for effective statistical analyses, stating that the number 30 is a useful rule of thumb when deciding on a suitable sample size. Staff in each category was selected for the study. A higher number of respondents were selected from Research and Senior Staff grade using convenience sampling methods, the reason being that these categories of respondents normally occupy managerial positions and influence policy.

Convenience sampling method was used to select respondents because of the ease of obtaining the needed information for the study. It is however worthy to note that a purposive sampling technique was used for the selection of junior staff, majority of respondents were from the Production Section of the Institute since they are directly involved in producing commercial products. This technique is appropriate because it enables the researcher use his judgment to select cases that could provide useful information for the study.

Data collection and analysis

Both primary and secondary data were used for the study. Primary data was collected directly from respondents through the administration of questionnaire. Secondary data was extracted from CSIR-FORIG's records covering the period 1996 to 2008. The questionnaire focused on issues such as the awareness of commercialisation policy by members of staff, performance of the Institute both before and after the policy with respect to patronage and the availability of products and services. Data collected were quantitatively organized and collated using standard and statistical techniques and norms. Statistical Package for Social Science (SPSS, 2007) programme was used to analyse the data.

RESULTS AND DISCUSSION

Out of 50 respondents, majority (76%) were males and 24% females. The ages of respondents ranged from 21 to 60 years with a higher percentage (44%) of workers between ages 41 – 50 and a small percentage (8%) between ages 21 – 30. With respect to age distribution, those in the age group of 41 – 60 years constituted 66% while those between 21 – 40 years constituted only 34%.

Table 1: Total number of respondents selected from the three categories of staff at CSIR-FORIG

Category of Staff	Population	Number Selected
Research Grade	53	27
Senior Staff	61	18
Junior Staff	142	5
Total	256	50

Awareness of commercialisation policy by CSIR-FORIG staff

Even though 48 respondents representing 96% admitted they were aware of the commercialization policy, 58% could not explain what exactly the policy was about, which is that each institute should generate 30% of their annual budget through commercialisation of research activities. While 8% of respondents could not say anything about the policy, 15% were of the view that the policy requires CSIR-FORIG to undertake commercial projects. These responses clearly show that most of the respondents did not understand the policy because not enough publicity and sensitization was carried out.

Performance of CSIR-FORIG before and after the commercialisation policy

Commercial products and services

The performance of the CSIR-FORIG after the policy could be seen from reported increases in the number of commercial products and services which were seven before the policy, but increased to twenty after the introduction of the policy (CSIR-FORIG Annual Report, 1996, 2007). Prior to 1996, relatively few products and services such as coffins, doors and window frames and consultancies were available for

commercialisation. However, after 1997 the number increased tremendously to include training in mushroom cultivation, beekeeping, production and sale of mushroom spawns, sale of wood, production and sale of prekesse syrup and contract research.

It is however worth noting that CSIR Institutes in general and FORIG in particular, would have difficulty in comparing the performance levels of individual institutes before and after the introduction of commercialisation policy. The reason lies in the fact that the Decree which originally established CSIR gave it the mandate to organize and coordinate scientific research in Ghana and to disseminate research findings (NLC Decree, 1996). Since there was no mention of commercialisation as one of the functions of research institutes, the performance of CSIR-FORIG was purely based on research output of scientists such as the transfer of technologies to members of the public (snail farming, bee keeping and mushroom production, consultancy services and sale of other products). An example of such consultancies was carried out in 1995 when the Ministry of Lands and Forestry commissioned FORIG to undertake a study to investigate the effect of felling diameter, sapwood-heartwood ratio and log defects on sawn timber recovery and their implication on prescribed felling limits for timber trees (FORIG, 1996). Therefore, this study

mainly focused on the yearly performance of CSIR-FORIG after the commercialisation policy with regard to the Institute's annually generated income and the effects of the policy as reflected in the number, quality and patronage of commercial products and services against what pertained before the policy.

Clients before and after the Policy

Clients of the Institute before the policy were mostly individuals and occasionally included organizations such as the Ghana Timber Association (GTA), Ghana Timber Millers Organization (GTMO) and the Ministry of Lands and Natural Resources (MLNR). However, after introducing the policy, categories of clients greatly expanded to include companies, academic institutions, foreign bodies, churches and District Assemblies as reported (CSIR Handbook, 1998; FORIG Annual Report 2007).

Factors which accounted for the Institute's failure to meet demands of clients for products and services like the production of coffins and other wood products, use of furniture testing machine and sale of seeds were given as low production, difficulty in getting seasonal and indigenous seeds, obsolete equipment, inadequate staffing, lack of capital, breakdown of equipment and inadequate training facilities (Figure 1).

These are serious challenges which need immediate attention. For example, increasing cost in seed collection and seedling production do sometimes reflect in the pricing system and with the proliferation of cheap private nurseries, the Institute continues to lose some clients to her competitors. The implications are that there is the need for management to, among others ensure a consistent supply of seeds to be collected,

regularly review the prices of all commercial products and services and reassess staffing requirements so that whenever there are vacancies, those vacancies would readily be filled. There is also an urgent need to re-evaluate the status of equipment in the laboratories and workshops so that obsolete ones are replaced and finally to increase production capacity.

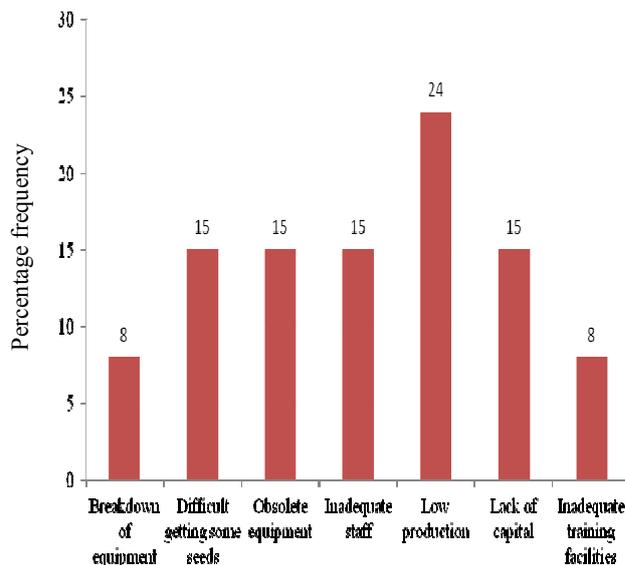


Figure 1: Respondents' perception of factors accounting for CSIR-FORIG's failure to meet demands of clients

Financial performance of CSIR-FORIG from 1996 to 2008

Generally, the financial performance of the Institute over a twelve-year period (1996 – 2008) after the introduction of the Commercialisation Policy in 1996 recorded a significant increase of over 1000% (FORIG Annual Report, 2008). However, there was occasional decline in the trend of the Institute's internally generated fund (IGF)

for a few years, notably in 2005, as shown in Figure 2. CSIR-FORIG Annual Report (2000 and 2006) for instance attributed the decline in seed sales to two basic reasons. One was threats from competitors, specifically the private sector, who are actively involved in seed collection and processing exercise and have succeeded in influencing many clients of the Institute by offering cheaper prices, in some instances, at the expense of quality. Additionally, private developers have established nurseries and therefore do not buy from the institute as they did in times past. It is worth stating that the financial performance of the Institute before 1996, the year the Commercialisation Policy was introduced was not available at the Accounts Division and could not be reported

Notable set-backs in policy implementation

There are a number of set-backs that hinder the smooth implementation of commercialised policy. It has been documented that the major challenges to commercialisation in research institutes in Ghana are financing, management, marketing, education and infrastructure (Yawson, 2004). CSIR-FORIG is equally confronted with many challenges such as inadequate funds, lapses in the institute's communication system which have led to low awareness of the policy, obsolete equipment as well as a weak marketing strategy.

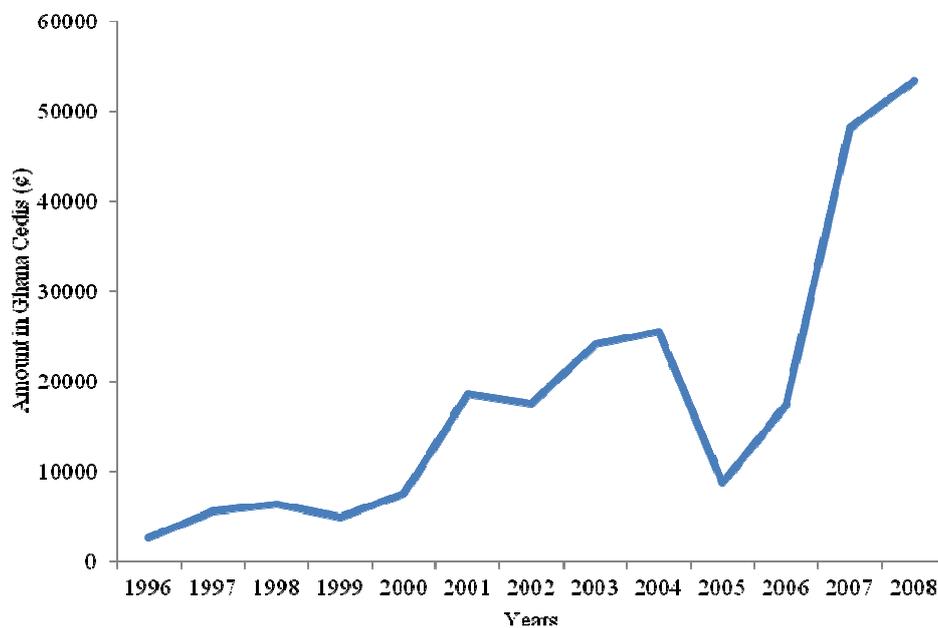


Figure 2: Trends of Internally Generated Funds (IGF) at CSIR-FORIG from 1996 - 2008

Research financing

Table 2 indicates that funding is the most single challenge accounting for 32% of the problems associated with commercialisation. Ghanaian research institutions for decades have had to battle with the challenge of inadequate funds for research in science and technology (MEST, 2010). Funding is the most serious limitation to research activities which affects not only the provision of infrastructure and general operations, but also is the root cause of the loss of motivation currently experienced by most research scientists in the country. Hence, it is not surprising that inadequate funds for research activities that could possibly be commercialized are the major challenge of CSIR-FORIG. Research funds provided by the Government of Ghana have dwindled significantly over the years. For example, between 2000 and 2010, the research component of a ten year budgetary allocation to CSIR-FORIG formed approximately 2% of the total budgetary allocation, making it almost impossible to invest in commercial products and services (FORIG Annual Report 2009; 2010).

Lapses in communication system

The second major challenge identified by respondents is a lapse in the Institute's communication system which has resulted in low awareness of the policy among members of staff. The survey revealed that whilst almost everyone was aware of the Commercialisation policy, only 38% of respondents fully understood the policy and its implications as enshrined in the policy statement. Others made statements like research institutes should be self-sustaining, research institutes should undertake commercial projects and research institutes should generate 70% of their annual budget. Such statements either had no bearing on the policy or were misunderstood by staff. It was in this light that Yawson (2004) mentioned education in the form of communication as one of the major obstacles to proper and efficient management of commercialisation activities in research institutes in Ghana.

Table 2: Respondents' perception of problems associated with implementing the Commercialisation Policy at CSIR-FORIG

Implementation Problems	Frequency of Response	Percentage of Respondents
Inadequate funds	16	32
Policy is not known	10	20
Weak marketing strategy	9	18
Low production capacity	7	14
High cost of collecting seeds	2	4
Obsolete equipment	2	4
Lack of information about commercial products and services	2	4
High charges for laboratory services	1	2
Too much bureaucracy	1	2
Total	50	100

Poor communication from the leadership of CSIR regarding the policy statement, benefits that would be accrued from the change, coupled with the fact that research scientists did not see the rationale behind commercialisation since they were trained and employed as scientists, not business executives have immensely contributed to low performance of research institutes in Ghana.

Marketing

Research output has value only when it serves a purpose and is useful to society. Therefore, research output on the shelf or in learned journals is purely an intellectual artifact until it is put into use for social development. The study however revealed among others that a weak marketing strategy is another major set-back in implementing the policy, accounting for 18% of the set-backs identified by respondents.

CSIR-FORIG employed both electronic and print media to promote the Institute's products and services. Yet, frequency of promotion by radio advertisement was not impressive because it was done either semi-annually or annually. Although the use of flyers was quite effective, it did not have a great impact possibly because clients of the Institute were both literates and illiterates or did not have access to various flyers. On the other hand, another alternative which seems to be promising but was not given much attention was the use of word of mouth advertisement. In the business world, it is estimated that every satisfied customer informs five to six people about a product or service but when dissatisfied, a customer informs up to 11 people (Cafferky, 2005). Similar factors accounted for slow implementation of commercialisation policy in New Zealand as stated by Cardow (2000). In his study, Cardow attributed non-commercialisation

to a lack of clear marketing direction, inability to find a manufacturer for products and services, combined with a lack of ongoing funding for projects.

In addition to the above, there are other related problems that deserve attention. For example, the sale of seeds as a commercial activity in CSIR-FORIG started as far back as 1996. At that time, more revenue was earned from the sale of seeds than from any other commercial venture but this position was gradually eroded as a result of high cost of seed collection, processing and storage (FORIG Annual Report, 2000). Unavailability of plus trees to serve as seed collection source has also affected the seed collection venture significantly. Even though seed sale was significant over the years, its role as a high revenue earner has been eroded as a result of high production and processing costs. Other issues that could be looked at include pricing and storage which could lead to a reduction in production costs.

A related study by Cohen (2002) revealed that insufficient funds for commercialisation, marketing and sales, technical and research personnel, and burdensome evaluation standards were the common obstacles in the commercialisation of research. CSIR-FORIG is no exception; however the Institute has employed three different forms of advertisements such as flyers, radio announcements and verbal communication to market products and services.

Different forms of advertisements such as verbal communication or word of mouth advertisement by staff of the Institute should be encouraged because it is not only financially viable but it is also established that satisfied customers are willing to spend time telling friends and relatives

about products and services of an organization that satisfy their needs.

RECOMMENDATION FOR IMPROVING COMMERCIALISATION

To embark on a successful commercialisation exercise, a strategy for achieving success must be developed. This study revealed the general perception of respondents arguing that the current marketing strategy of the FORIG and CSIR as a whole be re-assessed, coupled with a re-evaluation of the status of the entire Institute's equipment to improve performance. In India, a survey conducted by Feldman *et al.* (2002), proposed a functional strategy to improve research commercialisation which included technology, production, marketing, finance and human resource strategies. Furthermore, members of staff were of the view that there was and still is an urgent need to sensitize staff members on the policy and solicit for their co-operation (embark on a vigorous educational campaign with regard to details of the Commercialisation Policy, current commercial activities as well as any future policy). It is worth mentioning that some have argued that the Government of Ghana has taken steps to contribute her quota towards the "Commercialisation Policy" by assisting all CSIR institutes patent research findings by securing intellectual property rights for innovations (The Ghanaian Journal, 2009). This move by the Government would generate revenue for various institutes and motivate researchers to contribute positively to society; coupled with the proposal that a Commercialisation Unit be established in research institutes to commercialise research outputs.

CONCLUSION AND RECOMMENDATIONS

The study investigated the effects of the commercialisation policy on the performance of CSIR-FORIG. It examined the extent of commercial activities that pertained at the Institute both before and after the policy was introduced, specifically focused on the yearly performance of CSIR-FORIG after introducing the policy with respect to the Institute's IGF as well as other significant contributions of the policy as reflected in the number, quality and patronage of commercial products and services.

The study uncovered problems associated with the successful implementation of the policy such as irregular advertisements and obsolete equipment. The study emphasized the urgent need to improve upon the Institute's current marketing strategy and re-evaluate the status of all equipment to improve upon performance. Based on the results of the study, certain actions have been recommended for consideration.

1. Sensitization of staff on the Commercialisation Policy and what is expected of them should be vigorously carried out during durbars, workshops and captured in newsletters, brochures and on the intranet for active participation.
2. There should be a practical reflection in the structures of the Institute to make it more business-oriented. In this light, business plans for all commercial products and services should be developed and followed meticulously.
3. Management should, as a matter of urgency re-evaluate the status of all equipment to ensure that production and

- training programmes are not disrupted.
4. Stringent measures need to be in place to improve the current marketing strategies as a matter of urgency, by adopting other forms of advertisements like outdoor advertising, point-of-purchase advertising and use of show rooms to display the Institute's products. Furthermore, there is the need to increase the regularity and expand the scope of advertisements to include the use of electronic and print media.

REFERENCES

- Arundel, A. and Bordoy, C.** (2006) Developing internationally comparable indicators for the commercialization of publicly-funded research. UNU-MERIT, Maastricht, The Netherlands. pp.1-18.
- Cafferky, M. E.** (2005) Let your customers do the talking: 301 + word-of-mouth marketing tactics Guaranteed to boost profits. Upstart Publishing, Dearborn Publishing Group Incorporated. pp. 44-56.
- Cardow, A.** (2000) Quite patiently a myth: Commercialisation of patients in New Zealand, Unitec Institute of Technology, Auckland, New Zealand. pp. 2-6.
- Council for Scientific and Industrial Research Secretariat** (1998) CSIR Handbook. p.64.
- CSIR-CCID Task Team** (2002) Report on In-House Review of CSIR Commercialisation Plans, CSIR Accra. pp. 2-5.
- Calabrese, D.** (2008) Strategic communication for privatization, public-private partnerships and private participation in infrastructure projects, the World Bank – USA. pp. 1- 43.
- CSIR-Forestry Research Institute of Ghana** (1996) FORIG Annual Report, Kumasi Ghana. p. 46.
- CSIR-Forestry Research Institute of Ghana** (2000) FORIG Annual Report, Kumasi Ghana. p. 56.
- CSIR-Forestry Research Institute of Ghana** (2006) FORIG Annual Report, Kumasi Ghana. p. 85.
- CSIR-Forestry Research Institute of Ghana** (2007) FORIG Annual Report, Kumasi Ghana. p. 33.
- CSIR-Forestry Research Institute of Ghana** (2009) FORIG Annual Report, Kumasi Ghana. p. 61.
- CSIR-Forestry Research Institute of Ghana** (2010) FORIG Annual Report, Kumasi Ghana. p. 66.
- CSIR-Forestry Research Institute of Ghana** (2005) FORIG Brochure, Kumasi Ghana. pp. 7-28.
- Humphreys, I.** (2002) Performance measurement in airports – A critical international comparison, Sage Publications, Public Works Management and Policy, Vol. 6 N. 4. pp. 265 – 275.
- International Council for Scientific and Technical Information** (2001) Commercialisation of publicly funded research, ICSTI Ireland. pp. 7-12.

- Karlsson, M.** (2004) Commercialisation of research results in the United States, Swedish Institute for Growth Policy Studies, Washington, DC. pp. 35-45.
- Kouzmin, R.** (2009) Performance benchmarking in organisations. <http://www.wikipedia.org>, Accessed 3rd January 2010.
- Kumar, V. and Jain, P. K.** (2003) Commercialisation of new technologies in India: An empirical study of perceptions of technology Institutions, India Institute of Technology, India, pp. 113-120.
- NLC Decree** (1996) Act of Parliament, Council for Scientific and Industrial Research Act 521, Parliament of the Republic of Ghana, Accra.
- NSTP** (2000) The National Science and Technology Policy for Tanzania, Ministry of Science, Technology and Higher Education. p. 72
- PSDP** (1996) Implementation report, *Private Sector Development Project*, World Bank/MFEP, Accra. pp. 1-15.
- Stutely, M.** (2003) Numbers guide: The essentials of business numeracy, London Boomborg Press. p. 52.
- The Ghanaian Journal** (2009) Government to assist CSIR patent research findings, <http://www.theghanaianjournal.com>. Accessed 25th November, 2009.
- Wynberg, R. P., Laird, S. Shackleton, S. Mander, M., Shackleton, C., du Plessis, P., den Adel, S. L., Leakey, R. R. B., Botelle, A., Lombard, C., Sullivan, C., Cunningham, T. and O'Regan, D.** (2003) Marula commercialisation for sustainable and equitable livelihoods, *Forest Trees and Livelihoods* 13:203-215.
- Yawson, R. M.** (2002) Technology commercialisation and intellectual property rights in Ghana, The International Conference on TRIPS – Next Agenda for Developing Countries, Hyderabad, India. p. 13.