The role of networks in the field of agricultural training and research

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The Role of Networks in the Field of Agricultural Training and Research

Ghazi Hariri
West Asia and North Africa Regional Coordinator, ISNAR, The Hague (Netherlands)

Networking is a new name for an old practice as people are connecting with people. However, organizational methods of collaboration have changed markedly in the second half of this century, particularly in scientific research and training.

A network is a partnership of persons or institutions who work in close cooperation towards specific goals with a sharing among them of costs, profits and results. This kind of cooperation combines resources for concerted action of greater benefit to all partners, while preserving personal and institutional autonomy.

Formal partnership can take on a legal identity in many forms, e.g., societies, associations, committees or councils. If there are long-term or permanent working relationships among the partners, the formal partnership becomes a network. A research network links together scientists and institutions to work on common interests, e.g., discipline, commodity, natural resource. The clients and sponsors of the research activities are an intrinsic part of the network.

Partnerships are not new to agricultural research and training scientists and institutions in the West Asia and North Africa (WANA) and the Mediterranean regions. The spirit of cooperation and the need to communicate are long standing among institutions/scientists in many countries of the regions who traditionally join national, regional and international scientific societies, associations, and other forms. Such grouping link their members by publications, regular meetings and conferences, and training events which promote wide and rapid distribution of information. However, much agricultural research in the region is carried out in isolation form, and often in replication of the same activities in neighbouring countries with similar agroecological conditions, and in regional and international centers working in the region.

The establishment of agricultural research/training networks between researchers and institutions to gather isolated and scattered national elements into stronger regional research/training programs, with greater chances of success and continuity, has been the object of many serious efforts including FAO Near East regional projects, e.g., field crops, rangeland management, land and water use, palms and dates, animal production and health; current UNDP-financed regional projects, e.g., sorghum, rangeland and sheep, use of water and effluent water in agriculture, aquaculture, rinderpest eradication, fruit viruses control, and oilseed crops; ICARDA regional projects, e.g., Nile Valley food legumes and wheat projects, nurseries for the evaluation of the genetic potential of cereals; food legume and forage crops and agricultural libraries network (AINWANA); participation in the international networking efforts, e.g., CIMMYT maize and wheat nurseries, INTSOY; and other regional and international efforts.

I – Definition and Types of Networks

In a broad sense, the word "network" or "networking" could mean many things to many people. Webster's Dictionary has defined "network" as "an interconnected or interrelated chain, group, or system", and "networking" as "the exchange of information or services among individuals, groups, or institutions." These definitions tend to cover the overall concept. However, agricultural research or training networks could be defined within the context of inter-country cooperation as "a voluntary association of designated national agricultural research or training institutions in different countries with the shared pur-

pose to achieve desired goals, whose members contribute resources and participate in two-way exchanges or communication to carry out joint programs of information and materials exchange, training, services, and collaborative research on a cost-effective basis".

Common missions, concerns, interests and opportunities provide the basic response for systematic group interrelations and the establishment of mechanisms to carry out joint activities. Only when shared purpose and common goals are properly identified it is then possible to bring together a critical mass of individual scientists or institutions to constitute an agricultural research/training network. However, networks should be conceived as a complementary to, and not as a substitute for, national agricultural research/training network. Thus, the networking approach brings a catalytic role to focus joint resources systematically on common important research/training topics by establishing critical mass to carry out joint activities at relatively lower cost to each individual country through gathering isolated, scattered and fragmented strong national elements into stronger regional network program which will ensure greater chances of research/training success and continuity.

Many types of agricultural research/training networks are emerging. These can be classified into five major collections of networks. Each type should display the fundamental characteristics of a two-way communication between members and the "lead" or "coordinating" member, and horizontal communication and exchange between all members. These five types are:
- **Information exchange networks** organize and facilitate exchange of ideas, methodologies, results, data and other information through various mechanisms.
- **Service networks** involve the exchange of materials and information to improve services, operations supervision, training and research.
- **Scientific consultation networks** involve participant institutions or individuals who focus on common priority research areas initiated and implemented independently by participants who hold regular meetings and have other means to exchange information on research.
- **Collaborative training networks** involve joint development and exchange of training materials and conduct joint training events.
- **Collaborative research networks** involve joint inter-country planning, implementing, and monitoring of research on problems of mutual concern to countries within a region/sub-region. These networks could include information exchange, training services, and technical collaboration.

These types may be considered the ideal goal for the region or subregion countries willing to collaborate for solving common problems in agricultural research/training. However, each type implies a greater commitment associated perhaps with greater complexity in coordination and higher costs for the fifth type.

II – Essential Features of Networks

1. Criteria

There are at least five minimum criteria for calling a joint activity a network:
- a strong and common economic interest;
- a common purpose and well-defined objectives with which all participants concur;
- a two-way communication and a horizontal flow of information;
- some commitment of resources by all participants;
- a clear contribution by the participants to the common goals.

2. Network Linkages

Amicable relationships between participants of a network greatly facilitate the exchange of information, materials, training materials and technologies among them. *Figure 1* depicts the hub-and-spoke model A (in which information radiates largely from a hub to participants, ignores upwards and horizontal movement of information as well as secondary diffusion and feedback), and true network concept models, B (with rim effect in which participants collaborate with each other as well as with the hub) and C (where

there are national/subject/subregional sub-networks). Therefore, the essential distinguishing features of a true collaborative network are the horizontal communications and exchange of views, information, and materials between its members without necessarily going through the central hub or coordinating institution.

Figure 1. Network Linkages

A
Hub-and-Spoke

B

C̄

True Collaborative Networks
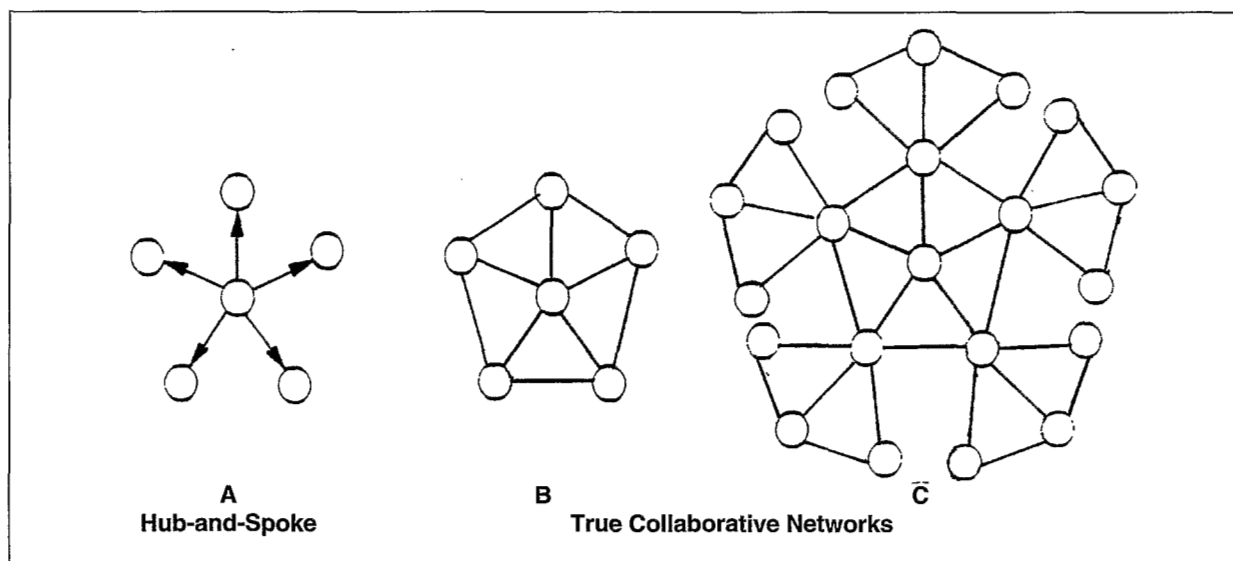
3. Time Frame

Networks are intended to be long-term arrangements likely to eventually acquire permanent status. Inter-country "networking" as a modality to implement collaborative regional technical assistance projects, however, could lead to "network structures" if sufficient attention is given in the design of projects to building the network structure and placing network mechanisms formation as central objectives.

4. Country Interest

Participatory countries initially perceive networks as primarily meeting national needs, rather than responding to regional obligations. However, mutual interest in national needs and the recognition of benefits from seeking joint collaboration serve as the driving force for establishing networks.

Benefits that national agricultural research/training systems derive from exchanges that are organized in networks could come from:
- ❑ a central-source network type where the technology sources, e.g., international and regional centers, use the network as a mechanism to carry out their programs in a hub-and-spoke exchange type;
- ❑ a regional network type based on regional intergovernmental organizations where policy makers and agricultural research/training leaders can establish a regional policy for collaboration between national and regional activities, and;
- ❑ a professional network of a scientific society type where individual scientists exchange information among them most often at a disciplinary basis.

5. Internal Generation of Network Ideas

Networks, as defined earlier, are "voluntary associations of designated national institutions". Thus, the idea to form networks should come from those institutions or, at least, be fully endorsed by them. External financial and technical assistance can play a useful catalytic role in promoting networks in bringing institutions together.

6. Self-Reliance

While external financial assistance is quite often targeted to support the early activities of already planned networks for a limited time, networks are originally planned to be entirely self-reliant later. Therefore,

networks ultimately become independent of any financial assistance coming from outside the participatory countries, and this is done through developing government commitment to networks, revenue-generating, and other means.

7. Special Advantages

Networks as a means of building research/training capacity and overcoming isolation have special advantages which consist of:
❑ promoting efficiency in sharing resources to improve the cost-effectiveness of institution activities by avoiding fragmented activities, and minimizing duplication of efforts by various participating institutions in the networks;
❑ widening the pool of expertise on each task of the network by consolidating efforts;
❑ developing symbiotic relationship between national and regional efforts by sharing country-wide activities at the regional level and by integrating regional efforts into national efforts;
❑ utilizing local experts in networks to expand the pool of regional expertise;
❑ raising the quality of science research/training by linking isolated activities to the world agricultural knowledge;
❑ enhancing external assistance, when channelled through networks, to contribute directly to self-reliance and assist in diminishing the needs for future external financial assistance.

III – Organizing and Managing Networks

Networks are intended to be long-term arrangements in organizational forms but less bureaucratic and hierarchical than institutions. Each network has its own path, either an evolutionary arising from spontaneous needs and shifting priorities or planned and set in motion from the outset (Plucknett et al., 1990).

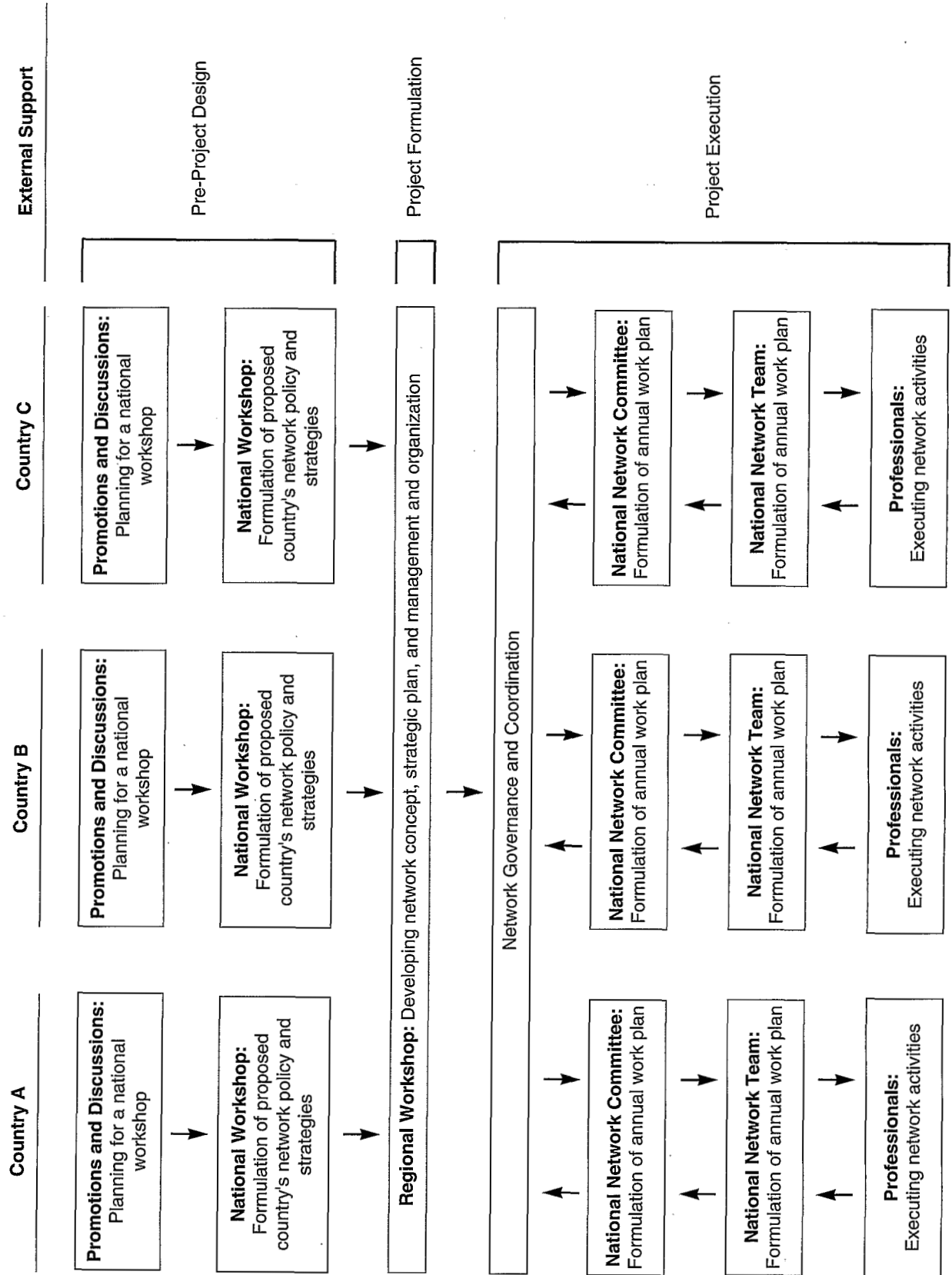## 1. Establishing and Developing a Network

Some concepts and experience gained from on-going networks suggest that the idea to form networks must come from participating country institutions, or at least be fully supported by them. Prime movers of a network have a two-fold task of both securing the interest of the potential network members, i.e., country institutions, and securing the essential funding to support the establishment of a network. External funding plays an important catalytic role in bringing institutions together to form networks.

While financial and technical assistance from external source is short-term in nature, the network is long-term. Thus, in establishing a network, the national prime movers must be dedicated to the network, and their institutions and country policy makers must be committed to ensuring that the network will continue functioning to achieve its objectives. To benefit from external assistance in establishing inter-country voluntary collaboration in the form of agricultural research/training networks, a conceptual framework is proposed *(Figure 2).* The framework calls upon country institutions and the external source assistance to simultaneously develop the network for the country institutions that will potentially participate in a regional project, with the main goal being to support the establishment of the network. Three phases for each network and regional project development could be identified. These are pre-formation, formulation and implementation of the network and of the regional project *(Figure 2).*

❑ **Pre-formation of the network (pre-project design):** In this phase, the network idea to solve important problems is initiated by either an individual scientist, the leader of a program, or the corporate wisdom of an institution. As a result of promotional activities, centering on discussions of the network approach with relevant individuals and/or institutions in the country concerned, a national meeting will be planned and held to formulate country proposed network policy and strategy. The external assistance role in this stage is to assist potential countries in promoting and discussing the idea of the network and to hold national meetings to formulate the country's proposed network policy and strategy.

In this stage, a broad-based national committee for the network is formed in each potential participating country to coordinate subsequent steps. The national committee should include policy makers and relevant program leaders and professionals. Having policy makers in the national committee

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Figure 2. Establishing and Developing a Regional Network with Support from External Technical Assistance (a Conceptual Framework)

External Support	Country C	Country B	Country A

Pre-Project Design

Promotions and Discussions: Planning for a national workshop

National Workshop: Formulation of proposed country's network policy and strategies

Project Formulation

Regional Workshop: Developing network concept, strategic plan, and management and organization

Project Execution

Network Governance and Coordination

National Network Committee: Formulation of annual work plan

National Network Team: Formulation of annual work plan

Professionals: Executing network activities

ensures that binding decisions can be made to commit government funds to network objectives and to convince them that networking will permit participatory countries to collectively concentrate resources to solve common problems between countries more efficiently.

Experience has shown that implementing this phase before the regional network formulation could assist to solve likely networking constraints.

❏ **Formulation of the network (project formulation):** At regional level, a workshop to discuss the network proposal should be held for potential participants in the network. The outcome of such a meeting is the network concept/strategic plan, and management and organization arrangements. Network governance and coordination will be decided at regional as well as at national levels. At this stage, the external assistance source will formulate its project in support of the network. The project's first aim should be to establish the network and to ensure its self-reliance in the future.

❏ **Implementing network activities (project execution):** A detailed annual work plan is developed by each national network team and committee, and then discussed and approved by the steering committee of the network. The annual workplan covers various issues within the type of network. The approved annual work plan is implemented by national institutions. To institutionalize the annual planning process at national and regional levels the following steps could be considered:
 – A meeting of each national network team is held annually in the participating country to review, discuss, and develop the annual work plan for the coming year and clearly identifies program activities and the annual budget required to implement these activities. The national team consists of all national professionals participating in the annual network program.
 – A separate meeting of each national network committee is held annually, immediately after the national network team meeting, in each of the participating countries in the network to discuss and recommend the annual work plan and its budget. The committee consists of directors of participating national institutions in the network, national coordinators, and other national members.
 – The steering committee of the network meets once or twice a year to discuss and approve the budget for the work plans for participating countries, joint activities by participating countries, and topics of common interest. It also makes recommendations for improvement. The steering committee of the network consists of national coordinators, regional coordinators and external assistance representatives.

2. Organizational Structure

There is a whole range of organizational structures for networks. These models vary according to many factors, such as level and kind of activities to be performed, and the type of linkages with various agencies, institutions and programs. However, once the strategic plan of the network has been developed, an organizational model for the network must be conceived, taking into account flexibility and minimal bureaucracy.

A. Governance structure and responsibility

Networks have several forms of governance. Most networks have a steering committee. The size of the steering committee varies according to the number of participating countries in the network.

There are few aspects of governance that steering committees should perform to ensure the success of networks:
❏ formulating policies and strategies;
❏ overseeing implementation of strategies and plans;
❏ establishing good relations between the steering committee and the overall network coordinators;
❏ managing the internal affairs of the steering committee.

B. Coordination

Effective leadership and coordination is one of the most important factors influencing the performance of a network, because of the informal structure of networks. The coordination component of the network has been called the hub or central core. It acts as a secretariat for the network and coordinates network activities.

The coordination unit consists of a network coordinator and staff, usually secretarial, but sometimes technical and professional. The coordinator, the key member of the unit, is the essential actor in any network coordination. As the network secretary, the coordinator implements the steering committee's decisions and works to link the network nodes through correspondence and visits, to provide technical backstopping to network members, to serve as a data base for network information, to organize meetings and monitoring tours, to edit network newsletters, to manage network financial resources, and to assist in implementing activities.

Effective coordinators should have good technical knowledge, good administrative ability, and the capacity to make close relations with various types of colleagues.

Most coordinators are hired to work full-time. The other extreme is a coordinator, elected by a network, who does the job part-time in addition to normal duties.

Coordination of a network could be at two levels: Overall network and national coordination, or at three levels: Overall network, sub-network (subject/sub-regional), and national coordination. The overall network coordinator is usually hired to work full-time. The sub-network coordinator could be hired to work full-time or to do the job part-time in addition to normal duties. The national network coordinator, however, does the job part-time in addition to normal duties.

The coordination component must ensure that the network's objectives and focus are clear from the start of the network. The conceptual framework proposed in this paper assists in developing effective coordination at the network governance and country participant levels.

C. Membership

The membership component of a network comprises the people, institutions, and countries associated with the network. It could include scientists and technical people, administrators and planners, non-governmental organizations, donors, national institutions and universities, and regional and international organizations. The membership component does the work of the network and receives its benefits. Thus, it is the body of the network which runs through management arrangements.

❏ Country institutions are the basic members and executing units of the network. Thus, their role in the network should be strengthened. Their programs and professionals, the main cells of any network, are constituents of the exchange matrix of ideas, guidance, program strategy, and program execution.
❏ Other participants include regional and international organizations, donor agencies, and developed-country institutions. International and regional organizations are sources for improved technologies, good promoters for outside funding for the network approach, and good central coordinating hosts, at least at the earliest stages of network development.

The promotions and contributions of donor agencies during the early stages of network development are critical and complementary to efforts provided by country participants.

On a mutual basis, developed-country institutions participate in the networking efforts with developing countries.

3. Managing Activities and Resources

The work of managing networking includes a cluster of five factors: Operational plans, coordination and communication, the work process, managing resources, and monitoring and evaluation.

A. Operational plans

Developing and implementing the annual operational plans in the context of networking was described earlier under the conceptual framework for establishing and developing regional networks. However, in integrated planning processes there are three stages: Strategic planning, operational planning, and monitoring and evaluation of program activities.

The strategy formulation for the network is a task for the countries participating in the network and the governing body of the network. In the strategy, a desirable vision of the network's future is described, essential elements of the course it intends to follow to realize that vision is outlined, and a justification for the identified course is provided. The strategy encompasses the guiding values of the network, incorporating broad policies adopted by the network's participating countries and governing body, and it reflects the vision of the network's members.

Operational planning involves making the strategy of the network operational by translating the strategic options into specific network program activities that are needed to achieve network objectives. These operational plans are prepared annually by the countries and discussed and approved by the network governing body. Those plans should be realistic to allow for successful implementation. Over-ambitious plans fail when an attempt is made to implement them.

The capabilities of a participating country strongly affect the level and type of operational plans that can be developed. Thus, network institutional capabilities—generally either weak, heterogenous, or well developed—affect the level of country participation in the network and influence the amount of input needed from an external support body. But, as a network matures, the level of external support will decline.

B. Coordination and communication

The salient feature of a network is the coordination and communication ability between its members. The communication and coordination component consists of the linkages that make a network and enable ideas, information, materials, and services to move between members. The contact devices can take many forms:
- ❏ indirect contact through correspondence by post or by electronic means, newsletters, and publications, data or materials exchange;
- ❏ coordination;
- ❏ direct contacts through visits, meetings, workshops, training sessions, and monitoring tours. Regular meetings, face to face, are considered to be essential for success in a network. The two main reasons for network meetings are to share results and information and to consider and update policies and plans.

Several mechanisms are used to coordinate and communicate network activities through various channels of a decentralized and non-authoritarian nature. Decentralization is a key ingredient in successful networking.

C. Work process

Members of the network identify the right processes for carrying out the work. However, it may be possible to have data management programs to help handle the administrative details of a network as well as to help in effectively using the data generated by a collaborative program.

D. Managing resources

Networks need resources to carry out their activities. Managing human, financial, and physical resources well is vital to maintaining the productivity of a network program and hence to ensuring continuity of support from country policy makers and external sources.

Funding of country activities within the network should come from the member countries. However, a lack of funds is usually the major constraint to the effective operation of most networks. In the case where sufficient government funds are not available, external supplemental funding should be identified through bilateral agreements with donors or through network funds. Small amounts of money can have an important effect on upgrading network activities. However, external funding should be viewed as a short-term measure. Networks should attempt to avoid dependance on external sources for funding but strive to finance their activities from their own local sources.

Human resources are the most important asset of a network. Professionals are the ones who benefit directly from being involved in a network. They are the direct input into the network and they themselves

benefit from attending network meetings, workshops, and training courses. Many networks have found that the training programs, monitoring tours, workshops, and meetings are essential to foster members' commitment to the network's guiding values and mission.

Physical resources are essential for network members to perform their activities. However, the availability of suitable physical resources varies among network members, who usually must operate with existing physical resources. Members of the network should be aware of each other's physical resources and plan their activities accordingly.

E. Monitoring and evaluation

The network should develop a monitoring and evaluation system to monitor network program implementation and to assess the outcomes of implementing strategies and operational plans.

Monitoring includes the periodic recording, analysis, reporting, and storage of data on key program indicators of the network. It primarily provides information on network performance. Data collected for monitoring will also be used for evaluating a network. Thus, monitoring and reviewing a system should be built into the network.

Evaluating a network provides data that can improve decision making on network program activities, coordination, and communication. It can also provide a justification for financial support for these components. Every network has some obligations to evaluate its activities, to identify and deal with problems before they become serious.

IV – Networking in WANA Region

A number of regional inter-country collaborative arrangements in the field of agricultural research/training exist today in the WANA region. However, in a few cases the concept of networking as a *modus operandi* to create self-reliance has been achieved in practice.

1. Regional Projects and Networking Sustainability

In relation to inter-country collaboration, regional projects could be classified to : (a) improve inter-country collaboration, (b) assist in establishing sustainable networks (network-oriented projects), and (c) improve inter-country collaboration through establishment of international/regional institutions. While collaborative activities for projects classified under (a) are of short-term nature, collaborative activities under projects (b) and (c) are long-term to permanent, with the objective of achieving self-reliance in the future.

Projects which could lead to the establishment of sustainable networks are characterized by a commitment from nationals to work jointly on some problems, with good coordination at national level as well as at regional level, an efficient governance system, commitment of the lead coordinating agencies, and establishment of network arrangements at an early stage within the project implementation.

From the review of UNDP-funded projects in the Asia and Pacific Region, a number of important lessons from the network experience were derived. These lessons are of importance for this paper. They include the following:
❑ network-oriented projects should be designed to assist in the formation and early life of networks;
❑ projects in support of networks are more successful when they place the objective of network-creation above all others;
❑ the sharing of common problems is not a sufficient rationale for a network, but the sharing of common solutions might be;
❑ projects to support the creation of networks will usually fail if the feasibility of operating the network is not clearly demonstrated in terms of development rationale, national linkages, commitment and compatibility of participating institutions, and economic benefit and cost-effectiveness;
❑ a clear and unambiguous structure, based on several possible models, must be determined at an early stage;

❏ the most successful management arrangements should be established within the network at an early stage;

❏ networks, which cannot foresee an end to dependance on external assistance, are either not fully formed, or are unsustainable in the long term;

Analysis of 15 UNDP-funded regional projects in the Arab countries has confirmed the importance of implementing the pre-project design phase before the project formulation in order to solve some networking constraints which were identified. These constraints include:

❏ lack of awareness and understanding of the networking concept among national participants in the network;

❏ incomplete survey of national institutions interested in the network;

❏ long time needed to develop a country's network policy and strategies after implementation of the project;

❏ low country commitment to the network;

❏ long time needed between project formulation and project launching;

❏ some networks are run by network coordinators and not by network country members;

❏ common activities are not well defined;

❏ projects are attempting to solve many problems with few resources at the same time, i.e., people try to do too much with too few resources;

❏ tendency by full-time coordinators and their host institutions to dominate their networks.

V – Potentials for Applying Information Technology for Networking

Information is required in a research/training institution as a key input into its activities, e.g., methods, data, techniques, but it is also an output of those activities, e.g., publications. Advances in information technology provide unprecedented opportunities for increasing the speed and reducing the cost of conducting research/training. New ways of collecting, storing, processing, communicating and disseminating information have already begun to influence the efficiency of research/training activities. New communication technology has opened new avenues for collaborative research, providing links among scattered programs.

A computer network may allow a user of one computer to use the resources of another computer. Common resource sharing services include remote login, file transfer, remote procedure call, remote job entry, and batch file transfer. These services could be one-to-one (mailing), one-to-many (mailing list), and many-to-many (computer conferencing) types.

The trend towards making more and more information easier and easier to get will certainly continue to be used to create "electronic communities"—collections of researchers in a single field who are linked electronically and who share information, instruments, software, and even computing capability (Pool, 1993). Some of the first of such communities may be the "national collaboratories". A collaboratory could be defined as "applying information technology for scientific research". It integrates people and resources in such a way that a researcher in any location could hook into the system and do his work as he needs, e.g., data, computing power, software, instruments, even other researchers (Pool, 1993).

Public data networks have been established in many countries in the WANA region. These include GulfNet in Kuwait and Saudi Arabia; PDN in Bahrain, Egypt, Iraq, Qatar, Saudi Arabia and U.A. Emirates; EARN in Algeria, Cyprus and Morocco.

Mediterranean and WANA countries' network connectivity status is growing rapidly. Many South European countries, e.g., France, Greece, Italy, Spain, and Tunisia in North Africa connect through InterNet, while Bahrain, Cyprus, Egypt, Saudi Arabia and Turkey connect through BitNet. Other countries are developing their network connectivity.

Agricultural research and training institutions in the region need to take full advantage of the opportunities offered by the information revolution. They need to examine their component mechanisms to ensure inter-institutional networking potential and information compatibility. These institutions should develop their capacities to participate as fully fledged actors in the global research/training efforts.

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