Developing world 'a permanent desert for research'

Six countries account for 85% of the world's total spending on research and development. This monopoly is a major feature of global inequality, writes **Anil Agarwal**

MOST countries in the world today form a permanent research desert, the remaining few forming a small number of R&D oases. This is the conclusion of Dr Jan Annerstedt of Roskilde University in Denmark who has conducted a detailed survey of R&D activities across the world. Six nations (USA, Soviet Union, Japan, West Germany, France and the United Kingdom) employ nearly 70% of the world's R&D manpower and spend nearly 85% of R&D funds. The USA and Soviet Union account for more than half of the world's total R&D expenditure. Together, these six countries spend a quarter of every R&D dollar in the world for military purposes.

This "concentration of research and experimental development to a small number of highly industrialised countries is one of the major features of global inequality", says Dr Annerstedt in his paper on the present global distribution of R&D resources, recently released by the Vienna Institute for Development. Developing countries account for nearly 70% of the world's population but they contribute less than 3% of the world's R&D expenditures, and about 13% of the world's R&D scientists and engineers.

As far as the developing countries are concerned, this distribution of world R&D activity has remained almost unchanged. Based on a sample of countries for which R&D statistics existed in 1963 — 1964 (excluding most socialist and developing countries), the United Nations had estimated that developing countries accounted for only 2% of the world's R&D expenditure. The US was responsible for 70% and other market economies for the remaining 28%. Using this same sample of countries, Dr Annerstedt finds that their research expenditures have increased from less than $30 billion in 1963-64 to over $60 billion in 1973. But the share of developing countries has only increased from 2% to 2.8%. The share of the US has dropped from 70% to 50.7%, while that of the other developed market economies has increased dramatically from 28% to 46.5%.

Annerstedt's own survey of world R&D expenditures in 1973, however, also covers socialist countries in Europe and Asia and several more developing countries. He estimates that the world spent a total of about $96.4 billion on R&D in 1973. Developing countries accounted for 2.9% of this sum. The rest was spent by rich countries, primarily in Europe and North America.

Annerstedt's data shows that within the Third World, South and Central American countries were spending most money on R&D in comparison to their populations — about 33% of the Third World's R&D expenditure on 11% of its population. Asian countries (excluding Japan, Israel and Turkey) spent over 50% of Third World R&D expenditure but they contain over 75% of the Third World's population. African countries contain 14% of the population and spend about 10% of the R&D resources.

The distribution of R&D manpower is more in favour of the Third World than the distribution of R&D expenditures. Annerstedt's study shows that developing countries had more than 12% of the world's scientists and engineers engaged in R&D, or 290,000 of the world's 2.3 million researchers. Three quarters of the Third World's R&D workers were active in Asia, about 10% in Africa (excluding South Africa) and the rest in Latin American countries. The latter, however, had the highest number of researchers per million economically active persons (EAP) that is, 460 R&D workers per million EAP.

But if all R&D personnel are included (that is, technicians and other supporting staff), then the Third World fares even better. The Third World, and in particular Asian organisations, have a higher number of technicians and supporting staff per researcher than the developed countries have.

Annerstedt believes that the distribution of overall scientific and technical manpower may be changing fast in the favour of the Third World. Educational expansion is faster in the developing than in the developed countries. In 1973, there were 4.6 million students graduating from universities and other institutions of higher learning all over the world. 23% of the third level graduates were from the developing countries (not considering those who were foreign students in developed countries and excluding China because of lack of reliable statistics). Among the twenty countries in the world with the highest total number of university graduates were seven developing countries: India, Brazil, the Philippines, Bangladesh, Democratic Republic of Korea, Egypt and Pakistan. The Philippines, Lebanon, Argentina, Venezuela and Chile had 54,500 to 48,050 third level students per million economically active persons. When compared in this way, they were only

Table 1: Distribution of world R&D expenditures among major regions and by average share of gross national product and per economic active person, 1973

	R&D expenditures: in mn US dollars	— in % of world total	per EAP in US dollars	in % of GNP at market prices
WORLD Total	96,418	100.0	66.4	1.97
DEVELOPING COUNTRIES	2,770	2.9	3.0	0.35
Africa (excl. South Africa)	298	0.31	2.8	0.34
South and Middle America	902	0.94	9.0	0.37
Asia (excl. Japan)	1,571	1.63	2.1	0.34
DEVELOPED COUNTRIES	93,648	97.1	182.1	2.29
Eastern Europe (incl. USSR)	29,509	30.6	160.0	3.82
Western Europe (incl. Israel and Turkey)	21,418	22.2	135.1	1.55
North America	33,716	35.0	331.1	2.35
Other (incl. Japan, Australia)	9,005	9.3	129.8	1.76

Source: Jan Annerstedt, On the present global distribution of R&D Resources, Vienna Institute for Development, Occasional Paper No. 79/1

Table 2: Distribution of researchers (R&D scientists and engineers) among major regions and per million economic active population, 1973

	Researchers total (000)	(R&D scientists and engineers): in % of World total	per mn EAP
WORLD Total	2,279	100.0	1,570
DEVELOPING COUNTRIES	288	12.6	307
Africa (excl. South Africa)	28	1.2	271
South and Middle America	46	2.0	461
Asia (excl. Japan)	214	9.4	292
DEVELOPED COUNTRIES	1,990	87.4	3,871
Eastern Europe (incl USSR)	730	32.0	3,958
Western Europe (incl Israel & Turkey)	387	17.0	2,441
North America	548	24.1	5,386
Other (incl Japan, Australia)	325	14.3	4,687

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behind the US, Canada, Israel and New Zealand.

In terms of sheer numbers, India claims to possess the world's third largest scientific and technical manpower, only behind the US and USSR. India had at the end of 1977, 2.3 million people with qualifications in science, engineering, medicine and agriculture. In April 1976, 54,000 professional scientists were engaged in R&D work supported by some 40,000 technicians and another 50,000 people engaged in administrative and non-technical jobs.

China too has a vast stock of scientific and technical manpower. Aqueil Ahmed of the Administrative Staff College of India believes that India and China should be alternatively either third or fourth in international comparisons of scientific manpower. The eight-year science and technology plan (1978-85) recently announced by the Chinese government aims to increase the number of professional R&D scientists to 800,000 (compared to the total Third World complement of 288,000 in 1973).

But the fact that developing countries spend so little (2.9%) on R&D even though they have a much larger proportion of scientists (12.6%), means that each R&D worker in the developing countries gets few resources to work with. Many scientists have, in fact, emigrated from the Third World to the developed countries complaining that they do not enjoy adequate support. □

Military research the big spender

MORE than a third of the global research and development budget is spent on military and space research, and less than a tenth on health and agricultural research, according to a report published this week by the Worldwatch Institute in Washington. In addition, over 95% of R&D funds are spent in the industrialised countries; yet these contain less than 20% of the global population.

The report, written by Colin Norman, a senior research fellow at the institute, covers ground similar to the Annerstedt report (see left). Norman says that imbalance in research priorities — both between subject areas, and in meeting the needs of the rich rather than the poor — urgently need to be reordered. It points out, for example, that the US Government is expected to spend about $670 million in 1979 on research and development aimed at improving the productivity of American agriculture; and that this sum far exceeds the agricultural R&D expenditures of all the developing countries put together.

"The worldwide distribution of R&D capacity closely matches the global distribution of economic power," says the report. The disparity applied both to financial and manpower resources. It had been calculated, for example, that during the early 1970s developing countries had about 300 scientists working on R&D for every million workers, compared to the developed countries, which had 4,000 scientists for every million workers.

The report says that the world's research and development priorities need to be reordered by, for example, channelling more money into neglected research areas, new research organisation and Third World laboratories, as well as encouraging the increasing expenditure by industrialised countries on research appropriate to developing country needs, and stimulating co-operative research efforts between the developing countries themselves.

However, the report warns that such efforts will not, by themselves, be sufficient to solve the world's major problems. "Many tasks are too urgent to wait for R&D to provide solutions and many cannot be solved by science and technology alone. Indeed when new knowledge is used to bolster and extend the power of governments, corporations and ruling elites, it can aggravate the social injustices that lie at the root of many of the world's most urgent problems," says the report. □

Knowledge and Power: The Global Research and Development Budget, by Colin Norman. Worldwatch Paper 31. Available from the Worldwatch Institute, 1776 Massachusetts Avenue NW, Washington DC 20036.

New US group calls for gene resource conservation programme

A DIVERSE group of scientists, concerned over the lack of support for efforts to protect genetic resources met recently in Berkeley, California, to form the National Gene Resource Program Co-ordinating Committee. The committee will initiate a train of events which, it hopes, will culminate in a national conference on gene resource conservation in 1981.

The committee's first action was to circulate a letter requesting other scientists and people concerned with bioresources to bring the problem to the attention of the federal government.

In an interview with *Nature*, the co-ordinator of the committee, geneticist David Kafton, elaborated on the goals of the group. "What we envision is making gene resources a high-priority national issue," he says. The task of the new committee will be to "provide a vehicle for effective action — not just talk."

Critics of the so-called Green Revolution have long pointed out the double-edged danger of over-reliance on just a few strains of essential crops: the chance that disease could wipe out whole harvests very suddenly and that further breeding potential could be lost forever as wild strains disappear. The devastation left by flare-ups of wheat rust, southern corn leaf blight and Dutch elm disease in the United States in recent years has illustrated this point.

Some action has been taken. The National Seed Storage Laboratory in Fort Collins, Colorado, has pioneered practical genetic preservation by storing and protecting seeds of more than 100,000 kinds of food and fibre plants. Bernard Finkle, one of the founding members of the new committee, and his colleagues at the Western Regional Research Laboratory of the US Department of Agriculture in Albany, California, have been experimenting with methods of storing in liquid nitrogen the individual cells of plants usually propagated by cuttings rather than seeds.

Such efforts, however, are too poorly funded to assure the preservation of genetic variability for even essential crops, Kafton says. He cites a memorandum sent last March to Secretary of Agriculture, Robert Bergland, by the National Plant Genetic Resources Board — an advisory body to USDA — outlining the need for greater effort in gene conservation. The National Academy of Sciences has also warned that the "genetic diversity for many species is severely threatened" and has recommended the setting up of a new agency for preserving germ plasms.

Meanwhile, an estimated 200 plant species disappear every year, particularly in areas of developing countries where land is cleared to raise fast-growing new hybrids only. Current levels of sample collection preserve only a small fraction of the existing natural diversity of crops and forests, Kafton and his colleagues insist, and too little research is directed towards finding new methods of conservation.

The letter they are now circulating — really a petition for action — calls for "the establishment of an effective and comprehensive conservation program to ensure the protection of this nation's irreplaceable and invaluable gene resources." Specifically they call for a national conference "whose primary task will be to initiate and design such a comprehensive program."

Technical support for the committee, and other action groups like it, is being supplied by a small, new, non-profit firm called Inquiring Systems Inc., of Berkeley. Loren Cole, an ecosystemologist, is executive director of the company, and David Kafton is one of the staff scientists. Kafton says that the new company is designed to work with groups like the new gene resource committee to stimulate action on social issues through such activities as organizing meetings, training personnel and publishing information.

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