R & D EXPENDITURE NEGLIGIBLE

The 20th century is usually described as a century of science. For a long time in this era science enjoyed a reputation as a panacea for developmental problems. Many held the view that the application of scientific methods in different sections of the economy would bring about improvement in our living conditions. The distinguishing element of this approach to science was that it was considered as "an independently existing all powerful source". To solve our problems all we had to do was to apply this all powerful force appropriately.

We are today in the fourth quarter of the 20th century. The human population, especially in that part of the world called the Third World, still suffer from scarcities even in those aspects known as 'basic needs'. Increasingly this has led the students of science and technology to alter their views about the power of science. Many factors show us today the drawbacks in considering Science and Technology independently of the social, economic and political structures of an entire society. Science and Technology develops and is applied in a certain social context and this in turn must influence its mode of development, the way in which it functions in society and what it is able to achieve. It is not possible even to comprehend Science and Technology by looking at it independently of socio-economic structures, let alone formulate a science policy. This means Science and Technology cannot be understood if one approaches it as collection of techniques which has to be developed. Such an approach ends up by suggesting the setting up of an institutional framework for the development of these techniques and this passes as science policy.

The link between the scientific and technological development and the social and economic history of a society as a whole can be illustrated by making use of the so called basic parameters of scientific growth, developed by Professor Dereck J. de Solle Price of Yale University the author of the books *"Science Since Babylon"* and *Little Science, Big Science."* Basic parameters cover not only the inputs of science (expenditures, number of personnel etc.) but also the outputs (number of publications etc.).

According to an UNESCO estimate in 1972, world Research and Development (R & D) inputs added upto a total which is close to the size of the national income of a country like Britain. Since the turn of the century, these inputs have increased at least 50 fold.

The global scientific development also reflects the economic disparities that are present in the world, between developed countries and developing countries. According to Price's calculations more than 95 percent of all scientific publications come from countries with a high level of development, which account for 84 percent of the world's Gross National Product and 43 percent of its population. Meanwhile, the countries which account for 16 percent of the world's Gross Product and 57 percent of its population yield less than 5 percent of the scientific product. The industrialised countries spend about 2.5 to 4.2 percent of their GNP as R & D inputs, as against a mere 0.01 or 0.02 for the developing countries.

Many developing countries spend more on patents, licences, know-how and so on than their own R & D. In 1970, Sri Lanka, for instance spent, 0.5 percent of its GNP on these forms of technology transfer and only 0.2 percent on its own R & D. This means that as in the economic sphere where the underdevelopment of the Third World countries is linked with the development of the first world, the lack of resources for scientific growth in the pheripheral third world is linked with the fact that we spend so much to buy the products of scientific growth from the developed countries of the centre.

A survey on expenditure on research and experimental development (R & D) for a ten year period from 1966 - 1975, carried out by the National Science Council revealed that Sri Lanka spent 0.25 percent of its G.N.P. on R & D. Most of the other data of this survey is summarised in the following diagram.

The results of this survey can be used to illustrate how scientific growth is closely linked with the socio-economic and political development. In Sri Lanka's post-independence economic development, one significant fact is the ever expanding role played by the State. This is a distinguishing element in the economies of third world countries that had grown within a capitalist structure. The capitalist growth of these countries differs from that of European capitalism by the significant involvement of the state. In R & D expenditure too state funds form the major component. The survey had concluded that the "funds coming from the private organisations were very low, about 3 percent in 1975".

The major colonial legacy of Sri Lanka was its plantation economy. Clearly, the problems confronting the development of scientific research in Sri Lanka are typical of any small backward nation, still suffering from the constraints imposed by its history. The country's research activities were also begun around these plantation crops — tea, rubber and coconut. In the post-independent period various governments gave importance to the domestic agricultural sector covering paddy and other crops. Sri Lanka still remains an economy based on agriculture and this is reflected in its research expenditure too. As the diagram above shows 39 percent of the expenditure on R & D is on Agriculture. Of the 30 percent in Natural Science some would be in fields related to agriculture. In another classification from the same survey the amount spent on agricultural research is Rs. 23,727,000 while that on research in manufacturing industries is Rs. 7,105,000. This same fact of the predominance of the agriculture sector is brought out through an earlier survey on scientific research projects from 1970-1973 carried out by National Science Council. According to this survey around 224 projects were on agriculture, while only 34 were on Engineering and Technology.

Another colonial inheritance that has an impact on our scientific growth is connected with our higher educational system. Our Universities were a direct replica of the type of institution found in the mother country at that time. What was established were teaching Universities geared to a liberal arts education. There was very little scientific research work in such institutes and this tradition has continued. The N.S.C. survey shows that only 3 percent of the expenditure on R & D is utilised by the Higher Education Sector.

In another survey carried out by the N.S.C. on the Scientific and Technical Personnel it was revealed that full time scientists engaged in agricultural sciences was only 174, while the number of scientists and engineers in Engineering and Industrial technology was 1,726. This means that although in terms of expenditure on R & D projects the agricultural sciences predominate, when it comes to personnel the agricultural field lies far behind. This again is a reflection on the higher education system which was expected to train the personnel. It is evident now that the liberal university model imposed on us had no room for training in such fields, like Agriculture. In 1973, the number of students in Agriculture and Veterinary Science contributed 2.9 percent of the total students and in 1977, 3.3 percent of total university admissions. The proportions have moved up gradually though not significantly .

The survey is also quite revealing regarding the role played to play at least some role in R & D. As mentioned earlier the private sector accounts only for a meagre 3 per cent as a source of funds but as a receiver it gets around 11.2 per cent. Private firms had begun to play at least some role in R & D only in the early seventies, and only four companies, Lever Brothers, Ceylon Tobacco Company, Chemical Industries (Colombo) Ltd, and Walker Sons Ltd, were listed in the NSC survey as establishments with a significant contribution to the R & D activities of Sri Lanka.

Distribution of Expenditure on R & D, 1975