more cautious attitude. The United Kingdom has, however, been able to persuade its partners not to adopt the wide-sweeping legislation the Commission proposes until further studies have been carried out.

Various scientific committees will now be given the job of examining the health hazards of natural oestradiol, testosterone, progesterone, trenbolone (a processed natural hormone), zeranol and perhaps others. The United Kingdom rules permit the use of these hormones, which many other member states have forbidden. Similarly, until there is "conclusive" scientific evidence to the contrary, oestrogens, androgens and gestagens (except stilbenes) are considered safe, as far as the Community is concerned, for therapeutic use and to regulate the menstrual cycle.

The consumers feel that this scientific research could drag on for a long time, and matters will not be helped by the United Kingdom taking over the council presidency after the summer from the Dutch, who support tough Community legislation. **Jasper Becker**

Canadian radioastronomy

Longer bases

Washington

Canadian astronomers have started design work on what it is hoped will eventually to be the largest radioastronomy facility in the world. An eight-dish array of 32-metre antennas is to be distributed along a 5,000-kilometre line stretching from one end of the country to the other.

Canada's National Research Council (NRC) has already given its formal approval to the project, provisionally named CASCADE (after the Canadian Astronomy Society). Meeting in Ottawa in February, the council members gave the array top priority over four other possible national facilities that had been suggested for funding: a high-energy electron ring, an orbiting observatory, a kaon antiproton physics facility, and the creation of several centres of acoustics.

NRC and the Natural Sciences and Engineering Research Council have now agreed to share the costs of a $300,000 design study for the array being carried out by a technical committee chaired by Dr Ernest Seaquist of the University of Toronto's department of astronomy. It is hoped that detailed plans for the array, estimated to cost about $30 million at 1981 prices, can be completed by the beginning of next year; and that if the Canadian government can then be persuaded to support the project, funding for construction be provided in 1983.

Plans for a very long base array — which will be able to provide an angular resolution of 5×10^{-4} arc seconds at a wavelength of 1.5 centimetres, a hundred times better than can at present be provided by the largest Earth-based radiotelescope — have been discussed for the past three years within the Canadian astronomy community, one of the first to develop and work with very long baseline interferometry. Two years ago, the very long base array came out on top of two other proposals, a 100-metre centimetre-wavelength dish and a large (25–30 metre) millimetre-wavelength antenna, in a study conducted by the Canadian Astronomy Society.

Despite enthusiastic support from astronomers, there was initially some scepticism from industrialists in NRC, who doubted that the project would have sufficient economic pay-off to justify the initial capital investment. However, after considerable lobbying several companies, particularly in the electronics, computing and telecommunications industries, were persuaded to back the proposal, particularly after it was pointed out that most of the components would be built in Canada. Astronomers argued, for example, that the increased production of antennas and equipment, together with some improvement in high frequency performance, would help Canadian aerospace and communications companies to compete for foreign markets.

As planned, the array would stretch along an east–west line from Newfoundland to Vancouver Island. Signals would be recorded independently at each station and subsequently correlated at a central processing facility, giving 28 components of the Fourier transform of the image of a cosmic radio source.

Efforts are being made to generate public support for the array by appealing to nationalistic instincts. A circular distributed by the chairman of NRC, Dr Larkin Kirwan, says the array would "assure Canadian leadership in radioastronomy for at least thirty years", and the Canadian Astronomy Society says it would "remain a permanent advertisement for Canadian science and technology".

In a similar vein, the secretary of the design committee, Dr Brian Andrew of NRC's Herzberg Institute of Astrophysics, heads a public relations committee whose task he describes as being "to elevate the array to the status of a national shrine." He also points out that the planned array would be able to take advantage of Canada's unique geography, and that "linking the country from end to end seems to have intangible overtones that would make it politically attractive".

Meanwhile budget restrictions have forced US scientists to put back their own plans, developed last year by a group at the California Institute for Technology and its Jet Propulsion Laboratory, for a two-dimensional array stretching across the continent of the United States, and including antennas on both Hawaii and Alaska (*Nature* **288**, 4; 1980).

Similar in size, conception and cost to the Canadian plans, the US proposal is said to have been given top priority for the next decade by the Field committee now preparing a report on the future of US astronomy for the National Academy of Sciences. A north–south array would fit well with Canada's plan.

However, one of the victims of the budget cuts announced by President Ronald Reagan in March was a 25-metre millimetre-wavelength radiotelescope planned for Mauna Kea in Hawaii, and previously approved for funding through the National Science Foundation by the Carter Administration. With this project placed back in the melting pot it seems unlikely that other new capital construction will get much consideration in the next few years. **David Dickson**

Hungarian agriculture

Economic growth

Hungarian agriculture is to be remodelled in the next twenty years on ecological principles. This is the burden of a report last month to the Academy of Sciences of an interdisciplinary survey of the country's "agroecological potential". The survey was first proposed at the 1978 annual general meeting of the academy by Dr Istvan Lang, at that time deputy general secretary. Thirty research institutes, universities and computer centres took part, and more than 400 scientists were involved.

The survey asked three main questions: what quantity of agricultural plant production can realistically be attained by the end of the century? What conclusions can be made about the long-term targets of economic policy? How can production be increased and costs reduced in the medium term? The preliminary conclusion is that in the most favourable conditions, the annual grain yield could reach 22 million tonnes (present level 12–13 million tonnes) and that the productivity of grasslands could be doubled.

Nevertheless, the survey notes, there are constraints on the development of Hungarian agriculture. The country is poor in fossil fuels, so that with rising oil prices a point may be reached where it is economic to settle for lower than maximum yields and less expenditure on fertilizers. The country's geology is also a constraint. Hungary lies in the lowest part of the Carpathian basin, and the run-off from the mountains has produced tracts of saline and/or alkaline soils, principally in the western half of the country. Thus the Puszta remains a virtual desert in spite of an annual precipitation of 550 mm. Yet normal leaching methods of reclamation are ineffectual, since the soil is so impermeable that the water would simply pond on the surface. Moreover, Hungary has no means of disposing of the drain water, since the quality of the rivers Tisza and Danube must be ensured at the southern frontier.

Nevertheless, on the Comecon scale of

0028-0836/81/220276-02$01.00

"relative climatic productivity", which assigns an index of 100 to the Soviet Union south of latitude 60°, Hungary scores 139, second only to Bulgaria with 145, and agricultural products, especially fruit and vegetables, account for some 30 per cent of Hungary's export earnings.

The goal of relating agriculture more closely to ecology was accepted in the five-year plan approved last year. The Hungarian economy has, however, come a long way from the central planning of the post-war Rakosci regime which, in an attempt to make the country self-sufficient, ordered certain collective farms to grow cotton and citrus fruits — with predictably poor results. Since the 1968 economic reform, the managements of the various collective farms have complete autonomy in deciding what they should grow. The only constraints are now those imposed by market prices and government incentives.

Often the consequences have been nonsensical. In the great sugar-beet affair of the mid-1970s, farmers applied more fertilizer than recommended and produced gigantic beet with no increase in sugar content. (Bonuses are now related to sugar yield, not gross weight.) In a more recent scandal, farms have obtained land improvement grants for top-soil dressing and then applied the soil to areas which were already of fairly high quality. This produced money for the farms, and excellent statistics for the soil improvement service — but a net loss to the economy.

The next step towards ecologically orientated agriculture will depend on the working out of suitable incentives for collective farms — free, it is hoped, from the loopholes and misunderstandings of the past.

Vera Rich

Direct satellite broadcasting

More TV ahead

Britain could start direct broadcasting by satellite in the mid-1980s. That is the government's response to the report of a Home Office study commissioned a year ago and published last week. The government favours a modest start in about 1986 beginning with two television channels and possibly some information services.

No change in the way broadcasting is controlled is, however, proposed, nor will the British government, unlike its French and German counterparts, help finance the venture. It hopes that British industry and the broadcasting authorities will be able to raise the money, estimated by the report to be £75–£160 million of capital to establish a system, depending on the type of satellite and the number of channels chosen. Throughout a 10-year period, the annual cost of operating a channel, including original capital costs, is estimated at £10–16 million. In addition, the broadcasting authorities would need to spend between £10 and £100 million a year to run the service for 50 hours a week.

The Home Office study was stimulated by the fear that delay could put British industry at a disadvantage in the supply of equipment to what is expected to be a rapidly growing world market. The Home Office also had to work out a way of using the allocation in 1977 of five television channels from geostationary satellites.

There are two possible systems to choose from — a modified version of the European Communications Satellite and a satellite based on L-sat, the prototype of the second generation of telecommunications satellites due for approval by the European Space Agency next month. Signals could be beamed direct to individual 2–3-m dishes or to larger community antennas. Control of programmes would remain with the British Broadcasting Corporation (BBC) and Independent Broadcasting Authority (IBA), which control all British broadcasting through terrestrial systems, although coverage would extend to neighbouring countries.

The investigation uncovered a mixed response to direct broadcasting. The aerospace and electronics manufacturers are the most enthusiastic. The BBC is also keen, believing that it could use two channels — one to transmit repeats of programmes already shown on terrestrial channels and paid for from the standard television licence fee, and the other to transmit new special programmes, paid for by subscription. But the IBA, grappling with the introduction of breakfast television and a fourth television channel, does not think there will be a market before 1990.

The technical problems are less forbidding than the financial. The broadcasting authorities, which do not have £75–£160 million to invest, would prefer to lease channels from an operator. Private industry, especially the newly-formed Satellite Broadcasting Company Limited, has expressed some interest in launching a satellite and operating it as a common carrier, but industry's willingness to invest will depend on its confidence that a market can be found.

The option of using L-sat to test the British market has been preempted by the Italian broadcasting authorities, which are planning to run an experimental project.

Elsewhere in Europe, France and Germany are planning to take up their allocation of five channels by means of joint ventures. Two of the French channels will be used for broadcasting signals now transmitted terrestrially. The prospect that a third channel might be leased to Luxembourg has faded, while plans for an internationally financed Swiss satellite, aimed at providing commercial television programmes for the whole of Europe, have been set back by the rules on foreign investment in Switzerland. Similarly, the Scandinavian plan for a regional broadcasting service by satellite is in limbo.

Judy Redfearn

Cooling sackcloth

New Delhi

This year Indians are beating the summer heat by installing a novel airconditioner on the terraces of homes and offices. They spread a number of empty, used gunny bags (sack made of jute) over the terrace and keep them soaked with water round the clock with the help of sprayers like those used on lawns. This simple system works like an airconditioner. The Sun's heat evaporates the water instead of warming up the roof, and the process of evaporation cools the roof. In other words, the water-soaked gunny bags reverse the heat flow — and the heat from the house is thrown outside through the roof instead of the other way.

A fall of as much as 10°C in indoor temperatures has been observed during day times with this technique. Sleeping conditions at night are much better as the ceiling fans, a common fixture in most homes, throw out cold air because the roof is even cooler than the floor.

The "gunny bag airconditioner" has been developed by the Central Building Research Institute (CBRI), who say it is a cheap alternative to the desert coolers and airconditioners that only a few Indians can afford, and which consume electricity that is in short supply. The cost of installing the system per square metre of roof surface is 5.50 ruppees (£0.30) and the water requirement is 9 litres per day.

CBRI started experimenting with its technique on its own buildings at the Roorkee campus. Results of these experiments, carried out during three successive summers, were so good that several factories and offices became interested. The system was installed on a 1,650 square metre roof of the four-storey building of Bharat Heavy Electricals Ltd in Hardwar. After the gunny bag treatment, the roof temperature of the building fell from 45°C to 28°C and indoor temperature from 39°C to 30°C. According to CBRI scientists S. P. Jain and Vinod Kumar, "not only the top floor but also rooms in the down floor were cooled as a result of constant working of the system".

CBRI engineers say that passive cooling by roof surface evaporation is suitable not only for India but for all developing countries in the tropics where artificial airconditioning is not within the reach of common man.

So far the roof surface evaporative cooling system has proved successful only for buildings with flat roofs. Attempts to use the system in roofs that are not flat are under way, and there are plans to develop inorganic water retentive materials as a substitute for gunny bags, which need replacement every three years or so.

K.S. Jayaraman

0028-0836/81/220277-02$01.00