African Technology Development Forum

ATDF JOURNAL VOLUME 3, ISSUE 4

INNOVATION; TECHNOLOGY; TRADE; DEVELOPMENT

"An institution is the lengthened shadow of one man."

Ralph Waldo Emerson *(1803-1882)*

HIGHLIGHTS:

ISSN: 1817-2008

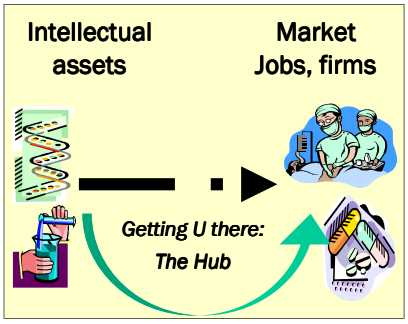
Abbreviation:

Afr. Technol. Dev. Forum j

http://www.atdforum.org/

December 2006

INSIDE THIS ISSUE



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Policy, Investment, and Partnerships for Agricultural Biotechnology Research in Africa: Emerging Evidence

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Abstract

This paper investigates to what extent the public policy and investment environments across the African continent are enabling the research, development and dissemination of agbiotech and GM crops. Using data from two surveys on agricultural research, this article examines the scope, magnitude and effectiveness of agbiotech and GM crop research in Africa. The findings indicate- that while a growing number of countries in Africa are investing in agricultural biotechnology and genetically modified crop research, their policy and investment environments may significantly inhibit the diffusion of these new technological opportunities. Findings suggest that valuable private sector resources are not being brought to bear on research and development in the region, thus slowing the pace of innovation. For such research to benefit Africa, greater efforts are needed to enhance the international exchange of information on environmental safety and to overcome institutional barriers to public-private research collaboration. Such efforts would significantly improve the effectiveness of public sector research on agbiotech in African countries by promoting a more entrepreneurial culture of innovation and by making research institutions more responsive to emerging needs and opportunities.

1. Introduction

The growing body of literature on the state of agbiotech in Africa includes three areas of inquiry that are critical to the present study: (1) studies on transformation events (please explain to the reader in a short footnote) and regulatory processes; (2) studies of the policy and investment environment in the agricultural research and development (R&D) sector in developing and industrialized countries; and (3) studies on the role of public-private partnerships in agricultural R&D. The literature in each of these areas is reviewed in detail below.

1.1 Studies on transformation events and regulatory processes

The literature on transformation events and regulatory processes includes databases such as the FAO's online database on Biotechnology in Developing Countries (BioDeC, http://www.biodec.com/), launched to monitor trends in the development, adoption and application of crop biotechnologies in developing countries [1]; AGBIOS, a Canadian initiative that assembles information on the global state of GM crops approvals as well as public policy, regulatory, and risk assessment expertise for biotechnology products in different countries [2]; and the International Service for the Acquisition of Agri-biotech Applications (ISAAA), which publishes periodic overviews and analyses GM crop adoption worldwide [3]. The data and analyses accompanying these sources suggest a limited number of transformation events and regulatory approvals for GM crops in developing countries, with the least representation coming from Africa. For example, of all the ten developing countries with regulatory approvals for the commercial release of GM crops listed in AGBIOS dataset (Argentina, Brazil, China, India, Korea, Mexico, Philippines, South Africa, Taiwan and Uruguay), South Africa is the only African country listed.

Studies of transformation events, regulatory processes and/or governance relating to agbiotech in Africa are highlighted by Wafula and Clark [4], Harsh [5], Sithole-Niang et al. [6], Alhassan [7], Mugabe [8], Baum et al. [9], and Johansen and Ives [10]. Complementary studies on the opportunities posed by agbiotech and the political and legislative uncertainty that influences country-specific regulatory systems are offered by Cohen [11], Cohen and Paarlberg [12], Paarlberg [13], and Komen et al. [14], among others. A conclusion that can be drawn from these studies is that timely advancement of agbiotech and GM crop research and its effective use to address local problems in agriculture is often hampered in countries where events and approvals are few and far between, where political interest groups advocate against the design and implementation of agbiotech policies and regulations, or where the innovative capacity of the country's research system is limited..

To date in Africa, agbiotech research is being conducted by Egypt, Ghana, Kenya, Morocco, Nigeria, Tunisia, South Africa, and Zimbabwe. Only Egypt, Kenya, Nigeria, South Africa, and Zimbabwe have developed national biosafety policies so far, though several others (e.g., Ghana, and Uganda) are advancing their policies [16]. There is significant variation in how the policies are framed. In Egypt, for example, while a draft law on agbiotech is under preparation, the current regulatory regime is managed by the Ministry of Environment and based on two decrees issued in 1994, one for GM seeds and a

second one for GM crops. In Kenya, guidelines and regulations developed in 1991 primarily govern biotechnology research, while in South Africa research is regulated under laws enacted in 1999. Many other countries in the region have participated in regional informational meetings on biosafety, signed on to the Cartageña Protocol, and/or engaged in discussions on regional harmonization of biosafety regulations [3, 16]. Yet very few of these countries have moved ahead into testing, approval and commercialization. Only South Africa has any significant number of approved field trials (172), confined field trials (7), commercial approvals (9) and hectares under GM cultivation (0.5 million) [3, 15].

1.2 Studies on the investment environment

Studies of the investment environment are also a good indication of the advancement of agbiotech and GM crop research in developing countries. Most African countries – with notable exceptions such as South Africa and Kenya – are facing declining or stagnating growth rates of public investment in agricultural R&D, and consistently limited investment from the private sector [17]. Based on a sample of 27 Sub-Saharan countries, a recent survey estimates that the growth rate of public agricultural R&D expenditure declined from 2.0 percent in the 1970s to only 0.8 percent in the 1990s. Excluding South Africa and Nigeria from the sample – where R&D expenditure grew during the 1990s – total spending in the region actually declined by 0.2 percent per year, resulting in a halving of average spending per scientist (Table 1) [18]. Research specifically targeted to agbiotech represents a tiny fraction of these figures, is concentrated primarily in South Africa, Kenya, and Egypt, and is often highly dependent on donor funding [19]. While there is some indication of a growth in agbiotech investment by the public sector in these countries and several others, figures still remain relatively low.

Yet at the global level, investment in agbiotech research is not insignificant. Estimates suggest that private investment in plant biotechnology by the leading multinational companies during the mid-1990s totaled approximately $1 billion per year, a figure that amounts to roughly half of all global expenditure on agbiotech R&D [20, 21]. Most of these expenditures, however, were concentrated on crops, traits and technologies directly relevant to industrialized country farming. Again, only a minute fraction of this research expenditure is immediately relevant to Africa.

In short, without consistent investment in agricultural R&D, it is hard to imagine how African countries can augment their investment in conventional research (plant breeding, for instance) with more advanced and more costly agbiotech and GM crop research.

Studies on the investment environment with respect to markets for seed and other planting materials are also a good indication of progress in agbiotech and GM crop research. Functional seed systems are critical because they are the channel through which many agbiotech applications will be deployed and disseminated in Africa. However, seed systems are, by their nature, subject to a variety of unique market and institutional constraints [32, 33]. First, problematic property rights result from fact that improved seeds can, in many cases, be reproduced by the farmer, thus reducing the ability of breeders to appropriate the gains from their innovative activities and investments. Second, information asymmetries result from the inability of farmers to make ex ante assessments of seed quality, since such knowledge is held only by the seller in the absence of certain types of regulation. Third, coordination problems result from difficulties of enforcing and monitoring contracts for seed use: farmers often save and exchange seed without the breeder's knowledge. Finally, inelastic supply responses result from the inability of breeders to respond effectively to rapid changes in seed demand from farmers: often, farmers may reassess their seed type and quantity re-

Table 1: Public and private agricultural research investment, c. 2000

Region/country[a]	Total spending			Shares	
	Public	Private	Total	Public	Private
	(millions 1993 international dollars)			(percentage)	
East Africa (7)	341.4	5.4	346.8	98.4	1.6
South Africa	365.6	15.6	381.2	95.9	4.1
Other Southern Africa	62.4	2.8	65.2	95.7	4.3
Nigeria	106.0	-	106.0	100.0	-
Other West Africa (13)	209.3	1.8	211.1	99.1	0.9
Total (27)	**1,084.7**	**25.6**	**1,110.3**	**97.7**	**2.3**

Source: Beintema and Stads 2006. [a] Numbers in parenthesis denote number of countries sampled in each region/subregion.

quirements just prior to planting based on expectations of rainfall, market prices, and other factors—decisions taken long after breeders have bulked up seed quantities for distribution.

Although seed systems may exist in Africa where markets for a given crop are well-developed, e.g., maize in Kenya, they are more often weak or otherwise incomplete due to the constraints noted above [34, 35]. Seed systems for "orphan" crops of marginal commercial value but critical importance to subsistence farming—sorghum, millet, groundnuts, pigeonpea, cassava, or sweet potato—are rarely functional throughout the region, due primarily to the combined weakness of the markets for these commodities, the non-appropriability of varietal improvements under current technological and legal contexts, and limited incentives to commercialize public research on varietal improvement in most countries [35, 36]. Thus, the market and institutional failures pose a significant barrier to the entry and growth of private seed firms which could potentially commercialize, market, and distribute varietal improvements resulting from public research. This is a major disincentive to increasing investment in GM crops and agbiotech research across the region.

1.3. Studies on the role of public-private partnerships

Next, consider the literature on public-private partnerships in agricultural R&D. Studies by Chataway [22], Hall [23], Spielman and Von Grebmer [24], Vieira and Hartwich [25], and Ozgediz and Nambi [26], among others, argue that public-private partnerships – broadly described as any joint effort between public and private entities in which each contributes to planning, commits resources, shares risks and benefits, and conducts activities to accomplish a mutual objective – represent an innovative and potentially beneficial approach to promoting agricultural and agbiotech research in developing countries.

R&D partnerships rely on processes of knowledge sharing, resource pooling, cost minimization, scale economies, and joint learning to generate synergies in conducting advanced research, commercializing new technologies, and deploying new products. Ideally, these synergies result in research outcomes of greater quantity, with a greater chance of success, or at lower cost than public, private or civil society actors could expect when acting independently. If the research is strategically focused on the needs of marginalized social groups, outcomes may ultimately translate into significant social and economic benefits. Several partnerships formed around this type of focus include projects on cassava [37], cowpea, sorghum, bananas and plantains [38] in Sub-Saharan Africa, and are expected to deliver beneficial outcomes over the next decade.

Partnerships are particularly useful to larger or more advanced systems that require access to cutting-edge research tools, proprietary knowledge, or other types of information and data; and to smaller systems which do not have the scale economies to conduct independent research efficiently [20]. In recognition of this potential, key public sector actors are engaged in several partnerships focusing on enhancing yields or nutritional content of crops such as rice, wheat and cassava. In Africa, the partnerships have been concentrated only in South Africa, Kenya, and Egypt, and are highlighted by such projects as multistakeholder research initiatives on insect-resistant maize; a livestock vaccine for East Coast Fever; virus-resistant sweet potato; micro-propagated, tissue-cultured banana; and bio-fortified grain crops [27, 3]. In most cases, the research centers of the Consultative Group on International Agricultural Research (CGIAR) play an important role in convening these initiatives, mobilizing resources, and conducting research, often in partnership with national research systems, multinational crop-science firms, and local seed firms. What remains to be seen is whether the partnership approach is yielding the expected outcomes.

2. Two surveys on agricultural research

Two recent studies on agricultural research provide additional evidence on the realities of the policy and investment environment in agbiotech and GM crop research in developing countries.

2.1 Next Harvest 2002

The first is a study entitled Next Harvest, initiated in 2002 by the International Food Policy Research Institute (IFPRI) and the International Service for National Agricultural Research (ISNAR). It was conducted to determine expectations and limitations on publicly researched GM crops and traits. The study was conducted based on a survey distributed to a purposeful sampling of 76 experts (researchers and regulators) from public research organi-

Table 2. Transformation events by country (2003)

Country	No. of events
Egypt	17
Kenya	4
South Africa	28
Zimbabwe	5
Total (Africa)	**54**
Total (all regions)	**209**

Source: Next Harvest survey data, 2003

zations in 16 developing countries. The sample was designed to capture the extensive variation in the type and state of research in different countries and organizations, and to ensure that relevant knowledge, experiences, and insight were provided to participants. Information on 209 transformation events was received through the year 2003, along with data on crops under research, desired phenotypic traits, transgenes deployed, techniques used to deploy transgenes, types and sources of genetic resources used, stage of regulatory approval reached, type of collaboration used to conduct the research, and plans for dissemination of research outputs [15]. Fifty-four of the 209 events (26 percent) were attributable to agbiotech research in African countries (Table 2).

2.2. IFPRI's PPP Study 2003-2004

The second study was undertaken by IFPRI in 2003–04 to examine partnerships between private firms and the international research centers of the CGIAR. The study was based on a purposeful sampling of 42 key stakeholders engaged in or closely associated with public-private partnerships in international agricultural research. Sampled stakeholders included representatives of multinational/national research-based agribusiness firms; international agricultural research centers and programs; multilateral and bilateral donors and foundations; and national agricultural research systems, academia, and non-governmental organizations (Table 3).

At least a quarter of the stakeholders were engaged in or closely associated with partnerships that were directly relevant to research in Africa. Data were compiled from semi-structured interviews and open-ended discussions, and were complemented by information from a research seminar held in February 2004. Topics covered included respondents' experiences in planning, management and execution of a partnership, their incentives and motivations for engaging in the process, and their perceptions of the process and their partners. [24]

3. Findings

3.1 Insights from Next Harvest

A key finding of the Next Harvest study is that public research institutions in developing countries have conducted a significant number of diverse crop transformations to express a wide variety of crop groups and transgenes [11]. However, while relatively large numbers of transformation events were recorded in Asia and Latin America, the only African countries with any significant number of events were Egypt and South Africa.

3.1.1 Transformation events: confined to the experimental stage

When classified by crop type, more than half (55 percent) of all public events recorded by the survey were concentrated among 15 crops that are critical to achieving sustainable food security and reducing poverty in developing countries. The remaining 45 percent of transformation events were focused on cotton, vegetables and fruits – crops of a more commercial nature. For Africa, the predominant group crop in all 54 transformation events was cereals, followed by vegetables, roots and tubers, and sugar, with each group representing a fairly diverse set of crop species. The greatest numbers of transformation events among all 11 crops were for maize (17.0 percent), potatoes (13.0 percent), and sugar and tomatoes (11.0 percent each) [6].

With regard to regulatory progress, most of these transformation events remained confined to the experimental stage of laboratory and greenhouse trials, while fewer have advanced to later stages in the regulatory process such as field trials for biosafety testing; scaling-up stage for wider environmental and efficacy testing; or commercialization stage for release to farmers [11]. Overall, African events lagged slightly behind their Asian and Latin American counterparts: While 70 percent of

Table 3. Respondents to an IFPRI Study of Public-Private Partnerships (number)

Affiliation	Respondents	
	Number	Percent
Multination corporation	15	36
CGIAR center/program	12	29
Donor agency	8	19
National agricultural research system	2	5
Academia/non-governmental organization	5	12
Total	**42**	**100**

Source: Spielman and Von Grebmer, 2004

Table 4. Institutional arrangements used in public transformation events (no.)

Institutional arrangement	Africa	All Regions
Single public institution	28	129
Public/Public	13	47
Public/Private	7	15
Public/Foundation/Public	0	8
Public/Private/other	5	6
All other (no private collaboration)	1	4
Total	**54**	**209**

Source: *Next Harvest* survey data, 2003

all events in the African countries surveyed were still at the experimental stage, only 60 percent were at a similar stage in Asia and Latin America.

3.1.2 Main research actors: poorly networked

Most of the surveyed public organizations worked in isolation from other research actors, both public and private. Across the study, only 7 percent of transformation events generated by these organizations were conducted in collaboration with the private sector, while only 22 percent were generated in collaborations between or among public institutions. In Africa, the distribution of involvement was somewhat different: half (52 percent) of all transformation events were from a single public institution while the rest was from public-private (22 percent), public-public (24 percent), or some other type of collaboration (2 percent). Africa also had more representation from the private sector regarding origin of genetic materials. While only 5 percent of all surveyed transformation events relied on genetic materials derived from local or foreign private sector materials, 15 percent of all materials used in Africa originated from the private sector.

3.1.3 Traits of GM crops: Limited in focus

In terms of transgenes and gene groups, the figures suggest that agbiotech and GM crop research may be limited in focus with respect to the particular biotic and abiotic stresses facing agriculture in many developing countries. Fungal, bacterial and other types of resistance are still at very preliminary stages of research for developing country crops and agroecologies, while herbicide tolerance, insect resistance, and virus resistance – originally designed for the needs of industrialized country agriculture – continue to dominate the research pipeline.

3.1.4 Agbiotech research: Limited by heavy regulation

in terms of regulatory progress, the figures indicate that forward movement in agbiotech and GM crop research in Africa is limited to very few countries, and that research in those countries are only now reaching the initial stages of the regulatory process. While agbiotech may shorten the time needed to identify transgenes and transform plants, the resulting GM crop still requires time for scaling up, efficacy trials, environmental testing, and other regulatory requirements particular to genetic modification. Agbiotech research in Africa has not moved far along this road.

This reality is, according to many survey respondents, worsened by the fact that some countries have subjected GM crops to multiple years of testing, significant waiting periods for approvals for scale-up or pre-commercial trials; or have only interim guidelines or regulations in place that do not allow for commercial approvals. Even those countries that do have the ability to evaluate GM crops and provide commercial approvals often lack confidence in their commercial decision-making. Others may be facing limitations such as growers' inability to produce adequate seed amounts for large-scale or food safety testing.

3.1.5 The absence of interaction between the public and the private sector

The relatively small role attributable to the private sector in agbiotech and GM research in African countries suggests that public-private research collaborations face significant barriers to implementation. This absence of collaboration could pose difficulties for public institutions as they advance from research to regulatory approval and commercialization. Without exchanges of valuable regulatory data from private firms and other research

institutions that have conducted transformations of similar crops and/or traits in industrialized countries, public institutions are less equipped to navigate the regulatory and commercialization processes with full information. Without scientific interaction and information exchanges between sectors, many of the public researchers who will be tapped for biosafety committees, regulatory agencies, or advisory bodies will be similarly less equipped to provide real expertise.

3.2 Insights from the IFPRI study on public-private sector collaboration

The IFPRI study on public-private partnerships provides some useful insight. Respondents to the study indicate that partnerships are constrained by conflicting incentive structures, high transaction and opportunity costs, competition and risk associated with proprietary assets, and mutually negative misperceptions. Their responses indicate that competition and risk, along with negative misperceptions, are the most significant constraints, followed by conflicting incentives and high costs.

3.2.1 Conflicting incentive structures: People vs. profits?

Consider first the more obvious issue of conflicting incentives. According to respondents, a barrier to successful collaboration results from the obvious differences in incentive structure: private firms exist to maximize profits, while public agencies exist to fulfill wider social mandates. Where common interests do not exist or are difficult to identify, the potential for collaboration and cooperation are necessarily lower, according to survey respondents. But many respondents were quick to point out that public and private interests do, under certain circumstances, coincide. Public agencies may pursue collaborations with the private sector to access their cutting-edge research tools and technologies, or to use their marketing and distribution channels to farmers and other end- or intermediate-users. Similarly, private firms may pursue collaborations to access emerging markets in African and other developing countries, gain knowledge about local regulatory processes, obtain genetic resources held in the public trust, or enhance their reputations and goodwill with the public or with public interest groups. Partnerships may also be a prerequisite to research funding, for instance, in some competitive grant programs, thereby creating an incentive for coincidental interests.

3.2.2 High transaction costs in contracting, coordinating and enforcing rules of collaboration

Yet even where coinciding interest are identified or created, public-private partnerships may face additional challenges. Respondents cited high transaction costs as a major constraint to successful partnership and partnership outcomes. The direct and indirect costs of contracting, coordinating, and enforcing a relationship between collaborators may result in slow and inefficient interactions and negotiations. This is reflected in the costs associated with managing regulatory and contractual aspects of partnerships that rely on proprietary knowledge such as patented transgenes. This is also reflected in the search costs associated with information asymmetries between parties: often, public research organizations and private firms lack a priori knowledge about the opportunities offered by the other party's stock of proprietary knowledge or its way of doing business, and must engage in a negotiation process (of the which the outcome is uncertain) to obtain such information.

3.2.3 High opportunity costs for firms

Respondents also cited high opportunity costs as a barrier to partnership, i.e., where conventional research investments are foregone in favor of an investment undertaken through an untested, non-traditional or uncertain modality such as a partnership. Firms are ultimately accountable to their shareholders, and only a small number of African countries offer the large agricultural markets, strong IP protections, and/or adequate investment incentives, that provide profitable opportunities for firms in the agbiotech sector.

3.2.4 Risk and competition associated with proprietary knowledge

However, the majority of respondents stated that the most significant barrier to partnership was associated with the risk and competition that comes with the use of proprietary knowledge and intellectual property (IP). Here, the main issues cited were not access to patented tools or applications, but concern over the use and misuse of the IP. This is a critical aspect of agbiotech and GM crop research given its overt reliance on plant genetic resources and the tools and methods of genetic engineering. Respondents from the private sector noted that partnerships that revolve around IP run the risk that a public partner might share the IP with the private partners' competitors, inadvertently or through detailed, public disclosure of research activities; or mishandle the stewardship of the IP, potentially allowing for misuse or abuse by third parties. Respondents from the public sector, on the other hand, noted that similar types of partnerships run the risk that a private partner might capitalize on genetic materials held in trust for the public good, appropriating any gains from its use for private gain.

These risks can translate into significant financial and reputational liability for both public organizations and private firms. Respondents suggested that while contractual limitations on the use of IP and other sensitive

resources can help reduce risk and liability, full enforcement of contracts is often difficult in many developing countries and sometimes undesirable where long-term public-private relationships are being forged.

Thus, the constraints posed by risk and competition are not easily mitigated. This may also explain, to some extent, the extremely limited reliance on private sector transformed materials observed in the Next Harvest survey.

3.2.5 Persistent misperceptions

Finally, the willingness of public institutions and private firms to partner is significantly constrained by persistently negative perceptions between the sectors. Typical misperceptions – researchers in multinational firms should be treated with suspicion, while researchers in the public service are slow and inefficient – are prevalent. Other misperceptions are brought about by the process of partnering, for example, the use of confidentiality and nondisclosure agreements that, while standard in private research, are quite foreign in public research. Respondents also suggested that misperception result from the relative distribution of bargaining power: public institutions or private firms may be unwilling to partner where one party can potentially dominate the partnership by virtue of its organizational size, the value of its IP, the size of its research budget, or its ability to influence political and economic decision-makers.

4. Recommendations

Evidence from the two studies examined here indicate that while public research in Africa is advancing in several countries, the policy and investment environments may be hindering the advancement of this research. Regulatory processes are holding up testing and commercialization, while institutional and attitudinal barriers to public-private partnerships are preventing the use of private sector resources and expertise that would provide valuable learning and data exchange opportunities. These findings suggest that the policy and investment environments are insufficient relative to the requirements needed to realize the benefits of these new technological opportunities.

4.1 Improving the sharing of information

There are several regional, national and global policy options that could improve agbiotech and GM crop research in Africa. One is to enhance the quantity and quality of information on the environmental safety of GM crops in confined testing or commercial use through information sharing among countries and researchers – information such as the characteristics of transgenes, gene constructs, host plants, agro-ecological and agro-climatic zones, experimental designs and observations, and regulatory findings.

An option is to place this information in the recently-established Biosafety Clearinghouse so that environmental assessments of crops or traits can be carried out based on accumulated experience among industrialized and developing countries [28]. This presents opportunities for South-South collaboration, information networking, and data sharing, with the objective of minimizing redundancies while maximizing the flow of information and expertise based on solid and comprehensive sources of information, ultimately increasing regulatory proficiency and minimizing R&D costs. Greater knowledge of the array of available transgenes can also be used to strengthen the public sector's position in negotiating access agreements over proprietary materials and techniques. In this context, there is also a need to build capacity within research organizations and train local researchers to make effective use of electronic biotechnology research databases and conduct advanced research.

4.2 Improving the effectiveness of collaborative research

Several innovative approaches to collaborative research could also improve the pace and level of research on agbiotech and GM crops. One possibility is for the public sector to take a stronger public negotiation stance, advocate for greater private tax incentives, or promote other mechanisms to improve the willingness of firms to invest in or provide IP donations for research with a public-interest focus.

For example, the Golden Rice Humanitarian Board – a partnership charged with promoting research on beta carotene-enhanced rice – manages not only the transformation work of academic researchers in Germany and Switzerland, but also the intellectual property licensing, financing arrangements, and technology transfer to international and national research systems for more applied research and local adaptation [29].

Other arrangements may be formalized as commercial joint ventures, within which public and private collaborators establish a legal entity to execute a public interest research agenda, and endow it with a mix of governance and management characteristics from the public and private sectors. Lessons can be learned from China where several agbiotech ventures are advancing as commercial entities spun off from public research agencies, often wholly or majority owned by the parent agency [30, 31].

Alternatively, researchers and policymakers may explore the use of "honest brokers" or non-profit, third-party organizations to facilitate interactions between the sectors, manage the research execution, and assume responsibility for the use of proprietary knowledge and technology. The International Service for the

Acquisition of Agri-biotech Applications and the African Agricultural Technology Foundation are playing such a role in agbiotech and GM crop research in Africa.

4.3. Improving interaction among key players

The advancement of agbiotech and GM crop research in Africa necessitates greater interaction between key players engaged in the process. There is sufficient evidence to suggest that both the public and private sectors have an interest in advancing agbiotech and GM crop research, whether to improve food security, reduce poverty, or reap commercial rewards. Greater dialogue between the sectors is needed to reduce misperceptions, facilitate greater collaborative research opportunities, and improve the wider environment in which research is being conducted.

4.4 Improving commercial opportunities

The advancement of agbiotech and GM crop research in Africa also requires greater investment in building systems and markets for seed and planting materials. Enactment of plant variety rights and truth-in-labeling laws, combined with a greater commitment from public research organizations to moving technologies off the shelf and into farmers' fields, would facilitate greater investment in GM research and product deployment in Africa. Public-private partnerships, technology commercialization programs, competitive grants, reward/prize programs, and other such approaches could go a long way in shifting public research incentives toward more commercially-viable outcomes.

5. Conclusion

Slow progress in agbiotech and GM crop research in Africa is not simply the result of the highly politicized debate over the desirability or safety of these new technologies: rather, it is also a product of impediments to the research process itself. The two studies of agricultural research in developing countries examined here offer several critical findings about these impediments. First, while agbiotech and GM crop research are advancing as a result of public sector efforts, movement through the regulatory process is inadequate relative to the opportunities offered by the new technologies. Second, critical assets and competencies from the private sector are not being adequately brought to bear on the research challenge in collaboration with public research. Third, research institutions in advanced sciences need linkages, both public and private. Steps should be taken now to address these issues and the crops under research.

Finally, whatever the steps taken, investment in GM crops and agbiotech research in Africa also requires a real breakthrough—successful navigation through regulatory processes and deployment through commercial channels—to demonstrate the technology's potential contribution to the region's agriculture, and the modalities needed to get there. However, if the impediments discussed earlier persist, the pace of research will be insufficient to generate such a breakthrough, thus slowing the diffusion of new technological opportunities and the potential gains to social and economic welfare in Africa implied therein

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Improving S&T Development and Policy Making in Ghana and Other Africa Countries: Lessons from United Kingdom

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Abstract

The importance of science and technology (S&T) in national development can not be underscored, as many, especially the developed countries have achieved the height development through aggressive development and application of S&T to their economies. Consequently both developing and developed countries have put in place mechanisms to exploit the potential of S&T. However the differences between the two are the level resources commitment to S&T as well as mechanisms established in these countries to paddle S&T development. Equally important is how these mechanisms and the general S&T environment are facilitated by the government through an effective S&T policy making.

The United Kingdom (UK) has established strategic institutions that are designed to improve S&T policy in general and communication between scientists and policy decision makers in particular, as well as building capacity of the politicians (members of parliament) in scientific issues. The paper reviews the S&T institutional framework in the UK and general support for S&T development. The author argues that Ghana and other African countries should design similar institutions such as chief scientific advisor at the highest level of government, establishment of special body to support parliament in S&T issues (but probably with different priorities) in order to effectively mobilize S&T for development.

1.0 Introduction

Generally, science and technology (S&T) are critical drivers of economic development. Advances in science and technology have contributed significantly to improvements in the quality of life in both developed and developing countries (Juma and Yee-Cheong, 2005). The ability of a country to access, comprehend, select, adapt, and use scientific and technological knowledge is correlated with the well-being and quality of life of its people. Developed countries have recognised this and supported the development and application of S&T to their economies accordingly. The commitment is illustrated by the level of funding and the various structures that have been established to provide policy directions for the S&T. For example, in 2003, the USA spent 2.6% of its GDP on research and development, the UK 1.9%, Germany 2.6%, and France 1.2% (OECD, 2005).

There has been increased political interest and participation in the development of S&T in the UK. This is epitomized by the array of policy making institutions and processes established to support S&T development. Special offices or structures have been established at the highest level of government to provide advisory services and coordinate S&T and innovation activities in the country. Such offices are the Parliamentary Office for Science and Technology (POST), Office of Science and Technology (OST) and other advisory committees and bodies. They were set up mainly to assist the political authorities in S&T policy making and advice. These are also buttressed by political statements, reviews and commission with the ultimate aim of positioning S&T on a higher pedestal in their development activities. Examples of UK's strategic programmes include:

⇒ Science and Innovation Investment Framework 2004 – 2014, launched in 2004. The over-arching objective of this Framework is to make UK's centres of excellence top world class research centres and this is to be achieved through the following:

Maintaining the second position after the US on research excellence, and current lead against the rest of the OECD; closing the gap with the leading two nations where current UK performance is third or lower; and maintain UK lead in productivity

i. Retain and build sufficient world class centres of research excellence, departments, as well as broadly based leading universities, to support growth in its share of international mobile R&D investment and highly skilled people. This is to be achieved through increasing 1.9 to 2.5 per cent of GDP invested in R&D (HM Treasury et. al, 2004).

⇒ The UK Foresight Programme launched in 2002. The aim of the Foresight programme is to increase UK's utilisation of science through identification of unique niches for the economy or society from new science and technolo-

gies, and actions to help realise those opportunities. The modus operandi to achieve this aim is by providing a core set of skills in science-based futures projects and unequalled access to leaders in government, business and science.

All Foresight projects among others are to deliver:

i. Thorough and up-to-date information and analysis of recent developments in relevant areas of science and technology, including an international perspective, and forecasts of what the next developments might be;

ii. Visions of the future, reflecting the potential impact of science and technology, and forecast social and economic trends, i.e. benchmarks for success and

iii. Recommendations for action, by research foundations, business, government or others, to make the most of the potential of science and technology[1].

These initiatives and others are to make the UK stronger in scientific field so as to achieve its objective of becoming second to USA in scientific ratings. A few indicators will buttress the underpinnings of these strategic frameworks and policies in UK. As at 2002, UK was fourth among the Organisation for Economic Co-operation and Development (OECD) countries in terms of patents applications to the European Patent Office (EPO). In all 5,265 applications were received from the UK (OECD, 2005). Further, in 2003, UK ranked fourth (9.9%) in the OECD export market share of high-tech manufacturing industries, as well as fourth (2,168 patents) in the triadic families patents (OECD, 2005)[2]. Again in terms of global subscriptions to journal by scientists, the UK's contribution is about 3.3% of the world's total, while its researchers contribute over 5% of all articles published world-wide[3].

1.1 S&T in Ghana

The S&T development and strategic plans as seen in the UK do not prominently feature in Ghana's development agenda. Beside, S&T Policy launched in 2000, not many high profile and strategic S&T programmes have been enunciated in Ghana. The national S&T policy has the objective of mastering S&T capabilities, developing infrastructure to support industry and other sectors of the economy to meet the needs of Ghanaians (MEST, 2000). Sadly, the strategic plan to implement the policy is yet to be adopted and implemented by the government. This is due to among others, the absence of political structure at the highest level of government to advice and champion the crusade for implementation of the strategic plan.

On the whole (albeit on limited scale) some national development plans, in the recent years have been thinly laced with statements of utilising S&T to propel development. For example, the Ghana Vision 2020 contained a statement on using S&T as a pedestal to enhance the socio-economic development of the country (Ghana Government, 1996). Further, the Ghana Poverty Reduction Strategy (GPRS) I (2003 – 2005) emphasized the need for robust development of S&T to bolster industrial production, employment, and natural resource production, food security, sustainability, self-sufficiency and environmental health (Ghana Government, 2003). However, in the case of GPRS II (2006 – 2009), no mention is succinctly made of S&T as tools to achieve the development targets in the document.

Generally, synergy between S&T and the political system had been weak in Ghana and the other African countries. NEPAD has alluded to this weak links on the continent, as it emphasized that political organizations have not accorded S&T top priority in their manifestoes and parliamentary activities (NEPAD, 2003). NEPAD also admits that technological change is a complex business that is influenced by many political factors. The dominance of vested national and international political interests that prefer to avoid technological change may have contributed to the weak position of S&T in most African countries. Yet, there is also the problem of weak institutions, inadequate financial and technical support and weak political commitment to the promotion of S&T that explain the poor performance of African countries in their efforts to mobilize S&T for development. For example, Ghana established the Council for Scientific and Industrial Research in 1968 with the mandate to conduct and coordinate all aspects of scientific research in the country[4]. Other countries such as Zambia, Kenya and Uganda have established science councils to spearhead scientific and technological research in their respective countries[5]. These institutions were established by Acts of Parliament of the respective countries, yet these Councils did not receive adequate resources and recognition to operate effectively. Thus, the initial enthusiasm has not been sustained throughout these years. Therefore, there is the need to regain this enthusiasm by initiating new programmes that will galvanise and build the capacity of the political authorities. The purpose is to enable them to appreciate and understand how S&T contributes to social and economic development.

The objective of this paper is to review the institutional framework for S&T policy making and for developing synergy between science and the political system in UK. The

study draws experiences from UK, which are practicable for Ghana and other African countries to emulate to enhance their S&T capabilities. It also looks R&D funding and contributions of S&T to national development. The paper does not address how S&T policies are made or the quality of the policies, but it examines some of the institutional frameworks within which the policies are carried out.

2.0 Science, Technology and Development in Context

S&T have critical roles to play in developing economic opportunities and growth. There are some indicators that point to the strategic linkage between S&T and economic growth and development. For instance, since the industrial revolution, countries with the most S&T capacity have experienced rapid growth. Thus, these countries have become increasingly wealthy, and their rates of growth have not diminished (Pritchett, 1995, cited in Crawford and Farley, 2003).

Clark and Juma (1992) argue that there are empirical evidence and theory to support the claim that long-term economic growth requires not only capital but also an understanding of innovation. For example, in Latin America, there have been increased levels of income and capital but growth rates have remained low. As a result, depending solely on accumulated capital may not be enough to ensure long-term growth rates that can reduce poverty (UN Task Force, 2005). There is the need to devote more attention to the catalytic role S&T can play in ensuring economic growth, as well as national development.

The UN Task Force Report (2005) also emphasized the need for countries to reduce dependence on the exploitation of natural resources and shift to technological innovation as the basis for development. The report cited the experience of Finland which has transformed its economy from one dependent on natural resources to a technology-based one, and thus becoming competitive in the global market. This was achieved through a combination of S&T, industrial and innovation policies. The experience of Malaysia is also instructive here. The country's economic success is basically achieved through aggressive development, utilisation and exploitation of S&T, and this culminated of its being ranked as fourth world competitive country in 2003 (Fan, 2004). This gives a strong indication, especially to the developing world about the potency of S&T to drive economic growth and development. Examples from other developing countries, bolster the importance of S&T to economic development. China's exports of high-tech products accounted for 28.6 percent of all of China's exports. The country is to increase its R&D expenditure to 2.5 percent of GDP so as to reduce reliance on foreign technologies as well as rank among the world's top five patent-holding countries[6].

Further, S&T are key ingredients to achieve the targets of the Millennium Development Goals. Improved farming methods achieved through advances in knowledge and technology can increase agricultural productivity, and production to improve food situations in many developing countries (UNECA, 2002). This, in combination with other factors can reduce poverty and hunger in the world (Millennium Development Goal 1). Further, improvements in fermentation technologies are providing wide range of food products, development of substitutes and also improvements in the quality of food which will improve the nutrition status of the people and improve their health.

In the same way, advances in science and technology can help address many of the health problems that confront the human race. Modern biotechnology and genetics are expanding the possibilities for producing new drugs and improving the efficacy of existing ones. Genomics in health research is also creating a wide range of new diagnostic tools that are changing how common diseases are diagnosed, managed, and treated, while advances in pharmacogenics are providing greater understanding of how the body responds to drugs, making it possible to provide more accurate and effective medication (UNECA, 2002).

The UN Human Development Report for 2001 stated that there has been growing political interest in the potentials of 'new technologies' such as biotechnology, genetics, biomedical technologies, energy technologies, remote sensing technologies and information and communication technologies to advance development (UNDP, 2002). The statement has positive connotation, however, but what is very important is how developing countries including Ghana, have not translated this interest into actual support for S&T. This is an area where most developing countries have woefully failed.

Given the low level of S&T development in Ghana and Africa as a whole, one would have thought that many of these countries will devote more resources to S&T development so as to bridge the technological divide between them and the developed countries. Sadly, the situation has not been so. Most African countries have failed to show serious commitment to incorporating S&T into their developmental strategies. Steinhauer, et.al (2003) analysed references made of S&T in the Country Strategic Papers (CSPs) of the African Caribbean Pacific Countries (ACP) to obtain support under the ACP-EU Pact[7]. According to Steinhauer, et. al, only 9% of the

Country Support Strategies (CSSs)[8] identified S&T as tools to enhance specific sector of their economy. Only five states referred to S&T in agriculture, and frontier technologies such as biotechnology, genetics and remote sensing technologies were not even mentioned. They were of the opinion that the term S&T was rarely used in the CSSs and this typifies the minor importance the countries attached to S&T as part of their development strategies. In this context, the UK House of Commons Select Committee on Science and Technology emphasized that developing countries ascribe low priority to S&T, and therefore, it is important for international development partners to clearly articulate the enabling role of S&T in programmes so as to achieve development target, such as MDGs (House of Commons, 2004).

Given the importance of S&T to economic growth and development, it is necessary that Ghana and other African countries become more serious about the development, application and utilisation of S&T resources for national development. A strong call is made for the establishment and commitment of adequate resources to institutions that can advice and strengthen the capacity of the political system to appreciate and make S&T the rubric of national development. There is a possibility that the existence of science advisors at the top hierarchy of government and at ministerial levels (as the case is in UK) would have ensured that ACP countries make S&T the core of their CSSs.

3.0 General Framework for Science and Technology Policy Making

Dialogue between the political system and scientists is one of the essential conditions to spur sustainable S&T development. The dialogue will provide avenues for knowledge sharing, appreciation of challenges that face each other, and more importantly engender the political system's interest in S&T. In this section, we shall review some of the institutions for S&T policy making in UK (a developed country) and Ghana (developing country) to see the institutional set-up for S&T policy making in these countries.

3.1 The Case of the UK

The presentation on UK draws heavily on the work of Cunningham (2002). Figure 1 presents the main government institutions involved in S&T policy making.

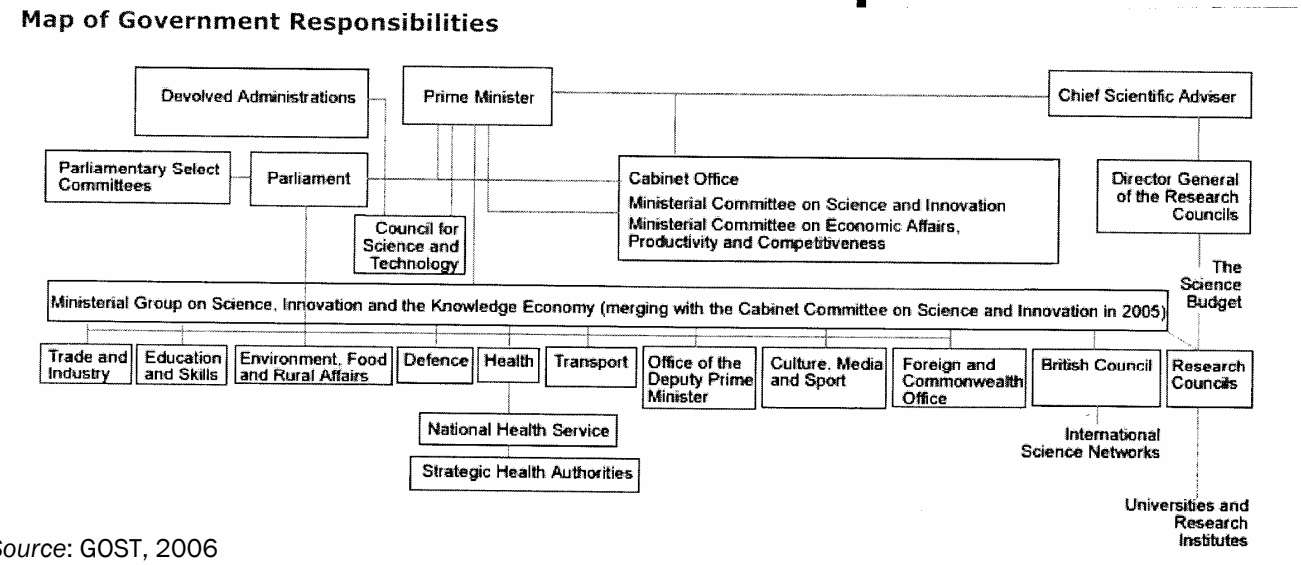
According to Cunningham (2002), the UK science policy making process is organised largely in a pluralist way with advice being received from a diverse network of committees and advisory groups. He further argued that there was an expectation of a drive towards centralisation of the policy making machinery with the creation of OST[9] which was to play a pivotal role in S&T policy making. However, this expectation is yet to be realised.

One of the important aspects of the S&T policy making process is the establishment or appointment of a Chief Scientific Advisor (CSA). The CSA provides policy advice on science, engineering and technology issues directly to the Prime Minister, the Cabinet, the Secretary of State for Trade and Industry, and the Minister for Science. The CSA is the head of OST. The CSA is also responsible for reviewing the entire research system and sits on virtually every important committee and advisory group - for example, the Council for Science and Technology and the Chief Scientific Advisor's Committee (CSAC).

The CSA, as stated by Cunningham (2002) also chairs the Committee of Departmental Chief Scientists, known as the cabinet official Committee on Science and Innovation. This committee has merged with the Ministerial Group on Science, Innovation and the Knowledge Economy. The Group discusses cross-departmental science issues, provides Cabinet ministers with much of their required information and plays an important role in policy implementation. The departmental chief scientist concept is an important one as it will ensure that departments are able to track and develop policies which are specific to their departments. It places scientific issues into the hands of officers who have competence to handle them. As a result, there is the likelihood for S&T issues to receive much attention and embedded in the activities of the departments.

Another set up of importance is the Council for Science and Technology (CST). It is one of the key scientific advisory groups in the S&T institutional framework. It was established in 1993 as the Prime Minister's top-level advisory body on medium- to long-term issues concerning the government's strategy for ensuring that S&T meet the country's needs (DTI, 2004). It also advises cabinet ministers on matters relating to science, engineering and technology and related policy issues.

In parliament, there is the Science and Technology Select Committee of the House of Commons as well as the House of Lords. Unlike the S&T Select Committee of the House of Lords, the Commons' committee is less influential in broader matters relating to S&T. It focuses more on the expenditure policy and administration of OST and associated bodies, and makes appropriate recommendations. The Lords' Science and Technology Committee, conducts on its own initiative, reviews on a broad range of scientific issues[10] and the Lords probably



Source: GOST, 2006

exercise greater influence through the Select Committee's reports than through its votes (Cunningham, 2002).

Finally, there are other institutions whose activities feed into the policy making machinery of UK. These are the Research Councils and the universities. The Research Councils consist of:

- Biotechnology & Biological Science Research Council (BBSRC);
- Council for the Central Laboratory of the Research Councils (CCLRC);
- Engineering & Physical Sciences Research Council (EPSRC);
- Economic & Social Research Council (ESRC);
- Medical Research Council (MRC);
- Natural Environment Research Council (NERC);
- Particle Physics & Astronomy Research Council (PPARC).

Arts and Humanities Research Council (AHRC)

One interesting thing about the S&T institutional framework of UK which needs emphasis is the presence of scientific advisors in all ministries to address S&T issues which are specific to the ministry concerned. Such advisors will enable the ministry to deal adequately with S&T matters peculiar to it and develop appropriate tailor-made policies and responses to advance the activities of the ministry. The critical question is how the government maintains synergy with all these bodies, committees and others.

3.2 The Case of Ghana

There is a sharp contrast between Ghana and the UK in terms of institutional framework for S&T policy making. In Ghana, there is no inter agency or an apex coordinating body that plays pivotal role in S&T making process. There is no cabinet advisory body on S&T or official chief scientific advisor to the President of Ghana. At best, the Minister of Education, Science and Sports could advise cabinet on S&T issues.

In Ghana, until May 2006, there was the Ministry of Environment and Science that had responsibility for cross-sectoral S&T policy making and the implementation of these policies required the collaboration with other ministries[11]. However, S&T policy specific to a particular sector, however, is engineered by the Ministry which has responsibility over that sector. In most cases, such ministries collaborate with others, including the universities and the research institutions in the formulation process and the implementation as well. In view of this, the mandate of Ministries with more S&T components are discussed in this section.

The Ministry of Trade, Industry, Private Sector Development and President Special Initiatives has overall responsibility for formulation, implementation and monitoring of Ghana's internal and external trade as well as the development of local industries. This is achieved through policy formulation, facilitating enterprise development including micro and small enterprises, development and enforcement of standards in trade and industry, and promoting Ghana's internal and export trade with emphasis on diversification and value-addition.

With the exception of cocoa-coffee and forestry sectors, the Ministry of Food and Agriculture (MOFA) is in charge

of the development and growth of agriculture in the country. Its primary roles are the formulation of appropriate agricultural policies, planning and co-ordination, monitoring and evaluation, and these are carried out within the overall national economic development plan.

Most of the agricultural research is carried out by scientific institutions which are not affiliated with MOFA. For example, the Council for Scientific and Industrial Research which is the country's foremost research council is now under the Ministry of Education, Science and Sports.

In relation to health, the Ministry of Health assesses and monitors the country's health status, advises the central government on health policies and legislation, formulates strategies and designs programmes to address health problems of the country. The Ministry also implements, monitors and evaluates (in collaboration with other related sectors and agencies) all health programmes and health research activities in the country.

Before the assignment of the science portfolio, the Ministry of Education and Sports was in charge of education and sports development. The responsibilities cover areas such as: expanding access to education at all levels, providing and improving infrastructural facilities, raising the quality of teaching and learning more from effective outcomes, making education more relevant to national goals and aspirations by focusing on vocational and technical education, and making tertiary education more cost effective.

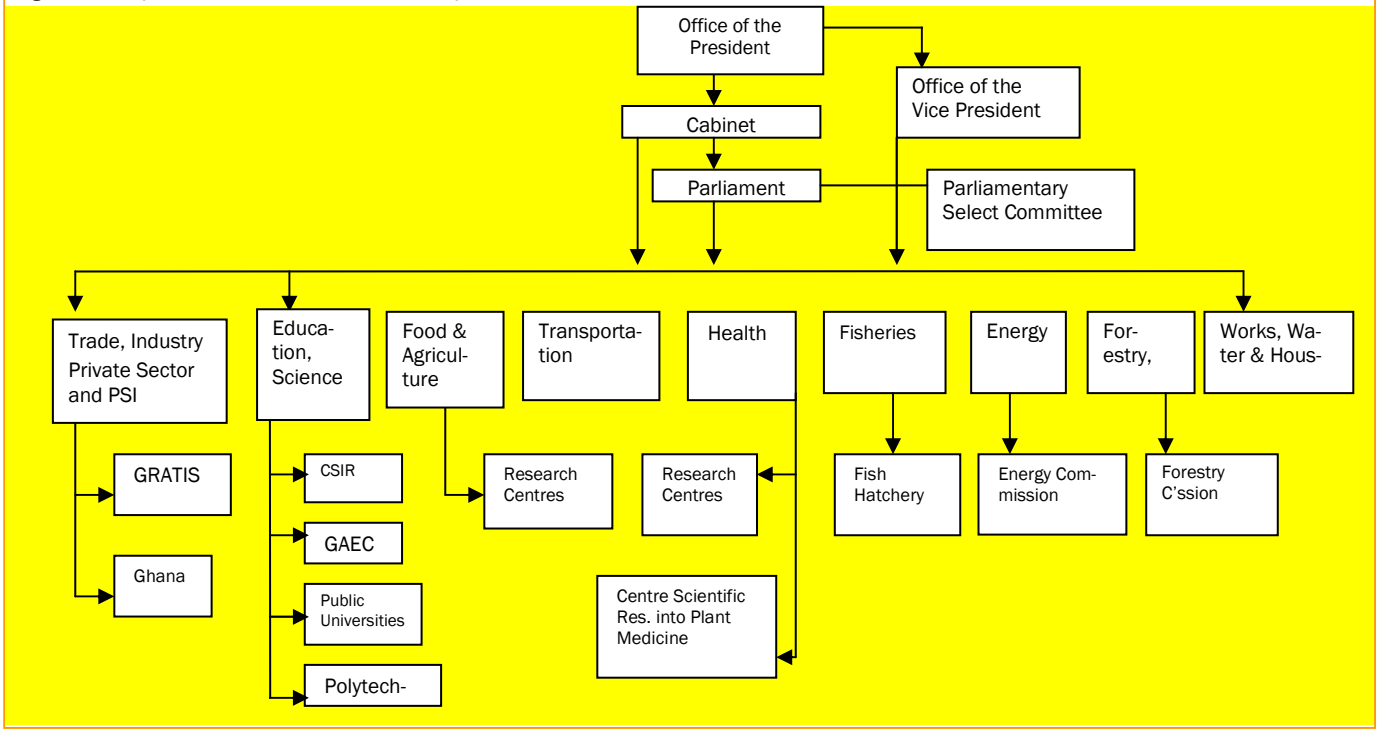
As energy issues are within the ambit of the Ministry of Energy, the Ministry is to extend and ensure reliable supply of high quality energy services to all sectors of the economy to facilitate productivity and reduce poverty. This is achieved through: improving existing energy supply systems, increasing access of modern energy services, productive and efficient use of energy, securing future energy supplies and minimising environmental impacts of energy supplies and consumption through increased renewable energy/energy efficiency economies.

Similar to agricultural research, energy research is mostly undertaken by institutions which are not affiliated to the Ministry of Energy. However, there is the Energy Foundation which among others, provides direction and financial support for energy research in the country. The Energy Foundation Ghana is a non-profit, public-private partnership institution, devoted to promoting energy efficiency and utilisation of renewable energy to meet Ghana's growing energy needs.

Besides the ministries, there is the Select Committee on Science and Environment of the Parliament of Ghana. The Committee's task is to review scientific matters referred to it by parliament for advice. It is also responsible for bringing to attention S&T issues that parliament and cabinet need to address.

Abysmally, there is no strategic body or inter ministerial committee to serve as a pivot to drive S&T issues in

Figure 2: Map of Government of Ghana Responsibilities



these ministries, or a definite outfit to advise the president and cabinet on S&T. The question is, besides the Minister for Education, Science and Sports, who does the president consult for independent opinion on scientific issues? That is where the need for a CSA to the government is important. The CSA just as in UK should be not be political appointment but as a Civil Servant appointed by the Public Services Commission of Ghana with service conditions comparable with high level officers working in the Service. This will give the CSA the independence to play that crucial role.

4.0 Outlook of S&T Funding

In the United Kingdom (UK), under the government's strategy for SET launched in 2002, the government plans to invest an additional £400 million[12] per year by 2005-06 in science and engineering research programmes, and an extra £100 million annually on equipment and capital infrastructure[13]. This shows the level of commitment of the UK government to improving her SET capabilities and infrastructure. Currently, UK research funding as a percentage of gross domestic product (GDP) is 2.0 percent and it is required by European Union to reach 3.0 percent[14].

The situation is different in Ghana and other African countries where not many financial resources have been committed or earmarked for the development of S&T. Most countries are unable to commit the minimum of 1.0 percent of their GDP to S&T development. This target was set in 1970s, as part of the Lagos Plan of Action for Accelerated Development in Africa (NEPAD, 2003). The average S&T funding Ghana has achieved is 0.3 percent of GDP, Nigeria is about 0.5 percent and 0.3 percent for Kenya.

The effectiveness of investment in R&D in UK can be assessed by a number of indicators, for example, the number of patents and level of R&D intensive-businesses among many others. In comparing the level of R&D intensive businesses in UK in 2002 with those of France, Germany and USA, the UK's share of high technology intensive businesses was 26.7 percent[15] (Department of Trade and Industry, 2006). This performance is viewed against the goal of narrowing the performance between leading international competitors. Further, UK's share of patents filed at the EPO reflected the support the country gives to R&D activity. For example, in 2002, UK ranked second after Germany in biotechnology patents filed at the EPO by European countries. Germany share was 13.6 percent, while that of UK was 5.6 percent (OECD 2005). The UK's share was higher than the combined total of all other European countries excluding Germany, France, Netherlands, Denmark and Sweden.

Over the years, R&D funding as percentage of GDP had been erratic in Ghana. Ghana achieved the highest funding as a percentage GDP in 1986. Generally R&D funding as percentage of GDP was relatively better from 1975 – 1986. Since then the country's performance has slackened.

Overall, support in terms of research funding has largely been inadequate. For example, in 2004, 81 percent of Ghana government's budgetary allocation to the CSIR was for personal emoluments with only 9 percent for research activities (Gogo, 2004). Gogo argues further that not all of these operational funds are actually released. For instance, in 2003, only 74% of budgetary allocation for that year was released. However, this was an improvement between 15 – 23% over the previous years.

UK funding of R&D for the three years was close to 2.0 percent of GDP. In Ghana, the funding for the years was under 0.4 percent. In the UK, the private plays a key role in R&D funding. For example, in 2002, it contributed about 1.24 percent of GDP to R&D activities. There is no credible data on the level contribution by the private sector in Ghana towards R&D activities. Such contributions if any might be very low, since some of the private companies still have a wrong notion that R&D funding as a public activity which must be supported by the government. More importantly, most of the private companies are largely small scale and seem financially weak to adequately support R&D activities, but are likely to adopt and exploit scientific results to bolster their economic activities if they come with little or no cost to them. Another disturbing phenomenon is that the few large companies, especially the multinationals, which could passably support R&D in the country, mostly resort to laboratories of their parent companies for scientific support.

Another significant issue is the role donor agencies play in the funding of R&D activities in Ghana. Donor support is increasingly becoming an important component of R&D funding in Ghana. According to Gogo (2004), the donor component of the total R&D funding for 2004 was 48 percent. Gogo was quick to add that the figure could be higher as not all donor support are captured in the annual budget estimate. Though donors support governments in their efforts to fund R&D activities, this support may not be sustainable on the long run. Most often, the project ceases once the donor funding comes to an end. This raises questions about the purpose of such donor projects and whose interest the projects ultimately serve? There have been divergent opinions on this, but the important thing is that government should demonstrate

commitment by backing such projects with funding and make adequate arrangements to sustain such projects once the donor funding comes to a close.

Given the unsustainable nature and research priorities of most donor funding, efforts should be made by policy makers to find ways of allocating adequate resources for the R&D activities. This becomes a compelling issue, as there are equally important sectors competing with research activities for the limited available resources. Most often the politicians prefer to allocate more resources to sectors whose results are eminent in the short run so as to gain political advantage. These issues can be addressed within a policy framework that recognises the catalytic role S&T play in socio-economic development and even in politics. In view of this, there is the need to strengthen the capacity of the political structures, especially parliament to understand the indispensability of S&T in national development so that they can put high premium on S&T issues, especially funding. Special institution(s) which could provide technical support to parliament on S&T issues, as in UK is necessary. The success achieved by POST (as will be seen in the next section) in its work with the UK House of Commons is enviable. Scientific briefs, independent research reports, consultations and advisory services to the parliamentarians are some of the services a similar institution in Ghana and other African countries can provide to parliament. This will go a long way in deepening the competence of parliament in S&T matters.

5.0 Strategic S&T Policy Making Institutions

In the previous section, we discussed the institutional framework for S&T policy making in UK. The discussions here look in greater detail, two institutions which are crucial to policy making as well as integrating political authorities into the mainstream of S&T activities. The institutions are the Parliamentary Office for Science and Technology (POST) and the Office of Science and Technology (OST).

5.1 Parliamentary Office for Science and Technology (POST)

POST is an in-house independent body established in 1989 prompted largely by the setting up of the US Office of Technology Assessment in the United States (Cunningham, 2002). It was established out of the realization that parliamentarians were always confronted with S&T issues of which they have limited knowledge. Therefore, POST was to assist parliament to access expert knowledge and information on S&T and related issues. Its aim is to inform parliamentary debate on S&T through the provision of independent and balanced analysis of S&T issues. It works mainly with the Select Committee on S&T of the House of Commons. The House of Commons has oversight responsibilities over operations of POST.

The main activities of POST are:

- Publishing POSTnotes (short briefing notes) and detailed reports. Both focus on current S&T issues and with the aim of raising policy implications for parliamentarians;
- Supporting select committees, with informal advice, oral briefings, data analyses, background papers or follow-up research;
- Informing Houses of Commons and Lords about public dialogue activities in S&T;
- Organising discussions to stimulate debate on a wide range of topical issues, from small working groups to large lectures;
- Horizon-scanning to anticipate issues of S&T that are likely to impact on policy[16]

The establishment of an office dedicated to assist parliament with access to S&T information, briefings, clarifications and investigations among others, is very instructive and provides an avenue for building similar capacities within parliaments in Africa. This is because most parliaments in Africa are populated by 'professional' politicians that lack the scientific background to critically understand and articulate scientific issues with proficiency.

5.2 POST and Members of Parliament/Scientist Pairing Scheme

One important project which POST is involved is the Member of Parliament (MP)/ Scientist Pairing Scheme which was initiated by the Royal Society of UK in 2001 [17]. The Pairing Scheme was part of a larger project (Science in Society) launched in 2000 by the Royal Society as the result of the of the BSE crisis that hit the country in the early 1990s.

The pairing programme was borne out of the realisation to foster greater linkages between science and politics to bolster better understanding to deal with issues of great concern to society.

The aims of the programme are to:

- Help scientists recognise and understand the potential methods and structures through which they can feed

their scientific knowledge to parliamentarians and government;

- Help practicing research scientists to understand the pressures under which MPs operate;
- Give MPs the opportunity to forge direct links with a network of practicing scientists;

Give MPs the opportunity to familiarise themselves with the process of scientific understanding and topical research and ultimately to be able to bring this knowledge into better informed discussions and decision making (The Royal Society, 2005).

Under the scheme, the MPs and the scientists form a pairing relationship for a period between three to four months to help foster mutual understanding. For the four years the scheme has been in operation, 94 MPs have been paired with scientists in different laboratories, research institutes and universities. Figure 3 gives a breakdown of MPs from the various parties who have participated in the Scheme.

Taking a global picture, the number of MPs who have participated in the scheme formed only about 15 percent of the total MPs in UK's parliament. However, the fact that the MPs have declared their avid interest and participated in the scheme is a step in the right direction, and also provides positive implications for their counterparts in Ghana.

Arguing for the need for parliamentarians to be abreast with scientific issues, Kass is of the opinion that legislators can and do influence S&T in a number of ways:

Approving overall levels of public expenditure on research and development (R&D);

Formulating, debating, amending and approving laws to ban or regulate certain technological developments, such as human cloning;

Raising issues of concern to the citizens they represent, and bringing pressure on governments to act in response to these concerns; .

Scrutinising the work of governments to ensure that they are accountable for their decisions and actions. (Kass, 2000:322).

The importance of building the capacity of MPs in scientific issues is buttressed by the fact that parliamentary questions on S&T have increased in UK. Analysis by Padilla and Gibson (2000) revealed that the percentage of questions related to S&T has risen over the past 10 years from less than 1% in 1988–89 to around 6% in 1998–99. As argued by Padilla and Gibson, the increase of parliamentary questions on S&T was not due to the activities of neither POST nor the pairing scheme but the increasing importance of S&T in UK's society. Therefore, it underscores the need to strengthen the capacity of the MPs to grasp them to exercise their responsibilities with distinction, as S&T.

Some of the experiences of POST need to be highlighted. POST was set up to assist parliament and therefore, it is strictly not an arm of the executive. It is accountable to parliament and not the government. It has gained, and has been able to maintain credibility among the political divide in UK which is a lesson to be learnt by all institutions established to assist parliament in its work in the area of S&T. The credibility was achieved through balanced judgements, neutrality in all its activities and publications.

Further, POST enjoys a good relationship with the scientific community. For example, it has a good relation with the Royal Society in terms of participating in joint programmes and hosting fellows, researchers and scholars from the Royal Society. In this way, it benefits from the expertise of the scientific community in the preparation of Postnotes and detailed reports on topical issues affecting the country. This has improved the quality of its publications and consequently provided a good image for the office.

5.3 Office of Science and Technology (OST)

OST was formed in 1992 as a result of the merger between the former science branch of the Department of Education and Science, and the Office of the Chief Scientific Adviser in the Cabinet Office[18]. In 1995, OST was moved to the Department of Technology and Industry in order to improve links between government, industry and the science and engineering base of the country. The move, as stated, was to enable OST to work more closely with the DTI in encouraging businesses to make effective use of the science. The objectives of OST are to:

- Sustain and improve the science and engineering base;
- Improve the performance of government departments using science and technology;
- Improve the flow of people and ideas between the science and engineering base and users;
- Improve engagement between science and the rest of society[19];

Ensure sound advice is given to Ministers and the Government on science issues.

OST is also responsible for the allocation of the science budget (currently over £3 billion per annum) through the Research Councils for S&T activities in the country. The office consists of two key divisions namely; the Science and Engineering Base Group (SEBG) and the Transdepartmental Science and Technology Group (TDSTG). The TDSTG supports the Chief Scientific Adviser in his/her advisory services to the government on SET matters, while the SEBG assists the Director General of the Research Councils among others to allocate science budget among the seven Research Councils, which are the OST's principal associated public bodies.

It also provides assistance to a number of commissions and committees which advise government on or formulate policy with respect to S&T issues. The bodies include:

⇒ Agriculture and Environment Biotechnology Commission

⇒ Council for Science and Technology

⇒ Ministerial Committees on Science Policy (SCI) and Sub Ministerial Committee on Biotechnology

⇒ Natural Hazard Working Group

6.0 Implications for Developing Countries

The S&T policy making process in UK with its attendant specialised or strategic institutions presents a number of insights that could also be useful for Ghana and other African countries. These insights could potentially help transform and energise the status of S&T as well as fostering strong partnership between science and politics in African countries. This section looks at some policy issues that can galvanise the development of S&T, as well as create synergy between scientists and politicians in Ghana.

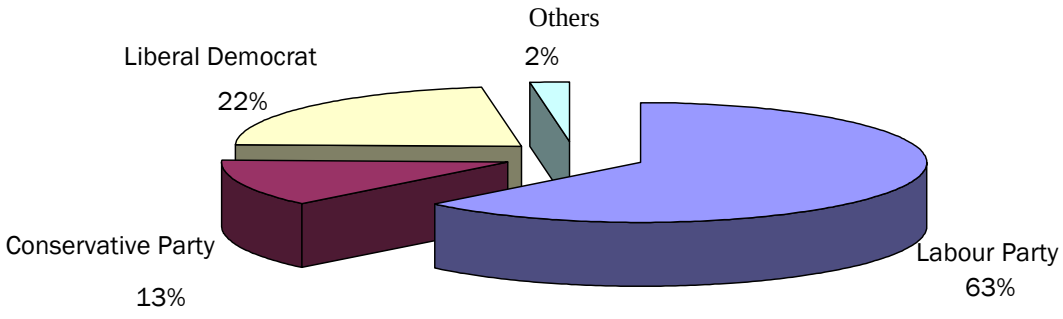
6.1 Establishment of Chief Scientific Advisor (CSA) Position

The UK experience has shown the existence of a CSA who plays a key role in SET policy making process. Though the CSA is physically located in DTI, he/she has direct reporting links to the Prime Minister's Office. The CSA, as we discussed sits on every scientific advisory committee and coordinates research in both government departments and within the Research Councils. The position and wide ranging powers of the CSA epitomises the seriousness the UK government attaches to SET issues.

6.1.1 Chief Scientific Advisors for Africa

The existence of a similar office to coordinate research and advice to governments or presidents/prime ministers on S&T issues has not been part of the institutional set-up for S&T policy making in most African countries. As is in most African countries, Ghana has no institutionalised scientific advisors for presidents or the cabinet. Most often, it is the Minister for Science who speaks on science at cabinet meetings, but experience has shown that such ministers are often just politicians who lack scientific background to articulate S&T issues. Though this position is a cabinet one, it is normally occupied by junior ministers who are not well established in the ruling government, and therefore, has little political clout to influence discussions, especially budgetary allocations during cabinet meetings. In effect, such ministers are unable to introduce science into the development agenda in their countries. There is the need for an independent scientific advisor of high stature to advice governments on S&T issues. However, due to pressure on

Figure 5: Number of MPs Participated in Pairing Scheme (2001 - 2005)



Source: The Royal Society, 2005

national budgets, no elaborate office should be established (as the case is in UK) for the CSA but should be integrated into the Office of the President/Prime Minister.

The establishment or the appointment of a scientific advisor at the highest level of government will allow the president or prime minister to have access to independent scientific advice. The CSA, having the coordinating role of S&T activities across ministries will reduce problems encountered by most Ministries of Science in coordinating cross-sectoral S&T activities.

Nigeria has taken the lead to establish the position of CSA in their political system. In Ghana, discussions have been on-going for a long time with no decision in sight. The various governments have developed cold feet towards the establishment of such an office.

Given the realisation that African countries can overcome underdevelopment - poverty, famine, poor health and malnutrition, poor agricultural and industrial performance only through the integration, development and application of S&T to their developmental efforts, it is necessary that S&T issues be entrenched in the government's administrative machinery. However, Ghana should avoid repeating UK's mistake of establishing numerous advisory bodies which it might be difficult to resource and maintain synergy among them (Cunningham, 2002).

6.1.2 Science Advisors in Ministries

Another interesting development in the UK S&T institutional policy process is the existence of science advisors in government ministries and departments. In the UK every, government department with significant science and/or technology elements within its portfolio has a Chief Scientist who is responsible for S&T issues and provides a channel of communication for these issues, usually via membership of a range of committees. It is a safety valve to help civil servants who might be handicapped in scientific issues related to their offices.

In many instances, ministers rely on their technocrats for advice, however, we are living in an era where there is an acceleration of scientific knowledge, and most often such civil servants are overwhelmed by administrative issues to the extent that they are unable to tract scientific developments related to their ministries. Therefore, the scientific adviser for the ministry will fill in this gap.

Ghana has made some efforts in this direction by creating the position of Special Assistants to the Ministers. These Special Assistants are supposed to be specialists in the ministries assigned to them and are to provide technical knowledge which supposedly, is not available in the ministry to aid the minister in decision making. This comes close to the situation in UK, but the experience is that such positions have been more of political rewards, with most of them having little competence in S&T issues specific to their ministries.

Having scientific advisors at the ministerial levels can contribute to rich repertoire of scientific expertise which could be tapped into the general S&T policy making machinery of the country. Such positions should not be political rewards but an integral part of S&T policy making process of the country.

6.2 Establishment of a Parliamentary Scientific Support Unit

The environment we are living is being dictated by S&T, therefore, law makers should have the capacity to understand science, so as to make independent judgements on the scientific advice and also legislate on S&T issues with competence. More importantly, they should also be helped to understand the modus operandi of science. The complexity of modern S&T underpins the need for parliamentarians to be assisted through scientific briefings and access to balanced research materials and ex-ante and ex-post policy research into emerging issues that are likely to affect the country and its citizens.

In the UK, this handicap has been minimised through the establishment of POST to give scientific support to parliament. The establishment of similar offices to assist parliaments of SSA is worthy of consideration. MPs in SSA are equally handicapped just like their counterparts in UK. The select committees can use these offices to gain better understanding of protocols of international issues, for example, global warming and climatic change, and controversial issues such as genetic engineering, stem cell research, biotechnology, genomics and nanotechnology among others. It will boost the capacity of parliament to periodically review government's S&T policies so as to put steam into those policies. The critical issue is whether parliament has the financial resources to support this unit in Africa? A way out is to use and resource an existing policy research institution to provide support for parliament.

6.3 Replicating MP/Scientist Pairing Scheme

The MP/Scientist Pairing Scheme is a positive move to bridge the 'divide' between politicians and scientists. In Ghana, a better partnership between the politicians (MPs) and scientists is also critical, as there is a seeming 'animosity' between scientists and politicians, especially

when it comes to sharing national resources. The politicians have always accused the scientific community as being non-performing national assets, while scientists on their part, have accused the politicians of not devoting much resources to scientific activities, as well as not according science top priority in national development activities.

Such an initiative, which has proved successful in UK, can be adopted by Ghana as one of the mechanisms to ensure a better understanding between scientists and politicians. It is worth stating that the Royal Society of UK has already started consultation with similar Societies (Academies) in Africa to establish similar schemes in Africa.

Linked to the issue being discussed is the role played by S&T professional bodies in policy formulation and the advancement of S&T in the country. There are a number of S&T professional associations such as Ghana Academy of Arts and Sciences, Ghana Institute of Engineers, Ghana Medical Association, Ghana Biological Sciences Association, Ghana Science Association and Ghana Science Teachers' Association among others. Most of these bodies made inputs into the formulation of the national science policy and address critical issues that border on science during their meetings or public lectures.

Collectively, the influence of these bodies on S&T development in the country had been minimal as most of them have turned into trade unions. For example, the Research Staff Association of the CSIR, University Teachers' Association of Ghana and Ghana Medical Association, among others are more interested in fighting for better working conditions for their staff rather than championing S&T development in the country.

7.0 Conclusion

The paper has revealed that UK has put in place an elaborate institutional framework for S&T policy making. The contrast is sharp in the case of Ghana where no apex body has been established to drive an S&T policy agenda into national politics. The institutional setup to forge deeper collaboration between scientists and political authority is also absent in Ghana. This illustrates the weak recognition given to S&T in national development efforts as well as in the integration of the political structures into S&T development and management.

Also, the paper revealed the existence of frameworks in the UK to support and commit more resources to the already developed S&T capacity. The UK's funding of S&T as a percentage of the country's GDP is 2.0, however, the highest S&T funding in Ghana was achieved in 1986, and since then the percentage of GDP committed to R&D had hovered around 0.3 percent. This situation is largely due to lack of deeper appreciation by the policy makers and political structures of the catalytic role S&T could play in national development.

Therefore, Ghana and the other African countries can critically look at the experiences of the UK in order to replicate some of these experiences in their national economies, especially the appointment of Chief Scientific Advisor, Scientific advisors in Ministerial and special S&T support units for parliaments to direct S&T policy making process, but this should be attuned to local conditions. The effectiveness of these institutions and programmes in the S&T development process of UK cannot be taken for granted in Africa. Therefore, it is important that Ghana revolutionalises its S&T policy making set-up to take on-board structures which could positively enhance S&T development in the local context. It is hoped that these initiatives will achieve the desired results - development of an effective S&T policy making framework and placing S&T on a higher pedestal of the national development programmes through allocation of adequate resources and effective implementation of S&T policies

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Acknowledgements

The paper is based on a research report submitted to PREST of University of Manchester, UK as part of a professional training supported by the Commonwealth Scholarship Commission. I greatly appreciate the financial support given by the Commonwealth Scholarship Commission, and Dr. Khaleel Malik, Dr. Deborah Cox and Dr. Paul Cunningham, all of PREST.

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Notes

1. http://www.foresight.gov.uk/About_Foresight/The_Programme2002/Foresight_2002.html

2. Triadic patent families are a set of patents taken at the European Patents Office, Japan Patent Office and USA Patent Trademark Office

3. http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/399we57.htm

4. The CSIR was re-established by CSIR Act 1996 (Act 521).

5. Kenya has the National Council for Science and Technology, while in the case of Uganda, it is hasNational Council for Science and Technology. And Zambian has the National Science and Technology Council (http://www.nstc.org.zm/legislation.html), Kenya and Zambia have Science Academies too.

6. http://www.uschina.org/info/chops/2006/foreign-

trade.html

7. There are 78 countries in the ACP Region. These countries adopted in 1997 a Declaration in Libreville that aims to improve development cooperation between ACP countries and the EU. This Declaration was preceded by the Lome Convention which came into effect in 1976. The Libreville Declaration placed on top priority the development of human resources, increased access to S&T, especially information technology and financing of research relevant to socio-economic development. (See http://www.acpsec.org/gb/declar/final_gb.htm)

8. The CSSs outline a country's development strategies, analyze its situation and suggest an EU response to critical sectors, taking the role and activities of other donors into account.

9. There will be detailed discussion on the OST in later sections.

10. Recent examples of House of Lords Select Committee on S&T reports include : Fish Stock Conservation and Management; Decommissioning of Oil and Gas Installations; Information Society: Agenda for Action in the UK; Towards Zero Emissions for Road Transport; EU Framework Programme for European Research and Technological Development; Innovation-Exploitation Barrier; and, Sustainable Management of North Sea Fisheries.

11. In the ministerial reshuffling which took place during the second quarter of 2006, a number of ministries were realigned. The Ministry of Science and Environment was among the ministries that were affected. The science portfolio was added to the Ministry of Education and Sports, while the environment was added to the Ministry of Local Government and Rural Development. Though Figure 2 incorporates the new changes, the discussions centre on the former mandates of the affected ministries, as the mandates of the affected ministries are being reformulated.

12. This amount is an addition to the normal government budget for SET.

13. http://www.ost.gov.uk/policy/investinnov.htm#Research%20Funding%20and%20Policy. Retrieved on 4th March 2006

14. The European Union, to ensure its competitiveness in the global scientific field has a policy for its member countries to commit 3.0 of their GDP to scientific research.

15. UK was third after USA (29.5 percent) and France (28.3) in high-tech manufacturing activities.

16. http://www.parliament.uk/parliamentary_offices/post/links.cfm Retrieved on 4th March, 2006

17. The Royal Society is UK's National Academy of Science

18. See http://www.ost.gov.uk/about_ost/index.htm#History%20of%20OST Retrieved on 6th March, 2006

19. See http://www.ost.gov.uk/about_ost/index.htm Retrieved on 6th March, 2006

THE WELFARE COSTS OF NOT BEING PART OF THE KNOWLEDGE ECONOMY: WHY RURAL DEVELOPMENT NEEDS MORE CREATIVE POLICY STRATEGIES

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Abstract

All forms of knowledge, from advanced science to the simple idea of finding a new use for an old good, contribute to economic growth, not by competing for scarce resources in existing markets but by creating new markets. Current agricultural, environmental and development policies ignore the social welfare generated by new markets because they are still based on the comparative-static approach of neoclassical Welfare Economics that only looks at the welfare effects of existing markets. This approach may have offered practical solutions in the Cold War context but looks increasingly outdated in today's dynamic knowledge-based economy. New Growth Theory, the more dynamic successor of neoclassical Welfare Economics, puts knowledge creation at the center of economic analysis. It suggests that improved access to new knowledge and technology, investment in human capital and effective support of rural entrepreneurship will result in a more responsible use of natural resources as well as more choice, diversity, social empowerment and economic growth in poor rural areas. This article discusses the major insights of New Growth Theory, its successful policy applications, as well as the reasons why policy decision-makers in charge of rural development tend to stick to old theory and therefore merely see themselves as regulators rather than facilitators of economic change.

1. Introduction

Wealthy urban dwellers from the baby-boom generation continue to shape the cultural, academic and political life of early 21st century. They tend to have a rather pessimistic view of globalization even though they turned out to be the great beneficiaries of this unprecedented phase of economic prosperity and social welfare after World War II. Still influenced by 'The Limits to Growth' a report published in 1972 by the Club of Rome, they argue that the global market economy is unsustainable because it would grow at the expense of the rural poor and the environment.

Current agricultural, environmental and development policies are largely reflecting the popular desire to promote sustainable development by preserving and protecting rural communities and their environment. Such policies find their theoretical legitimacy in the 'social welfare function[1], a concept developed in applied Welfare Economics (a branch of neoclassical economics) that is supposed to reflect the aggregated normative preferences in a certain society, which also include its prevailing social and environmental values. Applied Welfare Economics implies that there is market failure in the sense that the market economy would not address these normative preferences and result in negative externalities.

In this context, the government is expected to assume the role of a rational all-knowing social planner that designs policies that are supposed to achieve the normatively set goals (the aggregated preferences that are to reflect the social and environmental values of the citizens) in the most effective way. Apart from the fact that such policies are more concerned with the public perception of the affluent non-rural population rather than the real challenges the rural poor face on the ground, there are several flaws associated with the underlying theoretical concept of applied Welfare Economics:

1. Neoclassical Economics, which still shapes neoliberal and welfare policies alike, is based on a very pessimistic view of the market economy, which is best reflected in the laws of diminishing marginal utility and returns. These laws assume that no new goods will come into being whereas the returns from the production of existing goods, as well as, the utility derived from their consumption will diminish over time. Such assumptions imply that the market economy would eventually come to a standstill. Yet, in reality we observe the opposite: the market economy generated more economic growth and social welfare over the past century than a centrally planned economy could ever have dreamed of – and it continues to do so [3] [4].

2. The goal of applied Welfare Economics is to maximize welfare through the optimal allocation of scarce resources (Pareto criteria) and the adequate compensation of the identified losers (Kaldor-Hicks criteria). These two criteria are used to implement the normative policy objectives, set by the 'social welfare function'. Yet, there is

no such thing as a social welfare function because individual preferences and the individual utility functions on which they are based on are socially constructed, unstable and highly diverse [5]. It is, however, a very convenient function for opportunistic political actors who try to gain the public's favour by claiming to act in the 'public interest' that is supposed to reflect aggregated normative preferences.

3. The concept of a rational social planner is associated with the successful implementation of the normative goals set by the social welfare function. The concept was crucial to the centrally planned socialist economy and continues to be widely applied in agricultural, environmental and development economics. The failure of communism suggests however that such a naïve view of government as a responsible and responsive social planner often results in large-scale mismanagement of public resources rather than social welfare [6].

4. Applied Welfare Economics claims to be the best theoretical concept to manage public goods, which are assumed to be based on non-rivalry (they can be used by many without losing value) and non-excludability (no one can be excluded from using them). However, apart from clean air, there is probably no other pure public good on this planet because the public goods that are provided by the state are primarily meant to serve its tax-paying citizens only (outsiders can be excluded). In this national public good concept, the private sector is defined as a producer of negative externalities (e.g. a company pollutes the environment and society at large has to pay the cost) and as unable or unwilling to provide public goods ('market failure'). However, the private sector is also producing positive externalities that generate public goods (e.g. more choice, employment, technological innovation, wealth and a more efficient use of natural resources) and technological evolution makes it increasingly efficient to let the private sector help manage public goods. The concept ignores that positive and negative externalities are general by-products of any human action independent whether it is public or private sector action [7].

These inadequate assumptions of neoclassical Welfare Economics were identified and rebutted by many of the leading economists of the past five decades representing different types of economic analysis (e.g. Romer [8] Olson [9] Kahnemann and Tversky [10], Buchanan and Tullock [11]). Yet, apparently their insights only had a minimal impact on mainstream textbook economics as David Warsh illustrates in his recent bestseller 'Knowledge and the Wealth of Nations [12].

The persistent popularity of applied Welfare Economics in education and public policy brings us back to the wealthy baby-boomers and their continuing influence in academia, government, and mass media.

As young idealistic students, the baby-boomers protested in the 1960s and 70s against the capitalist mindset that it would result in the exploitation of the poor and the destruction of the environment. Their protests led to many welcome responses in business and politics but their enthusiasm for Freud, Rousseau and Marx was happily ignored by the policy decision-makers at that time. Today, the aging baby-boomers have become more moderate but are still fond of these controversial thinkers. They believe that economic globalization is a zero-sum game that causes social, environmental and psychological damage that must be addressed by government in its role as the wise social planner. The idea of the social planner is equally prominent in Marxist and Welfare Economics and therefore helped the former disciples of Marxism[2] to re-invent themselves as responsible political leaders that embrace a socially acceptable form of market economy. The same applies to the more romantic advocates of Rousseau and his idea of a social contract. The social welfare function is well-placed to be interpreted as a sort of volonté générale (general will of the people) that needs to be respected in the social contract.

There is increasing evidence that this ideologically stretched version of Welfare Economics may create more problems than it is solving in the area of rural development and environmental management[3]. Even though Welfare Economics might well have been the best theoretical concept available to address the challenges posed by the Cold War (state interventions in the name of national security made perfect sense) it may turn out to be counterproductive in today's global knowledge-based economy. Especially in view of the availability of a more advanced economic theory that promises to be more practical, fair and sustainable.

This more advanced economic theory is called New Growth Theory, the economic theory of the new knowledge economy. New Growth Theory rejects the idea of a social planner and sees opportunities where Welfare Economics just sees problems. Paul Romer, who is widely considered to be the father of this new theory, argues that knowledge applied in the process of innovation is a non-rival good that is not limited by the laws of scarcity. Investment in knowledge therefore generates increasing returns through the creation of new markets. This simple insight explains why the market economy continues to grow in spite of decreasing returns in existing markets [13]. New Growth Theory is not just a substitute for Welfare Economics but adds a dynamic dimension to it that allows to portray the social welfare surplus

that results from the introduction of new goods and services. This surplus is created through the introduction of new goods and services (positive externalities). In this concept, it is monopolistic competition and not perfect competition that generates innovation and new markets. This type of competition is not primarily based on cutting prices of existing products but on augmenting product characteristics (variety, quality, features) and the introduction of new products, processes and services. The basic insight of the theory is that knowledge is a non-rival good that may be costly to produce but once produced, can be infinitely re-used at zero marginal costs.

As a result, the increasing growth of knowledge increases the probability that new goods and services emerge out of this knowledge. Knowledge therefore creates opportunities for nearly boundless growth, not by devouring more scarce resources (labor, land) but by developing new ways (e.g. instructions, designs) how to make more efficient and creative use of existing resources. In other words, 'the raw materials that we use have not changed, but as a result of trial and error, experimentation, refinement, and scientific investigation, the instructions that we follow for combining raw materials have become vastly more sophisticated' [8].

Since the concept of scarcity does not apply to knowledge, knowledge also holds the keys to a more sustainable future that facilitates social empowerment through improved access to knowledge and entrepreneurship and makes economic growth more compatible with environmental sustainability. Yet, for that to happen policy-decision makers should not rely on a wise social planner but create the institutional environment and the human capital that ensures equitable access and effective use of knowledge, and supports human creativity, technical change and entrepreneurship. In other words, governments need to become aware that they are not just regulators but also facilitators.

The first part of this article aims at making the reader more familiar with New Growth Theory and its relation to trade and development. It will be focused on Paul Romer's argument that the welfare losses of trade restrictions are not so much related to deadweight losses for consumers but to the fact that they prevent new (knowledge-based) goods from being introduced into the national economy. The second part of the article focuses on the issue of agriculture and rural development. It shows, how the principles of Welfare Economics were applied during the Cold War (Green Revolution in developing countries and the centrally planned agricultural policies in developed countries) and how they continue to be applied after the Cold War in form of cross compliance schemes for developing countries (compliance with food and environmental standards in return for foreign aid and access to export markets) and developed countries (complying with agro-environmental measures in return for more direct income support). It argues that the Post-Cold War policies are likely to harm rural development more because they involve more cultural paternalism and discard any possibility that modern technology could benefit the countryside in general and the poor in particular. Finally, the article argues for a change in rural development policies by skipping the old comparative static neoclassical thinking in favour of the more dynamic New Growth Theory and the Theory of Incentives [14][4].

Development, environmental and agricultural policies that are derived from New Growth Theory set the priority on the 'freedom to innovate' and reflect a return to the 19th century model of the land grant college system, that was designed to support farmers and the rural economy not through subsidies but through the transfer of useful knowledge that helped to solve practical problems, promoted technological innovation and generated local business. The spirit of this 19th century approach is being rediscovered today in developed and developing countries and its results prove to be compatible with rural empowerment and sustainable development alike. The case of New Zealand's agricultural policy and the successful international agricultural research initiatives undertaken by the global Cassava Biotechnology Network (CBN) will be used to illustrate the case.

2. New Growth Theory and the true value of technological change

Most economists today are still trained in neoclassical Welfare Economics. The neoclassical approach is mainly focused on the allocative efficiency in the production of an existing set of goods. Its basic comparative-static assumptions of perfect competition, knowledge as a pure public good, and price-setting as market failure were very popular in the 20th century because they enabled elegant mathematical formalizations of general and partial equilibrium models from the household economy to the world economy. This neoclassical approach is based on the assumption that all goods and technologies that could possibly exist, do already exist.

This philosophy of plentitude [16], proves to be particularly inadequate in a knowledge economy where the exponential growth of knowledge leads to an exponential growth of the probability that new goods and technologies come into being and generate new markets.

Monopolistic competition: A market structure in which several or many sellers each produce similar, but slightly differentiated products. The demand for each good is not perfectly elastic. Each firm command brand loyalty and can set its price and quantity without affecting the marketplace as a whole.

This process is not just the primary source of wealth and prosperity but also generates a social welfare surplus that cannot be captured by the innovating company itself. Paul Romer, the father of New Growth Theory, used the formal language of neoclassical economics but put endogenous technological change at the heart of economic analysis [8]. This analysis was able to highlight the social welfare impact of new goods[5] [4] and to disqualify some of the very basic convexity assumptions of the neoclassical model [13].

2.1 Explaining the knowledge economy

New Growth Theory emerged in the 1990s in response to the inadequate assumptions of neoclassical theory. In his paper, 'Endogenous Technological Change' Paul Romer [8], showed that knowledge, unlike other production factors such as land, labor and capital, is a non-rival good that can be used by many simultaneously without losing value. Thanks to the revolution in information technology, this knowledge can be reproduced at almost no additional costs. Yet, the creation of new knowledge is expensive since it requires large fix costs spent on research and development (R&D). These costs also include the hiring of scarce and expensive human capital, the most sought-after resource in the knowledge economy [17]. It is therefore not surprising, that those who create new knowledge want to make its use partially excludable through intellectual property rights (IPRs). This temporary monopoly right allows the owner to extract a rent by putting the price of the new knowledge-intensive product above its marginal production costs. It thus enables his or her company to generate a profit that compensates for the high fixed costs that were spent on R&D, and provides incentives to invest again in the improvement of the product and the development of new products.

Neoclassical economists (and this includes neoliberal as well as welfare economists) often denounce this kind of monopolistic competition as the extraction of an undeserved rent by a monopolist at the expense of the consumers that suffer deadweight losses due to the higher price they have to pay for the product. This thinking is however based on two contested assumptions that (a) knowledge is a pure non-excludable public good funded by governments and produced at public universities and national research institutes and (b) monopolies are the result of undeserved market power achieved through rent-seeking (e.g. regulation that protects the incumbent from new competitors).

These two assumptions are not wrong but they are not the whole truth. Governments indeed fund the production of knowledge and make sure that it is widely accessible. But the private sector also invests in a more specialised kind of knowledge production that enables it to convert the widely accessible new knowledge successfully into new goods, technologies and services. Moreover, the monopoly profits that result from the introduction of new goods into the economy are different from monopoly rents extracted by incumbents that raise barriers to entry for new innovative players. The former are based on and encourage further innovation while the latter is based on political market power and prevents innovation through regulatory capture.

The introduction of new goods through innovation generates a social welfare surplus that cannot be captured by the company itself (e.g. more employment, more tax revenues, more knowledge in the public realm through patent disclosure, economic spillovers, that lead to generic products that are also affordable to poorer consumers/producers, etc). Knowledge is therefore not just benefiting the company that invests in it, but generates cumulative and catalytic effects: the bigger the stock of knowledge available the higher the likelihood that new goods emerge that are based on ideas that successfully combine existing publicly available knowledge with new proprietary knowledge. These new goods then create temporary monopolies that generate increasing returns but, in the long run, there will be more competition and the new good will become a commodity where price eventually becomes the dominant criteria of competitiveness.

Ideas are therefore at the root of economic and social change and the primary engine of economic growth. However, ideas are always embedded in a good like a machine or a service and because they are intangible we do not think of them as separate entities [4]. Information technology and biotechnology may have changed our awareness of the difference between ideas and products. New software programs (based on the use of the digital code) and new proteins with certain useful qualities (based on the use of the genetic code) are close to pure ideas. As more and more ideas accumulate and enter the public realm, more knowledge is available about how the world works and how to extract greater use out of the finite set of resources with which the world is endowed [13]. In this context, the clear separation of basic and applied research must be questioned because the development of new technologies and the wide application of existing technologies generates new knowledge that will again influence discoveries and theories in basic research.

2.2 The social welfare generated by new goods

The social welfare that results from the introduction of a new good is not new but was already noted by a French engineer called Dupuit in the 19th century [4, 18]. He calculated the cost of building a bridge and the minimal toll

the users of the bridge need to pay to reimburse the fix costs for building the bridge. He was able to show that the entrepreneur who builds the bridge is constrained in his efforts to extract a maximal rent from the users, because if the toll is too high, the user might simply not use the bridge (assuming that the users are acting in a competitive world with scarce resources themselves). He therefore concluded that the entrepreneur can never capture all the benefits of building the new good 'bridge'. The bridge would therefore generate a social welfare surplus by the mere fact that it lowers general transportation costs and facilitates more trade and exchange among people in the region. The same is true for a company that wants to develop a new technology. Yet, instead of extracting an additional rent through a toll price (as in the case of a physical good), the company would do it through a royalty fee on the patented technology.

2.2.1 Making welfare economics more dynamic

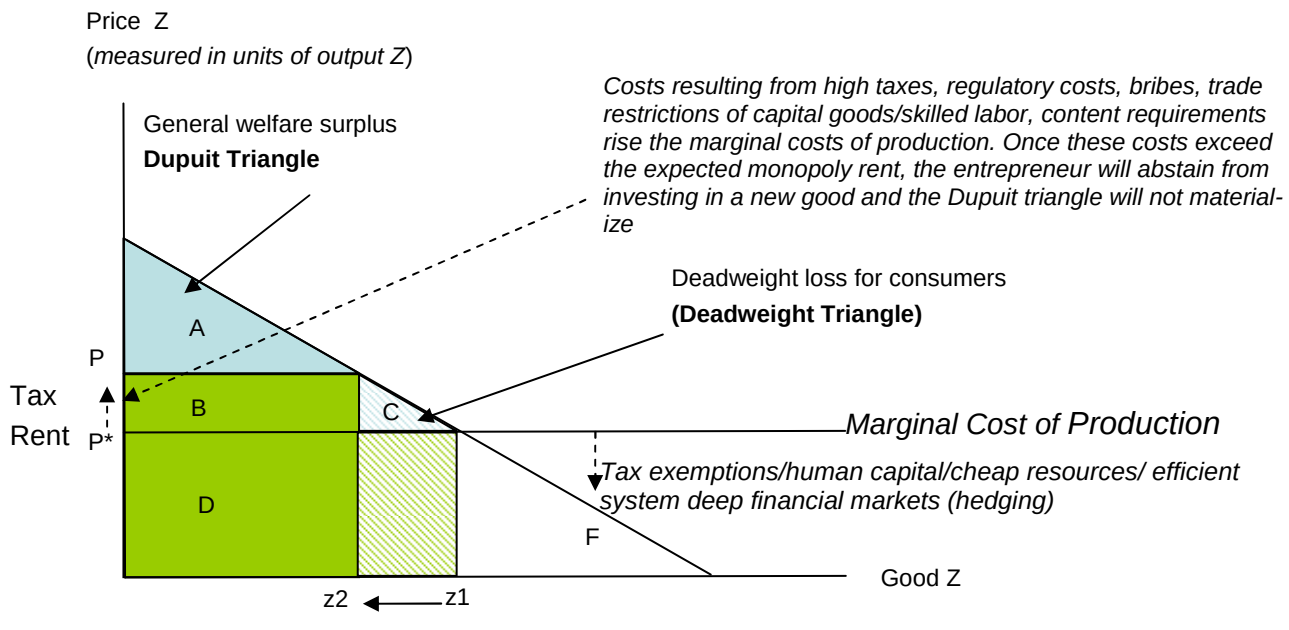
The creation of new goods that emerge from monopolistic competition can be illustrated by making use of a simplified version of an economic model that was adopted from Romer 1994 [4] (see Figure 1). It represents a partial equilibrium model with the x-axis referring to the amount of production[6] of Good Z and the y-axis the price per unit charged by the company.

The price is higher than the marginal production cost because the company aims at reimbursing the high fixed costs spent on the development of Good Z (not represented in the marginal cost of production) and making profits that allow for further investment in R&D.

Neoclassical economists interpret this graph as a typical case of a market that is dominated by a monopolist: there is only one producer of Good Z, which has the power to determine the scale of production and set the product price in a way that maximizes the expected returns (the sloping demand curve illustrates how the price increases with decreasing output). In order to illustrate the monopolist rent, the neoclassical economist would point at rectangle B, which represents the surplus the monopolist extracts through market power, and also triangle C representing the deadweight loss for consumers who have to pay a higher price for the good. However, if this monopolist has obtained his position not through rent-seeking but the investment in the development of a new good, then the graph must be interpreted in a different way. In this case the curtailing of the production of Good Z is no more related to a mere strategy to create artificial scarcity to push up the price of Good Z, but represents the resources that were diverted from the production of Good Z into the development and production of a new Good X. The subsequent introduction of the new good is then creating an additional social welfare Triangle A which represents all the positive externalities associated with a new good. This triangle has been ignored by economists prior to Romer.

Romer concludes that if economists would become aware of this Triangle A, which he also calls Dupuit triangle, they would realize that the primary source of wealth and well-being in society is not based on perfect competition but the introduction of new goods and technologies. New technologies may create new inequalities and risks at the beginning, when only few have access to the

Figure 1: The social welfare generated through the introduction of new goods (graph adopted from Paul Romer [4])



relatively expensive technological innovation, and accidents may happen due to lack of experience with the new technology. But in the long run, many new competitors enter into the market (if effective anti-trust laws are in place), increase the total offer and the choice among different versions of the new good, constantly improve the safety and lower the price. Eventually, the product becomes cheaper and safer and turns into a commodity designed for a global mass market. At this stage, the broad access also makes it a potential tool of empowerment; people start to adapt and tailor the new technology to their particular needs by combining their local knowledge with the new knowledge.

2.3 Governments as regulators and facilitators in developing countries

The creation of knowledge is however not a pure product of market forces and not all knowledge that is produced in the private sector increases social welfare. Almost every technological revolution has its roots in public sector-sponsored R&D [19] [20]. Moreover, the kinds of knowledge that are created in the private sector as well as the use and access to this knowledge are often influenced by institutions created by governments [13].

Welfare economics gives the impression that governments are needed only when markets do not result in socially desirable outcomes (e.g. market failure, the provision of public goods). The role of governments is therefore believed to be limited to the regulation of the private sector and the production of public goods. New Growth Theory challenges this view of the public sector. Firstly, public goods can and are increasingly provided by the private sector because a more market-friendly institutional environment and advances in technology[7] create the right incentives to do so; and, secondly, government institutions are not primarily designed to regulate but to create the necessary conditions for economic growth by investing in the production of knowledge and human capital. In this concept market failure exists primarily because markets fail to invest sufficiently in knowledge and human capital because innovators cannot capture all the gains associated with creation of these assets [13].

2.3.1 Losing the Dupuit Welfare Triangles in Developing Countries

In poor developing countries, governments often lack the means to invest sufficiently tacit knowledge (human capital) and codified knowledge (technical instructions, publications), which would be the essential two ingredients for the local private sector to develop and produce new knowledge-based goods. The production of new goods would be especially important in developing economies that largely relies on production and trade of primary commodities with increasing returns. They could offset the decreasing returns from existing goods with increasing returns from new good and thus facilitate the transition toward a knowledge-based economy. Since they are not in a position to generate sufficient tacit and codified knowledge themselves, developing countries are more dependent on its import through open-access agreements, research partnerships and foreign direct investment. Often foreign companies would prefer to simply export their goods but not the knowledge required to produce the good. Policy makers in developing countries must therefore create adequate incentives that induce foreign companies to offer the new goods and also to produce and market them in the country itself. Such investments eventually increase the stock of knowledge and human capital in the developing country.

Yet, national governments in developing countries often tend to discourage such private sector investment by imposing high profit taxes, trade restrictions on essential capital goods, prohibitively high safety regulation, and inefficient and burdensome government bureaucracies. Corruption and weak property rights can additionally increase the costs until the point is reached where a company decides not to invest anymore (despite cheap labor and abundant natural resources) because the costs exceed the expected gains. So the new good will simply not be produced and this means that the respective country loses the social welfare benefits of the Dupuit triangle [4].

Instead of just taxing and regulating companies and pushing up the bar of their costs of production, governments can also serve as facilitators and encourage investment through tax exemptions for R&D, a high degree of political stability, a valuable stock of domestic human capital (through more responsive universities), dependable public infrastructure as well as a relatively open and developed financial market (allowing for a better hedging of risks).

2.3.2 Why export of regulation from rich to poor countries is harmful

Governments in rich developed countries have the means and the institutions to become attractive facilitators of private sector investment and, they can afford to increase regulation (e.g. high environmental and food safety standards, labor rights, high corporate taxes etc) without discouraging private sector investments. The facilitating institutions (tax credits for R&D, good infra-

structure, large stock of codified and tacit knowledge) plus the strong purchasing power and the large market size make it profitable for a company to invest despite the high regulatory costs. Poor countries, however, are in a different position: because the state budget is too small to improve investment conditions and the market is tiny, additional regulation may quickly erase the profits that foreign companies expect to make, and therefore investment does not happen. This again leads to the loss of the Dupuit triangles.

Ironically, the increasing regulatory costs in developing countries that prevent the introduction of useful knowledge into the local economy are imposed by Western government and NGOs. They often require poor developing countries to adopt costly and often ineffective regulatory frameworks in return for access to their affluent consumer markets and generous foreign aid. These Western 'experts' are often convinced that they protect the interests of the poor and the environment through such exports of regulation when in reality they may perpetuate poverty and the unsustainable use of natural resources. Their thinking makes sense in the concept of Welfare Economics, but becomes nonsense in the concept of New Growth Theory (because it is merely focused on the production and dissemination of existing goods and ignores the introduction of new goods).

3. How to use knowledge and technology for development?

As illustrated above, the primary contribution of companies to social welfare may not occur through general taxes (as widely assumed) but through the generation of new goods and services. Yet, the problem is how to get the private sector to invest in the production and commercialization of goods that would result in large social and environmental welfare surpluses[8] and contribute to national security issues (e.g. food self-sufficiency).

These goods would produce huge Dupuit welfare triangles but often the low purchasing power, the small market size and the high regulatory uncertainty associated with the introduction of a new good are lowering the chances of sufficient profits to compensate for the high fixed costs. And if a company would develop such a good, despite all the uncertainty and the low expected revenues, it would be very difficult to enforce partial excludability (people would argue that the product has public good character and therefore should be available free of charge).

The question therefore is whether it should be the public sector that develops and produces these goods or whether there is any possibility to induce the private sector to participate in the production of these goods?

During the Cold War, neoclassical welfare economists provided the tools and the justification for the public sector to be exclusively in charge of the production of such goods. The Green Revolution was an international public sector initiative to develop, produce and disseminate new hybrid varieties of major staple food crops in order to avert hunger and starvation in non-aligned developing countries. At the same time, production subsidies and market protection for domestic agriculture was introduced in developed countries (in order to ensure food self-sufficiency) and state enterprises were fully in charge of network industries in order to ensure the countrywide functioning of essential communication, transportation and energy services in case of war.

The following chapter will illustrate the theoretical background behind these policies and explain why such policies still prevail in the post-Cold War period, especially in the area of agricultural, environmental and development policy.

3. 1 Development Policy in the Cold War Era:

Economic research as well as public policy during the Cold War era were highly influenced by the main principles of neoclassical Welfare Economics largely developed by three noble laureates in economics: Paul Samuelson, Kenneth Arrow and Robert Solow.

Samuleson [21] argued that public goods must be provided by the state because the private sector fails to do. He illustrates this with the example of a lighthouse that would benefit all shippers but no shipper actually has an incentive to finance a lighthouse because the others could equally benefit from it (free-rider problem). Since everyone benefits from a lighthouse and no one should be excluded from its use, Samuelson believed it to be a public good that must be provided by the public sector. Ronald Coase showed that this argument does not correspond to historical facts: lighthouses financed by user fees paid by shippers existed in Europe already in the 18th as he pointed out in his publication in 1979 [22].

Kenneth Arrow [2] believed that democratic decision-making results in rational social choice and is therefore best able address economic and social problems. In his conception, rational social choice ensures the pareto-optimal allocation of scarce public resources (making at least someone better off without putting anyone worse off). Since everyone is assumed to agree to such a choice, the respective political decisions are assumed to be based on unanimity and thus do not result in any externalities. Buchanan and Tullock [11] questioned these assumptions by highlighting the fact that the de-

mocratic decision-making process is neither based on unanimous decisions nor does it necessarily produce optimal outcomes from a social welfare point of view. Political actors pursue their self-interest and are not driven by the desire to maximize social welfare. Yet they might inadvertently produce social welfare because they have different intensities of preferences which they are willing to trade (through side-payments in a successive game of political decision-making).

Finally, Robert Sollow [23] developed a model that kept diminishing returns to capital and labor, but added a third factor, technical knowledge, that would keep economic growth from slowing down. With this model he managed to reconcile economic growth with the principle of neoclassical Welfare Economics. The model treats technological change as an exogenous factor that can be perfectly integrated into the neoclassical model of perfect competition where companies are portrayed as passive price-takers. Knowledge was therefore treated as a public good that must be funded by the public sector (assuming that it is based non-rivalry and non-excludability). Paul Romer was able challenge Solow's growth model with his paper on endogenous technological change [8]. In this paper he showed that technology as an input is neither a conventional good nor a public good but a non-rival, partially excludable good. In his model it is neither the public sector nor perfect competition but monopolistic competition that generates new goods and services.

3.2 The mindset of agricultural economists and how it influenced agricultural policy and the Green Revolution

Inspite of these inconsistencies, policy makers largely designed public policies in accordance with the principles of neoclassical economics. These principles were however not just used to justify neoliberal supply-side economics that favors small government and a laisser-faire market economy but also demand-side economics that advocates government intervention wherever someone claims to see market failure.

Agricultural and development economists argued that the high adoption rates of technology in agriculture in developed countries would produce negative externalities for the farmers themselves (production surpluses, low prices) they were concerned about the absence of agricultural technology in developing countries (which could lead to hunger and starvation because of low productivity in agriculture).

To explain, the problem in developed countries, agricultural economists used the concept of the so-called agricultural treadmill [24]. In this concept, farmers produce a homogenous[9] and inferior commodity. They are portrayed as passive price-takers in a market of perfect competition. The role of technology is reduced to its potential to increase agricultural productivity (while its potential to improve food quality is not addressed). Since farmers are standing in perfect competition they are assumed to produce at the level where their marginal costs just equal their marginal revenues. According to the concept of the agricultural treadmill, it is possible that certain farmers adopt a new technology that allows them to lower their production costs and produce more efficiently. This gives them a temporal advantage and thus a windfall profit. Yet, this advantage is quickly erased because all the competitors will have to follow suit if they want to stay in business. This agricultural treadmill is used to explain the surplus in food production and the decrease in relative food prices.

Unsurprisingly, agricultural economists concluded that this treadmill of technological innovation tends to benefit food consumers and input providers at the expense of food producers. They argued that the agricultural treadmill is producing a sort of market failure since farmers would get poorer even though they produce more, due to the inferior prices. By invoking these negative externalities and the need to ensure 'national food self-sufficiency' in view of the Cold War, they argued in favour of government intervention designed to support domestic farm production and avoid dependence on food imports. This resulted in highly complex agricultural policies that increasingly produced negative externalities themselves (export subsidies for production surpluses, environmental degradation, monocultural practices).

In retrospect, even agricultural economists would admit that it was probably not the agricultural treadmill, but the market-distorting instruments of agricultural policies that provided the biggest incentives to adopt intensive large-scale agricultural production at the expense of environmental and food quality. One only needs to go and watch the movie 'We Feed The World', produced by Erwin Wagenhofer in 2005 (the most successful Austrian documentary movie ever) to get a picture of the unappealing endless number of greenhouses in southern Spain that focus almost exclusively on intensive tomato production. Erwin Wagenhofer, who is an urban dweller with little knowledge of agricultural policy, blames the corporate world for all this misery. Yet, in fact, big business is part of the problem. For instance, intensive tomato production in Spain is a result of EU subsidies. The same goes for olive tree monoculture in Spain and Greece, overfishing in the Atlantic Ocean, excessive growing of low-quality wine in France and

many other subsidised products.

All these practices are not just harming the environment but they also discourage innovation and tend to make food quality worse – why should these producers care about innovation or satisfy consumer taste if the money comes from Brussels anyway? The EU's Common Agricultural Reform (CAP) tries to address the mistakes of the past but it turns out that there are simply too many vested interests involved to accomplish any substantial reform. As much as 80% of its subsidies still goes to the richest 20% of farmers, and the biggest single recipients of CAP payments tend to be giant agribusinesses and big, wealthy landowners. France continues to be the largest beneficiary of CAP money, taking around a quarter of all EU farm subsidies [25].

3.2.1 Agricultural Policy after the Cold War

In the 1990s, agricultural economists recognized that certain policies produced 'sub-optimal' results despite the rational social planning. They recommended a switch from production-tied subsidies to income-support subsidies. Agricultural income-support programmes included an output subsidy, a land subsidy, and a decoupled payment with and without mandatory production. The new objective was to maintain a strong, healthy and environmentally sustainable agricultural sector. As a consequence, things like agro-biodiversity, food safety, decentralized settlement, and custodianship of cultural landscapes were declared to be the new public goods that are provided by farmers - after the old public good of maintaining food security became somewhat obsolete in view of the production surplus and the end of the Cold War. It was christened multifunctional agriculture and provided the best justification to keep agricultural economists employed as social planners and continue to use all the old planning models designed to calculate the optimal allocation of scarce resources where markets presumably fail to do so. But did the markets really fail or are these public officials increasingly managing state failure?

There is increasing evidence that the new agricultural policies and the new justifications for government intervention in agriculture did not bring the expected improvements: direct payments were designed to mitigate the structural change that was expected to result from slightly more open agricultural markets as demanded by the WTO Agreement on Agriculture(AoA). Yet, direct payments proved to be an obstacle to structural change because they artificially increased the value of agricultural land and discouraged many farmers from becoming more innovative and competitive [26]. At the same time the new normative goals of agricultural policy to promote environmental, social and economic sustainability through compliance schemes (e.g. agro-environmental measures/labelling schemes in return for more direct payments and premium prices) once again turned out to be in the best tradition of government-sponsored research by agricultural economists, namely suboptimal: environmental improvements were relatively meagre and largely achieved through more efficient input technologies. In addition to that, a large evaluation of agro-environment measures in Europe showed that such measures rarely contribute to a real increase in valuable biodiversity [27].

As for the socioeconomic impact of direct payments, there seems to be a correlation between the amount of direct payments a rural region receives and its economic decline and subsequent impoverishment [28]. This is not surprising in consideration of the fact that a high dependence on direct payments is not an attractive way of life for the young people who want to be creative and participate in the new knowledge economy; apart from that the private sector is reluctant to invest subsidised regions because of the receiver mentality of the people and the relatively high costs of labor and land (pushed up indirectly through direct payments).

In spite of the timid opening of agricultural markets, agricultural trade hardly increased over the past two decades. One major reason for that is the AoA itself. It is primarily focused on a gradual improvement of market access rather than the reduction of domestic support measures. But, ultimately, it is domestic support measures that result in misleading market signals, overproduction and subsequent market access restrictions[10] [29]. The fatal consequence was that the amount of domestic support did not decrease but was simply moved from so-called 'actionable' subsidies (amber box of the AoA)[11] to 'non-actionable' subsidies (placed in the blue and green box of the AoA). It was assumed that non-actionable subsidies would not be trade-distorting but it turns out that they are. At any rate, this shift kept social planners employed and did not force anyone to look at theory. But are these policies sustainable and do they really benefit farmers? In consideration of what we now know, the answer is unlikely to be yes. A parallel development with a similar ambiguous outcome happened in the international arena where the primary concern was to help the poor in developing countries to become self-sufficient in food production.

3.2.2 The theoretical thinking behind the Green Revolution

In the 1940s policy makers in the United States agreed that developing countries must be assisted in the development of new varieties and modern irrigation systems in order to boost food production and avoid hunger and starvation. It was assumed that the private sector would have no interest in investing in technologies that would serve poor farmers in developing countries. Therefore public investment in international agricultural R&D was declared to be a public good that must be managed by the public sector (following the Solow model). The resulting global public sector initative is widely known as the Green Revolution. It was to a large extent a US-driven effort to improve food security in the non-aligned developing world as part of a global containment strategy against communism [31]. USAID and the Rockefeller Foundation were the main financial contributors to the establishment of the first Centers of the Consultative Group of International Agricultural Research (CGIARs) in developing countries. These CGIAR centers enabled Western scientists to work in well-equipped research centers in developing countries and design high-yielding varieties of major food crops such as maize, wheat and rice. The new varieties were subsequently distributed in rural areas through government institutions. The private sector was hardly involved, even though it later benefited from the scientific knowledge generated through this international undertaking. The research at these centers (CGIARs) contributed to significant increases in agricultural productivity and technology transfer to local universities and national research institutes in developing countries. Yet, the role of the private sector and especially the one local entrepreneurs in the commercialization and local adaptation of the technological innovations was somewhat neglected.

There is no doubt that the Green Revolution greatly contributed to global food security through the excellent international agricultural research that was conducted at CGIAR centers during the Cold War. However, the interaction between Western scientists, who developed high yielding varieties, and local farmers in developing countries who adopted these varieties through the national seed distribution programs, was rather poor. This led to some long-term problems such as inadequate use of pesticides, insufficient maintenance and operation of irrigation systems by local people, little seed choice for farmers and monocultural practices [32]. In addition, farmers in marginal regions did not benefit to the same extent from these new hybrid varieties that were mainly designed for favorable agricultural conditions with access to fertile soil, irrigation, markets and essential inputs [33].

Left-wing development activists point at these unintended side effects of the Green Revolution and tend to attribute the associated monocultural practices to the capitalist logic. Yet, as highlighted in the early case of the documentary of Erwin Wagenhofer, these undesirable side effects are a result of too little rather than too much private sector involvement. For example, public sector researchers based at CGIARs did not have to bother much about the real and complex set of problems that farmers face in the field or the particular consumer taste of different cultures. They could just focus on plant variety traits that would increase yields and then select the elite varieties and hand them over to national agencies for distribution. As a result, the private sector may have had little interest to invest in the development and commercialization of new varieties in developing countries and compete with the public sector that would distribute the seeds for free or almost for free. Thus, the private sector largely stayed out of the Green Revolution. This explains for example why the greatest bottleneck in many poor developing countries is probably the absence of a local seed industry and seed choice. It also explains why many Filipino consumers prefer to buy rice from Thailand which is the leading exporter of high-quality Indica Rice but actually never adopted high-yielding rice varieties. They say it simply tastes better than the rice varieties that were bred by International Rice Research Institute (IRRI) and widely adopted by Filipino farmers [32].

3.2.3 International agricultural research after the Cold War

After the end of the Cold War, foreign aid was cut in almost all state budgets of developed countries and public sector funding for agricultural research decreased significantly [34]. Right-wing politicians were arguing that there is no need for further investment in CGIAR research because the Green Revolution has already largely achieved its purpose of eliminating hunger. This argument is quite cynical considering the fact that there are still over 800 million people worldwide that suffer from hunger and malnutrition. Left-wing politicians, in turn, were using the familiar but flawed argument that there is enough food around but that it just needs to be better distributed. This led them to the conclusion that there is no more need for further investing in technology but instead just bring the food to the poor.

Agricultural ministries in developed countries that still do not know how to get rid of production surpluses

would most certainly welcome the idea. Yet, the fatal consequences of such forms of food dumping are widely known: local farmers in developing countries that cannot compete with donated food are forced to abandon farming because of lack of revenues. Thus such policies are likely to worsen food self-sufficiency and increase dependence on Western food aid. Even though the 'distribution problem' argument is still widely used by teachers in high-schools, it is even rejected by left-leaning development activists who embrace the paradigm that farmers in developing countries need to be assisted in growing their own food in a sustainable way.

Yet, the problem with Western Non-Governmental Organizations (NGOs) that pursue this approach in developing countries, is that they generally dismiss the role that business and new technologies in agricultural development play using the familiar argument that it would introduce a capitalist logic that is not compatible with the local traditions. They believe that farmers should rely on their traditional low-input and low-tech practices. They may assist them in finding slightly better techniques of soil fertility management and integrated pest management, but in general farmers are encouraged to use the agricultural practices they would use anyway. Subsequently, these Western NGOs help them to export the harvested agricultural products to developed countries where they are sold under different kinds of environmental and social labelling schemes. Such a strategy resembles the top-down approach of the Green Revolution: both strategies assume that there is a sort of market failure because business would not care about the poor. This produces negative externalities such as increasing social inequality, hunger and malnutrition that must be addressed by responsible Westerners. The only difference is that one approach looks at modern technology as the solution whereas the other one sees it as a curse.

However, the ideological mindset of such NGOs is likely to harm poor farmers in developing countries more than the previous overemphasis on public sector R&D. Farmers need to become actively involved in the process of technological change and they need to learn how to take advantage of the emerging knowledge economy by combining traditional knowledge with new knowledge in their efforts to realize economic opportunities in the market. This will eventually lead to more self-confidence and entrepreneurship and result in increases in agricultural productivity and nutritional quality of the traditional food crops. This is especially true for Africa, which did not benefit from the first Green Revolution.

In 2001, the Human Development Report 'Making New Technologies work for Development' [35] attempted to counteract the misconception of the supposedly negative role of technology and the private sector in sustainable development and was promptly attacked by sustainable development activists. This is a pity because this report merely reminded policy-decision makers that there is Principle 12 in the UNCED Rio Declaration that emphasizes the important role of new technologies in sustainable development.

It seems that neither agricultural economists that helped shape the Green Revolution, nor Western NGO leaders that advocate participatory approaches in agricultural development can see any benefit in getting the private sector more involved in agricultural development and encourage local entrepreneurship. This may be related to the fact they tend to use theoretical concepts that might have looked reasonable in the Cold War economy, but are rather outdated in the new knowledge economy.

4 The new knowledge economy slowly changes the rules of the game

The two major driving forces of the new knowledge economy are the revolutions in information technology and biotechnology that took off in the 1970s and 80s. Both revolutions started initially at universities and were strongly supported by the public sector. However, when the first prototypes of commercial interest emerged, the university-based inventors decided to seek intellectual property protection for their inventions in order to set up their own businesses in the form of spin-off firms. Some of them eventually established highly successful companies that partnered with multinationals in the commercialization of the technology, others focused on licensing out their patented technology to whoever was interested in using it, and others again simply lost out to entrepreneurial young outsiders that quickly grasped the economic potential of certain clumsy prototypes and improved them to a level where they could become commercial successes [20].

The IT and biotechnology industries have matured over the past decade. As a consequence the costs of IT and biotechnology products and tools have decreased significantly and are now reaching a far wider customer base. Unlike in the old economy where most developing countries merely played the role of suppliers of primary commodities and lacked the critical base of domestic human capital to make use of modern technology to develop their home-grown technologies, the new knowledge economy allows them to participate in the global economy in a much more extensive way.

4.1 The effects of Information and Communication Technologies

Thanks to all the new communication and information technologies, new knowledge spreads more quickly and widely, international research networks become much more extensive and effective, outsourcing business activities from simple accounting to R&D has become an integral part of the strategies of multinational companies, and global venture capital is increasingly invested in talented techno-entrepreneurs in developing countries. The resulting rise of many developing countries in science, culture, business and political power makes the jargon of North-South dialogue of many Western Development activists look increasingly old-fashioned. South-South business investments and research collaborations are growing five times faster than its North-South equivalent. In 2005, 35% of Foreign Direct Investment (FDI) in developing countries was from other developing countries [36]. Moreover, many big companies in the South are starting to even buy up companies in Europe and the United States. This rise of the rest is taking the Western baby-boomer generation by surprise. Their cultural paternalism and their ideologically-stretched version of welfare economics are at risk of becoming irrelevant, especially in the dynamic Asian economies, which are already fully embracing the principles of New Growth Theory.

4.2 The costs of not being part of the knowledge economy

There is a widespread prediction that the biotechnology revolution, powered also by the advances in information technology will eventually transform a rather dirty agrochemical and petrochemical industry into a more clean biology industry [37]. The potential economic, social and environmental welfare benefits of this transformation are enormous, and this time it is likely that developing countries with a critical domestic knowledge base will be at the forefront in the production of goods that produce large social and environmental welfare benefits.

If mankind is serious about protecting the natural environment and ensuring access to food, the growing demand for food over the next 50 years should not be met by further colonizing pristine ecosystems but by raising productivity on existing farmland; agricultural biotechnology is not just ideally positioned to meet this challenge but is also likely to produce new food products that are safer, more nutritious and tastier. The potential environmental and health risks of biotechnology must be taken seriously, but after ten years of experience and innumerous public risk assessment studies there is increasing doubt that existing genetically modified (GM) crops pose any risks that go beyond the risks known from conventional crops. Moreover, the ethical concerns raised about the current techniques of genetic engineering could quickly be overturned by the emergence of completely new transformation techniques and advances in genomic research. But one ethical concern will certainly not go away and that is the crucial aspect of social equity.

The private-sector driven biotechnology revolution may result in enormous social inequalities because the least developed countries that have simply no means, no critical knowledge base and no attractive markets to participate in this emerging sector may once again be left out. As a result the new products would merely improve the needs of affluent societies because they promise a high return on investment while the basic needs of the poor will remain unaddressed.

Paul Romer [4] points out that an exponential increase in knowledge leads to an exponential increase in the probability that new products and services will be created. These new goods and services generate innumerous new 'Dupuit' welfare triangles - but only for those societies that do not prevent them from being introduced and those that have sufficient purchasing power and market size to attract them. Therefore there is a high likelihood that the knowledge economy will even increase global inequality, unless national governments and international organizations design policies that ensure that the new technologies will also benefit and eventually empower people in least developed countries.

However, it would be a mistake to address the challenge by simply embracing a second green revolution [38] because, as explained above, the underlying principles of welfare economics are no more be applicable to the rules of the new knowledge economy. The belief that public goods should be provided exclusively by the public sector ignores the fact that the private sector increasingly contributes to the production of public goods (e.g. clean technologies, more efficient use of natural resources) as well as public bads (e.g. pollution, inequality, risk) [39]. The public sector should therefore not assume tasks that the private sector can provide in a more efficient way and in better quality (more focused on consumer/client needs) but learn how to better play the role of a facilitator of private sector activities that generate large Dupuit welfare triangles (creating positive externalities) and decrease the dependence on goods that produce environmental and social welfare costs (eliminating negative externalities).

As shown in the first chapter, the generation of these social welfare triangles requires high fixed costs that are spent on large investment in R&D, physical infrastructure,

and product development. Often companies are unwilling to invest such high fixed costs in the development of a new good unless the resulting market is expected to be profitable. This also explains why the first prototypes of new technologies were almost always designed in university rather than corporate labs [19]. Throughout the history of technology we can always observe the same pattern: there is the curiosity-driven researcher funded by the public sector who has no immediate interest in business. But there is also the bold entrepreneur who may partly steal the knowledge generated by the curiosity-driven researcher, design a new product out of it, adjust it to market needs, patent it and finally commercialize it on a large scale. Both characters are needed to create social welfare triangles. Sometimes the curiosity-driven researcher and the entrepreneur can be one and the same person. But often the inventor is not necessarily a good entrepreneur and the good entrepreneur is not necessarily good at inventing. At any rate, without the existence of smart entrepreneurs who are primarily focused on creating new markets that earn them large profits as temporary monopolists, the fruits of science could never translate into useful new goods and services.

4.3. National governance of the knowledge economy

The positive role of entrepreneurs must be kept in mind in the design of policies that aim at improving welfare in marginal areas. Effective rural development policies must combine agricultural, development and environmental policies with science and technology policy and the promotion of local entrepreneurship.

In the context of mobilizing science and technology for development, the public sector must first identify the potential technological innovations that could potentially generate large social and environmental welfare benefits in regions that tend to be ignored by the knowledge economy. It should then offer university research teams funding to develop first prototypes of such desirable goods, or offer a generous reward to the research team that first develops a dependable prototype that is sufficiently attractive to be licensed out to the private sector [39]. Yet, it should not be the university but the government that does the licensing negotiations[12]. Often it also discourages the private sector from using the new prototype because inexperienced researchers overestimate the value of their invention and underestimate the fixed costs and the risks that companies face when commercializing a new technology with uncertain market potential.

The government that initiated the research initiative to achieve certain social and environmental objectives may have a real interest in encouraging the private sector to use the prototype and convert it into new goods and new markets. The government might be more willing to waive licensing payments in return for certain reservations when it comes to the commercialization of the product (e.g. ensuring the research exemption for the patents obtained, privileged access of the product in markets with poor purchasing power).

If the prototype is not attractive to the private sector because the market is too small to make a profit, the government can design additional incentives such as fast track regulatory approval and tax credits for product research. Once the private sector is willing to embrace the product because it expects to make a profit thanks to the additional incentives, it will be much more efficient and more end-user focused than the public sector could possibly be.

4.4. Global governance of the knowledge economy

Often governments in developing countries may not have the means to offer sufficient incentives on their own to induce companies or research institutes to come up with products that would produce high social welfare triangles for their country. For example, improved orphan crops could save thousands of lives and significantly improve the health of the poor but neither the local private sector nor the national government have the means and the know-how to successfully invest in such improvements. At the same time, multinational companies that might have the know-how do not have any incentive to invest.

International donors could address these constraints by creating incentives for the private sector to produce such goods offering a generous prize for the first company or research organisation that is able to produce such a good [40] or offering an advance purchase that would boost expected demand [41].

Some people would denounce this as creeping privatization but the fact is that the new technologies that were derived from information and biotechnology make it increasingly cost-effective to include the private sector in the management of public goods. Generally these technologies permit smaller producers and more scope for competition [39].

4.4.1 The future role of CGIARs in biotechnology R&D

From 1996 to 2004, biotech crops have reduced the volume of pesticide spraying globally by 6 percent, equivalent to a decrease of 172'500 tons. The technology has also significantly reduced the release of greenhouse gas emissions from agriculture, which is equivalent to removing five million cars from the roads. The

increase in farm income that resulted from the adoption of GM crops is equivalent to adding 3 percent to 4 percent to the value of global production of the four main biotech crops [42]. Moreover the adoption of transgenic Bt[13] cotton in many developing countries turned out to have significant positive economic, health and environmental effects for small- and large-scale farmers alike [43]. All these facts just refer to GM crops and do not take into account the large economic and environmental gains that have been achieved by using all the other tools of modern biotechnology such as tissue culture, marker-assisted breeding, gene silencing and genome mapping.

Why then do politicians often argue that agricultural biotechnology does not offer any benefits to society and the environment? This may be largely based on a generally hostile public opinion and vested interests that prefer the status quo in agriculture. Yet it also seems that agricultural economists are not really able to provide them with convincing arguments why agricultural biotechnology will also benefit the poor and the environment. Their scepticism about private-sector involvement may be related to the general distrust of monopolistic competition that drives the process of technological innovation.

In agriculture, it adds to the already existing scepticism related to the agricultural treadmill hypothesis, which treats technology as exogenous and implies that benefits from introducing technology in agriculture would not go to farmers but primarily to the seed and agrochemical industry. This clearly contradicts the numbers of Brookes and Barfoot [42], who calculated an increase in global farm income through the adoption of GM crops of a cumulative total of $27 billion for the period 1996-2004, derived from a combination of enhanced productivity and efficiency gains. Obviously agricultural biotechnology must be more than just an agricultural treadmill. Moreover, it is wrong to reduce farmers to passive price-takers who struggle to survive in perfect competition. Farmers were always innovators and interested in collaborating with researchers; but the national agricultural policies can either encourage or discourage innovative farmer activities.

4.5 Farmers as innovators

The land grant college system in the United States was set up in the 19th century with the objective of promoting applied science and stimulating economic activities in the rural areas. The state universities that were established all over the country, had the explicit mandate to cooperate with the local farmers and support their efforts to find solutions to specific crop problems but also in the development of agricultural innovations that have a commercial potential. This collaboration produced technological innovations, new agricultural products and new companies in agribusiness. Apart from stimulating economic growth it also contributed to the social empowerment of the rural areas in the United States. A similar development happened in Switzerland at the end of the 19th century. The first agricultural law was passed in 1893 with specific emphasis on improvement agricultural research and development and in 1898 with the establishment of national agricultural research institutes [44].

This successful partnership between the university researcher and the farmer has largely been abandoned in Europe and the United States, because agricultural research institutes have either become focused on publishing in peer-reviewed journals or they just do consulting work for their governments. Yet, New Zealand started to rediscover this old success story after it decided to liberalize agriculture in the 1980s. The Royal Institutes of New Zealand were semi-privatized (they are expected to generate their own revenues through the development of new goods and services) and agricultural research projects must be committed to increasing competitiveness and sustainability through innovation, if they are to be funded by the state. This implies a close collaboration with business and the farming community.

Even though genetically engineered crops are not yet approved for commercialization, agricultural biotechnology is at the center of this new agricultural policy in New Zealand. New Zealand's biotechnology industry generated an estimated revenue of $811 million in 2005, with over $250 million in exports (supplemented by $160 million in manufactured agritech exports). The industry has helped ensure the continued international competitiveness and efficiency of New Zealand's food and beverage sector. This focus on technological innovation did not just create a more diversified, competitive and environmentally sustainable agricultural sector (compared to the previous subsidy-based agricultural system) but also boosted the social and cultural empowerment of the countryside. New Zealand's farmers do not see themselves as victims of a new knowledge-based economy but as an integral part of it.

Rather than relying on a social planner, they learned how to take advantage of the opportunities of globalization. Moreover, farmers in New Zealand are not just asked to execute national sustainable policy strategies but are asked to design policy strategy that best addresses the priority economic and environmental problems of their particular region. They often realize that there are no simple win-win situations but hard trade-offs when it

comes to making competitiveness compatible with environmental sustainability, and the only effective approach to address this trade-off is investment in knowledge and innovation. This investment requires however that farmers organize research on short-term problems by themselves through a collective tax and rely on the collaboration with public research institutes and the private sector when comes to technological innovation that allows a more efficient use of natural resources [45]. The agricultural treadmill would have predicted a different outcome.

4.6 Crop research networks as a new form of international agricultural research

Some would argue that New Zealand is an exception. It has invested a lot in knowledge and human capital, is well-governed, has excellent infrastructure and highly developed input and financial markets. Poor developing countries where none of this applies would face a much bigger challenge to make technology compatible with sustainable development, especially to improve orphan crops that are largely grown by subsistence farmers. These farmers would not benefit from private-sector innovations because companies have no incentive to invest in poor rural economies; and, in case they would invest, farmers would lack the knowledge to use new technology in a sustainable way. The arguments may sound reasonable but they underestimate the power of creative solutions.

The Cassava Biotechnology Network (CBN) started in 1988 as a global initiative to use biotechnology for the genetic improvement cassava. Its story is an excellent example to illustrate how creative thinking uses the potential of agricultural biotechnology for the benefit and empowerment of local subsistence farmers. Cassava is a typical orphan crop that is produced mostly by smallholders on marginal and submarginal lands in the humid and subhumid tropics.

CBN is based at the Centro International de Agricultura Tropical (CIAT) in Colombia and consists of a loose network of stakeholders that represent cassava research, cassava farming, cassava business as well as international donors with an interest in cassava agriculture.

One goal of CIAT was to use CBN as a vehicle to get more involvement of the private sector and the farmer community to learn more about the effective demand for certain innovations in cassava agriculture. Once the areas of research that are likely to result in useful products for farmers (creating large Dupuit welfare triangles) are identified, members of CBN look for funding and the best partners worldwide to collaborate on joint research projects and to ensure successful commercialization of the expected new product. Thanks to the advances in modern information and communication technologies international research collaborations have become much cheaper and also more effective.

One of the successful projects of CBN illustrates well how indigenous knowledge can be combined with biotechnology in the search for effective solutions in cassava subsistence agriculture. This project uses tissue culture technology, which has been constantly improved over the past decades. CIAT's Biotechnology Research Unit (BRU) has developed low-cost cassava in-vitro rapid multiplication techniques in collaboration with a Colombian farmer organisation called FIDAR (Fundcacion para la Investigacion y Desarollo Agricola). This comprises small tissue culture laboratories, cold chambers and greenhouses, built mostly with local material. The use of local material made the end product six times cheaper than the standard market version. Subsequently, local men and women were trained to learn how to use their traditional knowledge to select the best local cassava varieties and reproduce them in a tissue culture laboratory. The project proved to be very successful because the low yields of cassava agriculture are largely attributed to low quality and virus-infested planting material (stakes). It induced especially women to set up local businesses and specialize in the reproduction and sale of high quality cassava stakes in the region. Suddenly high technology ceased to be magic that could only be practiced by Western scientists but became a practical tool in daily life. This proves how the value of indigenous knowledge can be enhanced through the application agricultural biotechnology; and it shows that agricultural biotechnology can be a tool of empowerment [46].

Final Remarks

Neoclassical Welfare Economics treats business and technology largely as producers of negative externalities resulting in welfare costs that need to be minimized through state intervention. It assumes that the global economy is exclusively characterised by the laws of scarcity and diminishing returns, and thus ignores the fact that knowledge is a non-rival good and therefore not affected by the scarcity problem. The creation and use of knowledge therefore generates *increasing* returns in the form of new goods and services and the ever more efficient use of scarce natural resources through technological innovation. Yet, the neoclassical comparative-static approach does not show these increasing returns and therefore sees market failure almost everywhere.

New Growth Theory, as illustrated in this article, highlighted the flaws in the previous concept of economic analysis by showing that the partial equilibrium model

that is often used to portray the welfare costs of business and technology in form of 'deadweight loss triangles' for consumers, is not telling the whole story. What these models ignore are the positive externalities that business and technology produce for society. These positive externalities are a by-product of the private sector's effort to convert knowledge into new goods and services. A company that decides to forego part of the existing production of a certain good and invest it the production of a new good is not just making profits by creating a new market that gives it a temporary monopoly but also generates a new social welfare triangle called the 'Dupuit welfare triangle' that has hitherto been ignored in the comparative-static model of welfare economics.

Once the positive externalities of an innovation-driven private sector are recognized it becomes clear why applied Welfare Economics itself might produce large welfare costs in the sense that its single-minded focus on eliminating the negative externalities is inadvertently making it less attractive for the private sector to produce positive externalities through technological innovation. This is especially a problem in rural areas where there are already weaker incentives for the private sector to invest.

The criticism of the principles of welfare economics is not new but is well-documented in the economic literature of the past five decades. Yet, this criticism had little impact on textbook economics and public policy in general [46]. One exception is the area of science and technology policy, which grew in importance over the past decade in response to the emerging knowledge economy that was largely powered by the advances in information technology and biotechnology. Yet, there is this unfortunate divergence of different policy areas.

Science and technology policy is merely meant to strengthen global competitiveness of the already growing metropolitican regions and their innovation-driven industries. In turn, agriculture-based rural economies are seen as the losers of globalization and therefore treated like sick patients in public policy. It reflects an increasing divergence within governments between the departments that are in charge of development, agricultural and environmental policies and specialised in the management of negative externalities on the countryside, and the departments that are in charge of science, technology and economic policies and focused on the promotion of the generation of positive externalities in urban areas. Such a divergence is creating a schizophrenic form of governance (depending on the government department you hear a different story) and leads to a loss of political leadership. Moreover, the different policy treatments imply that rural areas are backward and therefore unable to take part in the knowledge economy; and, even worse for rural areas, the concept of sustainable development has been shaped by the doomsayers rather than the more forward-looking policy-makers who are in charge of promoting the positive externalities of the new knowledge economy. As a consequence, the potentially positive role of business and technology in sustainable development has been largely ignored by governments.

Apart from some initiatives in the area of public health, there are still few serious policy incentives for the private sector (through tax credits, generous awards, financial support for the development of useful prototypes at universities that are of interest to rural development and advance purchase agreements to increase the incentives to bring them to market) to develop and market new goods of high social value in regions that lack purchasing power and market size. Moreover, few policy-makers look at the potential of creating new markets in rural areas by transferring already mature technologies that have become very user-friendly and cheap (and therefore are not dependent on high-skilled labor); rural entrepreneurs may find new ways to employ these technologies to solve practical problems in the local business. There are already plenty of examples that illustrate how machine tools can be tailored to local needs by local grassroots inventors in developing countries [47].

The welfare costs of not being part of the knowledge economy are growing every year because the policies that intend to protect farmers from the forces of globalization, the environment from the introduction of new technologies, and the poor from using these new technologies in combination with their local knowledge; are inadvertently making things worse because:

⇒ heavily subsidised rural economies in developed countries experience economic decline because the private sector does not invest and the young tend to migrate (they want to be creative and not dependent on subsidies)

⇒ new technologies that would allow a more efficient and sustainable use of environmental resources are not being used, and

⇒ the poor are not supported in their efforts to search for new ways to combine traditional knowledge with new technical knowledge that would create new business opportunities and create new local goods and services.

The reluctance to abandon the principles of welfare eco-

nomics in economic textbooks and public policy may be attributed to habits. Those who dominate culture, politics and academia today in affluent societies used to be the enthusiastic young supporters of the social movement in the 1970s. At that time, they were challenging the uncritical mindset of their parents. The parents were identified as an emerging middle class, indulging in consumerism, uncritical of state paternalism, and indifferent towards the misery in developing countries and environmental destruction. Today many of these former protesters have themselves assumed the role cultural paternalists trying to shape a 'post-materialist' or 'value-based' society.

The demand for more value-orientation in politics is often linked to the belief that the adoption of shared community values on the societal level would lead to a more inclusive and less self-interested society. This belief represents a typical example of ecological fallacy: informal rules that work in a community are unlikely to work as formal rules on the societal level, and reversed, because community behaviour is based on a social/psychological rationality, whereas in society at large, it is based on a political/economic rationality [6]. This insight does however not seem to affect the popularity of post-materialist values in the voting and shopping behaviour of people in affluent societies. By buying organic and fair trade products consumer have a possibility to reveal their personal ethical responsibility and make a political statement against the global business that puts 'profit over people'. As citizens they manifest their discontent with globalization by voting for far-right or left wing parties that are presumably more concerned about protecting community values than the political establishment. This generates an atmosphere of we (a community that is based on the principles of fairness and reciprocity) versus them (a society supposed to be dominated by greed).

Political actors and supermarkets have become skilful in exploiting this distrust towards the formal institutions of the market economy and democracy that are both based on formal rules that assume people to be primarily driven by self-interest and the improvement of material well-being. Even though there is increasing evidence that ethical shopping is not a sustainable way to improve the well-being of the poor and the environment [48], supermarkets look at it as life-style products that make people feel good about themselves. Moreover it improves their public image because they are seen as value- as opposed to profit-driven.

Governments respond to the public pressure created by angry fringe parties and social movements that claim to represent community values, not by offering good counter-arguments why it makes no sense to adopt community values on the societal level, but by giving these demands political legitimacy in expectation of winning more public legitimacy themselves. They do so by arguing that these values would reflect the aggregated preferences of society that can be captured in the social welfare function in welfare economics. By passing regulation that is in accordance with these normative preferences (but often in contradiction to scientific evidence and best practices) they increase their popularity and at the same time can claim to be 'rational economists'.

The subsequent export of such 'value-based' regulation to developing countries (offering trade preferences and foreign aid in return for the adoption high regulatory standards) is thus an export of values rather than science and know-how. This cultural paternalism stifles local economic activity and discourages rural entrepreneurship in poor developing countries because these regulations often turn out to be highly burdensome for small local companies. In turn, they create more business opportunities for Western companies, NGOs and consulting firms because they either have the financial endowment and the experience to comply with this regulation in developing countries or get funding to implement it in the first place.

The value-driven economy is therefore likely to result in more economic inequality rather than a more 'humane world'.

After all, peaceful interaction on this planet does not require people to share the same values [49]. In fact, enlightened and active citizens are self-critical toward their own value-system which they do just not see as an authentic expression of personality or culture. As Max Weber would say, they embrace an ethic of responsibility rather than an ethic of conviction [50]. Morally and culturally evolving citizens also show a curiosity for people that do not share the same values. Culture is not something that grows out of a homogenous community but is rather the product of cross-fertilization that results from the interaction and mutual learning of different cultures in a heterogeneous society [49]. Moreover, values shared by a homogenous community may not just be based on reciprocity and fairness but also include dangerous stereotypes and prejudices that are the product of fear and ignorance [51].

New public leadership must resist the temptation to endorse community values, prevent the divergence of political strategies between the different government departments, and come up with more creative policy approaches to sustainable development that aim at facili-

tating rather than avoiding change in rural areas. Such new creative policies must not be invented from scratch. It just requires a willingness to learn from best practices and the experience of national and international policy initiatives that embraced New Growth Theory in their rural development strategies. The land-grant college system in the United States in the 19th century as well as the international Cassava Biotechnology Network (CBN) and the innovation-driven agricultural policy of New Zealand in the 21st century illustrate that New Growth Theory can successfully contribute to sustainable economic development in rural areas, independent of time, culture, geographical location, and stage of economic development. Yet, these success stories are all based on strong public leadership, a political will to embrace change, and active citizens that focus on self-improvement.

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Acknowledgements:

I would like to thank Victor Konde and Calestous Juma for their valuable intellectual input.

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Notes

1. Abram Bergson introduced the social welfare function in 1938 [1]. He sees the function as the aggregated end-product of the values held unanimously by a certain society rather than method of reconciling divergent value-systems as Kenneth Arrows suggested in his refined version of the social welfare function in 1963 [2].

2. In defense of Marx it must, however, be admitted that he had not a comparative-static but a dynamic view of economic development and consequently recognized technology-driven globalization as a powerful source of economic growth. Yet, since the student protesters looked at Marx as a prophet rather than an economist [8] they were not able to recognize it.

3. Some influential former left-wing baby-boomers eventually became frustrated with Applied Welfare Economics. Yet, rather than looking for better economic theory, they tended to stick to the old principles of

4. Neoclassical Economics (which they were taught in school in the 1970s) but just skipped the social welfare function and re-fashioned themselves as neoliberals or neoconservatives. Their policies were quite influential over the past decade (Washington consensus, Bush administration) but are now widely discredited. They are not discussed in this article because their interest in rural development policy was always rather marginal.

5. Policies that are based on the Theory of Incentives are more dependable and effective because they take into account the Principal-Agent Problem in the institutional design and thus avoid moral hazard and adverse selection. The Principal-Agent Problem is discussed in detail in a previous ATDF Journal article [15].

6. The great majority of the large number of possible new goods fail to provide sufficient utility for a sufficiently large market and therefore are unlikely to be introduced (the fixed costs are too high and the benefits too low). New goods' that are eventually introduced promise to significantly improve the efficiency of the production of an already existing market good, or are themselves expected to meet a large consumer demand. New goods can be tangible (e.g. bridge) or intangible (e.g. technical instructions). They require high fixed costs in the process of development and production which are to be compensated by a higher product price or a higher user-fee (e.g. bridge toll, royalty fee). However, intangible goods (e.g. technical instructions, new designs, etc.) are inherently different in nature, because unlike physical goods, they can be used over and over again at no additional cost [8].

7. The marginal cost of production indicates any additional cost required to produce a next unit. This marginal cost curve is flat rather than increasing because it only represents the variable costs of production (below the line) that are assumed to remain constant with increasing production in view of the low and relatively stable reproduction costs of an innovation.

8. Technological innovation allows for a decentralisation and decomposition of public utilities (unbundling). Public utilities were previously thought to be natural monopolies that had to be state-run (e.g. postal service, electricity, railway, telecommunication). Today the more liberalised market environment and new technologies in these nework industries allows companies to compete for the operation and management of these distribution networks. This may mark the slow transition from a public utility management to a market driven commodity business. Decentralisation of energy production may become a reality on the long-run when alternative energy technologies become available (e.g. micro-power plants based on hydrogen, organic waste or solar energy).

9. E.g. new orphan crops varieties with higher productivity and entriched nutritional quality, orphan drugs against communicable diseases (e.g. Malaria vaccine), alternative energy-, bio-, material technologies that accelerate the transition from a polluting petrochemical into a more clean biological industry.

10. Presuming that there is no potential to increase quality, taste and variety of the product.

11. Influential agricultural trade economists such as Kym Anderson still rely on comparative-static trade models and consequently ignore the welfare surplus that is generated through the introduction of new goods. Generous direct income support up to a maximal annual level of farmer income decreases the incentive to earn more through innovation and entrepreneurship. And this again may slow down the generation of increasing returns through the creation of new agricultural goods and services. At the same time, it increases the incentives to continue to produce the already existing agricultural products with decreasing returns (farmers who would have left agriculture otherwise, continue to produce in in order to receive direct payments). Therefore direct payments are not neutral but force governments to uphold market restrictions (increasingly in the form of non-tariff trade barriers). Because Anderson et. al [30] cannot find these undesirable developments in their trade models, they continue to insist that the potential contribution to global welfare would be enormous by removing agricultural tariffs but minimal by removing agricultural subsidies.

12. In WTO terminology, subsidies in general are identified by "boxes" which are given the colours of traffic lights: green (permitted), amber (slow down — i.e. be reduced), red (forbidden). Export subsidies that are usually prohibited and therefore fall into the red box. This is however not strictly applied in agriculture where export subsidised are still tolerated and therefore there is no red box for agriculture. The amber box contains all trade-distorting domestic support measures. Any support that would normally be in the amber box, is placed in the blue box if the support also requires farmers to limit production. Green box subsidies are meant to be non-trade-distorting. There are also exemptions for developing countries sometimes called "Special and Differential Treatment or 'development' box".

13. This is not prevent researchers from becoming entrepreneurs themselves. In case they themselves want to become entrepreneurs, patent ownership should be handed over from the university to the emerging entrepreneur. It could serve as a first asset of the new spin-off firm. The fact that the emerging entrepreneur does not have to pay a royalty fee to the university in the early stage when there are only costs and no revenues, makes it more likely that the young firm survives this precarious first stage. Instead of relying on the licensing revenues, the university could buy a stake in the emerging firm. This would give the firm more support in the early stage and the university more revenues in a later stage when the new good becomes a commercial success.

14. *Bacillus thuringiensis* (Bt) is an insecticide with unusual properties that make it useful for pest control in certain situations. Bt is a naturally occurring bacterium common in soils throughout the world.

The Proliferation of International Trade and Investment Arrangements in the Arab World: Key Issues and Challenges

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Overview

The absence of a multilateral framework on investment accentuates, in part, the recourse to Bilateral Investment Treaties (BITs) and the inclusion of investment provisions in Free Trade Agreements (FTAs) as a way to regulate international investment relations[1]. Arab governments have been actively concluding such agreements with a view to attract foreign direct investment (FDI). The proliferation of bilateral trade and investment agreements in the Arab region reflects the desire of Arab governments to implement specific policy measures aimed at creating a stable and predictable international framework for FDI. This development mirrors their efforts at the domestic level to update their national laws on investment and by the simplification of legal procedures for the entry and establishment of transnational corporations, the reduction of corporate taxes, provisions of incentives and guarantees to the free transfer of capital, exclusion of nationalisation. In addition, new laws on intellectual property rights are being adopted.

This paper attempts to shed light on the international regulatory frameworks for investment in the Arab world, in particular, it aims to review the network of International Investment Agreements (IIAs) (both bilateral and regional) in Arab countries. The paper then analysis the criteria that govern the selection of an investment treaty partner before concluding with possible ways to enhance the development dimension of these treaties.

1. Regional investment frameworks

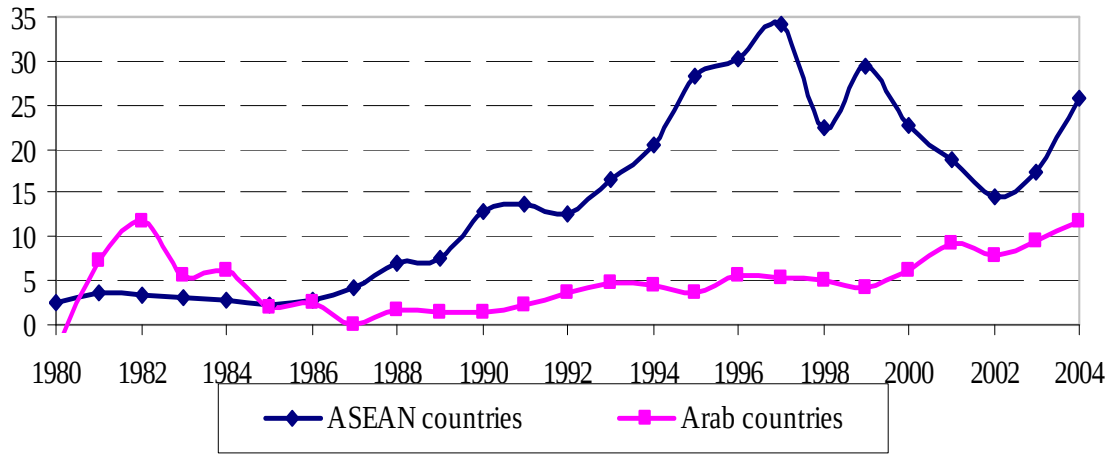
Some of the first initiatives to create regional frameworks for investment took place in the Arab world. As early as the 1950s and 1960s, Arab states had already concluded agreements aiming at encouraging intra-Arab investment flows. These initiatives were taking place in the context of rising pan-Arabism, a movement that aspired to a unified Arab nation. Under the auspices of the League of Arab States[2], several agreements were concluded, including the Agreement on Arab Economic Unity (1957) with the aim of fully liberalizing the movement of persons, capital and goods among the Arab League States , the Agreement on Investment and Free Movement of Arab Capital among Arab Countries (1970) was concluded to promote preferential investment treatment between Arab countries[3].

This agreement was followed in 1971 by the conclusion of the Convention Establishing the Inter-Arab Investment Guarantee Corporation further creating an enabling framework for investment flows within the region[4]. In 1980, the Agreement for the Investment of Arab Capital in the Arab States was signed. It permits the free transfer of funds and requires the parties to protect Arab investors and their revenues. The agreement also prohibits the nationalization of Arab investments unless it is for the public benefit, in a non-discriminatory manner and accompanied by fair compensation. Moreover, the agreement entitles Arab investors to unimpeded entry and residence within the territory of the Arab State in which the investment is made. The agreement also includes a chapter on dispute settlement that refers the disputing parties to the Arab Investment Court. The Arab Court is referred to in Chapter VI of Agreement; a first ruling has been rendered recently in a case involving Tunisia and an investor from Saudi Arabia[5]. The Court was set up to arbitrate disputes involving States that are members of the Arab League and investors that are nationals of other member States of the Arab League. As illustrated below, some BITs concluded by Arab countries refer to the Arab court as an arbitration mechanism in the investor-State dispute settlement provisions.

Another regional agreement is the Unified Economic Agreement between the Countries of the Gulf Cooperation Council (GCC) created by Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates in 1981. The primary objective of the agreement is to deepen economic relations between the members, but provisions on investment and services were only of trivial importance, the agreement called, in Article 21, for the unification of investment rules and the achievement of a joint investment policy; however, no specific implementation steps were stipulated.

More recently, the Arab League decided to initiate the Arab Free Trade Area (AFTA) in an effort to revive previously unsuccessful attempts at regional integration. In 2002, the 69th meeting of the Economic and Social Council of the Arab League, held in Cairo, decided to accelerate the establishment of AFTA, setting 2005 instead of 2007 as deadline for its launch. If successful, this new initiative should form a bigger and more homogenous Arab market

Figure 1. FDI inflows to ASEAN and Arab countries (1980-2004) (billion$)



Source : UNCTAD FDI database

and thus attract more foreign direct investments (regional and international) and strengthen the member countries' negotiating power when dealing with powerful economic blocs in international arenas such as the WTO. However, the AFTA is primarily a trade liberalization initiative, which may not suffice to create conditions conducive to a deeper integration comparable to other developing integration blocs. It should be noted that regional integration in Southeast Asia (ASEAN) and in Latin America (MERCOSUR) were not confined to the liberalization of trade in goods. Other issues such as investment and services were also included in the integration process of these blocs. As illustrated in Figure 1, since 1985, total FDI inflows to the ten ASEAN member countries[6] have been consistently higher than the total FDI inflows to 18 Arab countries[7].

Another free trade initiative is the Agreement for the Establishment of a Free Trade Zone between the Arabic Mediterranean Nations (*The Agadir Agreement*) which was signed between Jordan, Tunisia, Egypt and Morocco in 2004. The creation of a free trade zone between these countries could strengthen the Barcelona process (see below) and build on the already existing association agreements between these countries and the EU. The agreement could also be perceived as a building block towards a greater Arab Free Trade Area. The Agadir Agreement provides for a pan-Mediterranean cumulation of origin, however, the agreement does not cover investment, and only reaffirms the commitment of the member parties with respect to the multilateral WTO agreements on intellectual property (TRIPS) and on services (GATS). Again, a deep integration among the members of the agreement would require substantive disciplines on a number of issues in addition to trade in goods, these issues could include for example, the liberalization and protection of investment and services within the region, which would encourage the establishment of Arab companies and the development of linkages with local market forces and thus foster integration at a higher level than mere free trade. Moreover, a successful economic integration among the members of the Agadir Agreement would require more coordination in terms of exchange rate and macroeconomic policies[8].

2 Bilateral investment frameworks

2.1 Arab countries' involvement in bilateral investment treaties (BITs)

Bilateral investment treaties (BITs) constitute one of the most important international policy tools used by Arab countries to attract foreign direct investment (FDI). By signing these treaties – which provide protection and favorable treatment to foreign investment and foreign investors under international law – signatory countries are signaling their commitment to provide a stable, transparent and predictable investment climate[9]. The parties to a BIT commit themselves to providing national treatment and most-favored nation treatment (MFN) to the investors of the other contracting party. Under BITs foreign investors are also protected against nationalization and expropriation, have the right to transfer funds and profits back to their home country. BITs also include a provision which allows the foreign investors to take the host country to international arbitration if any provision is

perceived by the foreign investor to be violated. BITs usually give investors a choice between the International Centre for Settlement of Investment Disputes (ICSID) or the United Nations Commission on International Trade Law (UNCITRAL). Some BITs also refer to other institutions such as the International Chamber of Commerce (ICC) or the Stockholm Chamber of Commerce (SCC). There are also other regional arbitration centers such as the Arab Investment Court and the Cairo Regional Center for International Commercial Arbitration which are referred to in some BITs concluded by Arab states. The BIT between Jordan and Syria (2001) for example, states that:

"*All disputes related to different aspects of investments and activities…shall be settled through conciliation, arbitration, or by competent judicial authority in the hosting country of investment or by* ***the Arab Investment Court in accordance with the provisions of chapter 6 of the Agreement of Unifying of Investing Arab Capitals in Arab countries****…*" (Emphasize added).

The Cairo Regional Centre for International Commercial Arbitration is referred to in a number of BITs concluded by Egypt, including the BIT between Egypt and Nigeria (2000) and the BIT between Egypt and Pakistan (2000) [10] which states that:

"*If the dispute is not settled…within six months from the date of the written notification…it may be submitted upon request of the investor (his choice will be final) either to:*

A. The International Centre for the Settlement of Investment Disputes (ICSID)…

B. Ad-hoc Court of Arbitration established under the arbitration rules of procedures of the United Nations Commission for International Trade Law.

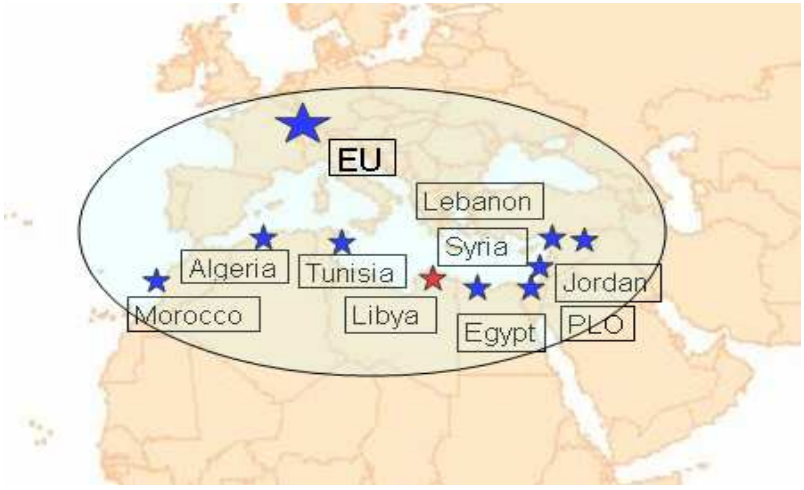
C. ***The Regional Center for International Commercial Arbitration in Cairo.***" (Emphasize added).

The investor-State dispute settlement clause in BITs is of critical importance as it ensures that the provisions of the agreement are effectively enforced. In this respect, BITs limit the sovereignty of the host state in providing preferential treatment to its own investors, and limits the rights to regulate foreign investment.

Despite a certain loss of policy space entailed in these agreements, the number of BITs has increased significantly in the Arab world, reaching over 520 BITs, constituting about 20 percent of the total BITs network. Moreover, while the effectiveness of these legally binding international treaties to protect the foreign investors under international law is unquestionable, their role in actually attracting foreign investments remains inconclusive[11].

Arab Countries conclude these agreements with the belief that on balance, the legally binding provisions found in BITs would encourage foreign companies to invest in their territories, and thus offset the loss of sovereignty over certain areas related to the regulation of foreign investment. In terms of the number of BITs concluded, Egypt, Lebanon, Tunisia and Morocco have been the most active in the region. In terms of intra-Arab BITs, over 80 such agreements have been concluded. As far as the geographical scope is concerned, Arab countries concluded most of their agreements with

Figure 1. The Euro-Mediterranean association agreements, June 2006[a/]



a/Libya has observer status

capital exporting Western European countries[12].

As mentioned above, in addition to BITs, some free trade agreements concluded by Arab countries include provisions on investment promotion and protection. These free trade agreements therefore form a part of the international regulatory framework for investment in the Arab world and deserve attention. Two schemes in particular are worth mentioning, first are the Euro-Mediterranean association agreements between the European Union and its southern Mediterranean neighbours, and the second are the free trade agreements between the United States and some Arab countries as part of the proposed Middle East Free Trade Area (MEFTA)[13].

2.2. Investment-related provisions in the Euro-Mediterranean association agreements

The Euro-Mediterranean Partnership initiative (or the Barcelona Process)[14] started in 1995 with the ambitious objective of creating a Mediterranean Free Trade Area by 2010. As part of this effort, eight Arab countries have concluded bilateral association agreements with the EU (figure 1)[15].

The association agreements with the EU constitute the legal basis of the EU-Arab Mediterranean countries relationship. The Euro-Mediterranean association agreements are comprehensive agreements covering economic, social and political issues. Investment provisions are also included, with the aim of facilitating and increasing the free circulation of capital for direct investments, as well as expertise and the transfer of technology from European to Arab countries; the agreements also call for:

- ⇒ the simplification and harmonization of procedures relating to the admission of investments;
- ⇒ the exchange of information on investment opportunities;
- ⇒ the creation of joint ventures (especially for small and medium-sized enterprises);
- ⇒ the encouragement of the conclusion of bilateral investment treaties (BITs) and double taxation treaties to improve the legal framework for investment.

These agreements also provide for consultations and deeper co-operation on the right of establishment of firms, and the effective protection of intellectual property rights.

As far as the right of establishment of firms is concerned, there are different approaches. In some agreements, the contracting parties agree to consider granting in the future the right of establishment of one party's firms in the territory of the other and assign the Association Council to make recommendations for achieving this objective. See for example Article 30 of the EU-Egypt Association Agreement, which states that:[16]

"1. The Parties will consider extending the scope of the Agreement to include the right of establishment of companies of one Party in the territory of another Party and the liberalisation of the supply of services by companies of one Party to service consumers in another Party.

2. The Association Council shall make the necessary recommendations for the implementation of the objective set out in paragraph 1."

A second approach consists of granting the right of establishment articulated through the granting of MFN and/or national treatment upon entry. As illustrated in Article 30 of the EU-Jordan Association Agreement:

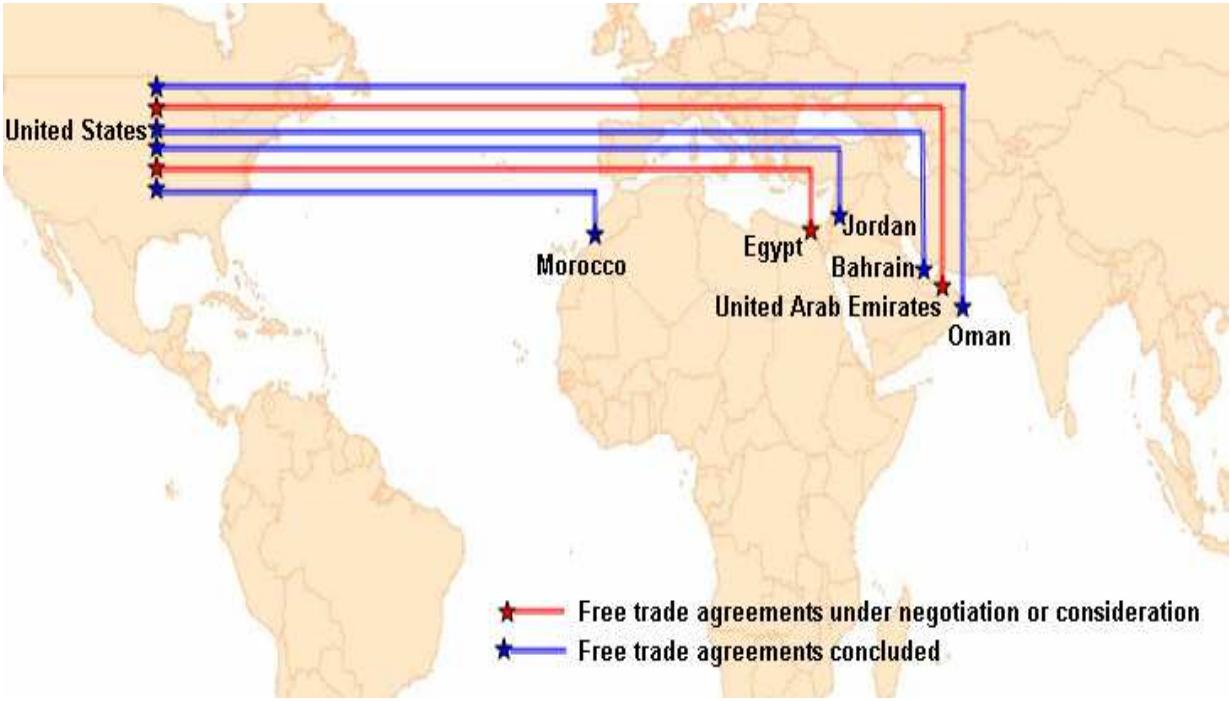
1 (a) " the Community and its Member States shall grant for the establishment of Jordanian companies treatment no less favourable than that accorded to like companies of any third country;...

2 (b) Jordan shall grant to subsidiaries and branches of Community companies, established in its territory, in respect of their operations, treatment no less favourable than that accorded to its own companies or branches, or to Jordanian subsidiaries or branches of companies of any third country, whichever is the better."

Furthermore, the agreements aim at strengthening scientific and technological cooperation (strengthening research capacity in the Arab countries, stimulating technological innovation, transfer of new technologies, dissemination of know-how and access to Community R&D programmes).

However, the investment provisions of the association agreements do not go as far as the provisions found in BITs or in other agreements concluded by the EU, such as, for example, the partnership and co-operation agreements with eastern European countries. Investment protection provisions concerning the post-establishment phase are not included in EU agreements because, according to the EU Treaty, the European Commission does not have competence on investment protection matters. An important exception re-

Figure 2. The network of U.S. free trade agreements with Arab countries, concluded and under discussion, June 2006



lates to provisions on the free transfer of capital relating to direct investments, which are included in all the association agreements.

From a European perspective, the association agreements are hoped to generate employment in the Arab Mediterranean countries so as to reduce the flow of labor migration into the Union. Another objective is to create favorable conditions to encourage European companies to invest in the southern Mediterranean countries.

The important question that arises here is whether and to what extent these agreements will help to reduce the prosperity gap between the EU and its Arab neighbours. The association agreements will open Arab markets to European goods and will make it easier for European companies to invest in the region. In return, Arab countries expect dynamic gains and economic growth through greater access to the EU market as well as larger FDI inflows and technology transfer. However, the actual benefits of these association agreements have yet to be proven. The tariff margins afforded to the Arab Mediterranean countries may not be significant enough to offset the competitive advantages of major manufacturing exporters like China and India. Moreover, European agricultural subsidies and high tariffs constrain the Arab ability to compete and export to the EU and world markets. In addition, even preferential imports are subject to anti-dumping and other protection measures such as quality and health standards and restricting rules of origin.

The countries of the Gulf Cooperation Council (GCC), which are outside of the scope of this initiative, are currently negotiating a separate free trade agreement with the EU. Negotiations on the EU-GCC FTA were opened in 1990 and re-launched in 2001. The delay in concluding the FTA is partially the result of high taxes levied by the EU on refined oil products of GCC countries and of issues related to the liberalization of the services sector in the GCC countries.

2.3 Free Trade Agreements with the United States

In 2003, the United States proposed a plan to increase trade and investment with Middle Eastern countries. The ultimate objective of this plan is the creation of a Middle East Free Trade Area (MEFTA) by 2013. This is to be achieved through a step-by-step approach beginning with actively supporting World Trade Organization (WTO) membership for the Arab countries that are yet to become full members. A second step is to improve and strengthen the regulatory framework governing FDI in Arab countries by encouraging the conclusion of trade and investment framework agreements (TIFAs) and BITs with individual Arab countries. The main objective of a TIFA is to establish an institutional body (a council) composed of representatives of both parties to hold consultations on specific trade and investment matters and to identify possible areas of trade and investment cooperation. The conclusion of a TIFA is often seen as a prerequisite to the beginning

of official negotiations for a more comprehensive FTA. In recent years, the United States has concluded many TIFAs, including with Saudi Arabia, Algeria, Egypt, Bahrain, Qatar, the United Arab Emirates, Kuwait, Yemen, Tunisia and Oman. TIFAs have no legally binding provisions on investment protection, but they do nonetheless send an important signal to U.S. investors and companies as to the willingness of the host Arab country to create a favourable climate for their investments.

Finally, the U.S. will conclude high-standard comprehensive FTAs with Arab countries addressing such issues as transparency, the rule of law, anticorruption, intellectual property protection and investment. Unlike the association agreements with the EU (which only provides for steps to encourage and to promote investment), the FTAs with the U.S. provide for more substantive investment protection provisions, similar to those found in BITs. The United States has so far concluded four comprehensive FTAs with Arab countries (Figure 2).

The conclusion of trade and investment agreements could be stirred by political variables, rather than economic ones. The politicization of FTAs is particularly evident in the case of the U.S. - Arab states agreements, which are in fact part of a wider geo-strategic plan that attempts to stabilize the region through economic interdependence.

'The political importance of the Middle East to the United States is evident from the willingness of the United States to wage a war in Iraq, the political capital some US administrations have invested in resolving the Palestinian-Israeli conflict, and the amount of aid extend to such countries as Egypt and Israel. It is not surprising, therefore, that political rather economic considerations have driven US free trade agreements (FTAs) in the Middle East'.[17]

Another example is the conclusion of the US-Bahrain FTA which was made possible only after Bahrain made it clear that it would no longer support a boycott of Israeli goods.

The net effects of such trade agreements on the U.S. economy are expected to be minimal due to the small size of the Arab economies relative to that of the U.S. Clearly, to the U.S., the importance of these FTAs goes well beyond increased trade and investment flows with Arab countries. The benefits the U.S. expects from these free trade agreements are mainly on the foreign policy level. Indeed the U.S. wants to build on the privileged relationship it enjoys with most Arab Governments through the preferential terms the FTAs stipulate. This is especially true today as support for the U.S. among Arab populations has significantly declined as a result of the political situation in the region. The security dimension is also an issue of concern for the U.S. By improving the standard of living in the Arab countries, the U.S. hopes to curb the rise of religious extremism in the Arab and Islamic world. Arab countries on the other hand, see real economic opportunities such as securing access to U.S. markets and attracting U.S. investors.

The U.S. has also been encouraging the creation of Qualified Industrial Zones (QIZs) such as the ones in place in Jordan and Egypt which provide for the establishment of free trade zones in special areas in Egypt and Jordan, where goods made with a minimum level of Israeli input gain preferential entry to the U.S. Again, the political factor in the creation of the QIZs is of great importance. It is hoped that these QIZs will boost exports while drawing foreign investment from businesses that want access to the American market. Moreover, Creating trade and investment linkages between the Arab countries and Israel could, on the long run, diffuse political tensions and create a more stable and economically prosperous Middle East.

3. Benefiting from international investment agreements

Most international investment agreements are influenced by two models (the U.S. model or the European model of IIAs). These models have been developed during the 1960s, an era of political, economic and social tensions when foreign investors felt threatened and vulnerable by the possibility of the nationalization of their assets in newly independent countries, or in countries that opted for the socialist state-owned economic system. In such a climate, it was only normal that the provisions of investment agreements focused exclusively on the protection of foreign investors and their assets. Today, the risk of sudden expropriation of foreign assets has diminished considerably, and FDI is widely recognized as an important engine of economic growth. The world is changing, and with it our perception of foreign investors. The foreign investor is now seen as an essential actor in the economic development of host states. The change in the perception of foreign investors in developing countries, i.e. from caution to enthusiasm was not echoed or reflected in the provisions of international investment agreements. Indeed, most IIAs still focus on the legal protection and favourable treatment accorded to foreign investors.

A number of issues need to be addressed in order to improve the overall development dimension of IIAs. For example, IIAs can be drafted in a manner as to admit and protect only those investments that the host country

wishes to promote for development purposes, thus providing more policy space for host countries to ensure the beneficial impact of the investments on its territory. As far as the treatment of established investment is concerned, it needs to be underlined that most investment agreements leave considerable flexibility for the host country to regulate investment activities. In addition, the contracting parties could lodge reservations, safeguard measures and exceptions with regard to the protection of sensitive areas such as health and the environment. Investment agreements can also provide for flexible timeframes for the implementation of specific provisions, based on the levels of economic development of the Parties, or on difficulties that can arise, such as those related to the balance of payments for example. It is also important to explore the possibility of introducing new development-oriented provisions in IIAs that are currently lacking; these can include a corporate commitment to invest in a socially and environmentally responsible way, to foster linkages with local investors, and a commitment to transfer technology. Such provisions in IIAs (alongside investor's protection provisions) would further encourage developing countries to conclude such treaties, and would at the same time, ensure the positive contribution of the foreign investors in the societies in which they operate.

Host Arab governments should try, as much as possible to give priority to admitting and protecting investments that will have a long-term positive economic impact (infrastructure projects for example) on the host country. The quality of the foreign investment should be scrutinized. More specifically, the *spillover* effects of the investment should be taken into account, for example will the investment project bring new technology, capital and managerial skills? Will it create jobs? Will it create joint ventures and linkages with medium size Arab companies? Which sectors are targeted – are they sectors that can generate exports, develop infrastructure? Will the investment help reduce the host country's reliance on imported goods? Some of these questions need to be examined and based on the results, it should be decided whether the conclusion of an investment agreement and the subsequent favourable treatment and protection granted to the foreign investor under international law would serve the development objectives of the host country. At the same time, too many obligations and requirements on the foreign investor (the imposition of performance requirements for example)[18] could defeat the purpose of the agreement which is to encourage investment flows. Foreign investors could perceive such obligations as a burden, and could decide to invest in other countries that impose fewer restrictions on their operations.

Conducting feasibility studies and establishing study groups prior to the beginning of formal negotiations on an investment agreement is of crucial importance, especially to the developing country partner. Such pre-negotiations research can for example estimate the impact of the investment agreement, determine the potential for increased trade and investment between the parties, provide recommendations to the negotiators on how best to serve specific areas of national interests; and identify potential overlaps and inconsistencies with other international agreements. The study group could consist of international trade and investment experts from the relevant ministries, but should also as far as possible involve members of the private sectors and academia. There should also be as far as possible an open debate and public scrutiny on how best to address the development dimension of these treaties. Transparency in international investment rule-making is crucial in order to gather the necessary public support, especially that such agreements can have an impact on issues such as labour standards, health and the environment.

Furthermore, Arab countries need to ensure coherence between their various international investment commitments and their national laws governing foreign investment. The harmonization of these rules and the formulation of a coherent national strategy on investment are essential to maintain a stable and predictable investment climate. Overlapping commitments on investment rules can occur for example between BITs, regional integration agreements, free trade agreements and national investment laws. These obligations result in a complex 'spaghetti bowl', which are difficult to navigate. Provisions such as the MFN clause add to the complexity in this regard[19].

Finally, the present inter-Arab regional investment agreements concluded between the 1950s and 1980s have become to a large extent obsolete; in this respect, the time is ripe to consider a new Arab regional agreement to promote and to protect investments within the region. Such an agreement could take into account the recent developments in international investment rulemaking, ensure the interests of Arab countries to create a more dynamic and integrated approach to inter-regional FDI, and could potentially supersede a large number of inter-Arab BITs; this would in turn simplify and harmonize investment rules in the region

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Notes

1. It could be argued that free trade agreements (FTAs) have also proliferated rapidly despite the existence of the WTO and the GATT Agreement; however the number of bilateral investment treaties (BITs) alone is almost 10 times higher than the number of FTAs.
2. The Agreement on Arab Economic Unity was signed on 3 June 1957 and came into force on 30 April 1964. The original signatory States were Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia, United Arab Republic, and the Arab Republic of Yemen. Mauritania, Palestine and Somalia subsequently also became signatories to the Agreement.
3. The Agreement on Investment and Free Movement of Arab Capital Among Arab Countries was signed on 29 August 1970 by the States members of the Agreement of Arab Economic Unity. It entered into force on 29 August 1970.
4. The Convention Establishing the Inter-Arab Investment Guarantee Corporation was opened for signature in May 1971. It entered into force in April 1974.
5. For more details on the Arab Investment Court and its first decision, see Ben Hamida, Walid, "The First Arab Investment Court Decision", in *The Journal of World Investment and Trade* Vol. 7 No. 5 October 2006 and El-Ghitany, Magda, Al-Ahram Weekly, 27 October 2004, (Issue No.713).
6. Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam.
7. Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, Bahrain, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestinian Territory, Qatar, Saudi Arabia, Syria, United Arab Emirates and Yemen.
8. For more information on the need of having a harmonized exchange rate policy among the Agadir Agreement members, see Bassem Kamar, "*Euro-Med Partnership, Agadir Agreement and the need for Exchange Rate Policy Cooperation*" (2005).

9. United Nations Conference of Trade and Development, Bilateral *Investment Treaties in the Mid-1990s* (1998).

10. The full text of these BITs are available at (www.unctad.org/iia).

11. For more details on whether BITs attract FDI, see for example, Mary Hallward-Driemeier, *Do Bilateral Investment Treaties Attract FDI? Only a bit… and they could bite*, June 2003 and Eric Neumayer and Laura Spess, *Do bilateral investment treaties increase foreign direct investment to developing countries?* May 2005.

12. UNCTAD's online BITs database (www.unctad.org/iia).

13. Arab countries have concluded a number of bilateral FTAs among themselves, but none included investment provisions.

14. For more details on the Barcelona Process, and for the full texts of the Association Agreements, visit: (http://ec.europa.eu/comm/external_relations/euromed/med_ass_agreements.htm)

15. The EU has concluded association agreements with Algeria, Egypt, Jordan, Lebanon, Morocco, the Palestinian Authority, Syria and Tunisia; Libya has observer status since 1999.

16. See also Article 31 of the EU-Morocco agreement, available at (www.unctad.org/iia).

17. Ahmed Galal and Robert Z. Lawrence (2004). "Egypt, Morocco, and the United States", in Free Trade Agreements: US Strategies and Priorities, edited by Jeffrey J. Schott, Institute for International Economics, Washington DC.

18. For more details on performance requirements, see UNCTAD, Foreign Direct Investment and Performance Requirements: New Evidence from Selected Countries, 2003.

19. See for example, Mann, Howard. *'Who Owns "Your" Water? Reclaiming Water as a Public Good Under International Trade and Investment Law'*, paper presented at the Seminario Latino-Americano de Politicas Publicas em Recursos Hidricos, Brasilia, Brazil, 22 September 2004, available at (http://www.iisd.org/pdf/2004/investment_water_economic_law.pdf).

ATDF IS PLEASED TO WELCOME ON BOARD TWO NEW MEMBERS

Sufian Jusoh

Bar-at-Law, LL.B (Wales), LL.M (Merit) (London), NCCR Research Fellow, Swiss National Centre of Competence in Research, World Trade Institute, Bern, Switzerland

Sufian Jusoh is a Barrister at Law (England and Wales) with more than 13 years experience in legal practice, mostly in shipping, intellectual property protection and management, biotechnology laws and regulations, product liability framework, and venture capital. Sufian has the experience of filing biotechnology patents in Europe.

Sufian graduated from Cardiff Law School in 1991 with Bachelor of Law and later admitted to the Honourable Society of Lincoln's Inn in the same year. Sufian was called to the English Bar in 1992. In 2003, Sufian obtained his Masters in Law (with Merit) from University College London, University of London, specialising in Intellectual Property and Biotechnology Regulations.

Sufian Jusoh was also an advisor to a Malaysian Government-owned technology company specialising in high technology research including biotechnology. In the year 2000 Sufian was drafted in to assist the Secretariat of the Malaysian National Economic Consultative Council II, on pro bono basis, where he advised on constitutional and knowledge economy issues. As a result Sufian was directly involved in the Malaysian Long Term Outline Perspective Plan (OPP3) (2001-2010).

Sufian is currently a NCCR Research Fellow at the Swiss National Centre of Competence in Research, World Trade Institute in Bern, Switzerland. His areas of interests are patent protection of biotechnology inventions; product liability of biotechnology products; development of biotechnology legal system in developing countries; risk management and risk assessment of international transboundary movement of genetically modified organisms and international biotechnology trade issues, in relation to World Trade Organisation Agreements on Sanitary and Phytosanitary and Technical Barrier to Trade.

Sufian has authored several books and articles and has presented several seminar papers.

Sunny Luther Ogbomode

Edif. Malak, Bulevar Sabana Grande, Caracas, Venezuela.

Sunny is an IT specialist, a Oracle Data Base Administratior and holds a Post Graduate Diploma in—Project Management, -Federal University of Technology, Owerri- Nigeria, and a Higher National Diploma (HND) in Computer Science.

He has been involved in training of professionals and corporate bodies on technical, business strategies and marketing leaders. These includes Seguro Caracas, Electricidad Caracas, Diageo, Nolver Representative, Energizer, P&B Controles, and Johnson & Jonson, Venezuela.

He also served on the t askforce on Computerization of Abuja Metropolis and Cadastral land, 2003-2004

Sunny is a Nigerian national.

ATDF CORNER:

ATDF Business Hub Website Design Competition up to $500!

Open to university and college students in Africa!

The ATDF Entrepreneurship Hub is inviting young people in African universities and colleges to enter a website design and development competition. The selected top five website designers will receive the following cash awards (the Hub website will be independent from the ATDF website):

1. First prize: $500
2. Second prize: $200
3. Third prize: $150
4. Forth prize: $100
5. Fifth prize: $ 50

Background information:

The ATDF Entrepreneurship Hub is an independent corporate entity of ATDF that assists and supports promising entrepreneurs in the creation of jobs and wealth. ATDF itself may invest up to 30% of the total shares or value of emerging companies.

Attributes of the website

Slogan: Make a suggestion of the slogan that should reflect the main driving forces and activities of the Hub: *Creativity, innovation and entrepreneurship in Africa*.

Colour: Propose colours and a logo for ATDF that are likely to appeal to a wide range of visitors that deal with innovation, entrepreneurship, rural development, and Africa in general, at home and abroad.

Technical details

The website should allow easy editing and publishing of content and is well-structured. The Frontpage should look inviting and make the visitor curious at first sight. It should also provide easy orientation and guide the visitor quickly to the relevant sites.

Hosting

The website will be hosted on an Apache server.

The available Database System is MySQL 5.x.

Requirements

The website should be based on a content management system (CMS). Use of a mature open source CMS is encouraged.

The website should:

- ⇒ contain a search engine
- ⇒ contain a site map
- ⇒ include some kind of contact information
- ⇒ allow data to be easily backuped and restored
- ⇒ be flexible and scalable (e.g. be able to integrate a forum)

Design Guidelines

Graphical appearance

- ⇒ Keep pages simple
- ⇒ Be consistent throughout the website
- ⇒ A consistent text navigation bar should be used
- ⇒ Only use clear, commonly used fonts
- ⇒ Use a range of type faces for text, always ending with the generic font type (serif or sans-serif)
- ⇒ Prefer sans-serif to serif fonts for text

Code

- ⇒ The code should be commented
- ⇒ Use HTML as the default page format

(filenames ending .html)

⇒ Use HTML to structure the document

⇒ HTML pages should validate against specified version of HTML

⇒ Use Cascading Style Sheets to format and style basic elements of a website

⇒ Cascading Style Sheets should be validated using the W3C CSS Validation Service (http://jigsaw.w3.org/css-validator/)

⇒ Browser-specific HTML or scripting methods should not be used

⇒ All important images must have an 'alt' attribute and meaningful description

⇒ Avoid the use of frames. If frames are used, a valid no frames element must be used and each frame within the frameset must have the title attribute set

⇒ The title tag should be present on all pages

⇒ Identification meta tags such as description and keywords are recommended

Accessibility and usability

⇒ Pages should be checked for compatibility on a range of browsers

⇒ Bear in mind that some internet users still connect to the Internet over a phone line, typically using 28.8 or 56 Kbps modems

⇒ When graphics are used, they should be compressed and optimised

Submission deadline

The Website designs should be submitted to: webmanger@atforum.org and info@atdforum.org by 31 March, 2007. Include your Name and contact address, name of your institution and two references and their contacts (lecturers in your institution.

The top ten selected web designs may be displayed as test-websites of ATDF. The winners of the top five websites may be invited to present their website or informed of the decision.

Checkout also the other ATDF investment products:

1. Zambia Entrepreneurship Award Up to $50,000

2. Entrepreneurship Challenge Award Strictly for young people starting up, especially graduates, up to $5000

For information visit *www.atdforum.org*