**STUDIES OF STRATEGIES AND MANAGEMENT**

# SCIENCE AND TECHNOLOGY POLICY REFORM IN BUSINESSES AND SCIENCE AND TECHNOLOGY ORGANIZATIONS

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***Abstract:***

*Science and technology (S&T) policy reform is a process of innovative thinking expressed in the contents of legal documents issued over past years and closely associated with the reform process of national development directives and policies leaded by the Party. Using listing, generalized method supported by objective evidences, this article focuses on: (i) General robust innovation process of directives, policies and mechanisms for S&T development over the past more than 30 years, (ii) Testament to the efficiency of such a S&T policy reform in businesses and S&T organizations by showing achievements in their own business sectors as well as in general socio-economic development, (iii) Some problems identified and solutions proposed to realize S&T development policies, mechanisms in a most synchronous and effective manner.*

***Keywords:*** *S&T policy; Policy reform; S&T organizations; S&T enterprises.*

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## 1. The process of science and technology policy reform

The reform process of Viet Nam S&T policy has been continuously undertaken and closely associated with the reform periods of the country's development directives and policies. Some basic reform landmarks relating to activities of businesses, S&T institutions will be listed below.

Until 1981, with the culminating Decree No 263/CP dated 27$^{th}$ June 1981 of the Council of the Government concerning the regime of S&T planning, all S&T activities were determined and decided in accordance with State planning indicators and only implemented by state scientific institutions. Management of S&T tasks was decentralized in three levels. *Central level*: to manage those tasks having major implications/significance for the entire national economy development, consolidating national defense and improving living standard of people; *Provincial and city level:* to manage

planned S&T tasks having important implications for economic and cultural life of local people and strengthening local defense. *Grassroots level (companies, Union of enterprises, independent enterprises, research-design institutes, and district level,...):* for management of planned S&T tasks to serve their own demand of production and services.

Decision No 175/CP dated 29th April 1981 of the Council of the Government to allow the application of contracting modality in scientific research and technological development. This decision had a great significance by giving a strong message of decentralization of S&T activities.

Decision No 51/HDBT in 1983 of the Council of Ministers allows R&D institutions to organize production of their research results which there had not any production facilities been in charge. That was the process to allow commercialization of scientific research and technological development products.

Decision No 134/HDBT dated 31st August 1987 of the Council of Ministers to allow all forms of links between researchers; partners were permitted to determine the value of their scientific products; production units were allowed to use their own budget to invest in S&T activities. This decision implied the idea to eliminate the concept of considering S&T tasks as administrative activities, increasing the autonomy of individuals and S&T institutions; socialization of investment for S&T.

Ordinance issued in 1988 on transfer of foreign technology into Vietnam to implement the idea of privatization of technology transfer activities.

Decree No 35/HDBT dated 28th January 1992 of the Council of Ministers on S&T management clearly stated: All state agencies, armed forces, economic organizations, social organizations and all citizens have the right to organize and carry out science and technology activities, apply new S&T achievements in production and life; have equal right in applying for leading or participating in state funded research and development programs/projects when they are periodically announced by competent authorities. Thus, the organization and implementation of S&T activities has been civilized. This was a great step forward. Investment in S&T was gradually socialized.

Law on Science and Technology in 2000 had legalized all innovative ideas until then.

Decision No 171/2004/QD-TTg of Prime Minister approving the proposal on S&T management mechanism reform has laid the foundation for autonomy in S&T operation.

Decree No 115/2005/ND-CP of the Government dated 05th September2005 stipulating provisions on the autonomy, self-responsible mechanism of public S&T institutions. This was actually confirmed the start of autonomy of public S&T institutions.

Law on Science and Technology in 2013 further developed the spirit of socialization of S&T activities, commercialization of research and development results in a more comprehensive manner; Radical, comprehensive reform and synchronized management, organization of S&T activities associated with market mechanism, international integration.

The process of S&T policy reform in Vietnam starting from the eighties of previous century to present transforms from the model of *State-run Science and Technology* (Decree No 263/CP) to *decentralized approach in carrying out S&T activities* (Decision No 175/CP), to *commercialization of research results (*Decision No 51/HDBT, Decision No 134/ HDBT), to *privatization of technology transfer activities (*Ordinance on technology transfer 1988), *civilization of S&T organizations and operations (*Decree No 35/HĐBT), and then *socialization of S&T activities* (Law on Science and Technology 2000). This process made S&T moved from the administrative, heavily subsidized mechanism to the market mechanism (Decision No 171/QD-TTg), public S&T organizations have their own autonomy (Decree No 115/ND-CP) with stronger and stronger *socialized investment and commercialization of the research results, radical, comprehensive and synchronized reform of S&T organization, operation and management mechanisms* (Law on Science and Technology, 2013). This was really an evolutionary process of innovative thinking expressed in the content of the already promulgated legal documents.

## 2. Results of science and technology policy reform in businesses and science and technology organization

The continuous reform process of S&T development policy of Vietnam in past years has brought about a number of results in respect of potential S&T development, improved production, business and social life. Recognizing the achievement made in particular business, production sectors and in general socio-economic development through the application of S&T advances, results is a necessary task to acknowledge the impact of the S&T policy reform and it is a kind of testament to the efficiency of the policy reform process taking place in businesses and S&T organizations.

### *2.1. Findings in actual local production and life*

In the period 2006-2013, the total number of S&T tasks implemented by local authorities was up to 11,911 of provincial/ city level and 21,000

grassroots level projects, respectively, with a total budget of VND 6,603 billion (including sources from the State budget, foreign funding, international cooperation assistance, investment by businesses, out of which funds from the state budget was VND 5,370 billion, accounting for 81.33%). The provincial level projects were implemented in all fields of S&T, namely 9.17% in natural sciences; 22.67% in technological and engineering sciences; 9.22% in medicine and pharmacy sciences; agricultural sciences was the lion share with 34.33%; 19.30% was in social sciences; and 5.31% of the total number of projects was in humanity sciences.

S&T activities have made practical contribution to the local and national socio-economic development. Research projects in the field of local agriculture focused on the selection, transfer of overall technical progress from seed selection, intensive farming processes to processing technologies appropriate with specific characteristics of each region, area, contributing to the generation of agricultural commodities with high economic value, large volume in scale, evenly in quality to enhance the value of exports as well as expand the domestic market. Thai Binh province had selected 4 rice varieties and 1 groundnut variety which were recognized as national seeds. Nghe An had increased the area of hybrid rice up to 76,000ha, with a yield increased by 15.2 quintals/ ha and profit increased about VND 400 billion, this made Nghe An reach the figure of over 1 million ton of food. Bac Giang Province applied the model of fresh litchi fruit production following VietGAP standards and replicated the model from 10ha to 4,000 ha, with the price of products 2-3 times higher than that of traditional litchi fruit production.

In the field of natural sciences and technological sciences, some basic science projects had developed scientific bases for technological innovation and improved technology level of the locality. These studies created the premises for acquisition of modern technologies, oriented to ecological environment protection and rational use of natural resources. Many R&D results had been applied by enterprises in Hanoi and Ho Chi Minh City and many other localities to create industrial products of high economic value.

Many localities had concretized reformed mechanisms and policy to create favorable conditions to attract extra-budgetary funds in addition to the State annual budget for S&T. For businesses, some local authorities developed specific mechanisms to encourage enterprises to invest in technological innovation, provide bank credit loans to invest in S&T activities[1]; take

[1]Dong Nai province applied the 70/30 funding mechanism (Provincial Department of S&T supports 70% and the remaining 30% was contributed by industries), the 50/50 funding mechanism for district level projects (Department of S&T supports 50% and the remaining 50% is provided by District). This cost sharing mechanism had a positive impact on the mobilization of resources for research and development, supplementing to the State budget for local S&T of about VND 10 billion. For Thai Binh, Binh Dinh provinces: 30% of the cost for R&D

enterprises into account as centre for S&T development in service of production by providing specific support, such as: support for technological innovation, strengthening the development of intellectual property, enhancing movements of increased productivity, quality, technical improvement initiatives, creating tripartite link "enterprises - state management agencies - research units", encouraging enterprises to make investment in S&T projects directly serving their production and business activities in line with the cost sharing mechanism whereby State fund supports 30%, enterprises invest the rest of 70%. Research projects must have specific target beneficiaries, be realistic and feasible with a view to motivating increased rate of research results introduced into production and life.

## 2.2. Findings in some productive sectors

### *2.2.1. In rice production*

The reform of S&T policies, mechanisms have actually made significant contribution in the field of the rice production. In 1975, Vietnam had a population of 47.6 million people, on average, the rice yield was 21.2 quintals/ha or 240.6 kg of rice per head. Vietnam was in shortage of food. In 2012, however, with a population of 88.8 million, the average rice yield increased up to 56.6 quintals/ha or 495 kg of rice/head. Therefore, after 37 years, the population increased by 1.9 times while average rice per capital increased by 2.1 times. This made Vietnam become the second largest rice exporter in the world, contributing significantly to the global food security.

**Table 1:** Average rice yield, period 1975-2012

| **Year** | **Cultivated Area** *(million ha)* | **Average yield** *(quintal/ha)* | **Population** *(million)* | **Average output per capita** *(kg/person)* |
|---|---|---|---|---|
| 1975 | 4.856 | 21.2 | 47.6 | 240.6 |
| 1980 | 5.6 | 20.8 | 53.7 | 268.2 |
| 1990 | 6.0 | 31.8 | 66 | 291.3 |
| 2005 | 7.3 | 48.9 | 83.1 | 431.2 |
| 2010 | 7.5 | 53.2 | 86.5 | 462.3 |
| 2012 | 7.8 | 56.6 | 88.8 | 495.0 |

*Source: Synthesis of annual data of General Statistics Office*

project was shared by State budget while businesses spend 70% to perform research, technological innovation tasks in enterprises.

Table 1 described the average growth of rice productivity over the period 1975-2012. Rice output increased from 10.3 to 44.0 million tons, maintaining the export volume of 5-7 million tons annually. This helped Vietnam become one of the countries having miracle increase in rice paddy productivity.

*2.2.2. In coffee, rubber production*

In coffee production, the coffee output increased sharply, the highest growth rate was in the period when S&T policies were received high attention for change that was the period when Resolution of the second meeting of the Party's Central Committee (VIII Session, 1996) came into life. In 2012, the coffee output of Vietnam reached nearly 1.3 million tons, its coffee export value accounted for nearly 50% of the world coffee import market.

In rubber production, the S&T policy reform also brought about significant impact. The yield increased rapidly after 1995, it was nearly doubled for every 5 years, the output of dry Latex reaches nearly 1 million tons now; the value of Vietnam's rubber exports accounted for 38% of the world rubber import market.

*2.2.3. In the field of fishery*

With respect to aquatic breeds production, we have so far mastered the breeding technology to produce unisexual, super male tilapia and catfish, for catfish we can proactively produce 12 billion fries/year; the shrimp hatchery technology with production capacity of 25 billion baby shrimps/ year. For saltwater aquatic species, we are able to produce fries of cobia, sea bass, grouper, red snapper, crab, sweet snail, abalone, etc. With only successful research and mastering production technology of 4 varieties: sea crabs, sweet snail, grouper, abalone it has opened up a new opportunity for aquaculture, formed the foundation for the development of aquatic product export programs in upcoming years with the target of reaching a total value of about VND 7,500 billion/year and a saving of about US$ 100 million/year from import of breeds.

Looking at the seafood export turnover of Vietnam, in 1980, it was only US$ 20 million, but by 2012, the sales revenue reached US$ 6.2 billion; with regard to aquaculture productivity, it was 0.55, 0.81 and 2.9 tons/ha in 1980, 2001 and 2012, respectively, so it is clear that the contribution of technical advances of breeding, proactive seed production, improved farming processes, etc was very significant.

### *2.3. Enterprises, research and development institutes in application of science and technology for development of production*

#### *2.3.1. Application of "Large Field" science and technology*

The area applying "Large Field" S&T by businesses is getting increased: if in 2011 it was only of about 6,650ha, then respectively by 2012 and 2013 there were 06 and 09 participating businesses with the total area of 25,000 ha and 32,000-40,000 ha. Implementation of this innovative model helped to lower the average production cost of 10-20%. As such, with an area of 35,000 ha of participating model, it can save for farmers about VND170 billion. On the business side, the model helped to control the quality of output (homogeneity, impurity, rate of broken rice, chemical residues,...), thus making the export price increased US$15-30/tons compared with similar products of other companies buying nominal rice in the market.

#### *2.3.2. An Giang Plant Protection Company*

The model of An Giang Plant Protection Company was established in 1993; equitized in 2004 with the State share of 26%. The company has 5 processing factories, a distribution network of plant protection drugs and seeds including 25 branches, 510 level 1 distributors and 5,000 retailers; 1 plant producing compost fertilizer. Currently, the company has more than 6,000 farmers, with 1,017 engineers working under "3 Together" modality, i.e, together with farmers in living, working and eating. These technical personnel are present at 12,000 points in the whole country (in 76/129 districts/towns of 13 Mekong Delta provinces). The company has sold out 2,500 shares for 6,000 farmers.

Since 2010, the company performed the "Rice production chain following sustainable processes" determined under the "Large Fields" model, such as: construction of raw material supply region, arranging contract with farmers to consume their fresh rice. In return, farmer were supplied with seeds, pest control drugs, fertilizers with 0% interest during the whole season, free packaging, transporting, drying and their rice is bought at the market price; free 30 day storage. Farmers were also trained to use Diary records to monitor field production costs as well as extract source data whenever needed - this is the key factor to enhance the value of rice brand when it goes out to market.

The core of this linkage is the S&T organization of the Company, i.e, the Dinh Thanh Agricultural Research Center (An Giang province). This center has combined the strength in the field of plant protection drug and seeds supply with research and technology transfer capacity in close association

with farmers (3 Together) in the application of S&T achievements for sustainable production.

Enterprises signed contract to buy S&T products, namely OM rice seeds (monopoly) of the Mekong Delta Rice Research Institute and paid for the rice breeds produced by the Institute at a price of VND200/kg.

*2.3.3. Bui Van Ngo Company model*

Bui Van Ngo company was established 58 years ago, originally it was a small mechanical workshop manufacturing agro-product processing machines and light industry equipment.

In 1988, under the economic and S&T policy reforms initiated by the Party and the State, the company focused on manufacture of rice milling equipment. Since 1996, the company has begun to export their equipment to Thailand, Indonesia, Philippines, Brazil, Argentina. From 1998, research results on the company's improved technology have been granted by the National Office of Industrial Property with patents, certificates for utility solutions, industrial design applications. It could be said that the company had undergone through three technological generations.

Since 2004, the company has invested high-tech equipment of new generation. The process of technological innovation and investment of the Company includes the following procurement: in 2006, a hi-tech *Punching machine* of old generation; in 2007, a *plasma metal cutting machine;* in 2009, a *laser metal cutting machine*. The multi-purpose high tech models of new generation had replaced the old generation hi-tech machines. The rate of use of steel materials increased from 80% to 95-97%. The proportion of non-standard machine parts decreased from 5% to 1‰. Rapid increase of labor productivity, quality of machine parts and equipment as well as processing work was up to international standards, increased competitive capacity on export equipment market, more efficient use of modern invested equipment.

It can be said, in the export of 7 million tons of rice/year by the Mekong Delta, over 70% of this volume was processed by the company's equipment and the quality was accepted by export markets in Southeast Asia, Africa and Latin America.

Thanks to the market, socialization oriented reform of S&T mechanisms and policies, economic sectors, businesses had been benefited with S&T achievements and had opportunity to apply these achievements for their production and business development. On the other hand, new mechanisms of promoting commercialization of research results had created favorable

conditions for S&T organizations to meet development needs of businesses as well as accelerate the research process, introduction of research results into service and production. In this context, internal resources and capacity of S&T organizations could be strengthened and the S&T market is getting clearly formed. However, the number of businesses applying S&T results for technology innovation is still limited and the number of S&T organizations having S&T products which can be sold out in markets is still small. This drawback has many causes where the underlying one was that there had not really been an environment for S&T to really be considered as the most important driving force, indispensable for innovation from the angle of management, organization and conduct of business in a scientific manner.

## 3. Some issues at stake

***3.1. Comprehensively considering,*** the process of policy reform in Vietnam has continuously undertaken and closely linked with development needs of the economy. However, it has not been still far from expectation if we go into details of each S&T areas in the light of the market economy's rules where it can be observed that specific policies have not been synchronous yet for S&T development to effectively meet the development needs of actual production, business. We say that S&T development is the first national policy, but economic policies have not really supported S&T to become the driving force of development, considered technological innovation as the core for growth and development of the sectors at different levels. Thus, the process of renewing S&T mechanisms and development policies "looks" as liberal, clear in direction but in reality it still has to wish "to be in service" for the country's development. The matter here is the perception of managers at all levels; troubles in operating management mechanisms making sectors become independent, not interrelated, not supplementary to each other, thereby leading to elimination of demand and favorable environment for S&T can play an important motivation role.

***3.2. Investment mechanism and financial policies*** for S&T are always behind in meeting the actual need of S&T activities. Key S&T programs, national S&T programs are still operating under the old mechanism, i.e, primarily receiving grant from State budget, following already determined objectives, which are quickly outdated but difficult to change to cope with technology innovation by advanced countries using research fund as a modality for national research programs to finance S&T tasks/projects to meet the goals and requirements of the program and have clear addresses of later application of results. The national and the enterprise's fund for S&T

development still follows the investment fund style (loans, loan guarantees) combined with partly grant, this arrangement cannot promote high efficiency for operations of high risk, high adventure like S&T activities or technological innovation tasks at enterprises which need a lot of capital.

***3.3. For enterprises*** to be able to make full use of S&T, technological innovation results there must be: (1) a healthy competitive business environment; (2) a simple, effective access to funding sources for technological innovation and application of S&T achievements; (3) a set of preferential policies available in a simple way, easy for enterprises to enjoy in the application of S&T results of R&D institutions in the country; (4) full delegation of rights and proactiveness given to enterprises in the use of their own funds and/or the local funds (where the enterprise is located) for S&T development and the application of S&T results for technological innovation of the enterprise. Particularly, for businesses in the agricultural sector there needs to provide more incentive policies, such as:

a, More attractive and effective policies to create strong development of agricultural businesses and mobilize more other businesses to support agricultural development;

b, Encouraging participating enterprises in the value chain of rice production to apply S&T, especially application of high technology, with priority loans at preferential interest rates. Promoting the linkage between business and S&T organizations for the purpose of adding value to the agricultural production chains (storage, post-harvest processing, product development, new commercial items after harvest with high value added, etc.);

c, Placing focus on technology/product innovation support, improving the competitiveness of enterprises, especially small and medium enterprises;

d, Promoting the formation of business associations; policy support to associations so that they can set up funds for technology innovation;

e, Encouraging enterprises to organize large-scale production, create more jobs, especially for youth, young intellectuals in the region. Promoting linkage between partners in the value chains with a view to forming large scale production regions.

### *3.4. For scientific and technological organizations*

a, It should develop soon a master plan for the system of S&T organizations where there are national institutions responsible for specialized fields throughout the nation and can organize subordinate organizations of their own around the country. It should not give

authority to S&T organizations to be in charge of regional, territorial S&T development. State resources should be concentrated on R&D organizations at national level. Assurance mechanism should be developed for national institutes which are assigned with tasks by the Parliament and they should have the right to carry out the tasks assigned and be fully accountable for the effective use of the given resources for the achievement of expected results.

b, It should give the ownership of State-funded S&T results to the host R&D organization[2]. It should also hand over the title of State assets, including land use right, to public S&T institutions for them to be able to undertake joint venture, association, mortgage loan for the production, business purposes./.

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[2]Many countries with advancedS&T development have made use of this mechanism. Bayh-Dole Act of the United States (1980) stipulated a mechanism whereby the state assigned ownership of State-funded research results to research institutes, universities. This policy had created a huge impact on research performance and commercialization of inventions. This experience has successfully been learnt by many countries around the world, including South Korea, Japan, quickly bringing these nations up to the leading position in S&T potential in the region and the world.