TECHNOLOGY POLICY AND PLANNING IN THE INFORMAL SECTOR

The Case of Food, Agriculture and Energy in Tanzania

By

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Introduction

This paper seeks to describe certain *strategic* aspects in relation to the metalworking branch of the informal sector in Tanzania with emphasis on agriculture, food, and energy. Within this strategic concern, the bias is on issues dealing with technology policy and planning.

The paper will first attempt to characterise what in the context of this essay will be taken as informal sector (1.0). It will then (2.0) describe some of the main ongoing activities in the sector with respect to the agricultural, food and energy sectors. Section 3.0 will sketch what seems to be the main problems inhibiting sustained growth and development of the sector. This is followed by a brief discussion on efforts and initiatives which have been taken by the government and relevant institutions in the country to stimulate the growth and development of the sector. This is followed by a brief discussion on efforts and initiatives which have been taken by the government and relevant institutions in the country to stimulate the growth and development of the sector (4.0). Section 5.0 outlines broad directions which appear appropriate for government policy and planning to follow in relation to future sustained growth and development of this sector. Finally, the main issues discussed in the paper are summarised, almost in point form, in section 6.0.

1.0 The Informal Sector: Towards a Working Definition

There are considerable problems in attaching one word or even one sentence definitions to elusive terms and concepts such as 'informal sector', «technology policy» «technology planning» etc. It is, indeed not possible to provide concise and precise definitions to terms such as those indicated above, however desirable this might be. At the same time for particular purpose (notably policy and planning) one needs to know with a fair degree of precision and «tightness» what one means (or at least implies) by terms and concepts such as those indicated above. This is important in order to provide a «policy and planning handle» for operational purpose. Two or more policy makers, implementers etc. should mean more or less one and the same thing when referring to concepts like informal sector, technology policy etc. or else execution is bound to suffer.

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This paper will not attempt to give a working definition of informal sector. It will, nonetheless, attempt a highly simplified characterisation of the sector.

In the context of this paper, informal sector will be taken as one characterised by amongst other features, the following :

- the form of enterprise organisation is dominantly artisanal, with its labour force drawn largely from family recruits;
- the technical systems used are relatively simple and are of low technical sophistication. Moreover, in most cases these are manually operated;
- requires relatively low levels of initial capital outlay to set up these plants and limited working capital for their ongoing operation;
- the output of these enterprises (goods and services) oftentimes is of inferior quality;
- in most cases enterprises engaged in this sector are not included in the formal government registries, and books of productive activities;
- often times, productive activities engaged in the sector are widely spread in both the urban and rural sectors especially in developing countries.

The activities engaged in the informal sector are wide ranging. They include, amongst others, manufacture of simpler motor vehicle parts, components, spare parts, panel beating, wielding, spray painting, battery charging, manufacture of lamps, kitchen stoves, frying pans, arrows, axes, matchets, spears, knives, bicycle carriers, dust bins, cement block machines, buckets, carts, chicken feeders, door grills, window grills, earth pans, water cans etc.

Although the sector is often described «informal», this should not be interpreted as a «second class» or inferior one in relation to its contribution to economic development of a given country. Indeed, recent empirical research work in the field (e.g. Bell, 1978; King, 1977; Amsden, 1977; Muller, 1980; 1982 amongst many) do suggest that this sector does play a crucial and dynamic role in the context of economic development in some of the developing countries. The range of activities engaged in the sector provide essential consumer goods, replacement parts as well as simpler machine parts and components needed for development. They also provide essential services such as repair and maintenance to equipment, machinery, etc.

Moreover, engaging in the «doing» involved in the activities within the sector does provide opportunities for the acquisition and subsequent accumulation of particular skills, expertise, experiences etc. on the part of those participating in those 'doings'. The stocks of skills, expertise, knowledge etc. so accumulated provide a basis for further economic development of the country in question. The above mentioned dynamic roles of this sector have been well documented by a number of studies in developing countries. In a study of cassava

processing in Thailand. Bell (1978) observes that much of the technical adaptations, modifications, alterations etc. executed on the imported cassava pelletising equipment in the industry during the 1960s and 1970s were conceived, designed, executed and managed by Thai owned and managed metal working and related light engineering enterprises drawn from the informal sector:

> *The process of technical change – the series of activities relating to system design and redesign, machine design and redesign, equipment production and improvement, materials specification and re-specification was carried out by about 8–10 enterprises – small foundries, small machine shops etc. One firm, the market leader had grown substantially in the 1968-73 period-from employing about 20 workers to employing about 100. The other group consisted of firms employing around 15-20 people – one employing about 5 or 6 (p. 48).*

Bell (1978) also notes that most of the technical alterations and modifications performed had the objective of simplifying the imported technical systems. Furthermore, these were 'incremental' or 'minor' types of technical change and drew heavily – almost exclusively – on locally available resources:

> *The resources of knowledge and expertise available to the firms were largely those of their owners and workers. The owner and founder of the larger firms had previously been an unskilled worker in a rice mill and an employee in a small foundry. He spent six years learning metal machinery 'on the job' in a small machine shop engaged mainly in repair work. He had no formal technical education at all but for a few months worked as a machining demonstrator in a vocational school. All the other technical leadership of this set of enterprises had very similar backgrounds. The highest level of formal technological expertise available to the group was that of a one year drop out from engineering study at university (p. 44).*

The execution of these minor technical changes on the imported cassava pelletising technical systems had the effect of simplifying the modified systems in the Thai economy. Bell (1978) notes that the locally developed technique:

- operated at a substantially small scale of output;
- had lower unit costs, but lower product quality, and hence lower product price;
- it generated a similar total flow of labour income per unit of output;
- generated a substantially larger amount of employment per unit of output and hence distributed the total income generated to a larger number of workers;

– required substantially less capital per unit of employment created (p. 24).

Bell (1978) also suggests that enormous dynamic economic benefits were derived in the Thai economy from the execution of these largely endogenous incremental types of technical change on the imported pelletising technical systems:

> *«It is even more plausible to argue that the development of the new small scale technique enabled cassava growing and drying to be expanded in more remote areas of rural Thailand than would have been possible with the expansion of the industry based on the original pelletising technique (p. 26).*

2.0 Ongoing Metal-Working Activities Within the Informal Sector

The previous section was intended to provide a wider context within which to describe rather directly the experience of Tanzania with respect to ongoing activities within the informal sector generally and metal-working in particular. In doing so, as indicated before, emphasis will be on agricultural, food and energy sectors. For example, it has been suggested in the above section that metal working activities in the informal sector had profound dynamic impact on the wider economic growth and development in a relatively underdeveloped economy: Thailand. It was also suggested that similar dynamic growth impacts of metal working activities were reported in the economy of Taiwan (Amsden, 1977) and Kenya (King, 1977).

The questions attempted in this section are thus: Does the experience of Tanzania provide evidence of metal-working activities in the informal sector playing a similar dynamic role in the context of the economic development of this country? What is the coverage of the sector? How much really is known about this sector, and by implication how much has yet to be known?

Hitherto, there are very few systematic and indepth empirically based research and analytical work focused on metal-working activities and their longer term dynamic implications for development in the economy of Tanzania. Nearly all the work which exists in this field is of a general baseline survey kind and in some cases of a theoretical nature (e.g. Muller, 1980; Bagachwa and Ngware, undated; Yindi, 1982; amongst others). None of the above pieces of work focuses on, for example, the identification of a set of key policy and planning (pratical) problems faced by the sector as its primary objective (or at least one of them) (1). Not surprisingly therefore most of the work in the field has not come up with detailed and systematic policy and planning prescriptions which the government and relevant authorities can implement to deal with the problems identified (2).

Despite the apparent limited empirical and analytic basis that characterise much of the existing research work in this field in Tanzania a few facts have been brought to light:

- Like in many other developing countries (Thailand, Kenya, Taiwan etc.) the activities in this sector are wide-ranging: motor vehicle repair, manufacture of implements etc.;
- the activities covered in the sector are widely scattered in both urban and rural areas;
- the goods produced and services rendered by this sector play an extremely important role for the economic development of the country. The sector produces goods like farm implements and render services like repair and maintenance for motor vehicles and other equipment and machinery used for productive activities in the economy. All these are important to sustain productive activity. Indeed, it is often suggested that if it were not for the repair and maintenance services rendered by informal garages located in the urban and rural areas of the country most probably many of the motor vehicles and other mechanically operated industrial machinery, equipment etc. in Tanzania would have been «down» and would have been so on a permanent basis. This includes motor vehicles and industrial machinery, equipment etc. owned by government and parastatal institutions as well as those owned by individuals. This may be an overstatement in some sense, but it underlines the central role of metalworking activities in this sector for economic development in the country;
- the sector has also been noted as being important for absorbing labour of young primary school leavers who would otherwise have been reduced redundant (Yindi, 1982);
- Furthermore, it has been reported by others (e.g. Yindi, 1982) that this sector does provide an important «class room» wherein those engaged in the «doing» of such activities as machining, forging, wielding, cutting etc. acquire and accumulate various kinds and qualities of skill, expertise, knowledge, experiences etc. This skill and expertise capability (human capital) is important for carrying out efficiently the operation – related tasks at subsequent periods. It does also provide a basis for moving into performing rather more technologically sophisticated tasks, operations etc. Regretably however, so far there is little empirical evidence to indicate whether, how and to what extent the skill, expertise etc. capability built up through the «repetitive doing» of routine tasks, operations in this sector provide a basis for progress to be made in the efficient carrying out of relatively more technologically sophisticated tasks, activities etc. (e.g. manufacture of technologically complicated machine parts, equipment etc.). Relatedly there is little information to suggest whether, how and to what extent (if at all) the skills, expertise etc. acquired and accumulated in this sector get diffused in the other productive structures in the local economy.

The pages below describe, in outline form, the position of metal-working activities within the informal sector in Tanzania with respect to the agricultural sector.

2.1 *Agricultural Sector*

With regard to the agricultural sector, the contribution of metal-working and related light engineering activities within the informal sector is discussed in relation to production of both pre-harvest and post-harvest tools and implements. Pre-harvest activities are taken here to include, amongst others, land preparation, sowing, weeding, fertiliser application etc. Post-harvest activities are taken to include: threshing, shelling, winnowing, storage etc.

A number of surveys (e.g. Ministry of Agriculture, 1983; Muller, amongst others) suggest that well over 70% of the country's cultivated acreage in Tanzania is done by hand tools. These hand tools include: tangled hoes (e.g. the Ufipa hoes) Tungwe hoes, round eyed hoes, axes, matchets, bill hookes, adzes, knives etc. The surveys (notably that of Muller, 1980); also do indicate that a sizeable part of the farm implements, tools etc. used in the country are designed and manufactured by blacksmiths and craftsmen. These are widely spread both in the rural areas and in the urban areas. The role of these blacksmiths and craftmen in the production of these implements in the country is likely to continue (and even to increase) at least in the short term. For one thing combined output of farm implements by modern factory based plants i.e. formal sector (e.g. Ubungo Farm Implements – UFI, Centre for Agricultural Mechanisation and Rural Technology – CAMARTEC – etc) falls very much short of the country's requirements of farm implements in any one year. This is likely to be so at least in the next few years. The deficit has to be covered somehow. Production of farm implements by the informal sector has for many years played an important role to fill this gap – and it is plausible that this will continue to do so for sometime to come. Secondly a good number of the farm implements produced by the modern factory based plants (e.g. UFI, CAMARTEC etc.) although definitely more superior in technical terms in relation to those produced by the informal sector are nonetheless more expensive and often well beyond the financial reach of individual poor peasant farmers. For example, the 'Ng'ombe Ox'plough designed and manufactured by UFI was retail priced at T. sh. 404.00 (roughly US $ 50) as at January 1st 1980, and is obviously much more expensive now. Likewise the 'Kifaru' plough designed and manufactured by CAMARTEC was retail priced at Tshs. 1,500 (roughly the equivalent of US $ 185.00) as at 1st July 1980. Compare these prices with those of the tangled hoe and the Ufipa hoe which were priced at round T.shs. 50 (roughly the equivalent of US $ 6.25) and T.shs. 60 (roughly the equivalent of US $ 7.7) respectively as at 1st July 1980. Although the items compared are not

strictly comparable in so many respects, but the peasant farmer who has limited financial resources will «choose» to buy the hoe rather than the plough. This is what he can afford while at the same time he is fully aware of its 'technical inferiority' in relation to the equipment manufactured by UFI, CAMARTEC etc. Furthermore, the village blacksmiths and craftsmen unlike UFI and CAMARTEC do provide not only the implements but also the much needed repair and maintenance services on the implements themselves when needed. In addition, the implements and repair services are provided within a closer proximity to the users – e.g. farmers. All this puts the village blacksmiths and craftsmen in a more «competitive» position than the formal modern factory based farm implement manufacturers.

Outstanding cases of farm implements used in the agricultural sector which have been designed and manufactured by local blacksmiths and craftsmen in Tanzania include:

(i) Fertilizer applicator

This implement is used for planting hybrid maize. It is very simple in design. Its use has resulted into substantial economy in the deployment of labour inputs in maize planting : in fact, it has more than halved the manpower input requirements in hybrid maize planting. Production of this implement until this stage is still on a very limited scale. For example by the end of 1982 only thirty (30) were produced. A number of technical 'hitches' in the design of the equipment have yet to be 'de-bugged'. To a large extent this equipment is still in the proto-type stage. A sizeable amount of 'research and development' work has needs to be done inorder to bring the equipment out of its present proto-type stage into full scale commercial production. This will be necessary if its use has to be widely diffused in the agricultural sector in the economy.

(ii) Planter

This is a twin purpose implement. It is used for applying fertilisers as well as for planting seeds of maize, sorghum etc. Again as for the fertiliser applicator, full scale commercial production of this implement has yet to begin, as more technical ('research and development') work still remains to be done to refine the design of the implement. Like in the case of fertilizer applicator, output of the planter is still very low indeed.

2.1 *Energy Sector*

The lion's share of annual fuel consumption in the country is burned in the rural areas using quite poorly, designed open fire places. Using these fire places, a good deal of the heat and energy so generated (well over 80%) radiates into the thin atmosphere. About 13% of all fuelwood used in Tanzania is burned to charcoal and consumed in urban centres in small metal – stoves (popularly known is Swahili

as jiko). These are manufactured by artisans – both in urban and rural areas. They are made out of thin metal plates – often times of old discarded bitumen drums which used to store petrol, diesel, kerosene etc. The «jiko» burns charcoal with a rather low efficiency level radiating through its thin metal wall well over half of the energy and heat so generated. To deal with this inefficiency in energy use, attempts are being made by institutions (much of which are within the formal sector) to produce better and improved «jikos» which will increase efficiency in energy and heat use derived from charcoal burning. Such institutions engaged in this engineering and related technical efforts include:

(a) Soikoine University of Agriculture

The faculty of Forestry of this new University has been working on improved charcoal stoves since 1979. The main objective of the project is to design and produce a charcoal stove with improved efficiency in fuel use. Experiments are being done using clay liner (Thai bucket).

(b) Dodoma Rural Energy Project

The Rural Energy Project based in Dodoma is doing some technical work geared towards developing and improving what is known as the 'Dodoma Stove'. This is an improved version of a stove which was originally developed by UNICEF in Nairobi popularly known as 'Umeme' in Kenya. The new improvisation is the fabrication of a double wall metal coating to the above in order to provide an added insulation and so minimize the extent of loss of heat and energy through radiation generated by the burning of charcoal. Heat transfer efficiency in Dodoma stoves is roughly 36% compared to 20% level of efficiency in the traditional stoves. The stove costs around Tshs. 250 (the equivalent of US $ 11.25). Large groups of village and urban artisans have been trained to manufacture these. Many of these trained have well 'mastered' the skills, expertise, etc. involved in the manufacture of these «jikos» but the problem of getting raw materials and especially discarded bitumen drums is enormous. This inhibits greatly the widespread 'diffusion' of the 'jikos' accross a wider section of the country as well as of the technology itself involved in the manufacture of these 'jikos'.

3.0 Main Problems faced by the Sector

A number of problems inhibit sustained growth of metal working activities in Tanzania. Many of these have been well documented by previous researchers in the field (e.g. Yindi, 1982 ;Mullet 1980; 1982 amongst others). However, it well may be useful to outline some of these.

One of the main problems (and which has received perhaps the greatest attention so far) faced by metal working activities in both the formal and informal sectors in Tanzania is the lack of appropriate

tools, equipment, skills, expertise, materials, funds etc. for the efficient carrying out of the key activities. Many of the village crafsmen and blacksmiths operate with inadequate tools and limited financial resources as Yindi (1982) notes:

> *«Although the requirement of tools and equipment is not demanding, most entrepreneurs have problems to fully equip themselves. A lot of them have self-made improvised tools and a few bought from hardware stores». (p. 5).*

Likewise an anonymous and undated study carried out under the auspices of SIDO on the consolidation of village blacksmiths in Tanzania suggests amongst other things that:

- there are no proper workingsheds for the blacksmiths, though nearly all of them were working from makeshift spaces;
- the workforce employed was largely untrained;
- the tools used were inadequate both in quantity and quality. In other cases, there were no proper bellows; just sheep skin and cement bag bellows. These were not efficient;
- Right kinds of raw-materials were unavailable.

There are also factors of a technical nature which have so far received little attention (if at all) but nonetheless inhibit rapid advancement in the growth of the sector. One such factor is the fact that much of the metal-working activities within the informal sector takes place on a rather weak techno-productive basis. The technical processes, procedures etc. used for productive activity in the sector are less standardised. Moreover, many of the metal-working enterprises within this sector do not have formalised engineering and related technical specifications, data, etc. relevant for the production of the goods and services they are engaged in. Technical data and specifications define the basic characteristics (physical, chemical etc.) of the goods and services produced. Lacking basic engineering and other relevant technical data, it becomes difficult to achieve and maintain product quality at a certain level. But more important perhaps, is the fact that lack of formal engineering design specifications retards the diffusion of the process technology used in the production of the goods and in rendering the services involved in the sector. Hence, 'imitation and replication' of the products by others is severely restricted since 'blue prints, technical formulae and engineering specifications' in relation to the processes, products, etc they produce and use do not exist in 'black and white'.

4.0 Measures Taken to Deal with the Problems faced by the Sector

The government and relevant institutions in Tanzania are well aware of some of the problems faced by metal working activities in the sector, and have taken a number of steps to deal with the situation. These include, for example:

(i) Setting up in 1973, by parliamentary act, a body known as Small Industries Development Organisation (SIDO): the main function of this body being to initiate, plan, promote and coordinate small industrial activities (including metal-working ones); to give managerial and technical advice to prospective and active entrepreneurs, assist in finding suitable markets for small industry products, provide technical and managerial training and assist in securing of finance and related material support required by small industrial plants etc.
Since established, SIDO's role has been mainly advisory. It has not found it appropriate to take the leading role in starting and running small industries. The business of starting and actually running these is left in the hands of the industrialists themselves. Many small industrial plants (including metal-working ones) have benefitted a great deal from the technical and professional services rendered by SIDO. Regretably, however, much of SIDO's work is concentrated on industrial plants in the formal sector rather than in the informal one.

(ii) The government has set up a separate directorate within the National Bank of Commerce to liase with SIDO and other related institutions to help and support small industrial activities (including metal-working ones). The department offers credits to small industry entrepreneurs.

Again, much of the credit and other forms of support offered by this department so far has been concentrated on small industrialists in the formal sector rather than on those engaged in the informal sector.

5.0 Lines for Future Government Policy and Action

The previous sections of this paper have indicated that the actual and potential role of metal-working activities within the informal sector for economic development in Tanzania is enormous. This is well recognised and appreciated by many in the country – not least by those in key policy and planning circles. Unfortunately, however, until now the activities of this sector have not been well enough integrated – in a formal sense at least – into the governmental machinery for development policy and planning. As yet, there is no form of policy and planning frame within the context of which the activities of this sector (which supposedly plays a crucial role) might be carried out. Lacking this broad policy and planning frame both the activities and growth of this sector are carried out in a haphazard manner.

It is evident therefore that an important government policy objective in relation to metal-working activities in the informal sector is to seek to integrate the activities of this sector into the overall

governmental machinery for policy and planning machinery. However, this should not be viewed as being purely a formal (and usual bureaucratic) exercise. But it should involve, for instance, the setting up of a seperate department within SIDO and/or Ministry of Industries specifically designed and suited for dealing with metal-working activities in the informal sector – both in rural and urban centres. As part of its activities, at least in the initial period, the department could carry out systematic and in-depth research to find out the size and activities of the units engaged in the sector; identify their main problems, and propose possible ways of dealing with the problems so identified. This is important inorder to get much deeper insights and understanding of the details of this sector. In turn this is important because much of what is known about this sector at the moment is of a general nature and is scanty. This is too weak a base to inform future policy, planning, action, management for sustained development of this sector.

This paper has also indicated that a large proportion of the metal-working activities in the informal sector operates under severely constrained factors – physical facilities, material resources, human resources, etc. An important line for future government policy initiative in this sector is therefore to help and support this sector to acquire right qualities and amounts of inputs (materials, human etc) they require inorder to carry out their activities efficently. This could be done, for instance, by instituting ways and means through which the government and its various departments and relevant institutions can ensure that metal-working activities in the informal sector do get regularly appropriate inputs and in the amounts required – e.g. scrap iron, metal materials etc. Ways and means should also be designed by government to provide and facilitate extension and training services to metal-working activities in this sector to help alleviate the skill, expertise etc. problems faced by the sector.

It was also indicated in this paper that although in some cases metal-working activities in the formal and informal sectors co-exist in a geographical sense formally, however, there is in most cases little (if any) interaction in the activities of these two sectors. It would therefore be worthwhile for future government policy and action in this area to help initiate, foster and develop appropriate and effective mechanisms through which the activities of these two sectors can be intimately linked. Such linkage mechanism might take the following directions:

(i) Unrestricted and unconditonal flow of information, experience etc. between the two sectors in relation to their activities, etc and especially in carrying out technical tasks – e.g. product and process design work, product and process innovative work etc. This will have the advantage of learning from each other which may results in considerable economy of time and effort which would otherwise be necessary to go into something a fresh which

the other party has already discovered a great deal about. In this regard, the formal sector for some reasons is in a much better position than the informal one. Many more process and product designs are conceived and proto-types developed in the formal sector than in the informal one. For example recently Tanzania Engineering Design Organisation (TENDO) has worked out quite some elaborate designs for and proto-types of (a) hand operated grinding mills for maize and sorghum; (b) portable pedal operated rice threshers (c) hand operated shellers etc. Likewise very recently the Institute for Production Innovation (IPI) situated within the University of Dar es Salaam has worked out elaborate designs for and proto-types of (a) an 8- tonner manually operated oil pressing machine. (b) a 20 tonner manually operated oil pressing machine. Both of these machines are used for pressing oil bearing seeds (e.g. simsim, castor, groundnuts, and sunflower) inorder to extract oil from them. One form of linkage which is suggested here is to make these proto-types available to village blacksmiths and craftsmen to give them a chance to learn and understand the engineering and related technical details embodied in those pieces of machinery etc. On the basis of such knowledge acquired – initially at least – to attempt replication and initiation of equipment and later to seek to modify and improve on them in subsequent phases. If successfully implemented this linkage approach may have the advantage of diffusing both the technology for the manufacture of these equipment as well as of the equipment themselves manufactured across a wider section of the country.

(ii) Pooling together resources (material, human etc.) and carrying out jointly technical and techno-managerial task geared towards for example developing designs, proto-types and test running of particular processes, products and/or developing and improving on known technical systems etc. One of the beauties of this kind of linkage mechanism is the sense of collectivity which is created in doing the technical tasks involved and so in the acquisition and accumulation of the technical and managerial knowledge, skills, expertise which arise from participating in the 'doing of these tasks'. In turn this skill, expertise etc. capability may provide a basis for progress to be made in developing increasingly better designs, proto-types etc. of new process products, procedures etc.

However, and as indicated earlier, the determination of the precise direction of policy initiatives that would seem appropriate to develop and administer in relation to sustained future growth of this sector would require (as a necessary conditon) deeper knowledge and understanding of the behaviour of the sector than what we know at the present moment. This, therefore, points to the need for carrying out much more systematic and tightly focussed policy research

and analytical pieces of work about the techno-economic behaviour and characteristics of metal-working plants and activities in the economy.

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RESUME

Comme c'est le cas dans de nombreux autres pays en développement, le travail des métaux peut jouer et joue effectivement un rôle considérable dans le secteur informel pour le développement économique de la Tanzanie. C'est là un fait reconnu et admis par plus d'un Tanzanien dont ceux qui occupent des postes importants de politique et de planification ne sont pas des moindres. Curieusement cependant, jusqu'à présent les activités de ce secteur ne sont pas bien intégrées dans le mécanisme gouvernemental en matière de politique et de planification pour le développement .pas d'une manière officielle tout au moins.

Dans cet article, l'auteur souligne que pour appréhender d'une manière complète le rôle réel et potentiel de ce secteur dans le développement économique de la Tanzanie, il faut nécessairement que le gouvernement ainsi que les institutions dont les activités sont liées à ce secteur initient une politique d'innovation.