TELECOMMUNICATIONS SERVICES FOR AGRICULTURE AND RURAL DEVELOPMENT: EXPERIENCES OF THE AID RURAL SATELLITE PROGRAM

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INTRODUCTION

Reliable rural telephone services in developing countries are slowly expanding. The work of the Independent Commission for World Wide Telecommunications Development and a series of studies by the World Bank and others have given significant impetus to rural telephone services. It is believed that such services will significantly stimulate economic development in rural areas. It is also believed that rural telephone services will improve the performance and efficiency of local governments in agricultural development. The USAID Rural Satellite Program (RSP) is the first program to promote, plan, and assess the use of rural telecommunications services in support of agriculture.

The drive for the expansion of rural telephone services is based on:

- recognition of the uses of rural telecommunications in economic development
- maturation of technologies suitable for rural conditions
- a slow decline in system costs
- the development of new and innovative financing packages
- establishment of major initiatives by the ITU and supporting countries

The expansion of rural telecommunications services throughout the world is evidenced by widespread telecommunications equipment procurement and installation, as well as through published plans for future systems. The underlying technologies vary significantly among countries and continents. Increasingly, satellite systems are available and used to provide the network which links the various rural facilities to the national telephone network. Local equipment, ranging from earth stations to the equipment in telephone offices and on the premises of individual customers, is more durable, uses less power, and can be operated and maintained with increasing ease. Promising rural systems and services which are not based on satellite technology are being developed as well. Experience suggests, however, that satellite technology may be the most suitable for rural services.

Whereas, in the past, rural telephone services were unavailable or unreliable, the next two decades are likely to see telephone services available for agriculture and rural development. At present, major development projects and implementing agencies operate their own private networks with varying degrees of success. There is no question that access to telephone services can improve agriculture. Based on the experience of the RSP, the following features appear to be of particular value in rural areas:

- **the electronic transmission of documents (facsimile) between project or agency headquarters and field offices.** There were many instances in which actions could not be taken locally, such as equipment repair, without written approval from the head office. Getting such approval can be expensive and time consuming, given the difficulties of transport, and could at times result in crop loss.

- **audioteleconferencing services and facilities in the local telephone office or at other local government buildings.** There were many instances in which regularly planned staff meetings of extension projects or in-service training could not be held because there was no transportation and no time for travel.

- **establishment of tariffs low enough to make the use of rural telephone services a viable option for rural development agencies.** In many instances, project headquarters and field locations are in different tariff zones, making telephone calls and audioteleconferences subject to various long distance charges. A closer integration of the administrative areas of development agencies and tariff areas is one of the vehicles to overcome the problem.

In the feasibility and planning phases of the RSP, many examples were found of the benefits of reliable telephone and audioteleconferencing services. Communications can support:

- **increased agricultural production by promoting wider participation of small farmers in the markets.** The individual farmer--and often the extension agents--do not have sufficient information about national priorities, policies, and strategies to respond to them in terms of what they grow. Information on credit and credit conditions is not always clearly understood or available when needed. Obviously, access to this type of information is only a small but important component in the overall market participation of small farmers. Prices paid at market and the costs of production are critical to the farmer's investment decisions. It is possible that a farmer will decide not to grow certain crops promoted by the government because the cost is too high. Access to the right information, however, is important as a basis for such decision.

- **greater economic efficiency in the marketing and distribution of agricultural products.** Farmers were often unaware of current market prices for their products, relying on traders or marketing boards for this information. Essential supplies and services for marketing were often beyond the reach of farmers, including such things as bags for rice or transport vehicles for perishable products. Lack of market information caused a maldistribution of agricultural products.

- **effective professional development for professional and technical staff and for farmers.** Lack of sufficiently trained and qualified manpower at all levels and difficult access to in-service training opportunities for those employed in the field as well as the low ratio of extension agent to farmer make human resource development a very critical component in agricultural development. Communications technologies, both audioteleconferencing and radio (or TV broadcasting), could bridge a critical gap caused by the generally limited availability of trainers and effective training methods.

- **improved efficiency of public and parastatal enterprises engaged in food and agriculture-related activities.** The role and efficiency of these agencies are undergoing critical scrutiny. They are critical to agricultural development, but their performance has generally fallen short of expectations. Quite apart from their future in general, significant efficiencies could be achieved by these agencies through well-planned telephone services and use. Many enterprises suffer from the lack of quick and reliable transfer of information and decisions. Analysis during the RSP feasibility studies showed that facsimile and audioconferencing could improve coordination significantly and stimulate activities and decisions among the different components of such agencies. Rapid decisions which are vital to local agricultural production, pricing, and distribution; regular staff and training meetings; and reliable access to administrative as well as to agricultural information from the field are some of the elements to which audioteleconferencing could contribute.

- **expanded private sector roles in agriculture and rural development.** Many of the roles which the private sector plays or could play in agricultural development can lead to additional economic benefits through telecommunications. Agricultural transportation, infrastructure development (e.g., construction of wells), supply systems, marketing, and maintenance/repair systems obviously could benefit from informed communication, and these benefits would be passed on to the sector as a whole. Private credit systems and banks in rural areas need easy access to branch and central offices to deal with loan requests and related matters. Major agricultural industries have long recognized the need for communications support and have installed their own private links to keep track of production, movement of staff and equipment, post-harvest activities, and external markets.

- **efficient and immediate distribution of food to those facing severe malnutrition and temporary food shortages.** Bottlenecks in effective food distribution have been a recurring dilemma during times of drought and other emergencies. The availability of transport and storage facilities as well as of communications services are obviously critical in overcoming such bottlenecks.

- **increased awareness and incorporation of sound nutritional principles in health and education programs.** Many examples exist of the successful uses of communications to increase nutritional awareness among client populations. At the same time, however, agricultural, health, and other field staffs who work in rural areas often lack sufficient knowledge of nutritional principles to effectively integrate them into their work. In-service training as well as coordination among the different sectors charged with nutritional responsibilities can be achieved effectively by audioteleconferencing services.

In agriculture and rural development, the most familiar models are those using radio or even TV broadcasting, rather than telephones or audioteleconferencing. Both types of systems are suitable for supporting development, but each is best used in different situations. Broadcast services are mass media and can reach anyone in the coverage area who has access to radio or TV. The sets are widely available, particularly for radio, and thus broadcasting is a good vehicle for reaching large numbers of people. A key feature of telephone and teleconferencing systems is their ability to allow participants to interact with each other, which makes the systems particularly suitable for administration and logistics. In addition, software production costs for training and education are minimized because the sessions generally mirror face-to-face meetings and permit the information needs of adult learners to be addressed.

Several legitimate functions for communications support strategies in agriculture are outlined in H. Ray's Incorporating Communications Strategies into Technology Transfer Programs for Agricultural Development (USAID, October 1985). They are:

- delivery of information to rural families
- feedback to extension from rural communities
- planning for research, supply, service, and marketing
- feedback to policymakers and technical decision-makers
- field staff training and support

As is evident, telephone and audioteleconferencing services can be very viable tools in the last three strategies. In the first two, they can be useful for field-level extension agents, primarily because access to facilities is limited and does not encourage direct or extensive participation of rural families.

RSP GOALS AND STRATEGIES IN SUPPORT OF AGRICULTURE

The RSP was designed to integrate communications into ongoing activities and to respond to the needs of existing projects and public enterprises. It was not set up to test new models of agricultural extension based on telecommunications support. RSP projects and feasibility studies were conceived to study ultimate uses of telecommunications and conditions under which it operates best as well as implications for the design of hardware. In practical terms this means a service which would be available for the public as well as for all rural development sectors ranging from agriculture to health to education.

These projects, which were conducted in Peru, Indonesia, and the West Indies, reflect very different types of uses of telecommunications in the agricultural development process. In sum, they relate to most of the potential benefits of telecommunications, as outlined earlier.

The Peru project offers, through satellite audioteleconferencing, the opportunity for agricultural extension services to organize in-service training, staff meetings, administrative conferences, logistical support, and other needed support activities.

The Indonesia project primarily focuses on the use of satellite audioteleconferencing services to improve human resource development at the professional level. It is designed to assist ten agricultural universities and teacher colleges in improving the quality of instruction of their established curriculum, particularly in areas where there is a lack of qualified on-campus faculty. In addition, it is designed to support and facilitate intercampus research, special lectures, and some graduate student programs. A subproject, consisting of an audioconferencing link with an agricultural high school in a remote settlement, was initiated to provide the opportunity for the Agricultural Institute in Bogor to assess this technology as one of its outreach methods.

In the University of the West Indies project, the RSP tested audioconferencing services as a tool to improve the University's outreach and responsiveness to agricultural agencies and farmers.

PERU RURAL COMMUNICATIONS SERVICES PROJECT (RCSP)

Background

The Rural Communications Services Project in Peru (RCSP), which began in 1978, was designed as a truly rural development support project. The project area in northeastern Peru and the technical system were chosen on the basis of a feasibility study which found the following:

- The area was undergoing efforts of rapid modernization with the introduction of new crops and farming methods, road improvements, landmapping, new harvest processing methods, and new storage facilities.
- Both the public and private sectors were active and planned to expand activities.
- No public telephone services were available, but they were desired by government and commercial entities.
- The regional agricultural, health, and education agencies had management staff in the communities chosen to participate. They were hampered by difficult travel conditions and the high costs of transport. Local activities were administered through a hierarchy with its center in Lima.
- The project proposal received strong support from the key government departments in the field as well as in Lima.

The seven participating communities range in population from under 1,000 to 10,000 people. There is a significant level of immigration into the area from coastal areas, and it is the center of major governmental agricultural development programs which concentrate on the introduction of irrigation systems and new crops to replace illegal cocaine-growing activities.

Each community has agricultural extension workers who report to the agricultural research and development agency in the major town of Tarapoto. The southernmost settlement of Tocache is an anomaly because the agricultural extension agents do not fall under Tarapoto's responsibility. Tocache, therefore, has not participated consistently in the agricultural sessions.

In addition to governmental agencies, the region also has an active private sector. There are various small merchants and distributors, banks, transport companies, some food processing plants, and agro-industries in the region. Public telephone service was essential in the design of a rural development telecommunications network.

It was expected that the private sector would take advantage of the telephone services without needing major training assistance. Past experience has shown, however, that governmental agency personnel would need training for their special use of telecommunications (teleconferencing) and because the project, to be effective, would require some major changes in their procedures.

ENTEL-Peru, the national telephone company, was keenly interested in testing the model in light of its future rural communications services. To be able to incorporate the planning experiences, develop tariff models, and establish necessary relationships with government users of telephone services, ENTEL established a "social programs" office. This office was charged with user planning, user training, scheduling activities, and the promotion of the service in Lima and in the region.

Technical System

The project network included three satellite earth stations, each with a four-channel capacity, which were linked to existing larger earth stations in Tarapoto and in Lima. The space segment was provided as part of ENTEL's national lease from INTELSAT of one satellite transponder. The three earth stations were linked by VHF links to four additional communities. Three of these operated a single channel. The fourth operated two channels.

To operate the public telephone service, ENTEL established telephone offices in the earth station communities and gradually introduced local exchanges in addition to call facilities at the telephone company offices. The service in the VHF communities was operated by local franchises.

In addition to providing public telephone service, the network provides audioconferencing facilities at each site. Each of the participating communities has a small audioconferencing room, seating up to 15 people, equipped with six microphones and one loudspeaker. For a two-year trial period this service was provided free of charge by ENTEL to user ministries. In addition, private companies, e.g., banks, were encouraged to test this type of service for their purposes.

Initially, it was planned that the audioconferencing facilities should be linked on a dedicated basis, primarily to minimize potential technical and operational problems resulting from channel switching. The size of the communities and the conferencing traffic they could realistically generate caused the design to be changed to provide the more economic shared use of the channels with the regular telephone services.

Technical problems have plagued the VHF sites, and for all practical purposes they were never able to participate in a meaningful way in the teleconferences. The equipment locally available to ENTEL did not stand up to the humid weather. It also is a heavy power consumer, and thus not very appropriate to the local conditions, where power is available only intermittently.

In this project, it was decided not to introduce peripheral equipment such as facsimile or slow-scan television. Capital, operational, and maintenance costs would be out of line with local conditions and volume of use. At the same time, however, the availability of facsimile for transmission of documents probably would have made many of the sessions more effective and, at times, better coordinated.

Applications

The focus in agricultural development in the project area is on increased production of staple crops, in particular rice, followed by improvement in the production of other products such as citrus fruit. Upgrading of livestock production, in particular cattle, is

gaining in importance. A major development plan has been implemented in part of the project area, providing significant materials and storage facilities, roads and bridges, and, through RCSP, telephone services. The regional agricultural research and extension center in Tarapoto is responsible for agricultural development in the area (except for Tocache), including supervision of extension agents, technology transfer, and communications.

Each rural earth station has an agricultural extension office, staffed as follows:

Personnel	Juanjui	Tocache	Saposoa
Extension agent	2	1	1
Extension technician	3	1	1
Administrative	1	1	1
Total: 12	6	3	3

Three VHF sites have an extension technician. Bellavista is a more important site and has four extension technicians in addition to one agent and one administrator. The main sites are also responsible for an additional 18 extension offices within their districts. The extension method in the area consists of training and visiting farmers. Additional expertise in areas such as artificial insemination is brought in from Lima.

To implement and promote the audioconferencing service of the project, technical assistance staff and the telephone company's social program office staff work closely with representatives of the development sectors to develop appropriate audioconferencing techniques as well as appropriate teleconferencing plans. The regional RCSP office in Tarapoto helps users to prepare and distribute print materials and to coordinate and schedule events. The Lima project office coordinates activities with the national government agencies and organizes and plans specialist sessions originating from there.

In 1984, 240 audioconferences were conducted. Education was the subject of the greatest number with 107 teleconferences followed by health with 101 and agriculture with 32. In 1985, teleconferencing use almost doubled to 410 sessions. Education was the subject of 113 sessions, health of 87 sessions, and agriculture 55 sessions. The remaining sessions in 1985 were conducted by ENTEL or represent a few special activities which do not fit into any sector directly.

Use of Audioconferencing by the Agricultural Sector

In 1984 the agricultural sector was the subject of 32 audioconferencing sessions of about one hour each. Over three months the system was not used because of technical failures and a strike. Discounting those months, there were audioconferences anywhere from three times (August, September, December) to nine times (February) per month. Monthly attendance varied from 176 to 21 participants, with an average of 13 participants at each session. As a general rule, agricultural extension agents from surrounding centers would come to the conferencing sites to participate. Those centers do not have telephone services, and coordinating their attendance was cumbersome.

Of the sessions, 13 can be categorized as training sessions, seven as administration and coordination sessions, and 12 as informational or promotion sessions. Four sessions focused on crops such as corn or soya, five on rice production, nine on livestock, 11 on rural development, and one on extension techniques. The remainder were planning and administrative sessions. Most sessions, however, had overlapping content and objectives.

Three of the sessions originated from Lima, the remainder from within the region, largely Tarapoto. It had been hoped that a work plan could be developed which would tie the teleconferencing activities directly to the supervision and in-service requirements of the field agents and agricultural cycle. In 1984 the newness of the system, technical problems, and labor relations mitigated against such applications. The five sessions over a six-month period related to rice production, however, dealt with issues ranging from soil preparation and transplanting to storage and demonstrated the usefulness of audioconferencing for agricultural extension work.

In 1985 the agricultural sector realigned its audioconferencing activities and integrated them into ongoing administrative and technical work. Hour-long scheduled conferences each Friday improved coordination significantly because they provided a focus around which extension agents and other staff planned their work. Because these sessions now are part of the ongoing work flow, actual field problems and issues are discussed in a timely manner. The increased and regular use of the service can largely be attributed to two factors. One is familiarization with the service, and the other is the presence of a supportive senior official at regional headquarters.

The 55 agricultural sessions conducted in 1985 have been classified by the participants as training (45), coordination (6), and administration (4). Twenty-five sessions originated from Lima and 30 from Tarapoto. This shows that the resources and information available to extension agents are becoming increasingly more advanced, diversified, and up to date. This allows them to deal locally with more complex problems.

The 1985 conferencing schedule shows encouraging and regular use of the service, with approximately one session per week. In the previous year agents had commented that the sporadic scheduling of sessions prevented them from attending sessions because they planned and scheduled farm visits ahead of time and traveled extensively, which did not allow them to participate in sessions on short notice.

The 1985 sessions also have overcome some of the other drawbacks of earlier sessions, which often consisted of lectures with questions at the end. In 1985 programming methods involved the agents in problem solving or field "laboratory" follow-up, thus orienting the sessions more toward field issues and problems.

Use of Audioconferencing by Other Rural Development Sectors

In addition to the sessions organized by the agricultural sector, which included the broader topic of rural development, the health and education sectors also organized sessions related to child health, including growth monitoring, preparation of nutritious food, diarrhea control, and vaccination. In 1984, 34 sessions related to rural development were conducted using a total of 36 hours and included 658 participants. These sessions were closely related to the rural development sessions conducted under the auspices of the Ministry of Agriculture and show that field agents of different ministries have at times overlapping responsibilities.

Use of the Telephone Services by the Commercial Sector*

The public telephone service was quickly adopted by the business community in the region. Over 5,800 public calls per month were made in the first year of operation. Twenty-two percent of the calls were made for business purposes. Of these, only two percent were made for government purposes. The percentage of business matters discussed during telephone calls is probably much larger, because business often is conducted with personal friends and family, but the call probably would be categorized by the respondent as "personal."

Communications as a substitute for travel is a significant factor in system utilization. Sixteen percent of survey respondents indicated that their calls were sufficiently important to warrant personal travel if the service were not available locally. Seventy-two percent said that alternate forms of communications would take from one to five days, if possible at all. More than four percent of the telephone users (or about 3,000 of those making calls in 1984) traveled more than 20 kilometers to the telephone offices. This shows the importance of telephone service in the personal and business lives of the region. Not only does telecommunications save time and effort, but people are also ready to spend time and money over and above the cost of a call to use the telephone.

Results

The potential of the agricultural uses of the Peruvian project was only realized in mid-1985. Labor-management problems and significant staff turnover did not allow trained staff to remain in place long enough to implement their ideas. Nevertheless, with continued exposure and use, the service now is integrated into the work plan under new leadership.

A significant outcome of the project activities is the planning by ENTEL of a much larger rural satellite system for other rural areas in the country. Plans combine the public telephone requirements with conferencing capabilities for the development and commercial sectors. Lessons from RCSP should help ENTEL establish appropriate parameters as well as appropriate tariffs for audioconferencing because cost and traffic data are now available. In addition, ENTEL as well as various agriculture agencies have a good base upon which to expand and refine projects.

Audioconferencing became the prime communications vehicle for all governmental rural development sectors. Although this is partially the result of the type of system and the service offered, several contributing factors exist. The audioconferencing service was free of charge. The telephone service was not. The lack of discretionary funds for telephone use obviously limited the use of this service.

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* The information in this section is from the Florida State University interim evaluation report.

INDONESIAN DISTANCE EDUCATION SATELLITE SYSTEM (SISDIKSAT)

Background

The primary and secondary school systems in Indonesia have greatly increased the number of high school graduates in the country, with over 500,000 students seeking admission annually to the 43 government institutions of higher learning. Only 18 percent of these graduates can actually be absorbed by these institutions. Others enter private schools or do not pursue a college degree. Two major challenges face the Indonesian higher education system. One is the inability of existing institutions to grow as rapidly as student demand would require. The other is the uneven development of the newer institutions, often caused by shortages of trained teaching staff.

The Directorate General of Higher Education (DGHE) has responded to these challenges with several innovative strategies. To give access to higher education to larger numbers of students, the Open University was created in 1984. In its first year of operation, the Open University registered over 60,000 students. The instructional system of the Open University relies on print material and a tutor system. To overcome the uneven development of the institutions of higher learning, the Distance Education Satellite System, known by its Indonesian acronym, SISDIKSAT, was initiated in 1984.

Technical System

SISDIKSAT links ten university campuses and teacher training colleges, some of them more than 2,000 miles apart. Each site has a special teleconferencing classroom. The network consists of satellite links for long distance communications and terrestrial facilities which bring the signal from the telephone company's earth station to the classrooms. The DGHE has leased from the telephone company two fully dedicated and conditioned telephone channels between each classroom. One channel provides the audioconferencing services among the sites. The other channel, commonly called the graphics channel, can alternate between facsimile transmission, electrowriting, or private telephone conversations.

Each classroom accommodates about 50 students. Great demand for several courses has led some campuses to add additional classrooms. Twelve microphones are distributed throughout the classroom for student participation in discussions. Two loudspeakers bring the sound from the other campuses. All the classrooms can hear the presentations or questions from the other classrooms. Usually, the session coordinator will call on the different classes to contribute.

In addition to the audio equipment, each classroom has three videomonitors, electrowriting equipment, and facsimile equipment for the transmission of documents. The project's main office in Ujung Pandang also has facilities for the production of teaching materials using the electrowriting system. Most classrooms are air conditioned.

After the initial testing and break-in of the equipment, the voice channel has performed satisfactorily with fewer than two percent of all sessions being cancelled because of technical problems. Several of the causes for cancellation were outside the responsibility of the SISDIKSAT system. The graphics channel experienced more serious

and continuing problems resulting from the complexity of switching arrangements and the sensitivity of some of the classroom equipment. The facsimile equipment has proven to be much more robust than the electrowriting equipment. The electrowriting equipment is quite sensitive to environmental conditions and operator skills. Use of this equipment is inconsistent because faculty members are wary of its performance.

Operational responsibility for the network is divided between PERUMTEL, the national telephone carrier, and the SISDIKSAT engineers. PERUMTEL is responsible for the overall network, basically from the point at which a signal leaves or enters the classroom. SISDIKSAT is responsible for the classroom equipment. PERUMTEL has shown remarkable dedication and support for SISDIKSAT throughout installation by upgrading its plant to accommodate SISDIKSAT requirements. In addition, PERUMTEL and SISDIKSAT, after trial and error, have developed satisfactory operational procedures which allow quick troubleshooting and fault detection.

In addition to the main intercampus network, SISDIKSAT operates a rural earth station sub-project. The earth station, located in the small rural community of Wawatobi, is powered by photovoltaic arrays and operates two telephone channels, one terminating in an audioconferencing room, the other in a public telephone service for the community. This network was installed in mid-1985 and is slowly coming into use.

Applications

SISDIKSAT was designed to help overcome the uneven development and limited teaching resources of the universities, which are members of the Eastern Islands Universities Association (BKS). BKS itself was created in the late 1970s as a loose organization for the purpose of pooling resources to upgrade teaching in the region through joint course development and the sharing of qualified teachers. This was to be achieved through the development of printed materials and videotapes as well as sending specialists to different campuses to teach short, intensive courses.

Several of the BKS member campuses have particular strengths and are centers of expertise in areas such as tropical forestry or fisheries. All campuses have an agricultural focus. The university campus in Ujung Pandang (UNHAS), also housing SISDIKSAT headquarters, is the strongest university in the BKS.

The Bogor Agricultural Institute (IPB), although not a member of BKS, was linked to the network because of its advanced and specialized resources in agricultural research and teaching. It also has a strong division in agricultural extension and communications which is particularly interested in exploring the link to Wawatobi via the small earth station. IPB is very interactive with the BKS member institutions, and its faculty members frequently give intensive courses at BKS campuses. UNHAS and IPB operate a special graduate student program under which students can obtain a graduate degree while studying at UNHAS and IPB under IPB staff supervision.

The Courses

The courses delivered by SISDIKSAT are jointly defined and developed by the rector of each participating institution. The flexibility of the network permits any of the campuses to originate a lecture and a course as well as for any campus to choose not to participate in a course if local resources are available.

A typical SISDIKSAT course is a two-hour per week session over 16 weeks and consists of direct teaching and interaction between faculty and students. Course materials are prepared by the teaching faculty. Local faculty tutors conduct follow-up activities, grade papers, and evaluate student performance. Students receive credit from the home campus. Additional sessions between faculty and tutors are encouraged so that the tutors ultimately can take over the teaching of a given course and SISDIKSAT courses can become more advanced. This helps BKS members in the short term to improve the quality of teaching on its campuses and in the long term to upgrade local faculty to make the campuses more self-reliant.

The 1984 Experimental Semester

A statistics and a food sciences course were taught in the experimental semester. The first course originated from UNHAS, the second course from the Manado campus. Six hundred students participated.

The courses offered valuable feedback to SISDIKSAT personnel regarding training requirements, presentation styles, interaction, and appropriate print materials. They also offered administrative insights into scheduling, materials distribution, test development, accreditation, and inter-campus coordination of academic calendars.

First Semester 1985

The two experimental courses were repeated, and eight full courses were added as well as several professional seminars. The Open University also used two two-hour time slots for work with tutors. Course and seminar topics related to agriculture during this semester included basic science, resource economics, statistics, cattle breeding, fishing gear, poultry production, basic forestry, basic ecology, human ecology, and natural science. These courses originated from five different sites, with IPB and UNHAS offering most of them.

Because of various administrative problems as well as a certain wariness about the system's technical performance or class cancellations for other reasons, fewer than 500 students on the average attended these courses per week. It is of particular interest to note, however, that the large majority of students who did attend were students at the most rural and underdeveloped campuses.

August-December 1985

Beginning in August 1985 there were 17 SISDIKSAT courses, plus regularly scheduled seminars in nutrition and a doubling of system use by the Open University.

SISDIKSAT operates for about 70 hours a week, of which roughly 50 hours are used for teaching, tutorial support, and seminars. The remainder of the time is used for administrative meetings, system coordination, and check-out. The first hour each day is used for meetings between the eastern-most campus of the BKS network and its branch campus. Because SISDIKSAT covers three time zones, no other campus is active at that hour. Courses taught in this semester included basic natural sciences, methods of social research, macroeconomics, resource economics, industrial law, technology of cattle

production, basic ecology, theory of adult education, social system of Indonesia, statistics, methods of fishing, fish diseases, food science, animal physiology, soil science, agrarian law, and criminal law.

The courses originated from seven different sites. Ujung Pandang offered seven courses and IPB three. Participating campuses (excluding the originating site) ranged from three to six. The two law courses were conducted by special request between Ujung Pandang and one small campus.

Student attendance at SISDIKSAT courses has grown over the semester with an average weekly attendance in August of 455 students and in October of 2,683 students. Almost 90 percent of the courses offered were successfully delivered in October, indicating an encouraging trend toward declining numbers of course cancellations. Less than ten percent of the cancellations resulted from technical problems of the audioconferencing channel.

The series of professional nutrition seminars initiated in this semester achieved a solid following of faculty, students, and outside professionals. Between 100 and 200 people at about seven sites participated in each session. The sessions, originally planned to last one-and-one-half hours, have been expanded to two hours to provide more time for questions and discussion.

Results

The rather dramatic increases in student attendance in SISDIKSAT courses, the increasing numbers of courses offered, and the significant decline of cancelled sessions in the last semester demonstrate that the audioconferencing system is offering a reliable service that meets the needs of students and campuses. Although no comparative student performance data are available, the increasing student numbers suggest that students are learning from the audioconferences and print materials offered. This means that adequate distance teaching is possible in Indonesia via audioconferencing at relatively low cost, since most lessons are conducted "live" by the lead teacher. It also appears that teaching is adequate without electronically transmitted visual support when tutors and print materials are locally available to the students.

The SISDIKSAT project is a model for higher education in agriculture. It is particularly useful for developing countries where agricultural research and expertise are limited. Interactive systems, compared with broadcast systems or "one way" systems, are attractive for two main reasons: 1) the number of participants/learners is usually limited and does not warrant the expense of broadcasting (program production plus distribution) and 2) graduate and professional learners like direct access to the expert for asking questions.

The SISDIKSAT project also is a vehicle for upgrading staff skills and knowledge at underdeveloped campuses, which can then take over the teaching of basic courses leaving SISDIKSAT to offer more advanced and specialized courses. This is different from the anticipated model which saw SISDIKSAT as a means to free the campuses from the need to build expertise in all areas and thus allow them to concentrate on selected fields of particular relevance. In the current model, SISDIKSAT is a transitional service helping campuses to balance their teaching, research, and expertise. Nevertheless, one could well imagine new and additional instances in which an expert from one of the regional agricultural research institutes teaches a research course to students at campuses

throughout Indonesia and elsewhere. Such sessions not only would upgrade faculty and student knowledge and skills but also would help the researchers to better understand local factors and conditions. This in turn could lead to advanced research more appropriate to the diversified conditions of the country.

UNIVERSITY OF THE WEST INDIES
DISTANCE TEACHING EXPERIMENT (UWIDITE)

Background

The University of the West Indies system has three main campuses in Jamaica, Barbados, and Trinidad as well as extramural centers throughout the region. The University's Faculty of Agriculture is located on the St. Augustine campus in Trinidad as is the Caribbean Agricultural Research and Development Institute (CARDI), which grew out of that faculty.

In addition to providing on-campus training for agricultural students, the faculty offers shorter diploma courses, conducts field research on other islands, and provides assistance to the ministries of agriculture in the region. This support includes transfer of agricultural techniques and technologies or extension methodologies. At present UWI operates a regional USAID-financed agricultural extension project in several of the islands with limited staff on Dominica, St. Lucia, and Antigua in the eastern Caribbean. CARDI's role vis-a-vis the national governments is similar, but CARDI has more direct representation on the islands in terms of staff and field activities.

Technical System

Beginning in April 1983 UWIDITE has linked Jamaica, Trinidad, Barbados, St. Lucia, and Dominica and, since September 1984, Antigua, into an audioconferencing network with conferencing rooms at the University's facilities on each island. Each room can accommodate up to 20 students and contains peripheral equipment such as slow-scan TV transmission, an electrowriter, and, on the campuses, computers. Each classroom has two loudspeakers and six microphones for the audioconferencing portion of the network.

The network is leased from the telephone carriers in the region and uses satellite and terrestrial links. UWIDITE maintains the classroom equipment and operational control. Only one channel is leased, requiring that it be shared between voice and graphics or data communication. The system has developed into a reliable service, with only occasional failures or fading at individual sites. The peripheral equipment, however, is not reliable enough for lecturers to use them alone to provide visual support. The classes rely more heavily on print materials which are mailed before the sessions and distributed when the lecture is transmitted. It appears that among the peripheral equipment the slow-scan TV is most reliable. Computer linkages have not yet been sufficiently developed to allow the computers to be evaluated.

Applications

Between September 1983 and March 1985 the UWIDITE network was used for a total of 2,058 hours for various teaching and administrative functions. Of those, 46.5 hours were used by the Faculty of Agriculture and CARDI. In addition to these strictly agricultural applications, another 36 hours were discussions ranging from nutrition to social welfare which often included staffs of the ministries of agriculture in the islands.

For network usage for agriculture and social development, by site, year, number of hours, and topic, see the following tables.

NETWORK USAGE FOR AGRICULTURE

Year	Topic	Site	Total Hrs.
83/84	General agricultural discussions	All sites	7
83/84	CARDI	All sites	10.5
84	Agricultural extension	Jamaica Barbados Trinidad	6
84	Student research/support	Trinidad Barbados Jamaica	3
84	Zoology	Jamaica St. Lucia	8
85	Integrated pest management	All sites	6
85	FARMTECH '85	All sites	6
TOTAL			46.5

NETWORK USAGE FOR SOCIAL DEVELOPMENT

Year	Topic	Site	Total Hrs.
83	Primary health care	Jamaica St. Lucia	2
83/84	Fertility management	All except Trinidad	4
84	Food and nutrition	All except Barbados	27
84/85	Social welfare	All sites	4
TOTAL			37

Student Research Support

Agricultural students are encouraged to conduct part of their field research outside of Trinidad. The system is used to guide and direct student field research. This remote supervision improved the quality of the research and saved time because supervision did not depend on the mails. In addition, students who had returned from field research held a conference with agricultural staffs on the islands where they were working to discuss results of their analyses.

Zoology and Integrated Pest Management

Two programs were developed from Jamaica. Zoology was especially requested from St. Lucia, and a program on integrated pest management (IPM) was developed as a result of interest on all the islands. Participants in these courses included supervisory and field staffs of the ministries of agriculture and health; the IPM course drew over 40 participants for six weekly sessions of 90 minutes each. Two two-hour sessions provided feedback and allowed for future planning. The lecturer used the slow-scan TV equipment extensively and with good results but did not have the confidence to use the electrowriter. He prepared and distributed supporting print materials. The participants received certificates of participation. A second course is in the planning stages and will include the commercial pest control people. The lecturer intends to continue using the UWIDITE system on a part-time basis to review and reinforce integrated pest management methods with participants of the certificate program.

FARMTECH '85

The use of UWIDITE by the Faculty of Agriculture was most highly visible during a major regional exhibit and seminar in Jamaica called FARMTECH '85. The Extension Department arranged for speakers at the seminar to repeat their papers and discuss them via UWIDITE with agriculturalists on the different islands. The project was a big success, with an average of 15 people attending each session at each site.

This project was carefully planned and included local organization on the different islands to ensure attendance and the orientation of the presenters to audioconferencing techniques. Participants were particularly pleased with the opportunity to ask questions and discuss the papers with the speakers themselves.

Caribbean Food and Nutrition Institute (CFNI)

CFNI organized a series of in-service nutrition education programs for Ministry of Health staff working in nutrition-related areas but lacking proper nutrition training. The first course in 1984 had 27 participants. On each island trained nutritionists were chosen as coordinators for local activities, including participant recruitment, materials distribution, preparation of nutritional profiles, organization of local discussions, and quizzes. The course was taught by a team of nutritionists from different islands. A CFNI-prepared booklet was the basis for the eight-week course which also made significant use of slow-scan transmission. The course provided an opportunity to assess the strengths and weaknesses of the booklet for future sessions and to involve participants in in-depth nutrition discussions that would not have occurred without UWIDITE.

The CFNI course participation increased with subsequent series, indicating a need and interest in the region. Course revisions included student case studies of national nutrition issues. No student fee is charged for the course. If CFNI offers its diploma course via the system, however, a fee would be charged.

Results

The Faculty of Agriculture, located on the Trinidad campus, unfortunately did not use the UWIDITE system to the degree expected or hoped. Many factors contributed to this, including Trinidad's poor domestic telephone link which inhibits satisfactory audio-conference communications. The faculty was initially quite interested and held a local planning workshop on the use of UWIDITE for agriculture; however, it was short of personnel. If its requests for staff support to coordinate UWIDITE activities had been successful, a different picture probably would have emerged.

Those uses that were made of the system, however, are quite varied and show ways in which faculty could accelerate outreach activities. The Faculties of Education and Medicine, which have continuously participated in UWIDITE, have redefined their outreach strategies. They are offering increasingly broad services to the participating countries, particularly in support of professionals practicing in the field. The Faculty of Agriculture could build on their experiences for future plans.

ANALYSIS OF THE PROJECTS

The three projects show a great diversity of audioconferencing uses in agriculture and rural development. The Indonesian project, with its focus on distance and higher education, is an example of applications for agricultural research and training. It is particularly encouraging to see both national and regional resources and expertise being used in Indonesia. The satellite system, therefore, acts as a real catalyst for the strengthening of domestic institutions and resources related to agriculture.

The other two projects are more extension oriented. In 1984 the University of the West Indies assisted the Agriculture Faculty in bringing university resources to the agricultural communities in the region. Its use of the system for academic purposes was limited; however, the outreach function of the university is very important for the university and for agriculture throughout the region. The Peru project is a true extension project where the participants are field staff and their supervisors, with occasional support from universities or research institutions.

In the West Indies and Peru projects, audioteleconferencing has been demonstrated as a potentially important tool for the management of agriculture projects and for in-service training. However, additional projects need to explore more fully the programmatic and administrative implications of such systems.

The projects are confirming early assumptions that programming for audioconferencing is inexpensive and requires basically expertise in teleconferencing techniques, print materials, and coordination. At the same time the projects demonstrate the importance of advance planning. They also point to the need to analyze activities to identify areas where teleconferencing can be an asset.

Although some of the functions performed by the audioconferencing system can be done by broadcasting, audioconferencing is particularly appropriate for in-service training. Feedback from participants of the sessions, however, reveals strong support for the conferencing sessions because they create a sense of belonging to a larger group which, given geographic and financial realities, does not often get reinforced. Although rural agents may not always ask questions, they like the fact that the possibility exists. Conferencing techniques which draw everybody into the discussion can be effective if planned in ways which do not embarrass individuals. The audioconferencing system in general got high marks from users for giving them a greater sense of professional status.

A main aspect of audioconferencing is the multipurpose utility of the network. It can handle many of the functions which are key to the effective management of an organization. These range from the development of long-term work plans to the coordination and review of specific activities, to building an operational team, to in-service training. Operational and technical constraints of the West Indies and Peru projects prevented the demonstration of the full potential of audioteleconferencing systems. Despite this, the technology appears to have taken hold, and usage by the agriculture sector is increasing and improving.

Although at this time audioconferencing has been shown to improve the internal effectiveness of extension services, it cannot yet be said what effects it might have on agricultural production itself. Anecdotes exist, but more observations and quantitative data are needed to make a solid case.

AID RURAL SATELLITE PROGRAM PUBLICATIONS

This report is one of a monograph series, "Telecommunications and Rural Development," prepared for the AID Rural Satellite Program by the Academy for Educational Development, including:

- **An Overview of the AID Rural Satellite Program**, Tietjen, K.
- **The Design and Installation of Rural Telecommunications Networks: Lessons from Three Projects**, Goldschmidt, D., Tietjen, K., and Shaw, W. D.
- **Distance Education via Satellite in Indonesia**, Shaw, W. D.
- **An Analysis of the Costs and Revenues of Rural Telecommunications Systems**, Goldschmidt, D.
- **A Handbook for Planning Telecommunications Support Projects**, Tietjen, K.
- **Training for Technology Transfer in Telecommunications Support Projects**, Tietjen, K.

Also included in the series is a report prepared by Florida State University:

- **An Evaluation of the Peru Rural Communications Services Project**, Mayo, J., Heald, G., Klees, S., and Cruz, M.

Other Rural Satellite Program reports available are:

- **Telecommunications Services for Agriculture and Rural Development: Experiences of the AID Rural Satellite Program**
- **Telecommunications Services for Health Care: Experiences of the AID Rural Satellite Program**
- **Peru Rural Communications Services Project: Final Field Report**

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