



Eden with oil wells

The stereotyped image of the oil-rich countries of the Arab Peninsula is that of an artificial, fragile, air-conditioned Eden made possible by the purchase of Western comforts, technology and scientific background. The picture holds an implied threat of collapse by the time oil reserves become depleted which, by most reckonings, should happen sometime during the next century, perhaps in the first half of it. That image is, however, only partly true. Large investments are being made in an attempt to achieve what should amount to a leap from the Middle Ages to the atomic era. On the Arab Peninsula, schools have blossomed and primary education has, in most cases, become compulsory. Technical training facilities have been established, medical schools are about to produce their first graduates and, in Saudi Arabia, one of the world's most modern specialist hospitals has opened its doors. Alexander Dorozynski reports on science and technology on the Arab Peninsula, where the avowed aim is to achieve scientific and technical self-reliance as rapidly as possible, and which, if the present effort is maintained, may well become the site of a unique achievement.

ALTHOUGH per capita income in several countries of the Arab Peninsula is among the highest in the world, income as a product of labour is among the lowest. Wealth has not had time to filter down to the majority of the population, and rich countries such as Saudi Arabia and Kuwait are still developing nations. But the means for rapid scientific and technological progress essential to development are available, and it seems that Arab leaders have understood the need to provide for future generations.

Thus, not only is there an effort to transfer Western technology, but to revive a scientific tradition that has largely been dormant since the days when the Arab empire extended from Spain to Samarkand, when cultured Arab envoys expressed surprise at the illiteracy of Charlemagne's court, and Arab scientists helped pave the way for the European Renaissance.

In Saudi Arabia, for example, illiteracy was widespread only 20 years ago, and the only centre of higher learning was the Islamic Studies Faculty, founded in Mecca in 1947. But since the University of Riyadh was founded in 1957 with a teaching staff of nine, the situation has changed rapidly. The College of Petroleum and Minerals (CPM) was set up with the help of the Arabian American Oil Company in 1963, and the Abd al-Aziz University was started in 1967 as a private institution sponsored by a group of business and political leaders.

Now Riyadh University has an enrolment of 6,000 students (about as much as the 100-year-old American University in Beirut) in eight faculties: arts, education, sciences, business, pharmacy, agriculture, engineering and medicine. The Faculty of Medicine is provided with professors, advisers and examiners by the University of London, and it will be the first faculty to move, in three or four years' time, to the \$500 million campus now being erected on the outskirts of the city. (In fact there will be two campuses, one for men, one for women.)

The Faculty of Sciences publishes a staff bulletin, whose contents reveal the wide range of interest and varying degrees of sophistication of research projects. A single issue, for example, contains a fairly simple and straightforward description of the morphology of the grasshopper and an analysis of climatic elements in the kingdom (with emphasis on potential agricultural developments), but also reports on subjects such as the electron spin resonance of several compounds. Professor A. A. Al-Khayal, Dean of the Faculty of Sciences, already voices a complaint familiar in academic circles, although unexpected in Saudi Arabia: lack of funds for facilities and

laboratory equipment.

The CPM, moving to an elegant, futuristic looking campus and chaired by Sheikh Ahmed Zaki Yamani, Minister of Petroleum and Minerals, teaches sciences, engineering science and applied engineering to some 1,000 students. High standards of admission are maintained by professors who, for the most part, come from American universities. The Abd al-Aziz University (arts, sciences, business and administration) has been integrated into the kingdom's educational system, and now has nearly 3,000 students.

These numbers alone, for a country of some 6 million people suddenly emerging into the modern world, represent an achievement. Another is the fact that women, traditionally kept outside the mainstream of life, now have access to primary and higher education. (This is attributed to the late King Faisal himself, and the influence of his wife, Ifat.) More than 200,000 girls, as well as half a million boys, attend school, and the numbers are constantly growing. Riyadh and Abd al-Aziz Universities have special teaching facilities for women. There is a shortage of women professors, and in many cases female students in separate quarters follow courses on closed-circuit television, and ask questions by telephone. Education at all levels (as well as medical services) is underwritten by the government.

Foreign observers familiar with Saudi institutions of learning generally agree that the level of standards is good and improving rapidly, particularly in professional education. But a straightforward comparison with Western institutions, which benefit from centuries of academic background and where religious and traditional values play a less important role, is difficult. Nevertheless, the admission of Saudi graduates as doctoral candidates at such institutions as MIT and Caltech is indicative of the standard that can be achieved.

An interesting (and controversial) initiative in Saudi Arabia has been the creation of the King Faisal Medical City and Specialist Hospital, which was inaugurated in April (before the graduation of the country's first crop of medical doctors). Conceived by King Faisal himself, the project was carried out under the leadership of Dr Rifat Alsayed Ali, personal physician to King Faisal and the royal family, who has coordinated the activities of dozens of foreign companies which have contributed to the building and equipping what is to become one of the world's most modern in-patient and out-patient specialist hospitals, offering facilities and skills seldom available under a single roof. The 250-bed hospital will be operated by an inter-

national staff of 750, part of which has already been contracted for. Future capacity will be 500 beds, with a staff of 1,200. Later this year, a clinical research department will be opened.

The idea, says Dr Ali, is not only to provide on-the-spot diagnostic and treatment facilities that many wealthy Arabs may seek in Boston, London or Paris, but to seek rapid medical progress in the region with the help of top foreign experts for whom the best possible working and living conditions are being provided.

The hospital has started operating on a limited scale, and on a paying basis. "Otherwise", says Dr Ali, "everyone will want to come here rather than to another hospital. But if any patient requires facilities and specialist treatment available only here, he will be admitted as a free patient if he cannot pay."

Another ambitious project in the kingdom is the development of agricultural research, considered as essential to self-reliance; the recently constructed laboratory of the Ministry of Agriculture near Riyadh is one of the most complete in the world in its design and equipment. It has yet to be fully staffed.

In Kuwait, where the development of a welfare state was started in 1951 by Sheik Abdallah as-Sabah and continued by his son and successor, Sheik Sabah as-Salim as-Sabah, schools have proliferated to provide for now compulsory primary education, and there is a splendid university (with a campus for women) which has research facilities with the latest equipment.

The progressive integration of women in a man's world is, here, more evident than in Saudi Arabia, where even secretaries are male. In Kuwait, women secretaries wearing modern dress are a common sight, and female researchers go unnoticed.

The Kuwait Institute for Science Research (KISR) has been operating for five years, and its prime purpose, in the words of its director, Mohammad Al Shamali, "is to build up a tradition for research. It is the first step, and perhaps the most difficult one to take."

While pursuing this goal, the KISR concentrates on research projects particularly suitable and useful to the country. Dr Al Shamali has long been interested by the potential use of indigenous desert plants, and a multidisciplinary research team led by Ibrahim Hamdan, an American-educated food scientist of Palestinian origin, is now trying to determine their nutritive value and their potential toxicity.

There are several hundred varieties of desert plant, perennial, annual and bushes, and little is known about them except that a little care, and a little more water, can greatly increase their

ONE of the most important catalysts to development in the Middle East is the Kuwait Fund for Arab Economic Development, created in 1961 as a government agency but granted complete independence in its finances, organisation, and policies. As Abdlatif Y. Al-Hamad, its Director General, likes to point out, one of its first principles is neutrality with regards to political and social systems adopted in the Arab countries. This neutrality seems to be more than simply token, as the fund has supported projects in countries with widely different political systems, such as Southern and Northern Yemen, Syria, Tunisia, Egypt and Mauritania.

Until last year, the Kuwait Fund functioned essentially as a regional development bank, providing assistance chiefly in the form of loans on concessionary terms, with interest rates around 3 or 4%, maturity about 20 years, and grace periods generally corresponding to the time needed for the completion of a project. (Some grants were also given, notably for technical assistance and the financing of technical or economic studies.)

In July 1974, the fund took a new turn when the National Assembly extended its operations to the rest of the developing world, and increased the declared capital from KD 200 million to KD 1,000 million, that is, more than \$3,000 million. Since then the fund has undertaken to support a number of development projects in Africa (livestock and sugar industry development in Uganda, river basin development in Senegal, tea plantations in Rwanda, textile spinning and weaving in Tanzania, construction of two harbours and a railway in Gabon.)

Other projects are being studied,

and the fund's director general has visited Asia, where several projects are expected to receive financial support (a urea plant in Sri Lanka, sugar factories and land reclamation in Afganistan, irrigation in Bangladesh, land rehabilitation in Malaysia).

In 1971 the Kuwait Fund was followed by the Arab Fund for Economic and Social Development, with headquarters also in Kuwait. The Arab Fund's charter restricts its activities to Arab countries, where joint developments are planned in such fields as highway transportation, telecommunication and agriculture. Finding that there is a shortage of well prepared national or regional projects, the Arab Fund has undertaken its own studies to help the development of a country in its regional context.

There doesn't appear to be an 'OPEC strategy' concerning aid to developing countries, but many OPEC members have reacted to the often-voiced charge that increased oil prices have crippled the development of poorer countries. Thus India has benefited from credit terms to obtain oil from Iran, Iraq and the United Arab Emirates, and for the poorer African countries, Arab oil producers have created a \$200 million fund to offset higher oil prices. Joint ventures have also been undertaken between rich and poor countries, for instance, between Kuwait and Mauritania to develop iron mines.

As there is little coordination between the various forms of aid financed by the OPEC, total figures are difficult to come by, but one estimate is that last year, more than \$5,000 million was committed to developing countries, either directly or through international agencies.

growth rate. Some of them have a good protein content, and, in a region where most of the fodder for cattle is now imported at considerable cost, they represent a potentially important natural resource.

A first step in the research project has been the identification of the principal varieties, some of which also exist in similar semi-arid regions of Australia, South and North America, but about which data is scattered or incomplete. This is now being followed by a determination of their nutritive value: a more sophisticated analysis of their carbohydrate, protein and crude fibre content. According to Ibrahim Hamdan, one perennial plant, atriplex, has been found to have a protein content of 16%, as high as that of alfalfa.

Many of the plants have been grown on the grounds or in greenhouses of

the KISR, and it has been shown that some of them may be suitable as a local substitute for more classical grazing plants that are costly to grow in the semi-arid tropics. Plants from regions with similar soil and climatic conditions have been included in the study, and attempts are being made to create a symbiosis between some desert bushes, annuals, and perennial plants (for instance, a deep-rooted shady bush, a climate-resistant perennial, and a succulent annual).

Recently, the cattle-feeding experiments were started on a desert plot of 20 square kilometres, acquired by the institute, and ways are being sought to complement this roughage with locally available additives, such as single-cell 'petroleum proteins' or microscopical algae (which are also experimentally grown at the KISR).

Toxicity studies have allowed the project to branch out into the study of the potential medicinal properties of some of the plants. Ali Anani, a chemist, has identified a number of alkaloids and other substances that are being studied in the particular context of traditional Kuwait medicine, which itself is probably an offshoot of ancient Arabic medicine, still practised by healers (*attarin*) who coexist in Kuwait with the free, Western-style medical services provided by the state. The *attarin* use herbal medicines, but jealously guard their secrets, sometimes mixing a number of substances in their preparations, apparently to camouflage the active ingredients. Some of the plants have already been shown to possess antibacterial activity. Soil bacteria and fungi have been included in the study, as well as hormone-like promoters of plant growth and soil enzymes that could be used to improve fibre digestibility.

Dr Mohammad El Shamali and Dr Hamdan believe this research may well turn out to be of significant importance in the development of agriculture, but also that it is a good way to train researchers of varied disciplines and nationalities to work together as a team.

It would be meaningless, again, to compare research undertaken in Kuwait with that of an MIT, Rockefeller or Pasteur Institute. But the effort is obvious, and the results, considering the lack of research background and tradition, encouraging indeed.

The pattern is repeated elsewhere on the peninsula. In the small state of Bahrain (where oil was found in the early 1930s) there are more than 100 schools for a population of 220,000, and several vocational training centres. In tiny Qatar, there is a technical school, a school of commerce, a teacher's college, and a total of about 90 schools; last year, the ratio of teachers to the population was about 1 to 1,000.

At the same time, the 'technological transfer' continues, with an increasing amount of goods being produced on the spot (albeit with the help of foreign technicians) rather than imported. Thus, while a few years ago the story was that a desert prince would discard his Cadillac when the ashtray was full or the tank empty, now there is a plant in Saudi Arabia where cars are overhauled and rebuilt, and arrangements are under way to set up assembly plants. In Riyadh, production of pharmaceuticals is expected to start this year; the General Petroleum and Mineral Organisation (Petromin), a public corporation owned by the state, runs a steel rolling mill on the Red Sea coast south of Jiddah. Local

THE government of Saudi Arabia is planning to spend \$12,000 million of its oil wealth in an effort to turn the country's desert green.

The desert lies 180 miles east of Riyadh and is the centre of a massive desert reclamation programme, part of a \$143.5 thousand million five-year development plan.

Altogether, the Saudi Arabian government plans to turn 4.18 million hectares of sand into farmland, which according to the Under Secretary of Agriculture, Mr Taher Efeid, will take at least half a century to accomplish.

At present, only 1.4 million acres of farmland are cultivated in the desert monarchy. This earns more than \$25,000 million in revenues annually.

The Kingdom envisages improving and regulating underground water resources and installing an efficient drainage network to reduce salinity in various areas.

Five research centres, dealing with fishing, insecticides, fodder, seeds, fertiliser and poultry have been set up in Jeddah, Riyadh, Jassa, Hofuf and Qatif. These centres also operate model farms.

Two hundred and fifty types of rice are being tested to cultivate 167,000 acres which will raise the production from 75,000 tons to 100,000 tons over four years.

To encourage private investment in agriculture, the government will distribute reclaimed land at an average of 32-160 acres per farmer. The farmers will be given three years to prove they are capable of tending the land satisfactorily. Otherwise, the land will be taken and given to

another more experienced farmer.

In the incentive programme, farmers will be able to purchase agricultural machinery at 55% of regular prices.

The prices of imported fertilisers will be reduced by 50% and dairy equipment will be sold at 70% of their import prices.

Farmers will receive \$2.50 annually for each sheep and \$14 a year for every she-camel.

There are 17 medium-sized dams in the country and it is hoped gradually to increase these to 23. Most of the dams control rain waters in the southern region of Jaizan and Abha.

The biggest—Jaizan dam—is approximately 1,000 feet long and 125 feet high with a capacity to store enough water to irrigate 50,000 acres. It cost \$27 million to build.

Seventy million dollars were spent on the Hassa irrigation and drainage programme which increased the cultivable area around Hofuf from 20,000 acres to 50,000 acres.

Also under the plan \$51.8 thousand million was budgeted for electrification projects, desalinated water production is expected to rise from 57 million gallons a day to 163 million and a total of 270,000 new homes—some in reclaimed areas, are to be built.

Agriculture officials say that 'the days of scratching a living from small sandy plots are over for the farmers and Bedouins of Saudi Arabia'.

Vegetable production is near self-sufficiency, reports say, and the farmers who had deserted their salinity stricken farms are now returning.—*Gulf Mirror*.

cement factories supply about half of the demand of a booming construction industry; fertilisers and polyethylene bags to store them in are made on the spot.

In Bahrein, aluminium ingots are made from imported bauxite and exported. Kuwait has an aluminium smelter, clothing and household goods factories, plants making prefabricated houses and building materials. Research in hydroponics has been going on for several years, and some vegetables produced in this way now reach the market in Kuwait city.

Although one does not find on the peninsula the relatively sophisticated native technology such as is frequent in Beirut, Amman or Cairo, it should be remembered that only a few years ago, the Arab Peninsula was quite literally a scientific and technological desert. An added impetus to this awakening comes from collaboration with the poorer Arabs—Egyptians, Jordanians, Lebanese, Palestinians—

and an effort is being made to attract from Europe and particularly from the United States Arab scientists who have become established abroad, and even taken foreign nationalities. Most come on short-term contracts (a sabbatical year for instance) but a few find their ancestral land so transformed that they are tempted to remain.

There is, understandably, a problem posed by instant wealth. Although it has certainly given a boost to this 'leap' into the modern age; sometimes it becomes an obstacle by removing some of the incentive to learn in a system where not only is there no tuition but nationals receive a substantial living allowance. It seems, though, that there is a consciousness of this, and in several centres of higher learning, incentive have been set up to reward effort and achievement. Talented young Arab graduates are subsidised to continue their studies abroad, and are assured of finding a rewarding position when they return home. □