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Internationalization of Remote Sensing Technology

The Agency for International Development (AID) is taking an active part in the transfer of remote sensing technology to the developing countries.

Abstract: *Since the launch of Landsat-1 in 1972, the Agency for International Development (AID) has sponsored several symposia and workshops to familiarize the developing countries with the capabilities of satellite remote sensing. Past criticisms of satellites for the purpose of international resources surveys have centered on: (1) political participation benefit quotients, (2) data utilization-to-acquisition ratio, and (3) the "astronauts and farmers" issue. These criticisms are rapidly being laid to rest by responses from the developing countries for satellite interpretation technology as a result of the 1976 AIDSAT demonstration. AID's follow-on to this demonstration includes the regional remote sensing centers which diffuse remote sensing skills to resource planners who can directly use them to help the poor. AID's remote sensing program is designed to address issues regarding the widening gap between the rich and poor in developing countries, the limited experimental nature of Landsat applications, and the uncertainty of a continuing multispectral scanner data source.*

Remote Sensing for the Developing Countries—Kindling the Fire

Conitz and Lowe[1,2] illustrate the history of remote sensing in AID. Six years of sponsoring workshops, seminars, and in-country grants have led the Agency to its present successful conclusion of two census projects, one in Kenya and the second in Bolivia. Landsat imagery of the Lake Nakuru area in Kenya was visually interpreted to reveal 67 percent of the census enumerative boundaries existing on Kenya administrative maps, boundaries indicative of major land cover changes. AID and the U.S. Bureau of the Census have been successful in convincing the Kenya statistics bureau to redefine some of the remaining 33 percent of these boundaries to conform to population densities recognizable by cultural land uses, such as agriculture and settlements interpreted from Landsat imagery.

Bolivia's eastern rain forests are being decimated by new lands colonization programs in which tens of thousands of previous inhabitants of the altiplano are migrating to the eastern lowland jungles. The resulting "slash and burn" agricultural practices and new villages are reducing the forests more rapidly than government planners had realized. Landsat computer compatible tapes have been digitally classified to produce land cover theme maps showing the extent of deforestation. In addition, agricultural and village patterns recognized on the maps provide rough estimates of the numbers and densities of people in the lowland areas. The Bolivian project concluded in November 1977 with an international symposium on remote sensing and demography in La Paz which was attended by 104 participants from almost every Latin American country. The United Nations added one of

its four annual remote sensing workshops to the symposium with the Food and Agricultural Organization also participating. So many issues relating to remote sensing in Latin America were raised in round-table discussions that a remote sensing council for Latin America is being planned.

AID's grant program has provided approximately $20,000 for each of 12 developing countries to purchase equipment and travel to improve their remote sensing skills. In addition, these grants are matched by greater amounts of funds in the form of AID technical assistance in using the equipment on a relevant national development problem. For example, in Peru we are locating, by Landsat digital analysis, previously unknown stands of aguaje palm, a valuable resource for cooking oil. In Cameroon, we are pushing for the successful development of a national remote sensing laboratory by teaching the people, who will be responsible for this center, managerial skills which will permit them to work effectively with line agencies responsible for carrying out the resource mapping. In this way we would hope to avoid some of the problems in agency cooperation which continue to plague us in countries like Zaire, Egypt, and Thailand. In Pakistan, the rates of river sediment loads and the accompanying accretion of coastal swamps are being estimated by Landsat image analysis to locate a new port in an area of minimum silting.

The Katz Crash—Cold Water on the Fire

An almost 20-year feud between the Honorable A.H. Katz and NASA erupted again[3] in 1976—his bold letter abstract: "The tasks of Earth-resources surveys can be done easier, cheaper, sooner, better, and in a politically more palatable and manageable manner from aircraft than they can be done from satellites." The statement challenges debate, and in the halls of the National Aeronautics and Space Administration, debate he has received. Katz's arguments deal directly with foreign nations, and especially with developing countries; his points regarding satellite Earth surveys have been rendered somewhat obsolete by recent Landsat developments. Three major points emerge from his discussions which, although generally ignored by the remote sensing community, are quite relevant and raise valid questions about the manner in which the U.S. pursues Earth resources surveys from satellites. For ready referral these points are termed: (1) the political participation benefit quotient, (2) the data utilization to acquisition ratio, and (3) the rather amusing terminology, the "astronauts and farmers" issue.

First, Katz claims that the "political participation benefit quotient" is high with aircraft, zero or even negative with satellite. By this he means that the problems of international cooperation in Earth resources surveys are compounded with satellites, since nations may be sensitive to satellite flights imaging their resources, flights over which they have no control. His point is that, in order to stage a fleet of aircraft in another country for an international resources survey, the countries concerned must plan the survey beforehand; hence, an effective and well-thought-out program is more likely to occur than the present method of imaging by satellites. The use of satellites for Earth resources surveys has even negated, to a marked extent, the need for cooperation and mutual planning of these surveys by participating nations, since the satellite is insensitive to political boundaries, joint agreements, and national plans for resource inventories.

The second argument against satellites, or any remote sensing platform for that matter, is the data utilization-to-acquisition ratio. Katz argues that there are already volumes of environmental and Earth resources data and, even if they are limited in accuracy and coverage quality, the problem is that no one is analyzing how to use these existing data to deal effectively with the Earth's agricultural, land-use, and environmental problems. Katz asks that, with expanded satellite data of all nations, so what? What would India and the U.S., for example, do with complete agricultural information on both countries? Would this information feed the starving masses of the former country? Despite the claim made by many remote sensing specialists regarding the benefits to be gained by mutual international cooperation in remote sensing of Earth resources, do we have even one example where nations have cooperated in such an endeavor in which there has been a social or economic gain to either or both?

Almost everyone in remote sensing can corroborate this statement on utilization-to-acquisition ratio. The author's recent experience supporting this contention was based on recent imagery NASA was kind enough to acquire for the Sahel program over Mauritania and Senegal during December 7-12, 1977. The Sahel program staff were concerned with looking at the extent of desertification with this one-time sequence of Landsat imagery. Discussions had centered around beginning a new data base and

monitoring the changing deserts in future months and years. We pointed out that the dramatic changes began back in 1972 with the unexpected drought which cost hundreds of thousands of lives and almost a three-quarters loss of all livestock in Upper Volta, Mauritania, Mali, and Chad. We acquired the important 1972 and 1976 Landsat imagery of the same areas imaged in 1977 to carry out the multi-temporal analysis necessary to see the real losses in agricultural land in the early 1970s. 1972 and 1976 Landsat imagery was an example of data acquired, but almost not utilized.

The astronauts and farmers issue is Katz's division of NASA into two groups; the first (astronauts), which gauges the success of Earth resources surveys by the number of sensors and spacecraft performing this job (the "technology push" syndrome); and the second (farmers), which perceives Earth resources surveys in terms of world-wide crop inventories (a la LACIE). This extreme emphasis on one application is evident by the major economic assessment modeling which has been applied to agricultural inventories. Because of NASA's charter to build space systems and the agricultural emphasis on Earth resources surveys, Katz speculates that NASA's satellites do not really address Earth resources problems and hence, as tools, are inferior to aircraft in conducting international surveys.

The Spark Rekindles

Despite the valid criticisms above of satellite resource surveys, the demand for the technology from the developing countries swamps the ability of foreign assistance institutions in the developed countries to supply. By 1975, three years after the launch of ERTS-1, a sufficient number of successful applications of Landsat was evident that NASA hosted an international symposium in Houston, Texas. Papers from authors outside of the U.S. clearly revealed that foreign national agencies had successfully experimented with the technology and were ready to use the data for routine, operational monitoring. Agencies such as the Comisión para Estúdio de Território Nacionál (CETENAL) of Mexico were routinely buying and analyzing Landsat imagery in order to prepare vegetation and land cover maps of their entire country, and updating these maps twice a year!

By 1975, it also became obvious that other international assistance agencies were leaping into the satellite remote sensing arena in a big way. The Canadian International Development Agency (CIDA) was promoting remote sensing projects in the Sahel and are presently cooperating with AID in developing a regional training center in Upper Volta. The International Training Center (ITC) at Enschede, the Netherlands, of course, has been applying air photo interpretation techniques for assisting developing countries since the 1960s and was involved in a consultative capacity in the well-known South American radar mapping (RADAM) project. The French Centre National d'Etudes Spatiales (CNES) has been assisting Francophone African nations with imagery interpretation. They have worked and trained in some of these countries ever since these countries first achieved their independence when they began exploring and developing their resources by themselves.

The real proof of the value of Landsat for developing countries came in the form of the hard cash investors. It is well known (and sometimes not so well known) that the big multi-national energy companies watch the developing countries closely by means of Landsat imagery. But the international lending institutions, which expect to see a small but steady, long-term return on their investment, have now included remote sensing as an evaluative tool for lending decisions. The International Bank for Reconstruction and Development (World Bank) has been building Landsat image mosaics of the state of Orissa, India, and parts of Burma to assess total rice harvest. They have been looking at erosional features along the coasts of Morocco. The Interamerican Development Bank has begun remote sensing projects in Central America to aid these countries in developing their natural resources. They are opening a regional training office in Guatemala City, Guatemala to coordinate remote sensing training activities throughout the region and select prospective candidates for training in the United States at certain institutions. The Bank of America evaluates loan applications in developing countries by using remote sensing to determine the resources a country has to develop; e.g., forests, subsurface water, and minerals.

Thus, despite the concerns of foreign countries that U.S. satellites were systematically surveying their resources and the controversies over whether airplanes could do these surveys cheaper and more efficiently, Landsats-1 and -2 continued to orbit the earth every 104 minutes relentlessly imaging every resource detectable by its 4-channel multi-spectral scanner and of interest to somebody with enough influence to

persuade NASA to turn it on. But the real show was yet to come; somewhere over India a geosynchronous satellite called ATS-6, for Applications Technology Satellite, had been beaming educational television shows to rural Indians. In the spring of 1976 ATS-6 was about ready to begin a long, slow journey from India back to a point over the western hemisphere. This "round-the-world in 80 days" voyage would introduce her to the practical benefits of her sister Landsat satellites. ATS-6 was to become the voice of these remote sensing sentinels.

AIDSAT—The Spark Ignites

"Satellite technology holds enormous promise for mapping and developing the resources of the developing countries." With this pronouncement by ex-Secretary of State Henry Kissinger at the United Nations Conference on Trade and Development on May 6, 1976, a new era was introduced in satellite remote sensing technology and its relation to the developing world. As a result of the Kissinger speech, NASA and AID cooperated in a joint venture telecasting three films via ATS-6 to 27 developing countries from August 1 to October 30, 1976. The three films concerned communications in education, disaster assessment, and satellite remote sensing of Earth resources ("Images of Life"). Copies of the films have been provided to the three major television networks in the U.S. and 180 additional copies were provided by NASA for wide distribution. "Images of Life" was produced by film crews who actually visited many developing nations to film Landsat investigators in the field. Many land mapping activities using Landsat were filmed and narrated by the crews; i.e., the location of fresh water under a salt flat in Iran, the mapping of newly formed islands in the Ganges delta off Bangladesh, the identification of a diamond mine as the pollution source of several rivers in Zaire, the determination that Thailand had 20 percent less area in forests than government estimates, and countless other applications of Landsat analysis.

In each of the 27 countries in Asia, Africa, and South America, a portable receive-and-transmit terminal was set up in the capital city and up to three receive-only terminals were set up in out-lying villages. Generally the audiences in the capital included the Chief-of-State. A beamed greeting from ex-President Ford preceded the films and a two-way panel discussion between U.S. Landsat scientists and developing country planning officials followed the films, usually moderated by a U.S. astronaut.

The Flame—AID's Program

If one objective of AIDSAT could be defined as the creation of high level interest in the usefulness of Landsat in developing countries, then AIDSAT with its film "Images of Life" was successful. Cables from some 30 to 40 countries have requested AID's help in developing in-country capability to process and analyze Landsat data. The sheer number of countries requiring assistance was more than AID could handle. Economies of scale were in order, and the concept of the regional remote sensing training and user assistance center was born.

The regional center is intended to be an integral part of an institution dedicated to solving problems related to natural resources. The components of AID's regional centers are discussed by Conitz[2]. These institutions must attack regional problems associated with similar geomorphological or ecological conditions as opposed to concerns in any one country. Where existing institutions have been established, such as the Centre for Services in Surveying and Mapping in Nairobi, Kenya, the first regional remote sensing center was created as an operational arm of this surveying and mapping center. In the case of the second remote sensing center now being developed in Ouagadougou, Upper Volta, the regional framework must be developed from scratch. In the remainder of the developing world, including the Middle East, Latin America, and southeast Asia, we are facing serious obstacles in setting up these centers, in some cases due to a lack of commitment of the countries concerned to cooperate in developing a regional capability. In other cases, the obstacles we face are due to a lack of appreciation for the benefits which can be derived when even middle income countries pool their technical resources to attack problems the effects of which spill over into various countries (flooding, forest diseases, and drought).

A recent National Academy of Sciences (NAS) report[4] supports AID's philosophy regarding the international transfer of remote sensing technology. The NAS Committee on Remote Sensing for Development recommended that the United States officially declare its intent to proceed for some finite period with further development of resource oriented space technology and that an international mechanism be established to promote consultation on technical and managerial aspects of remote sensing among user countries. The Committee also recommended that the United States work with other nations and international bodies toward the in-

ternationalization, on a regional basis, of receiving stations, training centers, and data processing, analysis, and distribution facilities.

In its recommendation to AID the Committee urged that AID increase its funding support for remote sensing by a factor of ten over that budgeted for remote sensing in fiscal year 1976. This expanded program would provide for (1) training developing country resource managers; (2) development of regional training centers; (3) pilot and demonstration projects to show resource managers how the technology works in individual resource sectors; and (4) the integration of remote sensing data into AID-sponsored projects on a more regular basis. The committee also recommended that AID take the lead in coordinating the flow of remote sensing information from any source in the U.S. to developing countries and that AID promote the development of institutionalized capability to apply the technology to development needs.

It is impossible to list the $27 million worth of AID remote sensing projects in the space allotted here. A description of a few will provide a flavor of the actual projects we carry out. In addition to the grants projects and regional centers already mentioned, the Agency is building up the ERTS-Zaire and Cameroon national centers (project CAMSAT). We are inventorying rangelands in Mali and will be looking with Landsat-C for new lands free of the centuries-old onchocerciasis (river blindness) to relocate tens of thousands of residents presently overcrowding cities in Benin, Togo, and Upper Volta.

All of our projects have social and economic analysis elements which exceed by far the funding levels associated with the remote sensing element. These studies are necessary to identify and surmount the human prejudices associated with the dreaded diseases of areas into which governments are attempting to motivate people to move. It is probably misleading to call any of AID's projects remote sensing—we have development, resource exploration, new lands settlement, and other projects. In many of these projects, and the number continues to grow, the use of remote sensing, and Landsat in particular, continues to grow.

We have just finished four successful demonstrations, using Landsat in Morocco, to produce photo-maps, geology maps, target areas for further mineral exploration, and a sample inventory of coastal erosion areas and fresh water upwelling in the coastal zone. Morocco wants to map snow pack in the Anti-Atlas Mountains to derive runoff estimates necessary for irrigation needs. We are purchasing analog analysis equipment such as density slicers, color additive viewers, and Zoom Transfer Scopes for the Government of Tunisia. We have a five-year plan to build up a national soils mapping and remote sensing laboratory in Syria, using a modular approach by starting with air photo interpretation training, moving the second or third year into analog equipment, and by the fifth year into digital processing and classification. In Costa Rica we are monitoring the extent of deforestation and the encroachment of metropolitan San José on the surrounding countryside.

Our schedule for FY 1978 is already full. In response to the United States initiative made at the United Nations Conference on Desertification in Nairobi last August, we are starting a small desert monitoring project using Landsat. The area of focus is the western Sahel, using the capabilities of the soon-to-be-formed West Africa Regional Remote Sensing Center. We are ready to begin a crop area frame sampling project in the Sudan using the techniques perfected by the U.S. Department of Agriculture.

We are playing a key role in helping the Environmental Research Institute of Michigan organize the Twelfth International Symposium on Remote Sensing of Environment in Manila. This will be the first of this well-known series to be held outside of Ann Arbor, Michigan, and illustrates the importance of the developing countries in applying remote sensing to natural resource problems.

We maintain a very close liaison with both NASA and the U.S. Geological Survey. We are exploring, with the former, possibilities of getting a portable Landsat receiving station to developing countries, as well as defining developing country applications for the MSS thermal band of Landsat-C and radar data from SEASAT. We also are funding South Dakota State University to experiment with different training strategies in Nepal and the Sudan so that we can see which mix of short term, in-country, on-the-job training and long term, U.S. formal training seems to be best for transferring remote sensing technology.

Chill Drafts in the Future—Landsat Issues

Because the Agency has such a heavy commitment in terms of dollars and projects which depend upon the Landsat program, we indeed have a tremendous interest in the development of the Landsat missions. Our

agency is represented on the White House Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) and its ad hoc earth resources satellite subcommittee, chaired by Dr. Frank Press. Issues regarding Landsat which affect AID directly are defined and discussed below:

Issue No. 1. Adelman[4] provides one dissenting statement to the report, revealing that the dissemination of U.S. technology to developing countries has actually widened the gap between the rich and the poor in these countries.

Discussion. Remote sensing technology in itself will probably neither contribute to, nor reduce, the extent of this problem. But the manner in which the potential users of this technology are trained will have an effect on the income gap. The AID regional centers will begin training with visual interpretation capitalizing on labor intensive techniques. These techniques require a greater understanding of various resource disciplines, e.g., agriculture, forestry, rangeland management, land use, and geology, than they do of specialized image processing techniques. Since these resource discipline skills, as opposed to image processing know-how, are more likely to be found among those persons responsible for resource management and familiar with the conditions of the poor in the developing countries, we hope that this cadre of resource planners would use improved crop forecasting as derived from remote sensing, for example, to help benefit the poor. In addition, the success of agricultural inventories via remote sensing hinges on large amounts of ground-truth data which could only feasibly be supplied by large numbers of farmers. This assures technical cooperation between the agricultural planners and the farmers who generally make up the poorer segments of the society and who stand to benefit from better crop forecasts and agricultural management. Thus technical cooperation, jobs, and food, we hope, will result together.

Issue No. 2. Remote sensing technology is complex, ranging from orbital dynamics and mission analysis to artificial intelligence applications in digital classification of satellite data. The transfer of this technology to developing countries still coping with a large percent of illiteracy in their populations will be difficult at best.

Discussion. The space segment is not intended to be taught. As outlined in the first discussion, training would begin with labor intensive analysis by using visual techniques (photo interpretation), and by using their knowledge (the developing countries) in identifying and measuring natural resources. Slowly, and in parallel with training in mathematics and electronics, equipment and computer techniques to extract even more information from the satellite data would be introduced in the training courses. The training is for the application of this technology, not the details of the technology itself.

Issue No. 3. The U.S. Administration has taken the stand that the Landsat system is still experimental. Thus, the push to transfer the technology to developing countries may not be appropriate and somewhat misguided.

Discussion. As summarized above, the message AID is getting from many developing countries is that the U.S. is not moving fast enough to train and equip them to use Landsat imagery. The NAS report spells out many operational uses of the technology already in developing countries. Whether one wishes to define the Landsat program as experimental or operational is relevant only to those planning an "operational" Landsat system. To resource planners providing for the poor and hungry, Landsat data is there, it's useful, and they can "operate" with it.

Issue No. 4. At this time (December 1977), the MSS has not been approved for Landsat-D. How does this affect multispectral data continuity for developing country users?

Discussion. Using the Landsat-1 MSS as a statistical data point, the MSS on board Landsat-2 will probably last until at least 1980, and that on board Landsat-C (to be launched March, 1978) until 1983. If no further MSS's fly after Landsat-C due to the Office of Management and the Budgets' (OMB) reluctance to fund them, multispectral data from the experimental Thematic Mapper (TM) on Landsat-D can be resampled and processed at the NASA Goddard Image Processing Facility so that the data appear to resemble MSS data. Because of the different spectral and spatial resolutions of the raw data from the TM, however, the resampled data will definitely differ somewhat from existing MSS data.* This would extend the MSS data continuity in a limited manner into the mid-1980s time frame.

* The degree of difference and acceptability are open to debate. For a viewpoint as to the unacceptability and non-continuity of TM data, see Colvocoresses, A.P., "Proposed Parameters for an Operational Landsat," *Photogrammetric Engineering and Remote Sensing*, Vol. XLIII, No. 9, Sept. 1977, p. 1139.

The TM data, in and of itself, is of such high resolution (30 meters) and wide spectral coverage (7 bands) that it will be without question of great benefit to the developing countries for certain selected areas. Of course, the data volume would be too great to update national inventories, a second reason why the MSS is so important in addition to the data continuity argument. Without the MSS, processing of imagery for national coverage can only be obtained over long periods of time, if at all.

In summary, without the MSS on Landsat-D and future spacecraft, developing countries will need to be able to computer process TM data (or have it done) by 1983 if they wish selected inventories consistent with data currently being collected by Landsats-1 and -2. Some regional centers are planned to be able to provide this capability to member countries by 1983. There is little hope for updating national inventories with the TM, but an improved possibility of targeting resource exploration and identification with the higher spatial resolution associated with the TM would be forthcoming.

Issue No. 5. Even if the MSS is approved for Landsat-D, the developing countries are still faced with the problem of MSS data availability.

Discussion. Both tape recorders on Landsat-1 are now dead; only one still remains operating on Landsat-2; it will fail any day because it has reached its 1000-hour lifetime. What's left of this recorder is heavily committed to NASA's Large Area Crop Inventory Experiment (LACIE). Present ground stations cover only North America, the central portion of South America, and the Mediterranean countries. Present NASA and AID strategies have been to encourage the orderly construction and development of Landsat receiving stations around the world. The central concern is the procedure which should be taken from the present forward in order to assure the availability of Landsat coverage of all of the developing countries. The issues which contribute to this central concern are on-board tape recorders, the Tracking and Data Relay Satellite System (TDRSS), portable ground stations, permanent ground stations and the TM, and permanent station overlap. These are treated in turn:

(a) Why not rely on more reliable tape recorders (e.g., the one being designed for Landsat-C) than those on Landsat's-1 and -2 for global coverage and forget the costly development of permanent receiving stations?

Discussion. An improvement in tape recorder performance still does not permit one to have much confidence in their continuing operation over many years; their history on Landsats-1 and -2 does not encourage optimism in tape recorder reliability. The recorders can only store 60 MSS scenes at a time; thus, an argument for global coverage in any reasonable length of time with tape recorder dumps to existing receiving stations can hardly be made.

(b) In 1980 The Tracking and Data Relay Satellite System (TDRSS) will transmit Landsat data via one of two geostationary data relay satellites to a central facility in White Sands, New Mexico, where the data will be processed and then transmitted to an Intelsat station in a developing nation via one of several communications satellites. Won't this system tend to make obsolete the permanent ground stations under development around the world?

Discussion. The TDRSS will be available only for limited amounts of time for Landsat data transmission. NASA will probably discourage dependence upon TDRSS for transmitting Landsat data of all the developing world. In addition, the Intelsat stations are themselves quite expensive to build, although they do provide communications capability and most developing countries already have them. The data continuity issue, as well as a developing country's sense of autonomy in being able to directly receive Landsat data, would still encourage permanent Landsat receiving stations.

(c) Portable ground stations?

Discussion. The portable ground station is a crude replica of a permanent station; the station and antenna can be flown into a country by plane and set up in a few days to receive Landsat data directly. The portable station can be leased for a period of several months and then removed. It permits a country or region the opportunity to obtain and use Landsat data (the raw MSS data still have to be processed to provide imagery or computer compatible tapes) before deciding to go ahead with the development of a permanent station. Portable stations are ideal sources of Landsat MSS data from the present through the next five years while AID's regional centers are being developed. The portable station enhances AID's efforts in promoting the growth of regional centers and transferring remote sensing technology to those areas of the world covered by the station.

(d) With or without the MSS on Landsat-D, how can those developing countries with meager resources presently de-

veloping permanent stations afford to modify their stations to accommodate the higher telemetry rates associated with the Thematic Mapper?

Discussion. Stations presently being planned in developing countries are being developed with this modification built in. Only the existing stations in the developed countries face this issue. Our understanding is that the amount of modification to existing stations is far less than opponents of the Landsat-D Thematic Mapper are leading the remote sensing community to believe. I think it's safe to say around a quarter of a million dollars modification to a five million dollar investment is about right, but we would prefer to let NASA answer this in due time.

(e) Presently planned ground stations will already cover areas in common when they become operational; as more stations are planned and become operational, the areas of overlap in station coverage will expand. This poses problems in developing countries or regional centers attempting to recover station costs through the sale of remote sensing data products since these products will be available through several stations.

Discussion. AID and NASA are playing a major role in alleviating this problem through judicious selection of regional training centers and the encouragement of receiving stations in the vicinity of the training centers and in locations which minimize areas of overlap. One method of handling this issue is to encourage NASA's present policy regarding the area of overlap between the proposed Argentine station and the existing Brazilian station: the older and established Brazilian station has the sole right to sell imagery of the overlap region, except for that region contained in Argentina. Argentina has the right to acquire any imagery of the overlap region for its own use and sell any imagery (including overlap) of Argentina.

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