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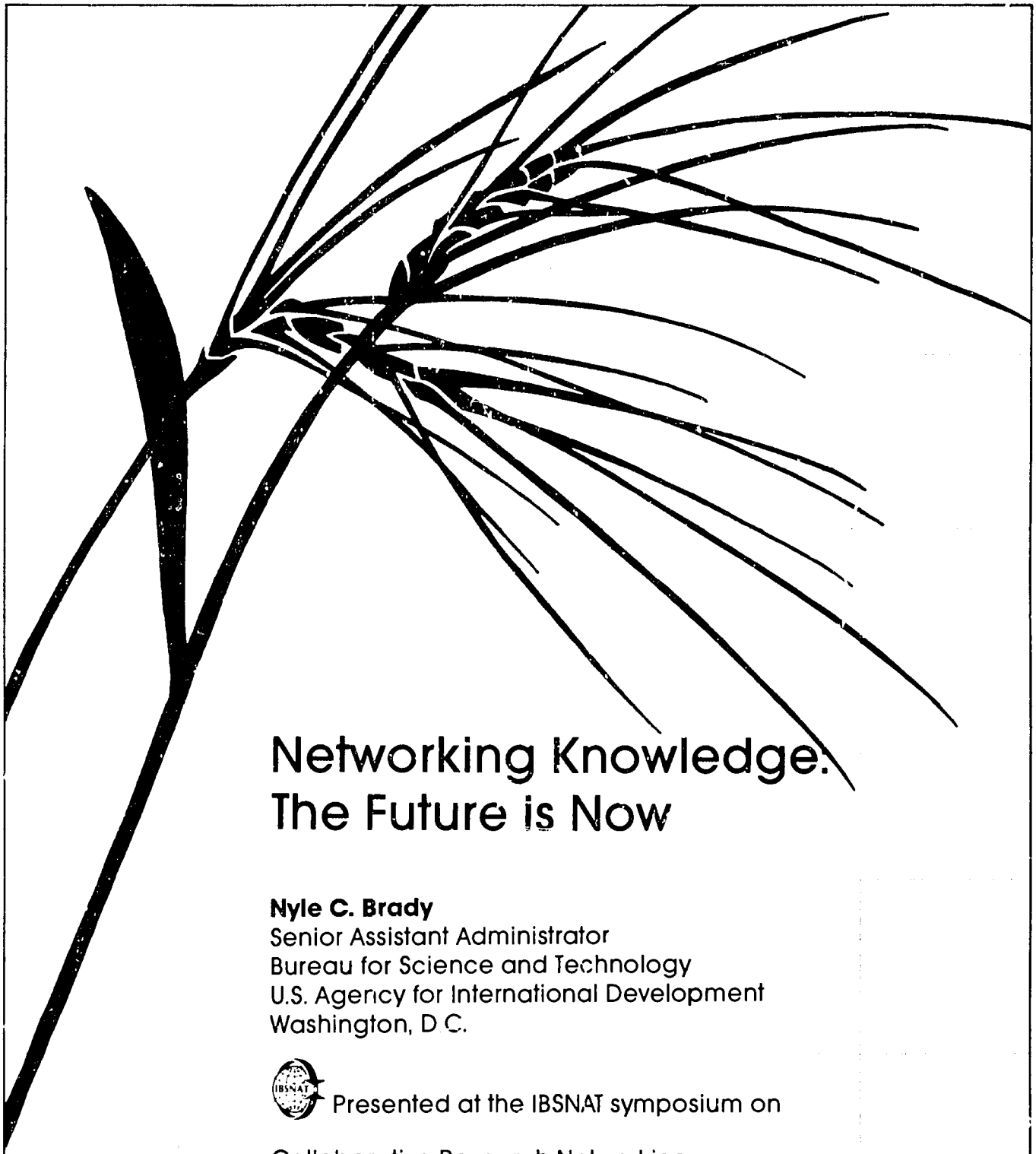

Networking Knowledge: The Future is Now

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Introduction

During the last half century, science and technology have made immense strides. With the advent of improved medical, nutritional and agricultural knowledge, the human life span has greatly lengthened; our understanding of life-sustaining systems has increased dramatically and discoveries in other sciences have altered our concepts about the world in which we live. Scientific and technological know-how is increasing exponentially, and the changes that have taken place in the last two decades are grounds for greater expectations in solving agricultural, health and environmental problems.

Much of the recent progress is because of the fascinating advances in artificial intelligence which has greatly increased the capacity to collect, manipulate and analyze data and to precisely apply the resulting information. These advances are the result of industrial technology. Our challenge as agriculturists is to be in the main-stream of these changes and apply these innovative measures to increase food and fiber production.

Revelle (1976) estimates, like many others, that the population-supporting capacity of the world is about 40 billion. There are about 5 billion people today and the population by the year 2050 is expected to double, which is still well below the supporting capacity. Yet, hunger and malnutrition is rampant in many countries. There are two primary reasons for this disparity. First, is the absence of production and utilization technologies that are clearly superior to those in use in the developing countries today, and second are the public policies and support systems (including input availabilities) which make it profitable for the improved technologies to be adopted.

Agricultural research is essential to develop the new technologies and to provide a rational basis for profitable systems of production, marketing and utilization. Our objective is to stimulate and sustain research in developing countries so that with time they will have the capacity and capability to manage their own country's specific problems. At the same time, we must try to avoid duplication of research, particularly when the problem is not country-specific and, therefore, we subscribe to the concept of agrotechnology transfer.

The title of this paper is Networking Knowledge. It implies innovative and collaborative approaches to solving LDC agricultural problems. The classical approaches in agronomic research such as the NPK trials have served their purpose. Billions of soil samples have been analyzed to determine fertility, and billions more will continue to be analyzed. We have learned much from these exercises, but it is now time to change course. We need innovative and cost-effective approaches, and we need multi-disciplinary and collaborative work that will lead to food self-reliance in the LDC's.

AID's strategy

The objectives of U.S. assistance in food and agriculture as stated in the AID policy paper, *Food and Agriculture Development in May 1982,* are to enable countries to become self-reliant in food, assure food security and achieve economic growth. Agricultural research provides the key to alleviating constraints to food and agricultural development and AID's policy is to increase the emphasis on research in future portfolios of its country Missions, Regional Bureaus, and the Science and Technology (S&T) Bureau.

The "green revolution"—based largely on research that created new technology for rice and wheat farmers with perhaps the greatest impact in Asia—serves as an example of the high payoffs from research in developing countries. The success was due to improved cereal varieties and associated technologies, both products of agricultural research.

These new technologies are the result of teamwork among international Agriculture Research Centers (IARC), and their collaborators in both developing and more developed countries. We are continuing to support the IARC's and other national and regional efforts. But, in planning for the future, we had to evaluate the

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major constraints to achieving the Agency's food and agriculture development assistance objectives and from these we have developed the following priority areas of special concern:

1. sustained high productivity in relatively favored natural resource areas;
2. increased production in less-favored natural resource areas;
3. crop and animal protection (Pre- and postharvest) by most cost-effective and enviromentally acceptable means;
4. livestock in mixed range and farming systems;
5. food and agriculture policy;
6. institutional capability to generate suitable technologies and to get them applied.

Within the framework of these six crosscutting concerns, the following research categories and topics were identified:

1. New technology will continue to be developed through the IARC network, through the Collaborative Research Support Program (CRSP) and through the centrally-funded research activities;
2. Priority research supported by Regional Bureaus and USAID country Missions will concentrate on technology development and adaptation to resolve specific host country agricultural development problems;
3. Special effort will be made to link and coordinate research funded by the Regional Bureaus and Missions with activities supported by the S&T Bureau.

The Office of Agriculture of the S&T Bureau is already working towards this strategy. I would like to mention here, as an example, the cluster of soil-related projects of the Division of Renewable Natural Resources (RNR) of S&T. In the nineteen seventies, RNR began with the institutional strengthening grants under the 211 (d) program to enable U.S. institutions to strengthen their capabilities to serve tropical agriculture.

Several U.S. universities joined together to form the Consortium of Soils of the Tropics. The Benchmark Soils Project (BSP) of the Universities of Hawaii and Puerto Rico was one of the major projects under this program. BSP immediately adopted the network approach in its work and established the fact that the Soil Family category with additional site information could serve as a reliable basis for agrotechnology transfer. The work by North Carolina State University and Cornell University showed us how to manage some acid soils. The Soil Resource Inventory project by Cornell University also highlighted the deficient nature and poor quality of soil resources information in LDC's.

The next logical step was to involve LDC institutions in research efforts, and this is being achieved through the Title XII CRSP soil-management activities. Agronomic research will be of little use if the information is not transferred to the small farmer. Consequently, as a result of the previous work, the Soil Management Support Services (SMSS) project was established in collaboration with the Soil Conservation Service of USDA to assist countries in soil survey and classification and to enable them to use Soil Taxonomy—the U.S. system of soil classification—which serves as the vehicle for transfer.

Agrotechnology transfer

The Benchmark Soils Project has defined agrotechnology transfer as the taking of an agricultural innovation from its site of origin to another site where it is likely to succeed. To succeed in the new location, the innovation must be technically sound, economically feasible, socially desirable and environmentally safe. These are brave words and it is evident that traditional research approaches are inadequate. The concept calls for a systems approach to agriculture development; it calls for cost-sharing; it calls for multi-disciplinary teamwork; it calls for cooperation and collaboration; and, more importantly, it calls for radical changes in our thinking.

Nix (1968, 1979), Swindale (1979) and Gill (1979) have all written about the conceptual basis for agrotechnology transfer. Based on these concepts and the success of the other programs a new project was initiated in October 1982. This project, implemented by the University of Hawaii with collaboration from the University of Puerto Rico, is the International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT).

IBSNAT, as I see it, is a challenge; it is a promise; it is an innovation; it is an opportunity; and I think it represents the direction that should be taken. IBSNAT is a challenge because the approach is original and unique. It is a promise because, if successful, it will be one of the more cost-effective ways of assisting developing countries. It is an innovation because it utilizes artificial intelligence for food production; it is an opportunity because we have been looking for a breakthrough in our efforts to improve food and fiber production in developing countries, and it is the direction to take in agricultural research because it involves networking, collaboration and cooperation.

The primary objective of IBSNAT is to develop a method for the transfer of agroproduction technology that combines elements of transfer by analogy with systems analysis and computer simulation techniques. Hopefully it will:

- accelerate the flow of agrotechnology from its site of origin to new locations.
- maximize the successes and minimize the failures in the transfer of agricultural technology in the tropics and subtropics; and

- access the long-term effects of agricultural practices on the soil resource.

Although funded by AID and implemented by the Universities of Hawaii and Puerto Rico, IBSNAT does not belong to anybody, and I believe this is the spirit with which it has operated. The challenge is so great, the task is so big and the need is so urgent that, of necessity, it is a multi-national effort.

We are fortunate that much of the groundwork in modelling has already been laid by scientists around the world, particularly the Agricultural Research Service of USDA in Temple, Texas, and CSIRO in Australia. The IARC's and other regional and national institutions have accumulated considerable experience and information on crops. SMSS, through its technical assistance activities, has helped to create an awareness of the need for better and more soil resource inventories in developing countries. IBSNAT, then, becomes the nucleus to collate all this information, derive the minimum data sets to drive the models and assist collaborators to validate and later utilize the simulation models.

Networking

Basically, an international network is inter-country teamwork in the larger sense of the term. Because AID is involved in technical assistance and research all over the world, the term network has a special meaning to us.

Problems in agriculture are often common from one country to another. Research to solve some of the common problems is also taking place in many of the countries. Our task is to help these countries develop a collaborative mode which will make their research more cost-effective, will reduce duplication of experiments and will disseminate research information so that scientists are continuously kept abreast of the research findings.

In the Agency, we are recommending the development of common theme networks which utilize "ribbon" or "linkage" projects to stimulate inter-country collaborative research. The escalating cost of research, the lack of research facilities in developing countries, the benefits of linkages of scientists and institutions along with the need for multi-disciplinary approaches are the motivating forces in our common theme network concept.

The fundamental question confronting my Agency is: How can we make our research efforts in the developing countries more efficient? Our present answer is networking, but we still need your assistance to determine the operational aspects of a network.

What is the most efficient way to develop a network so that the benefits reach the most people, so that the limited funds are judiciously used, so that the work of each collaborator adds to the pool of the network, so that every scientist retains his/her identity but at the same time benefits from the network as a whole, and so that others who are not part of the network can also benefit?

The Benchmark Soils Project is an example of a successful network. But, its success stems from the fact that there was central control of funds and activities. Collaborating countries received financial support to participate.

The International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT) is taking a totally different approach: it is requiring collaborators to invest in the effort. Can this work? The success of such an approach depends on the financial capabilities of collaborators and their belief in and commitment to the effort. This, in turn, will be determined by the degree to which the developing country collaborators are intimately involved in the planning as well as implementation of the project. The Soil Management Support Services has successfully shown that this is a viable approach.

More and more international institutions are adopting the network approach for similar reasons. The International Agriculture Research Centers (IARC's) each have their own networks. The International Network on Soil Fertility and Fertilizer Evaluation for Rice (INSFFER) network, coordinated by IRRI, is a familiar example to most of you. In addition, IARC's are also considering pooling resources for common themes. At a recent meeting of Directors of IARC's at Addis Ababa, a proposal was discussed to collaborate on defining agro-ecological zones and the systems approach to research.

I am more than ever convinced that, for our objectives, networking is the direction to take. This is one of the reasons why the IBSNAT project is so exciting to us in the Agency. IBSNAT is a prototype network which has many of the ingredients for success. But, the achievement of success depends on the degree to which you do your job. The particular advantage of the IBSNAT approach is that each one of you only has to make a small contribution, but the rewards you receive are tremendous.

IBSNAT and developing-country cooperators

The networking approach is applicable not only for international work but also on a national level. I was particularly impressed to hear of the Soil Capability Assessment Network (SCAN) of the Soil Survey of Pakistan and the Soil Capability Evaluation Project (SCEP) of the Department of Agriculture of Fiji.

Both are based on the Benchmark approach and both are now collaborating with IBSNAT. I have also been informed that there are efforts to form an ASEAN Network (ABSNAT) and an Oceanic Network (OBSNAT). These are encouraging developments and evidence of IBSNAT's impact. Further, establishment of regional networks is one of IBSNAT's stated objectives.

I would, however, like to add a word of caution here. Soil-weather-crop simulation models are not the only

means to solve our agriculture problems. IBSNAT is not the end but only a means. The models are necessarily modular – and modules can be changed, replaced or discarded as knowledge grows. This implies continued emphasis on research and vigilant monitoring of the models. While it is rewarding to be at the forefront of technology, a computer simulation model with the capability to forecast yields or to determine management requirements has little use without quality information on the kinds and distribution of land resources in the country. Participants in this workshop must bear this in mind and work towards rectifying the imbalances which they encounter.

IBSNAT, although essentially a research project, also has a responsibility in technical assistance. The sum total of the experience and expertise within IBSNAT is probably unmatched and should be put to use for assisting developing countries. You have the capability for guiding agronomic research, for evaluating research priorities and for networking agronomic research efforts. This is perhaps the larger meaning of IBSNAT. I do, however, appreciate that at the initial stage of the project you must focus on a limited number of components.

Conclusion

I am really impressed with the list of collaborators in this network. Your contributions to the project and your commitments will go far to ensure the project's success. I would like to add that you are all pioneers in this age of information. Your efforts will reach out to test the limits of technology, and I am proud that we are partners in this effort.

In the week ahead, you will participate in long hours of discussion and information exchange. I am sure you will arrive at suitable experimental designs for the model-validation research and will pave the way for the all-important task of applying the technologies in your respective countries. Please remember that while each of your individual contributions may appear small, the pooled research results generated in the worldwide network will not only be highly significant but will impact on agricultural development throughout the world.

Finally, although I have been out of the research field for sometime, it is a privilege to be part of this joint endeavor – I wish you success.

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