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WORKING PAPER No. 15

HUMAN RESOURCE MANAGEMENT FOR AGRICULTURAL RESEARCH: OVERVIEW AND ISSUES

PAUL BENNELL
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isnar

International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands, on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

Of the thirteen centers in the CGIAR network, ISNAR is the only one that focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on research policy, organization, and management issues, thus complementing the activities of other assistance agencies.

ISNAR has advisory service, research, and training programs.

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ISNAR WORKING PAPERS

The ISNAR working papers series is a flexible instrument for sharing analysis and information about relevant organization and management problems of the agricultural research systems in developing countries.

In the course of its activities - direct assistance to national agricultural research systems, training, and research - ISNAR generates a broad range of information and materials which eventually become the formal products of its publication program. The working papers series enhances this program in several important ways:

1. These papers are intended to be a rapid means of presenting the results of work and experiences that are still in progress, but are already producing results that could be of use to others.

2. They are intended to be an effective vehicle for widening the discussion of continuing work, thereby increasing the quality of the final products. Critical comment is welcomed.

3. The series provides an outlet for diffusing materials and information which, because of their limited coverage, do not meet the requirements of "general audience" publication.

The series is intended mainly for diffusion of materials produced by ISNAR staff, but it is also available for the publication of documents produced by other institutions, should they wish to take advantage of the opportunity.

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HUMAN RESOURCE MANAGEMENT

for

AGRICULTURAL RESEARCH:

OVERVIEW AND ISSUES

INTRODUCTION

People are the most important resource for national agricultural research. The human resources of a research organization are the primary means by which it achieves its objectives. Productive agricultural research systems, therefore, require effective planning for and management of professional researchers and their support personnel. The objective of this document is to assist agricultural research program managers and administrators at all levels in developing the knowledge and skills needed to maximize the effective productivity of these specialized human resources.

The policies and practices required for managing human resources of agricultural research institutions differ in important respects from those for many other types of public and private-sector institutions. Most notably, agricultural research is highly skill intensive, requiring the recruitment of specialists and the provision of continuous professional development. Agricultural researchers are engaged in a complex array of activities with generally unpredictable outcomes. This, plus the fact that several disciplines and sub-disciplines are involved, complicates the planning for and management of human resources and the development of an effective information system.

Agricultural researchers themselves have unique occupational needs and characteristics which have important implications for management. As potentially creative individuals, it is asserted that they have especially high expectations for job fulfillment and need considerable autonomy in deciding on and carrying out their research activities. An important responsibility of agricultural research managers, therefore, is to insure that the organization retains and effectively utilizes human resources with the specific skills, attitudes, and motivations which will allow the organizational objectives to be attained as efficiently as possible.

This document provides an overview and identifies some important issues relating to human resources management for agricultural research. Most of the material in the document is equally applicable to individual research institutions and well-coordinated national agricultural research systems (NARS).

There are two sections in this document. Section I focuses specifically on five human resource management tasks for agricultural research which can be defined as follows:

1. Planning involves the determination of types, amounts, and availability of human resource skills required for the attainment of predetermined program objectives and tasks over a specified time period in the most cost-effective manner.

2. Staffing involves the development of job descriptions and the policies and practices that relate to recruitment, selection, assimilation, and deployment of personnel.

3. Development involves the continuous improvement of the capacities of research personnel through formal education, specialized and on-the-job training, and participation in professional meetings.

4. Compensation relates to the structure of grades, promotion policies, and salary and non-salary rewards which influence the motivation and performance of researchers and support staff.

5. Evaluation includes performance planning, appraisal, and counseling which are critical to the effective management of human resources.

Section II focuses on organizational behavior factors relating to researcher motivation and interpersonal and intergroup behavior. The latter includes such management issues as leadership, team building, effective communication, and conflict management.

Appendices provide practical guidelines and sample documents for NARS managers and personnel directors. Other ISNAR documents provide NARS managers and administrators with an understanding of the rationale for and utilization of information for human resource management, including a human resource information system (HRIS).

SECTION I - HUMAN RESOURCE MANAGEMENT TASKS

Human resources can be described as a sub-system within a larger organizational system. The human resource system within a national agricultural research institution or system includes the quantity and quality of its research staff and the organizational framework governing its behavior.

This section reviews the tasks required to plan and manage a human resource system for agricultural research. Figure 1 illustrates the planning and management process for a human resource system. It shows an iterative process that begins with three inputs: research objectives, available operating resources, and the current state of human resources. The manager first measures the available human resources against research objectives. Then, decisions are made in the planning stage to modify the human resources, within the available operating resources, so that the research objectives can be met. Management decisions are made and then implemented in the areas of staffing, development, compensation, and evaluation. At the end of the management cycle, the human resource system reflects the changes that have resulted from management decisions. The modified stock of human resources becomes an input into the next planning cycle.

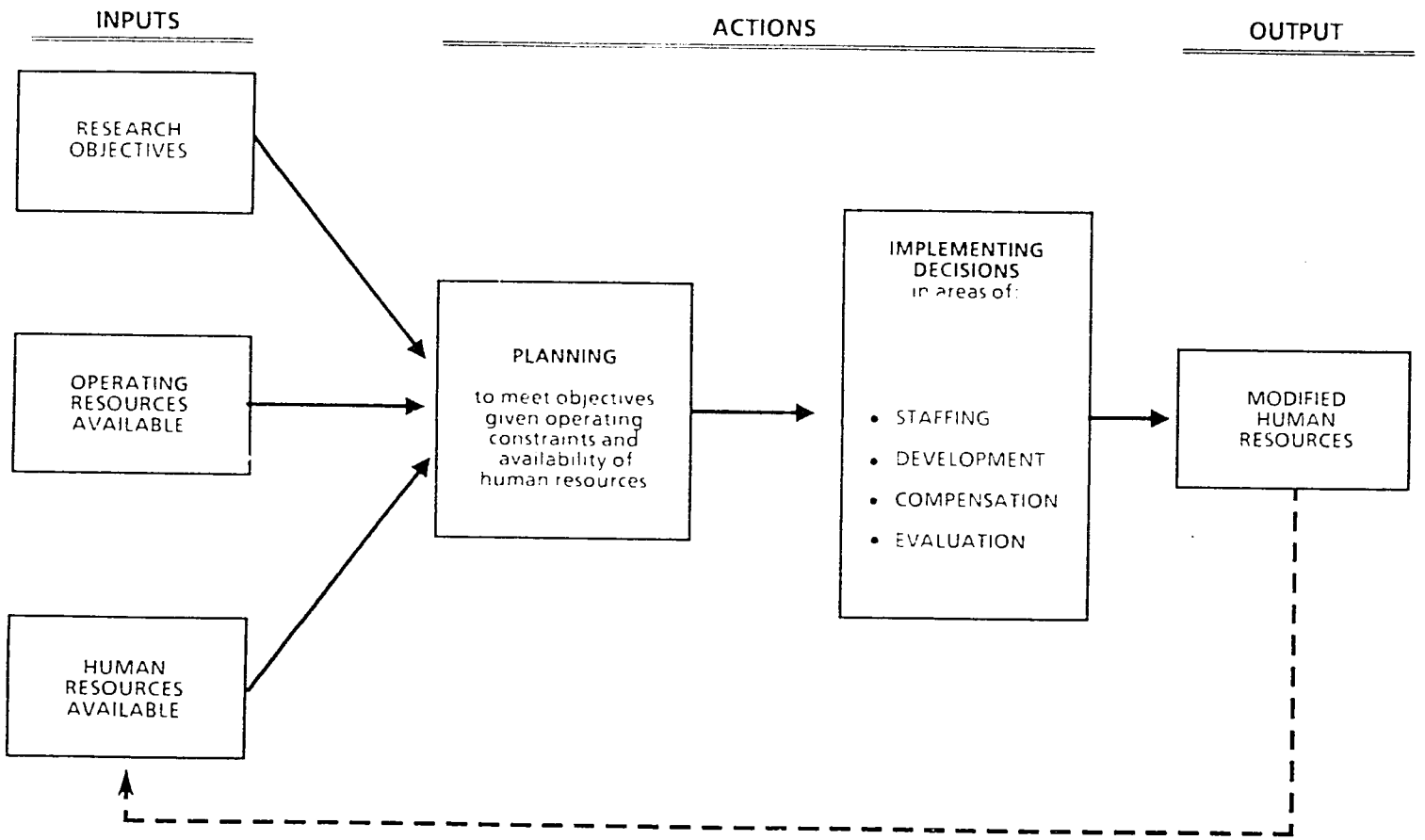
1. PLANNING

Human resource planning involves the analysis and determination of the types, amounts, and availability of personnel required for the efficient and effective attainment of organizational and program objectives. This activity allows research managers to assess where their organizations are and should be going in terms of human resource availability and utilization. The main products of this planning activity are realistic strategic and operational plans. The longer-term strategic plan may include, for example, the strengthening of the training capacity of the institution or proposed changes in personnel policies to appropriately reward research staff. The operational plan may include changes in personnel recruitment levels, redeployment of staff, or implementing a performance planning and appraisal system.

Human resource planning has not been a rigorous activity of many NARS, particularly those that are young and experiencing rapid growth in a relatively short period of time. Several factors which contribute to the lack of comprehensive human resources planning are: (1) a low level of overall program planning for the NARS, (2) lack of control over personnel recruitment, (3) excessive program and personnel fragmentation due to the nature of the system or to heavy reliance on donor projects, (4) rigid civil service regulations which reduce options for personnel deployment and rewards, (5) limited human resource planning expertise, (6) an inadequate human resource information system, and (7) a heavy reliance on donor funding for staff development.

Human resource planning is integral to the overall program planning process. The primary reference points for human resource planning and utilization are organizational goals and objectives and research program plans and priorities. It is essential, therefore, for research managers to be able to relate information about current and future staff to current and future

Figure 1: The Human Resource Management Process



commodity, regional, and/or discipline-oriented research programs. This link between human resource planning and program planning provides the basis for an effective and comprehensive research program that relates resources to national agricultural development goals.

It is important at early stages of the human resource planning process to make current and future assessments of the capacity of the research organization to effectively absorb, utilize, and manage projected levels of staff. The following are some of the factors that affect the utilization and, therefore, productivity of agricultural researchers. These factors will likely modify the projections of requirements disussed above..

- Training capacity within, or readily available to, the organization for researchers who must be trained on the job by experienced and competent researchers.

- Opportunities for university training for young, qualified staff on whom the organization depends for future program leadership. Of particular importance is the continued development and availability of basic research skills in addition to disciplinary expertise.

- Management capacity for staff direction, supervision, and monitoring. This includes management at the station, division/department, and program levels.

- Support assistance from technical and other support personnel. The number and quality of these personnel influence the number of researchers who can be employed effectively. While the needs vary considerably for different disciplines, a common overall relationship for many NARS is two technicians and three-four support persons for each researcher.

- Funds for operational expenditures is a major determinant of the numbers and kinds of researchers who can be employed effectively. Funds for operations and support personnel represent the total recurrent resources available per researcher. It is often said in developed countries that no more than 70 percent of recurrent research expenses should be for personnel. However, in developing countries where salaries are low relative to those in developed countries, but many operating expenses are priced on an international basis (e.g., imported fertilizers), such a ratio may be misleading. Under these circumstances, it would be more appropriate to establish a minimum average budget per researcher.

- Adequate facilities for agricultural research endeavors which require specialized laboratories or other facilities. Coordination of staff recruitment and facilities development is essential.

Assessment of these factors and their relevance to human resource requirements is crucial both for effective planning for the future and for understanding current management problems. Planned expansion of the level of staffing of a NARS may need to be deferred until these factors become adequate to permit the effective utilization of staff.

The human resource planning process includes three interrelated activities:

- analysis of human resources requirements (demand);
- assessment of the availability of human resources (supply);
- matching requirements to availability.

How these planning activities contribute to the development of a human resource strategy for a NARS is described below. This planning process can be facilitated by an effective human resource information system (HRIS) which is discussed in other ISNAR documents.

Analysis of Human Resource Requirements

Determining human resource requirements constitutes the "demand" side of human resource planning. Ideally, human resource requirement estimates are derived on the basis of carefully formulated national research strategies and program objectives. Effective human resource planning, therefore, is fully dependent upon the planning and programming of agricultural research activities. In other words, research managers can utilize a planning process to determine personnel needs only if they first know what they want to accomplish.

The research program should normally constitute the basic unit of research planning at all levels (institution, department, and project). Research managers, in conjunction with planners and budget authorities, determine the optimal allocation of all resources among the various possible agricultural research programs. Full consideration needs to be given to overall national and agricultural development objectives and the likely level of resources available in the future. When this is accomplished, more detailed planning is undertaken in order to allocate these resources to activities within research programs. This phase of operational planning is known as programming.

For human resources, the research planner first determines the optimal skill and discipline composition of each agricultural research program/project over a specified time period. This activity, called task analysis, also includes the determination of support personnel requirements and substitution possibilities for different sets of tasks. A considerable amount of experience and informed judgement on the part of research managers is required for task analysis.

Tasks to be performed are defined by the research program. Tasks are aggregated into jobs with job classifications and descriptions. Job descriptions may be similar for several positions (one for each staff member) in the organization. The organizational structure gives definition to the positions in relation to each other and to career possibilities in the institution.

As a research institution grows and develops, it becomes more important to analyze and define tasks which need to be performed by the four types of personnel: researchers, administrators and managers, technical support staff, and non-technical support staff. Task and job analysis allows the institution to (1) periodically review and re-define positions in relation to program objectives, (2) develop job classification systems, (3) establish specific recruitment targets, (4) establish appropriate schemes of service, and (5) evaluate performance against established criteria. See Appendix I for details on the content of a job analysis.

The core personnel of a NARS are its professional researchers. A basic measure of the current and potential future research capability of a NARS, therefore, is the level of education and training of its researchers. Preliminary data from 79 developing countries included in the ISNAR Agricultural Research Indicator Series Database show that an average of 12 percent of NARS researchers have a Ph.D. degree, 35 percent an M.Sc. degree,

and 53 percent a B.S. degree (or their respective equivalents). Given the fact that postgraduate degrees train agriculturalists in research methods, higher percentages of M.Sc. and Ph.D. staff would be necessary to effectively strengthen most NARS.

Technical support personnel in agricultural research organizations are composed of distinct groups: field technicians, laboratory technicians, station/farm managers, and support services (statisticians, information officers, librarians, computer specialists, etc.). Among them, they are responsible for carrying out the bulk of the activities undertaken by agricultural research organizations. It is important, therefore, to analyze tasks, provide appropriate career structures, and set performance standards for each of the separate types of technical support personnel. This process facilitates the determination of appropriate levels of technical support personnel required for researchers in various disciplines and at various levels in the system.

An emerging and important group of research staff are those who are involved in the technology transfer process. These may include on-farm research technicians, subject-matter specialists, and research-extension liaison staff. In many cases, these staff are affiliated with extension institutions. However, NARS are increasingly recognizing the value of such staff, and new positions are being defined within NARS to facilitate the technology transfer process. The numbers, placement, and position classifications of such staff are important issues for consideration by planners who are determining the future manpower requirements of a NARS.

Once these factors and considerations have been taken into account, it is then possible to derive approximate net human resource requirements by category of research personnel, location, discipline, and program area. Before defining the manpower plan, however, it is necessary to review the availability (supply) of research personnel and then match human resource requirements to availability (discussed in the next two sections). The final stage of the process involves a determination of absorptive capacity of the institution or system.

Availability Assessment of Human Resources

In addition to determining human resource requirements and organizational absorptive capacity, the human resource planning process also entails an assessment of the types and range of skills that are currently available and are likely to be available in the future. This constitutes the "supply" side of human resource planning.

A quantitative and qualitative inventory of currently available agricultural research personnel in the NARS is the point of departure for assessing the availability of human resources. This inventory provides information about the characteristics of the current staff of the research organization for (1) qualifications, including highest degree obtained, special training undertaken, and professional work experience; (2) allocation of staff in terms of crop, research program, discipline, function, and position; and (3) location of staff in terms of research center, on-farm/on-station, and region of the country.

An analysis of the human resources inventory, particularly over time, (1) permits the diagnosis of the manpower strengths and weaknesses of the research organization, (2) assists in the process of projecting availabilty in the future and (3) provides a basis for staff development planning with educational institutions and donors. Other ISNAR publications on information systems provide details about data requirements, analysis, and presentation for a human resource inventory.

Some NARS regularly experience high vacancy rates, particularly for researcher positions. While this may reflect the lack of availability of qualified persons to fill approved positions or rapid turnover of staff, it may also be related to the lack of allocated funds for these positions. In any case, it is important to assess the reasons behind each vacancy as part of the process of determining availability of staff for future appointments.

The future availability to a NARS of researcher and management skills depends on three primary factors:

1. Upgrading and redeployment of existing personnel. In most cases, existing research personnel comprise the bulk of human resources that will be available in the future. The previously referenced inventory of all personnel employed by the agricultural research system provide basic data. Detailed information on staff training and on current and previous work experience and activities is particularly useful here. Personnel policies which involve performance planning and assessment, reward merit, and promote internal mobility and training serve to facilitate the process of upgrading and redeployment to meet program needs.

2. Recruitment of new personnel. Researchers come not only from educational institutions, but also from the relevant national and international labor markets. Of particular importance is an assessment of the quantity and quality of all levels of trained agriculturists coming out of national technical schools, colleges, and universities currently and projected into the future. A thorough review would include an assessment of demand from competing employers. Another recruitment factor to assess is the general mobility of professionals within a country, considering political and cultural factors and civil service regulations.

3. Attrition of personnel. Attrition may come from retirements, deaths, resignations, and dismissals. Attrition levels plus estimated net growth of research personnel determine recruitment levels. The main component of attrition in many young NARS is voluntary resignations which reflect both the conditions of service within the research organization and external labor markets. In general, current trends in and levels of annual rates of attrition among different types of research personnel constitute the starting point for estimating probable rates of attrition in the future. To the extent that conditions of service are perceived to have improved relative to other potential employers, for example, future attrition rates would be expected to drop. As conditions change in related labor markets, attrition rates may be affected positively or negatively.

   High levels of demand for individuals with practical field and laboratory skills can make attrition of high-quality technical support staff high. Since research activities depend heavily on these personnel, analysis of recruitment, utilization, and attrition among these categories of personnel is important.

Matching Requirements to Availability

The final stage of the human resource planning process involves matching the estimates of skill requirements with probable skill availabilities from both internal and external sources. The planning process ultimately yields detailed information on the desired number of staff by skill level (experience) and specialization. Comparison of the desired staff with the existing staff determines the net addition to personnel. The net addition, combined with estimates of attrition, determines desired recruitment levels. The lower the estimated net growth, the more directly recruitment will correspond to attrition (i.e., replacement only). Conversely, the lower the attrition rate, the more directly recruitment will correspond to net growth. Where NARS are experiencing periods of consolidation rather than continued rapid growth, policies designed to reduce attrition will also reduce recruitment requirements.

In some exceptional cases, all proposed skill requirements can be satisfied; but, more typically, there will be shortfalls in selected categories of staff and disciplines. In some instances, these can be overcome by a reallocation of staff or changes in staff assignments in specific subject areas and/or recruitment of foreign research personnel. It is then possible to specify target projections for net additions and (using estimates of future attrition) for gross recruitment to each category of personnel and area of research specialization (discipline) for the duration of the planning period.

2. STAFFING

The planning activities described above result in overall estimates of numbers of staff required and likely to be available for the research program as projected to some future period. Through the process of staffing, the research manager builds upon the information generated in the planning process about specific tasks to be performed and the specific positions required. The research manager then seeks to operationalize plans by defining in detail job descriptions and specific recruitment targets for various categories of staff. The recruitment process includes the attraction, selection, and assimilation of new staff into the institution. A final staffing concern for research managers is the placement or deployment of staff within the organization in relation to location, linkages with other staff, and program priorities. This section focuses on these three elements of staffing.

Defining Positions

Full job descriptions identify the job in the organization, describe its purpose and activities, specify responsibilities and performance standards in detail, and list minimum and desirable qualifications for the job. The job description of an agricultural researcher would normally emphasize the following aspects of job performance (adapted from Arnon)[1]:

- inititative in recognizing new research opportunities and in proposing and preparing research projects;

- responsiveness to problems suggested by program leaders, extension workers, and farmers;

- cooperation in research teams where researcher competence is needed;
- supervision of other research staff and support staff;
- training of research and support personnel;
- familiarity with professional literature and interest in broader scientific subjects;
- planning, designing, and conducting experiments, including the collection of background information;
- analysis of results and determination of significance and conclusions;
- presentation of research results in a timely fashion in the form of a report or paper for publication;
- communication of the results to other scientists, extension workers, and farmers by the most appropriate media.

Job descriptions and classification systems (titles and grades) should be different for and responsive to the needs of administrators, researchers, technical staff, and support staff. For example, career ladders, incentive systems and task expectations are much different, and this needs to be clearly reflected in the job descriptions. Researcher classification systems normally provide for continued opportunities for advancement and recognize education, experience, and performance. Job descriptions are relatively flexible to allow for the creativity and initiative expected of professional researchers.

Recruiting Staff

The recruitment process depends upon the development of job descriptions, assurances of position approvals, and financial support from the appropriate authorities (often outside the research institution). The process is likely to be influenced or entirely controlled by central government regulations. In some cases, governments have recognized the special nature of research and provided separate conditions and recruitment regulations for scientists. In other cases, it is possible to obtain exemptions from normal regulations in order to facilitate the hiring of appropriate staff.

Ideally, a research organization should be in a position to control the number and types of personnel who are recruited. The recruitment process, then, is an outcome of the planning process which involves the matching of carefully formulated research programs with available and required numbers of qualified researchers and support staff. A rational recruitment plan must be related to the organization's capacity to provide effective training and supervision of new staff.

An initial step in the process of recruitment is the attraction of high-quality researchers who provide creativity, intellectual rigor, and long-term commitment for agricultural research. The ability to attract well-qualified staff is influenced by their availability within the country, competition in the labor market, and the conditions of service within the institution. This may require the development by the research institution of specific strategies, policies, and procedures to promote recruitment according to the staffing plan. For example, it is often possible to develop close

working relationships with the staffs of universities and training institutions. These relationships may include scholarships for promising students, collaborative research projects involving faculty and their postgraduate students, and work-study schemes. Also, it is possible to consider recruitment of staff from basic science and social science backgrounds for selective positions in the institution.

Experience and research have shown that it is possible to develop a profile of a productive researcher. Characteristics include: (1) highly qualified for the job, (2) highly motivated to performance, (3) positive orientation to job, (4) demonstrated maturity, and (5) effective interaction with others (adapted from Ranftl, pages 93-96)[2]. Many of these characteristics are intrinsic to the individual and best handled in the recruitment process. Others are subject to improvement through management decisions and policies. Management interventions such as training can be utilized for improving the productivity of those identified as having high potential for creativity, originality, initiative, and technique. This profile approach to recruitment implies that quality input has a high degree of predictive value in determining quality and valuable output.

The selection of candidates may be based on a variety of instruments and techniques which collectively provide a sufficiently accurate indication of the likely job performance of each individual candidate. Objective information will come from academic records, civil service examinations, and specialist examinations administered by the agricultural research institution. Subjective information will come from references, interviews, and the descriptive materials and publications submitted by the candidates. The involvement and comments of research personnel possessing the necessary technical competence will improve the selection process. Future evaluations of actual job performance can be used to assess effectiveness of prior staff selection procedures.

The assimilation or induction of recruited staff into the research institution is an important and often neglected part of staffing. The productivity and efficiency of staff is improved at a faster pace if the institution recognizes the need of new staff for information about (1) specific and detailed job expectations, (2) criteria and procedures for performance evaluation, (3) purpose and program of the unit in which placed, (4) the culture and doctrine of the institution, and (5) relationships and linkages with other relevant organizations (like extension). Deployment of new staff in teams with mature researchers can facilitate the process of assimilation into the institution.

Deploying Staff

The manner in which researchers and technical staff are deployed (placed) both within the organization and at what physical location will influence the productivity of a NARS. Many of the basic decisions about deployment are made during the planning process. The topic is treated here since managers implement plans and are often in the position of making the final decisions on deployment at any point in time.

The need to develop and maintain "critical masses" of researchers in terms of specialization, program size, and geographic location is of critical importance. This will permit effective inter- and intra-disciplinary interaction among the professional research staff. With increasing

decentralization of some research systems, staff interactions and collaboration associated with "critical mass" become increasingly important. Strategies for deploying on-farm research teams is of particular concern to many NARS.

It is essential that young researchers are deployed in such a manner that they receive close supervision. When there is a shortage of appropriately skilled and experienced researchers to perform this role, trainee researchers may need to be deployed in groups for more formalized in-service training. Supervisors and experienced staff may need to be trained to facilitate the early development of new staff.

Research staff must be carefully deployed in relation to research program objectives. This means that data on numbers and disciplines of full-time-equivalent staff be maintained by priority programs, whether defined by commodity, region, or other program-related focus. If research priorities define select target client groups, it is important to deploy staff accordingly. The mix of disciplines of researchers will be determined over time by the specific problems encountered and the ability to "borrow" technology.

Depending on the structure and organization of the NARS, it may be necessary for research managers to facilitate the interaction and cooperation of researchers between national bureaucracies, autonomous institutions, and universities. This is possible if the institutions involved have identified and articulated their respective roles and, therefore, the responsibilities of their staff. Where institutions have specific responsibilities for functions in an agricultural technology development system, it is particularly important that they be able to develop effective and legitimized modes of collaboration and cooperation. Linkage/interface mechanisms between organizations may be vital to staff performance in meeting program objectives.

Issues of deployment relating to personal satisfaction and special compensation of staff posted in remote locations are handled in the section on compensation.

3. DEVELOPMENT

To become and remain productive, an agricultural researcher requires both formal and on-the-job training. Agricultural research activities are, by their very nature, highly skill intensive, and many of these skills are initially acquired by formal academic training. However, if agricultural research personnel are to maintain up-to-date knowledge and skills in their area of specialization and, thereby, be able to continue to undertake high-quality research throughout their careers, training must be received on a periodic basis.

This apprentice-to-professional researcher development activity is characterized by rather specific training needs at various stages of a researcher's career. Three modes of training for agricultural researchers can be identified: (1) apprenticeship, (2) formal degree training, and (3) professional development.

Apprenticeship

As an apprentice, a new agricultural researcher ideally would receive structured, intensive on-the-job training under the specialized supervision of an experienced researcher. The purpose of this apprenticeship period is to acquire and adapt relevant skills and knowledge to the program needs of the institution and, equally important, to encourage the formation of appropriate attitudes and commitments for a productive career in agricultural research.

During the apprenticeship period, it is normal for the new researcher to attend short, intensive training courses to improve knowledge and skills. Since many NARS are small in size, these courses will often need to be organized on a regional basis involving both national and international research institutions. The apprenticeship period may last from two to three years, after which the trainee acquires professional status as an agricultural researcher. In some cases, however, formal degree training early in the researcher's career is considered to be a part of apprenticeship training.

Formal Postgraduate Training

It is essential for NARS to have a substantial core of staff with postgraduate degree training involving research. If not acquired before entry into the agricultural research institution, opportunities for postgraduate studies may be made available to young researchers early in their careers, but after a period of apprenticeship. While postgraduate degree training is essential for most trainee agricultural researchers, it is not a substitute for on-the-job training. For example, the necessary skills and attitudes needed for collaboration with farmers are acquired primarily by working intensively with farmers themselves. On-the-job training prior to postgraduate study is preferred, since it helps provide a relevant context for specialization in the degree program.

Postgraduate degree training within the country is preferable in fields where standards are adequate, since the relevance of the training is potentially high. In many cases, NARS have developed strong relationships with universities to influence the content of this training and to collaborate in the research required for the degree. In a few countries, NARS have initated and established their own postgraduate degree programs, often with at least the nominal participation of a university.

As a consequence of the limited postgraduate training capacity in the main agricultural science disciplines in many countries, however, large numbers of agricultural researchers with postgraduate degree training have attended overseas universities. In planning for staff to enroll for postgraduate degrees abroad, it is important that NARS managers to be aware of and deal with several critical issues:

- Relevance. Postgraduate programs in developed countries may lack sufficient relevance for students who wish to work in tropical environments. Similarly, research theses and dissertations may be based on topics that are of little direct or indirect value to research priority areas of the NARS.

- Specialization. A sound scientific education is necessary to prepare researchers to face future problems. However, staff with narrow specializations may not be suitable for research programs in the many situations where broader-based knowledge is required. This, then, can eventually reduce the capacity of the organization to understand and deal with priority agricultural problems. A high degree of specialization involving sophisticated equipment and large teams of support personnel may be inappropriate to country research needs and may be difficult to support over time.

- Diversification. To prevent inbreeding" of human resources and widen the base of methodology in a NARS, it is important to utilize several educational institutions for degree study. This point was made by one NARS manager as follows: "Ideally, students should be sent to as many countries and universities as possible so that in the end a weakness from one institution will be complemented by a strength from another."

- Selection and sequencing. Projects, seniority, and other factors often influence the timing and selection process. However, research managers need to view degree training and develop training plans in the context of overall organizational development and program goals. Persons selected for overseas degree training opportunities would normally be those with excellent qualifications, commitment, and promising careers in agricultural research (merit based). Ideally, researchers would begin advanced degree training after an apprenticeship period, but before mid-career.

- Duration and cost. Agricultural researchers have typically had to spend relatively long periods overseas in order to obtain their postgraduate degrees (a minimum of two years at the master's level and another two-four years at the doctoral level). The duration is even greater when instruction has been in a foreign language or when students have had to repeat courses as remedial or preparatory training. The cost of overseas postgraduate training is also an increasingly important issue. In recent years, total annual costs have been in excess of US$ 20,000 at most universities in Europe and North America.

- Re-entry. The process of re-entry and adjustment to culture, environment, family, and job is often underestimated. NARS managers need to recognize this process and develop reorientation activities to facilitate the reassimilation of trained staff into the institution. On this point, a NARS manager says, "The issue of re-entry after a period of study overseas is never taken seriously; and yet, it is important because it could lead to wasting of resources when officers conduct research of little practical importance."

Recognition of these problems with overseas postgraduate training has led to improvements and alternatives in recent years. Some research institutions have developed "special relationships" with one or more overseas universities involving links with teaching and research personnel and, thereby, providing the basis for more effective and relevant training. Provisions have been made by donors, universities, and research institutions for some degree candidates to return to their national research organizations in order to collect data for dissertations and theses on priority research topics. Another approach is where one student completes some of the required coursework at an overseas university and the remainder, including the dissertation or thesis, at a local

or regional university. In the longer term, this strengthens regional and national postgraduate training capacity while at the same time it responds to issues of cost, relevance, and over-specialization.

Professional Development

Appropriate training opportunities throughout the agricultural researcher's career are necessary not only for maintenance of technical and scientific competence, but also to sustain motivation and productivity. Through these opportunities, agricultural researchers (especially those who work in small groups and are geographically isolated) are able to maintain essential contact with other researchers and with the international scientific community in general. The need for specially arranged contacts with other researchers becomes increasingly important as the researcher gains in experience and maturity.

This in-career training may take a variety of forms, ranging from more formal and structured events (such as national and international short courses, conferences, seminars, workshops, and professional meetings) to more informal activities (such as study tours, special assignments, and contact visits to other research institutions). Each has its strengths and weaknesses, depending on the objectives and needs of the professional. It is important that research managers meet with researchers periodically to assess needs and plan or identify in-career, professional activities to meet these needs utilizing the most effective forms of training possible. Ideally, planning for professional development is part of an overall NARS planning process and occurs during the performance planning and appraisal process (see section 5).

The two most important decision criteria for researcher involvement in professional development activities are the priority goals and objectives of the research program area and the specific needs of the researcher in responding to these priorities over time. Practical considerations in the decision include the availability of financial support (particularly for international activities), the ability to launch appropriate training activities within the country (relevant where needs are specific and highly technical), and overall staff workloads. With the increased availability of international short courses and donor support for international training in some countries, research managers need to develop the capacity for careful planning and evaluate the utility of these opportunities to their institution. This will avoid distortions in staff development caused by well-intentioned, but uncoordinated outside influences.

Researchers with current or planned substantive management responsibilities should receive both general and specialized management training in order to develop appropriate skills and commitments. Agricultural research is relatively management intensive with typically 10-15 percent of researchers having significant management responsibility. Research managers are often young, with limited research experience. Also, they tend to be the most talented researchers who, in the absence of a "dual-track" career structure, are forced upwards into management positions. As a consequence, many are ambivalent and unsure about their roles as managers. Few NARS managers have received any formal training in either management or agricultural research management. Hence, well-designed and carefully targeted management training programs will help considerably in creating a more competent, professional cadre of agricultural research managers.

4. COMPENSATION

Compensation schemes (also referred to as conditions of service) relate to the structure of grades and positions, promotion policies, and salary and non-salary rewards. The retention, motivation, and performance of well-trained agricultural research staff depend critically on compensation policies and procedures. While agricultural research managers are not always in a position to make effective changes in policies and procedures for compensation of research staff, several options for improvement may be within the legal and policy framework of NARS.

A number of common problems can be identified in relation to grading, promotion, and reward structures for agricultural researchers. These problems stem from the fact that most agricultural researchers are subject to the same terms and conditions of employment that apply to all other professionals employed in the civil service. Public-sector compensation policies and practices are of central importance to all governments, both economically and politically. Civil service and finance units are often reluctant to make even minor changes unless there are compelling arguments for treating agricultural researchers differently from other groups.

For many NARS, strategies for improving productivity may not be successful unless there is significant improvement in compensation for researchers and key categories of support personnel. Salaries and other benefits need to be competitive with other professionals in the public sector as well as (ideally) with those in the private sector. This is not only true for apprentices in the early stages of their careers, but also for experienced research personnel.

Most civil service systems have promotion policies that favor seniority over merit. The absence of regular, objective assessments of on-the-job performance in determining financial rewards has been a major factor in stifling motivation. In many cases, this results in continued high rates of attrition of young promising staff and seriously impedes efforts to build up cadres of experienced and productive researchers and technicians. The value of investments in human resource planning and training is considerably reduced under these circumstances.

Studies of NARS have shown that there often is only a relatively small income differential between starting salaries and the highest attainable salary levels (usually the latter is less than 2.5 times the former). Often there are only a limited number of major promotion opportunities during the career of a researcher, and existing promotions are generally not associated with significant increases in income. In some organizations, researchers reach the highest attainable grade and salary level relatively early in their careers and have limited prospects for further advancement unless they become managers.

Guidelines

In order to provide attractive career opportunities for agricultural researchers, a well-designed grade, promotion, and payment system would have the following characteristics:

- Compensation policies are simple in concept and design. It is important that policies be easily understood by all employees and be implemented by management in a straightforward manner.

- Grades and salaries are based on (1) detailed job analysis and evaluations to determine the "size of the job" according to skill, knowledge, and responsibility requirements; and (2) national salary and compensation surveys of similar jobs and occupations (where compensation includes other than direct salary, it is important to evaluate the magnitude of these non-salary benefits for comparative purposes).

- Job titles allow both colleagues and outsiders to readily identify the seniority, position and, hopefully, competence of the individual. More importantly, they help the researcher to have a clear sense of career progression. Appendix 2 provides a sample grading scheme showing titles and responsibilities over a career of an agricultural researcher.

- Promotion and financial incentives are provided throughout the entire career of a researcher. This implies the existence of regular opportunities for promotion and significant percentage increases in compensation.

- Promotion criteria and requirements are well specified and place primary emphasis on demonstrated job performance. Where appropriate, adequate recognition is given to the attainment of job-relevant qualifications. Seniority criteria generally play a limited role, and promotions do not depend on the availability of vacancies in any grade category or job level.

- Accelerated advancement possibilities are provided for specially competent and highly motivated researchers who have made exceptionally valuable contributions to research programs. Without this flexibility, it is likely that such "star performers", who normally play such important roles in scientific research, will leave to take up more attractive employment opportunities elsewhere.

- The income growth curve corresponds to the underlying relationship between the experience of researchers and the level and rate of growth of individual productivity. Normally, this curve will rise relatively slowly at the outset of the research career. more rapidly once the professional apprenticeship period is completed, and more slowly again during the latter career stages. Appendix 3 provides sample grades and salary indexes which utilize this principle.

- Dual career ladders are designed to provide able scientists who wish to remain in mainstream research with the opportunity to attain the status and salary levels of senior management.

- Teaching and consultancy assignments are encouraged for mature scientists within a policy framework specifying amount of time and the relationship to normal responsibilities. However, employees are not, as a rule, permitted to engage in regular (part-time) income-earning activities outside of their normal employment. Such activities often give rise to conflicts of interest and tend to adversely affect the amount of time and commitment researchers devote to their work.

Implementation Possibilities

Since civil service systems can impose constraints on the development of desirable compensation schemes for agricultural researchers, NARS may consider the following alternative possibilities to improve the situation:

- Organizational autonomy. In a few cases, NARS or parts of NARS have been able to establish sufficient autonomy to devise their own personnel policies, including compensation schemes. In recent years, some have become semiautonomous foundations.

- Researcher classification system. In several countries, a special classification and compensation scheme has been established for all scientists, built around several of the above guidelines. This enables researchers to remain in regular government agencies while recognizing the factors which are needed to retain and motivate them for agricultural research. The results of salary surveys of other professional and technical groups in public and private sectors is then used to present the case for across-the-board increases in salaries and benefits for researchers and support personnel.

- Selective policy changes. Another approach is to focus on making selective changes to existing grading, promotion, and salary policies, some of which would have only limited cost implications. This approach may include: improvements in evaluation procedures, extended salary scales, dual-track career structures for researchers and research managers, improved salary and non-salary allowances and fringe benefits, awards for exceptional performance, and a modified grading structure.

Non-salary Benefits

In addition to salaries, NARS provide research staff with many other payments and non-monetary benefits. Payments are often made for per diem allowances, transportation, housing, education of children, etc. Also, government policies often directly provide health benefits, retirement (pension) plans, and life insurance. While these policies may be established for all civil service personnel, their application is often conditioned by the circumstances of the NARS and donor-funded projects. In some cases, NARS have been able to obtain exceptions to civil service policies to respond to their unique circumstances.

The very nature of much of agricultural research requires residence in rural areas, often in relatively remote locations. This poses a serious problem for research managers in their attempts to provide incentives to motivate researchers who may, by virtue of education and acquired status, prefer to live in or near a metropolitan area. To address this problem, it may be necessary to provide adequate housing, transportation, medical facilities, and schooling for children, as well as recreational opportunities. Given the prospective difficulties in making available some of the amenities cited above (e.g., medical care and schooling), it may be necessary to reward those scientists working in remote locations with disproportionately greater training and promotion opportunities. Further, it may be necessary to implement a long-term staff rotation scheme, both to insure adequate staffing for remote field stations and to ensure that experience at such stations is part of the career development of each researcher. Care should be taken to minimize problems of program discontinuity in any rotation scheme.

Where salaries and normal benefits are not sufficient to attract and retain high-quality researchers, special forms of compensation are often devised or applied. These range from liberal interpretations of per diem policies to the provision of honoraria for involvement in research projects. These payments may be necessary and are useful where the civil service system emphasizes seniority instead of merit and as a selective means of encouraging and rewarding productivity. Under some circumstances, these payments have the potential for abuse and may encourage the proliferation of marginal, low-quality research activities. It is important that such policies be managed carefully and reviewed often for impact on the quality of the research output.

Another mechanism, which would both motivate staff and improve the quality of performance, is the introduction of a system of limited supplements, bonuses, or special awards based on exceptional performance alone. The system would need to include specific performance criteria which would not discriminate against staff in any discipline or function.

5. EVALUATION

Effective human resource management requires periodic staff evaluation. This is normally accomplished through the establishment of an appropriately designed performance planning and appraisal system. In practice, evaluating the performance of technical and other support staff has been more common and acceptable than evaluations of researchers and administrators. There is a natural reluctance on the part of researchers to allow administrators or peers (particularly those from other disciplines) to pass judgement on qualitative or quantitative aspects of their work. Despite this, there is growing acceptance of the need for an effective performance planning and appraisal system for agricultural researchers. As one NARS manager declares, "Absence of regular assessment of on-the-job performance in determining financial rewards has stifled motivation alright, but the result has been not so much high rates of attrition of staff (usually there is no alternative employer), but a general malaise or apathy."

Measures of Performance

Quantitative measures of performance for agricultural researchers are difficult to establish and maintain. This is due to the range of activity from basic to applied to adaptive research as well as to the characteristics of output from the various disciplines. This is further complicated by the fact that actual performance of a researcher may be influenced as much by resource and facilities availability and reward and promotion systems as by the individual's ability and output.

The most common measure of performance of reseachers is publications in professional journals where, in some cases, the more senior the staff, the more publications are required. However, this may not be entirely appropriate for those involved in important adaptive research activities. In the extreme, excessive reliance on "scientific" publications may effectively direct research output away from meeting critical needs of farmers the system is

designed to serve. Other quantitative measures of performance may include reports issued, recommendations made and accepted by client groups, and number of projects in which the researcher is engaged. All fall short of providing meaningful and appropriate measures of researcher performance.

Because agricultural research is relatively non-repetitive, requires creativity, and has unpredictable outcomes, the evaluation of researcher productivity is better suited to qualitative assessment. The beginning point for this is the program plan and the corresponding plan of work for the researcher. It is important that personal goals be compatible with organizational goals. Once this is established, it is possible to define tasks and to establish a reasonable time frame for their completion. At the time of annual performance reviews, research managers can review output with respect to time involved, relation to task requirements, use of effective research techniques, problems/errors, impact, etc. Over time, NARS managers can establish and communicate a set of expectations for researchers that will be understood throughout the organization.

Performance Planning and Appraisal

Performance planning for the researcher is analogous at the individual level to the organization's macro-level program planning activities. Similarly, performance appraisal is a component of program monitoring and evaluation.

The process of performance planning involves: (1) a prior and periodic elaboration of individual goals to be achieved in relation to program goals and (2) the establishment of criteria by which specific aspects of researcher goal achievement can be measured.

Performance appraisal involves a periodic and mutual assessment of actual performance in relation to desired (planned) performance. It offers the opportunity to review researcher, management, and organizational factors which may influence staff performance.

Well-designed personnel performance planning and appraisal systems serve the needs of both the organization and individual employee. From a management perspective, a personnel appraisal system provides essential information for planning the future use of human resources. The system forms the basis for informed decisions about future training activities and about the allocation of financial and other rewards to employees. With regard to the individual employee, a well-designed and implemented personnel appraisal system is of decisive importance in maintaining and improving motivation. It provides regular feedback information on job performance, indicates how performance might be improved in the future, and generally creates a favorable environment in which individuals are able to discuss their personal growth and development in the organization. A sample form for performance appraisal is shown in Appendix 4.

The following are characteristics of effective performance planning and appraisal systems:

Specific and accurate. Effective performance planning and appraisal systems are based on clearly specified and measurable performance standards and indicators. Only those activities that are important for successful job performance are taken into account. Other characteristics, most notably the personality traits of the individual that are irrelevant to job performance, are excluded from consideration. Similarly, only the actual work done is to be evaluated, not the potential for work yet to be done. The starting point of the process is mutual agreement by management and the employee on the employee's job description and on performance goals to be achieved. The different aspects of job performance are clearly delineated, separately assessed, and then combined using a common weighting system.

- Reliable and consistent. Once appraisal techniques and methods are determined, effective appraisals produce consistent measurements of performance both among individuals and over time. Appraisals typically rely on both objective and subjective performance ratings. The need for reliability and consistency becomes greater as dependence on subjective estimates of performance is increased.

- Practical and simple. It is important that the appraisals be kept as simple and practical as possible, with a minimum of paperwork. Personnel appraisal systems can quickly become overly elaborate and complicated. When this happens, both management and employees face considerable difficulties in understanding the concepts and procedures involved, and the whole process becomes time consuming and prone to breakdowns.

- Regular and routine. Personnel appraisals, undertaken on a regularly scheduled basis, usually satisfy both management and individual needs. In practice, effective communication is unlikely to be maintained unless formal appraisals are completed at least once a year. For effective management, informal day-to-day contacts and interactions are also used for feedback on progress of staff towards individual and program goals.

- Participatory and open. Effective personnel planning and appraisal systems are based on a high level of direct participation by employees in the appraisal process. This normally takes the form of appraisal interviews with superiors who have the best direct knowledge of the employee's past performance. Past perfomance is discussed in a frank and open manner, and goals for future work, as well as strategies for performance improvement, are established. Such a system is dependent upon a high level of acceptance by employees. There are some situations where comments from the individual's own colleagues and indirect feedback from client groups can be helpful in the appraisal process.

- Integrated with rewards. Personnel performance planning and appraisal systems are most effective when job performance is closely linked to individual rewards. Without such an association the appraisal process becomes of marginal value and importance to both management and employees.

- Relevant and responsive. Performance planning, appraisal, and rewards for the individual must be directly related to program plans and objectives of the NARS. For example, if program goals require more client orientation, individual plans and evaluation criteria need to be responsive in terms of research activities, procedures, and locations. In such a case, the performance plans and the reward structure would encourage publications for extension workers, and personnel policies would provide sufficient incentives for living and working in remote locations.

High levels of responsibility and commitment throughout the management hierarchy are necessary for personnel planning and appraisal systems to be effective. In practice, many managers are reluctant to be critical of colleagues as subordinates in a merit-based system. Consequently, there are often strong tendencies toward excessive leniency in rating employees and/or excessive bunching of evaluation ratings within a narrow range of values.

Managers can be taught to evaluate personnel performance. Critical skills include the ability to (1) be an "active listener", (2) empathize and communicate effectively with subordinates, (3) be supportive rather than excessively critical, and (4) develop short- and long-term plans for individual improvement. In general, appraisal systems are most effective where managers have a basic understanding of researcher motivation and the socio-psychological aspects of job behavior and performance.

An effective performance planning and appraisal system requires a capacity for employee counseling. Continuous interaction between the researcher and program managers will facilitate performance consistent with program goals and norms within the institution. Where there are difficulties in reconciling program and individual goals and problems arise between researchers, counseling by someone other than a supervisor may be required. NARS are well served to identify a senior person who can serve to resolve conflicts and assist staff in achieving job satisfaction.

SECTION II - ORGANIZATIONAL BEHAVIOR FACTORS

A primary task of research managers at all levels is to create the appropriate policy, technical, and social environment within their organization that facilitates the effective and efficient performance of research personnel within a NARS. Performance is normally viewed as effective if it corresponds to and achieves organizational objectives and efficient if it achieves the highest research output possible from the combination of resources and knowledge at its disposal. An understanding of the social structure of the research system and the values of researchers is basic to the task of improving personnel and organizational performance.

As stated in the section on evaluation, the performance of agricultural research personnel is sometimes difficult to define and certainly difficult to measure. Managers who understand the factors which motivate their research personnel to improve their performance will be in a good position to influence and improve the overall productivity of the organization. Management for research and development activities requires a balance between flexibility to encourage creativity and direction to ensure that organizational and program goals and objectives are served.

Researcher performance can be improved by the effective execution of the five management tasks described in the previous section. There are, in addition, several organizational behavior factors which influence researcher performance and for which research managers can develop and improve their capabilities to handle. The first is to understand researcher motivation. The second is to manage interpersonal and group behavior through effective leadership, team building, improved communication, and conflict management.

1. RESEARCHER MOTIVATION

What motivates agricultural researchers varies from culture to culture and organization to organization. There are, however, some concepts which are useful for review and evaluation by all NARS managers, since they are common across cultures and organizations. Many of these concepts are embodied in the Maslow theory of human needs and the Herzberg theory on motivation. Maslow's theory states that individuals will behave in such a manner as to meet a hierarchy of needs from the basic to the more complex. According to the theory, the order of human needs is as follows: physiological (survival), security (safety), belongingness, self-esteem, and self-actualization.

Herzberg's theory looks at motivation from the standpoint of job context (environmental factors) which may cause dissatisfaction and job content which relates to satisfaction of research personnel. The former, called hygiene factors, includes: company policy and administration, supervision, working conditions, interpersonal relationships, money, status, job security, and effects of the job on a researcher's personal life. The latter, called motivators, includes: achievement, recognition, work itself, responsibility, advancement, and professional growth. Within a NARS, it is important for managers to evaluate the importance of these satisfiers and dissatisfiers in order to improve performance of human resources.

Based on past and current research, there are several important motivation requirements which influence the behavior and performance of agricultural research personnel. These may be placed in the following categories for consideration and appropriate action by NARS managers: personal, administrative, professional, and organizational. Each of these motivation requirements or factors can be assessed for both importance and adequacy within the research organization.

- Personal. Personal motivation factors for agricultural researchers combine the human needs defined by Maslow as physiological (survival) and security (safety), and the environmental factors discussed by Herzberg. For the most part, personal factors are considered to be dissatisfiers or demotivators. In other words, if they are not adequate, they have a very negative impact on performance. Included are:

  * job security
  * sufficient financial support for self and family
  * equitable financial and status rewards
  * suitable living conditions.

- Administrative. The motivation factors considered to be administrative relate to the support required to successfully and satisfactorily complete a research activity. These may be considered to be maintenance factors in that they are neither strong dissatisfiers or satisfiers. Included in this category are:

  * operating supplies and services
  * equipment and tools
  * transportation
  * experimental land
  * amount and quality of technical staff
  * amount and quality of labor
  * scientific literature/library
  * advice from experimental researchers.

- Professional. The professional motivation factors for agricultural researchers are a combination of Maslow's self-actualization needs and Herzberg's motivators. These factors are viewed as satisfiers or positive motivators for agricultural researchers. Included are the following:

  * freedom to choose research problems on which to work
  * opportunity for professional advancement
  * promotion based on merit
  * scientific recognition
  * opportunity for advanced education
  * contact with other scientists
  * freedom to publish research results
  * utilization of research results
  * opportunity to train subordinates.

- Organizational. In addition to personal, administrative, and professional motivation factors, scientists have expectations of the organization and management which influence their performance and behavior. These are also motivation factors and may include:

* scientifically trained management
* management with a reputation for scientific achievement
* organization with a reputation for scientific achievement.

How agricultural researchers perceive the relative importance of various motivational factors is critical to their performance. It is possible for NARS managers to assess both the importance and adequacy of motivational factors within their organization through surveys, staff consultations, and performance appraisals. ISNAR is currently initiating research to explore this important management area in more depth.

2. INTERPERSONAL AND GROUP BEHAVIOR

The relationships among agricultural researchers, individually and in groups, require careful management for effective individual and organizational performance. Inter- and intra-departmental cooperation is required to handle the breadth of disciplines for even a single research problem as well as for engaging the various support services and managing the diverse functions of the research process. To influence interpersonal and group behavior, managers need to understand leadership, team building, improved communications, and conflict management.

Leadership

Agricultural research organizations require a style of leadership and management which will allow a diverse group of highly trained and potentially creative individuals to work individually and together to achieve organizational goals and objectives. The style of leadership of a NARS and its various administrative and program units is dependent on factors relating to the manager (personality, confidence, values, motivations), the researchers (motivation factors, education, experience, commitment, understanding of organization goals) and the organization itself (mandate, resources, responsiveness, place in society). Many of these factors can be addressed by NARS managers to improve researcher and, therefore, organizational performance.

Few agricultural research managers have received training in management. In many cases, they are in their positions by virtue of their excellent research and, therefore, have the full respect of their colleagues. This is an important and necessary requisite for effective research management, but management skills are also required. Management training is available for both functional and process-oriented skill development. One of the most important of the process-oriented skills is the ability to manage/lead in an atmosphere which places high values on collegiality and creativity. Such leadership requires a balance between highly directive, authoritative approaches and entirely non-directive, "hands-off" approaches. While different situations may, in fact, require different approaches on the part of research managers, a participatory approach, with a concern for both the researcher and the task to be performed, has been found to be most effective.

Research managers can learn much about their own leadership styles and the perceptions of others about these styles through self-assessment exercises now available in agricultural research training programs.

Team Building

The building and management of team-oriented activities to meet program objectives has always been an important activity of agricultural research managers. In recent years, however, NARS have given greater attention to client-oriented, farming systems, and problem-oriented research. This has focused the attention of research managers on the need to build effective, multidisciplinary teams of researchers in projects involving multiple locations. In some cases, these teams have included professionals from other agencies, such as extension, and primary client groups like farmers.

The performance of researchers as a team requires careful and effective management. This includes a clear specification of tasks required for each team member, a common understanding of the objectives of the activity, a legitimization of the activity, and a reward system which encourages teamwork. The ability to manage interpersonal conflict and develop group cohesiveness is essential to achieving an effective level of performance from researchers in team activities.

Communication

Many NARS now have communication units which perform a variety of communication tasks, including the transfer of research results to client groups and funding agencies, public relations, and internal communications. The performance of researchers is dependent on a flow of information from external knowledge sources (including client groups), between and among discipline groups, and between them and managers and support personnel.

Communication within a NARS can be difficult due to the high degree of specialization of researchers, the value placed on individual thought and creativity, and a degree of autonomy often granted to units in the research organization. While it is obvious that communication cannot be left to chance, excessive communication can be time consuming and expensive. Managers can encourage informal communication through such mechanisms as periodic social events, sports activities, dining and recreation rooms, and professionally oriented field trips. Formal communication can occur through regular staff meetings with agendas, research teams, limited committee activities, publications (newsletters, annual reports, and circulated research reports), and periodic research reviews.

The development of interpersonal communication skills is essential for NARS managers to obtain the optimal performance of agricultural researchers. Training programs exist to facilitate the development and utilization of these skills.

Conflict Management

Agricultural research organizations are not immune to conflict. In fact, the diffusion of authority, the diverse character of its staff, and the nature of the research process itself all contribute to the potential for serious conflict within a research organization. Achieving good performance from research personnel requires (1) the acceptance of conflict as inevitable within an organization, (2) a good understanding of types of conflict situations, and (3) the management skills to respond appropriately.

The experience of a NARS manager in Africa leads him to conclude: "Some research managers find it very uncomfortable to deal with conflicts. In such situations, there is little or no teamwork and a minimum of communication of staff at all levels. There is also a tendancy for backbiting and berating of other researchers, especially the weak ones. If the conflict situation goes on for too long, the whole institution falls into disarray, and the removal of the institute head is inevitable."

A modest amount of conflict can be healthy and functional for a research organization, since it may offer opportunities for exploring new concepts and for dealing with underlying factors contributing to poor performance. If conflict is viewed as inevitable rather than avoidable, it can be used as a catalyst for positive change in the organization. Conversely, if conflict is suppressed, it can lead to negative behavior on the part of research staff and can reduce the opportunities for creative responses.

There are several types of situations where personnel conflict can occur. The first type is where the objectives of the researcher and the organization do not coincide. The second type is where there are challenges of authority at any level. The third type relates to the problems between classifications of personnel, e.g., researchers and technical support staff. The fourth type is where horizontally related groups such as departments have problems due to task or resource interdependence. A fifth type is where research personnel have problems with external groups such as clients and political groups. And, finally, there may be conflicts that are related to differences in personalities.

In dealing with conflict, managers need to define the problem carefully before deciding on an appropriate strategy for a response. Four types of conflict management strategies have been identified (Arnold and Feldman, page 225)[3]: avoidance, defusion, containment, and confrontation. An example of an avoidance strategy is ignoring the problem when it appears to be a trivial issue. Imposing a solution when decisive action appears to be warranted may also be an avoidance strategy. Smoothing over a tough situation before it becomes more difficult is an example of a difusion strategy. An example of a containment strategy is where a manager bargains with the conflicting parties, given the fact that several acceptable solutions may be available. One might employ a confrontation strategy by redesigning the organization to improve the coordination of research efforts. While none of these strategies is necessarily wrong, it is possible to employ the wrong strategy for the conflict at hand.

Experience and judgement are important in conflict management. Through effective leadership and good communication with research staff, NARS managers can utilize conflictual situations to the advantage of the organization. Creating a dynamic and open climate for researchers will help reduce the potential negative aspects of conflict situations. In dealing with conflict, the importance of understanding the factors which motivate research staff in a NARS cannot be understated.

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APPENDIX 1

Major Components of a Complete Job Analysis for Agricultural Research Staff

1. Job title, work location and salary range.

2. Experience, training, and education requirements.

3. Training required after employee is hired.

4. Previous jobs in the organization likely to qualify employees for this job.

5. Future jobs for which employee may qualify by successful performance.

6. Analytical, technical, and behavioral skill requirements.

   * kinds of equipment to be operated: e.g., computer
   * interpersonal skills: e.g., communicating with farmers
   * technical knowledge: e.g., genetics for plant breeding
   * technical skills: e.g., statistical analysis
   * physical skills: e.g., walking 5 kilometers per day

7. Performance standards for each type of skill, including frequency of use and level of expertise required.

8. Working conditions relating to travel, stress, safety, etc.

9. Role relations: who evaluates? who supervises? who provides information, supplies, and other services? who receives information and reports on work?

10. Decision-making authority: time span, magnitude, and review procedures.

Source: Adapted from U.S. Training and Employment Service, Handbook for Analyzing Jobs, U.S. Government Printing Office, Washington, D.C., 1972.

APPENDIX 2

Sample Grading Scheme for Agricultural Researchers

Professional Grade	Requirements
Assistant Researcher	Recognized first-degree professional qualification. High potential to undertake research with appropriate attitudes and intellectual competence.
Researcher I	Successful completion of 4-5-year professional apprenticeship as assistant researcher involving structured on-the-job training and supervision, and completion of master's level postgraduate degree training.
Researcher II	Normally a minimum of five years service as Research I. Demonstrated ability to undertake, with appropriate supervision, good-quality and relevant agricultural research.
Senior Researcher	Normally a minimum of five years service as Researcher II. Consistent performance as a mature, productive researcher able to train and supervise junior colleagues. Acquisition of relevant Ph.D. degree training would normally assure promotion to this grade.
Principal Researcher	Normally a minimum of five years service as a Senior Researcher. Recognized specialist with record of extensive original research with a national and international reputation. Above-average performance.
Chief Researcher	Normally a minimum of five years service as a Principal Researcher. Exceptional qualities as a researcher with outstanding publications record and clear evidence of research impact on agricultural productivity.

APPENDIX 3

Sample Grades and Salary Indexes
for
Agricultural Researchers

Years Service	Grade	Index	Annual Increase
1	Assistant researcher	199	-
2		103	3.0
3		106	3.0
4		109	3.0
5		112	3.0
6	Researcher I	123	10.0
7		128	4.0
8		133	4.0
9		139	4.0
10		144	4.0
11	Researcher II	158	10.0
12		168	6.0
13		178	6.0
14		189	6.0
15		200	6.0
16	Senior Researcher	220	10.0
17		229	4.0
18		238	4.0
19		247	4.0
20		257	4.0
21	Principal Researcher	283	5.0
22		290	2.5
23		297	2.5
24		305	2.5
25		312	2.5
26	Chief Researcher	321	3.0
27		326	1.5
28		331	1.5
29		335	1.5
30		341	1.5

A Sample Performance Appraisal Form

AGRICULTURAL RESEARCH

PERFORMANCE REVIEW FORMS*

NAME .....

DEPARTMENT/STATION .....

A. REPORT ON QUALITIES AND PERFORMANCE

(i) SCIENTIFIC and RESEARCH

1. SCIENTIFIC INTEGRITY

Outstanding for integrity in his research ..... 1 ☐
Maintains a high standard of honesty in research ..... 2 ☐
Generally reliable scientifically ..... 3 ☐
His scientific integrity leaves something to be desired ..... 4 ☐
Unreliable scientifically ..... 5 ☐

2. ORIGINALITY AND INITIATIVE

Always full of good research ideas ..... 1 ☐
Usually makes a valuable contribution ..... 2 ☐
His solutions are usually adequate ..... 3 ☐
Seldom takes constructive action ..... 4 ☐
Fails to respond to a new situation ..... 5 ☐

3. SCIENTIFIC KNOWLEDGE AND ATTAINMENT

Exceptionally wide, thorough and up-to-date ..... 1 ☐
Considerable breadth or depth of knowledge ..... 2 ☐
Sound within his field ..... 3 ☐
Narrow or out of date ..... 4 ☐
Inadequate ..... 5 ☐

4. OUTPUT

Outstanding in the amount of work he does ..... 1 ☐
Gets through a great deal of work ..... 2 ☐
Output satisfactory ..... 3 ☐
Does rather less than expected ..... 4 ☐
Output regularly insufficient ..... 5 ☐

* By courtesy of Dr. Walsh, Director, The Agricultural Institute, Eire.

THE RESEARCHER

5. INTERPRETATION OF DATA

Exceptionally good use of data and results ..... 1 ☐
No difficulty in reaching good conclusions ..... 2 ☐
Uses data satisfactorily ..... 3 ☐
Not good at interpreting results ..... 4 ☐
Fails to use data effectively ..... 5 ☐

6. PUBLICATIONS

Outstanding in prompt and excellent publication of work ..... 1 ☐
Maintains a high standard of publication ..... 2 ☐
Publications of good quality ..... 3 ☐
Written work not just good enough to get by ..... 4 ☐
Inaccurate and slow in publications ..... 5 ☐

(ii) PERSONAL

7. PERSONAL RELATIONS

Retains highest regard and respect of all ..... 1 ☐
Is generally well regarded and respected ..... 2 ☐
Gets on reasonably well with others ..... 3 ☐
Not very easy in his relationships ..... 4 ☐
Very difficult person ..... 5 ☐

8. RESPONSIBILITY AND RELIABILITY

Accepts responsibility at all times: distinguished for reliability ..... 1 ☐
Very willing to accept responsibility: highly reliable ..... 2 ☐
Accepts responsibility as it comes: generally sound ..... 3 ☐
Inclined to refer matters he could decide: not too reliable ..... 4 ☐
Avoids taking responsibility: unreliable or careless ..... 5 ☐

9. QUALITY OF ORAL EXPRESSION

Exceptionally effective ..... 1 ☐
Clear and convincing ..... 2 ☐
Expresses himself adequately ..... 3 ☐
Not an effective speaker ..... 4 ☐
Cannot express himself clearly ..... 5 ☐

10. JUDGMENT AND DISCRETION

Displays exceptional wisdom, foresight and discretion ..... 1 ☐
Always sensible and discreet ..... 2 ☐
Handles most situations adequately ..... 3 ☐
Tends to be erratic in judgment or indiscreet ..... 4 ☐
Judgment faulty ..... 5 ☐

(iii) ADMINISTRATIVE

11. LEADERSHIP

A natural leader: always inspires subordinates ..... 1 ☐
Inspires others and manages staff very well ..... 2 ☐
Exercises adequate control ..... 3 ☐
Does not enthuse subordinates or control them well ..... 4 ☐
A follower ..... 5 ☐

12. ORGANISING ABILITY

A brilliant organiser ..... 1 ☐
Very effective in organising work ..... 2 ☐
Plans and directs work satisfactorily ..... 3 ☐
An indifferent organiser ..... 4 ☐
Has no organising ability ..... 5 ☐

13. ABILITY TO DEAL WITH FINANCES AND FACILITIES

Distinguished for responsibility in handling resources ..... 1 ☐
Manages finances and facilities very well ..... 2 ☐
Adequate in resource use ..... 3 ☐
Indifferent in dealing with money and facilities ..... 4 ☐
Poor at dealing with them ..... 5 ☐

(iv) CONDUCT and PUNCTUALITY

Satisfactory .....
If not, explain under "Other Observations".

B. OVERALL ASSESSMENT OF PERFORMANCE IN PRESENT POST

Outstanding in all respects ..... 1 ☐
Very able and effective ..... 2 ☐
Competent ..... 3 ☐
Not fully up to standard ..... 4 ☐
Unsatisfactory ..... 5 ☐

C. OVERALL ASSESSMENT OF FUTURE POTENTIAL

Likely to stand out in the higher grade ..... 1 ☐
Well fitted for immediate promotion ..... 2 ☐
Now ready for promotion ..... 3 ☐
Likely to qualify for promotion in time ..... 4 ☐
Unlikely to qualify for higher grade ..... 5 ☐

D. REPORTING OFFICER'S OTHER OBSERVATIONS AND CERTIFICATE

Note any comments not already covered.

In my opinion, the ratings of the Officer are as stated.

Signature..... Date.....

E. COUNTERSIGNING OFFICER'S OTHER OBSERVATIONS AND CERTIFICATE

Note any general comments. If you disagree with any rating by the reporting officer, please indicate which you consider correct by a cross in the appropriate box and initial the entry.

In my opinion the ratings are correct, subject to any amending entries or remarks which I have made and initialled.

..... Date.....

A N N E X

ANNEX

An Agricultural Research Management Perspective on Human Resource Information Systems

Larry Zuidema

Introduction

This paper is designed to be complementary to the ISNAR working paper Human Resource Management for Agricultural Research: Overview and Issues. The purpose is to provide managers of agricultural research institutions and systems with an understanding of how information about and related to human resources can be made useful and accessible for planning and implementing agricultural research programs.

Organized, accessible information about and related to human resources can be a major contributor to management decisions. An effective information system describes the state of human resources in the research system and what changes take place over time. The manager uses human resource information together with the accumulated knowledge and wisdom, the perceptions and opinions of staff, the reactions of clientele, and organizational policies to make effective management decisions.

A distinction is made in this annex between information about human resources and other information related to human resources. Information about human resources describes their characteristics and utilization in the research system. This can be organized as a component of a management information system (MIS) and is often referred to as a human resource information system (HRIS). Information related to human resources describes the internal and external environments within which researchers function and about which policies and procedures can be made. An example of this related information is a list of training opportunities for research staff.

This annex focuses on the development and use of an HRIS for program management, i.e., for analytical rather than purely administrative purposes. Other organized information related to human resources which can be effectively utilized along with an HRIS is also identified and briefly described. The topics of this document are: the rationale for an HRIS, organization of information, outputs, sources of information, managing information, computers and software, information for human resource management (HRM) tasks, and a summary.

1. Rationale

Many NARS have grown rapidly in the past decade in both size and scope of activity. In such a situation, it is essential that the structures and tools utilized for human resource management be adequate for the tasks which the contemporary manager must perform. One very useful tool for agricultural research managers is an organized information system.

The effective management of human resources for agricultural research requires the continuous availability of relevant information in a usable form and a process for data analysis. An information system can be designed to provide managers with a comprehensive understanding of the current situation relating to research personnel as well as to make projections into the future. Such a system will contribute substantially to the research manager's ability to deal with each of the five areas delineated in the overview and issues paper: planning, staffing, development, compensation, and evaluation of human resources.

The basic rationale for an HRIS and the maintenance of related information for human resource management is to improve the decision-making capability of research managers to serve the goals, objectives, and program plans of the NARS. An HRIS, therefore, becomes an integral part of the processes of strategic planning, programming, monitoring, and evaluation of a NARS.

An HRIS is usually designed to be utilized by all levels of management, including: agriculture ministries, agricultural research institutes or councils, research stations and, in some cases, research programs. The HRIS provides information which responds to questions about human resources in relation to projected program activities. Outputs of the system contribute to: recruitment plans, training plans, work plans, and decisions on re-deployment, compensation, promotions, and staff motivation.

2. Organization of Information

The HRIS is a collection of related pieces of data about current research staff. For use in management decision making, data are drawn from the data base, organized, combined, and reported in ways that inform the manager about the state of human resources in the system.

An HRIS can be defined as "an integrated data base of pertinent information on people and positions that can aid managers in evaluating the present status of the human resources in their organization, formulating objectives for activities relevant to human resources, and evaluating the success of those activities at a future date." (Cascio and Awad, p.583)[1]. The primary focus of an HRIS is to assist managers in ensuring that research objectives are met. However, the HRIS can be designed to be compatible with routine administrative tasks like salary administration as well.

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The most comprehensive use of an HRIS is for information about researchers employed by the agricultural research organization. However, an HRIS should also include information about technical support staff upon whom researchers depend to perform vital research tasks. Much of the personnel data requirements will be the same for every individual. This will include personal background information, basic data on education and work experience, training undertaken, ongoing research activities, work performance, and remuneration.

A research manager needs more information than that contained in an HRIS. Some related information useful for human resource management is external to a NARS, and special efforts may be required to acquire the information, e.g., training opportunities abroad and lists of potential recruits nearing completion of their degrees. Some information is external to the human resource system, but internal to the NARS, e.g., budget resources and program plans. Whether or not one uses a computer-based system, it is desirable to develop these files of external data to be compatible with internal HRIS data files for improved management decisions. For example, one could match specific training needs with training opportunities and quickly develop a training plan for some period in the future.

Other organized information may be developed for the following purposes:

1. Recruitment--Information about sources of new staff, including lists of those nearing completion of postgraduate degrees, can be organized for recruitment purposes.

2. Training opportunities--A listing of opportunities for specialized training, internally and externally, facilitates the matching of program needs and qualified staff with opportunities.

3. Motivation and behavior survey--Information from non-attributable surveys, such as for motivation and behavior of researchers, is maintained in a separate data base. This keeps the information anonymous and comparable from one time period to another.

3. Outputs of an HRIS

In creating an HRIS, a research manager first defines the desired output of the system, i.e. the reports and summaries needed for specific management purposes. Some of the reports an agricultural research manager would want to have from an HRIS include:

Human Resource Inventory--This is a report of the quantitative and qualitative characteristics of current research staff of the research unit or system. The inputs are primarily the biographical data about research staff. The report consists of a series of tables which describe the human resources numbers, quality, and output for each of the units in a system. These would include cross tabulations relating to staff education, discipline, age, years of service, position, publications, etc.

Human Resource Flows--This is a report of the status of human resources from one point in time to another. The information is based on the output of the inventory, but is a level of analysis which enables the manager to review the dynamics of the system. Using this information, it is possible to project future trends for human resources in the system. Statistics generated in this report include: attrition rates, turnover rates, and other changes in the characteristics of human resources over time (such as improvements in numbers with postgraduate degrees).

Human Resource Deployment--This is a report about the deployment and utilization of human resources described in relation to the organization and its research program objectives. Tables would show time allocations for each unit in the system for: functional responsibility (management, research, teaching, trainee, etc.), type of research (basic, strategic, applied, adaptive), commodity focus of research, location in the system, etc.

Training Assessment--This is a periodic report of the short- and long-term training (ongoing and completed) for research staff in the system. The summary allows for a monitoring of the training effort which can be substantial in many newly developing NARS. The report may also include information about training needs of individual staff in the future, derived from performance appraisals or management reports. Tables would show numbers of staff involved in degree training by discipline and/or unit, person days of short-term training by unit, etc. The assessment summaries would contribute to training plans for the future.

Researcher Performance Report--A report about researcher output is necessary to assess progress towards research objectives and to prepare general and annual research reports. Output is not always easy to measure, but publications of various types remain a fairly reliable indicator of output. Quantitative data on researcher performance (e.g., from a point system) can be obtained from performance appraisal documents and can be summarized and analyzed for each unit in the system.

Compensation Review--Summary reports relating to staff salaries and allowances, grades and steps, and promotions are important for effective human resource management. Since much of this data may be confidential, it is usually necessary to restrict access. The tables of information useful to a manager include those which show numbers of research staff in each grade and step, rates of promotion, costs of various components of compensation schemes, and relationships between various characteristics of researchers and their salary levels. This information contributes to planning and policy decisions designed to retain promising and effective researchers.

Motivation Factors--The HRIS will not contain information on researcher motivation, since it usually is not attributed to individuals. Survey data can be summarized in a separate data base, however, to show what factors are most critical in motivating staff, what problems management may address to increase researcher job satisfaction and performance, and how researchers feel about management decisions. This is an area for increased attention by many NARS managers.

4. Sources of Information

In practice, many NARS already have human resource data available in the form of personnel files for each individual employee. If the data are aggregated and organized, often it is only in a form required for administrative purposes like salary administration. Some of these data, however, can become the beginning of an HRIS. Conversly, an HRIS designed for NARS management/analytical purposes can also be functional for some routine administrative purposes and to meet some information requirements of other supporting agencies like civil service, budget, and national development units.

Several sources of data and organized information may be utililized for an HRIS. The basic data for an HRIS may initially come from central administrative records of personnel. Those data that cannot be collected easily or reliably in this manner can be obtained directly from agricultural research personnel themselves in the form of a questionnaire. This would be administered to all current personnel as part of the process of establishing the information system and, subsequently, to all new personnel when they join the organization.

It will be necessary to define a procedure for the annual update of the data base at a time when the output can be used for strategic planning purposes. Some data can be updated continually as part of the process of keeping good administrative records. For other data, research staff will need to complete an annual update form. The best timing for an annual update of the data base for the HRIS is prior to the performance review, when the data can also be used as information for appraisal purposes.

5. Managing Information

Ideally, an HRIS is a component of a larger management information system (MIS) which includes data on program, budget, and facilities, as well as personnel. Given the importance of human resources in a NARS and the fact that some organized data already exists in personnel files, the development of a comprehensive MIS may well start with a focus on personnel. The need to relate personnel to program activities, financial considerations, and the availability of facilities will create the environment for the eventual development of a full MIS.

The creation of a formal information system is often stimulated by the need to provide reports to an external agency or donor for a very specific purpose like the management of trainees. The availability of special funds for information management activities for such a specific purpose provides an ideal opportunity to develop and implement a more comprehensive system which will serve the routine needs of a NARS.

Difficulties in establishing and maintaining an HRIS are likely to occur in situations where a NARS is a loosely coordinated system of institutes, centers, and universities. In such cases, where the normal reporting requirements and employment conditions and practices may vary considerably between organizations, an agricultural research council or other coordinating unit may be charged with the responsibility for maintaining the system. A means of standardizing and accessing data would then need to be developed.

Management support and long-term commitment are essential in order to insure the effective institutionalization of an HRIS. One critical component of this support is the designation of a high-level manager to the function of human resource management, either part- or full-time. Once such support and commitment are in place, the most important task is to appoint and train the individual(s) who will have specific job responsibilities for developing (where appropriate), maintaining, and operating the information system. The actual design of the system is best developed collaboratively by senior managers and information/computer specialists.

For larger agricultural research organizations, the development and improvement of a human resources information system should be accomplished in stages, e.g., starting with one institute or program unit. This will permit the testing of a computer-based system on a small scale, should a computer be utilized for the HRIS.

An effective HRIS will require not only a high level manager, but also an appropriate location in the organizational structure. While the existing structure may provide few options for any one NARS, the range of options for many would include: a staff office to the director general, the planning unit, a separate HRIS or MIS unit, the data processing unit, the socioeconomic unit, or the personnel office. One basic decision is whether to locate the system with data providers or data users. While data providers must be part of the process, it is recommended that the operation be housed with data users. This would seem to indicate that the management of an HRIS should be with the planning unit or a staff office of the director general. In any case, an HRIS needs a firm and respectable home in a NARS.

6. Computers and Software

Although an HRIS does not need to be computerbased, computers increase the speed and range of data access. A computer-based information system for human resource management can be created and maintained using modern and relatively inexpensive microcomputers and software packages. Such a system can be used to store large volumes of data for both analytical/planning purposes and for administrative purposes. Effective systems are designed to meet well-defined management objectives, allow for data to be readily retrieved and analyzed, and be updated regularly.

Software - Commercial software tools that are available for maintaining and analyzing data fall into three main categories: statistical, spreadsheet, and data base management.

1. Statistical software is used primarily for storage and analysis of numerical information. Results of the statistical analyses are reported in tables, graphs, and standard statistical formats. Some packages can produce graphical displays of data such as box-plots and scatter diagrams.

2. Spreadsheet software allows easy mathematical manipulation of information that can be represented in a tabular format. The data as stored in rows and columns, much like an accountant's worksheet. Formulas that describe the relationships between the data elements are incorporated into the spreadsheet. When a piece of data is changed, all the other data elements linked to it change as well. Spreadsheets are ideal in situations where quick calculations for "what-if" analyses are required. In a human resource information system, for example, a spreadsheet could be used to determine the effect on total research expenditures of increasing the number of researchers in a certain field.

3. Data base management software stores related pieces of data in separate records, or sets of unique data. A computer data base stores personnel data, for example, in a format similar to physical personnel files. Each individual file folder containing data about one person corresponds to a record in the computer data base. Every record contains the same pieces of information: name, birthdate, academic specialty, etc. The complete data base is the set of all the individual records.

   Computer-based data base management systems allow data to be selected from the data base for manipulation and analysis. For example, a human resources planner could extract information about discipline specialties and relate that to research program areas. The kinds of analysis possible using a computer-based data base are usually only limited by the information that has been put into the system.

Organization of Data - Research managers perform many tasks related to human resource management. Payroll, training, and recruitment, for example, are three separate management functions, each generating and using different sets of human resources data. Information used by one sub-group within the larger human resources management system is related to information used by another because it all refers to a single employee. In a computerized system, different subsets of information can be stored in separate data base files, related to the other files in the system by an employee's name or identification code.

Developing a system of separate but related files has several advantages over a system where one file contains the full set of data. Access to data is faster, more efficient, and easier to control. Access to salary information, for example, often must be restricted. Controlling access to data sets or files within a system is easier than controlling access to fields within a file.

Creating a System - There are two basic steps to creating a computer-based information system: (1) specify the goals of the information system and (2) define the data structure. Once these two steps are completed, appropriate hardware and software can be selected and the system can be put into operation.

Determining the goals of the information system is an important process that is often done poorly or not at all. Clarifying the purpose of the system in the beginning can insure that expectations are realistic and prevent wasted time, money, and frustration. In defining the overall purpose of the system, a manager identifies general problems for which an

information system could be useful. The next step is to develop a set of questions whose answers will address the general problems, being as specific as possible. At this point, it is possible to decide what aggregate information is needed to answer each of the questions and specify the information needed about individual researchers. At the end of this process, a research manager would have a set of questions to be answered and a description of the kinds of information that will provide answers to these questions.

7. Information for Human Resource Management Tasks

This section of the annex identifies the relevant questions for managers for each of the task areas identified in the HRM paper. For many of these questions, the following are indicated: (1) information requirements, (2) information sources, (3) potential information summaries from an HRIS, and (4) the organized reports to which an HRIS can make a substantial contribution.

Planning

A primary use of organized information about and related to human resources is for planning, whether annually for programs or at strategic times for policy-making. Once plans are made and accepted, implementation decisions may require even more detailed information. While planning occurs for all HRM tasks, it is a task in itself and one which focuses on the broad issues with which NARS managers must deal. Relevant questions for broad-based planning are:

1. What are the tasks that need to be performed and/or expected outputs to meet program plans/requirements?

Program-related information is absolutely essential as an input for effective human resource planning. Program plans must be adapted and combined with information generated from an HRIS for appropriate analysis. For example, it is necessary to disaggregate commodity plans into tasks and activities which need to be performed in order to place the plans in a human resources context. One of the products of this exercise is a task or job analysis which can later be used for recruitment purposes.

2. What are the resource constraints affecting the utilization of human resources to meet the program requirements?

These constraints may involve physical facilities, financial resources, transportation possibilities, organizational structures, civil service positions and policies, etc. If an MIS is already employed, this information may be readily available. To be useful with HRIS data, the constraints must be expressed in terms of their impact on human resources, i.e. facility capacities, budget available for personnel categories, ceiling numbers for staff categories, etc. Once the constraints are defined in this way and compared to the information about human resources generated from the HRIS, it is possible to identify possible trade-offs and areas for policy change. The result is a contribution to realistic recruitment targets and plans.

3. Are the human resources that are required for the program, given the constraints, already in the system?

The information generated to respond to this question comes directly from an HRIS and is utilized for many other HRM tasks besides planning per se. The basic information for each category of staff includes: personal data, technical and educational qualifications, employment experience, program activities, and some measure of performance. Most of the information can be obtained from employee files, but some will come from managers or the employees themselves.

The output and summaries constitute a human resource inventory which describes research staff age, education level, experience, etc. by units within an organizational structure or by discipline. Various levels of analysis can be performed on the data to establish ratios, averages, and percentages which help explain what human resources are available at a point in time in relation to the program requirements. This information and analysis can be used to generate reports on what kinds and qualities of human resources are required for a future time frame.

4. What changes are taking place in the quantity and characteristics of human resources in the system?

To deal with this question, it is necessary to have the capability to analyze the information in the HRIS at two or more points in time. The summary report on human resource flows will yield information about attrition rates, turnover rates, intra- and inter-institutional transfers, and trainee return rates. Managers require this information in order to predict future changes and develop recruitment, staffing, and training plans.

5. What are the options for improving the adequacy of human resources to meet the program requirements in the next time frame?

Options which need to be considered include: the possible availability of released manpower resulting from changes in program objectives and plans, the variety of actions which can be taken to modify the existing human resources (e.g., training), and the availability of and opportunity to hire new staff. In most cases, some mix of these options will be appropriate and/or conditioned by the resource or policy constraints. The information required for this level of planning includes: the inventory of human resources from the HRIS; some measures of recruitment, training, re-deployment, and other staff costs based on past experiences; and external information about the sources and availability of technical and scientific staff. Budget and expense information within the organization can be used in conjunction with an HRIS on a per unit basis for comparing the costs of various positive options. A separate data base can be maintained for information about the availability of national scientific staff who are in research degree programs within and outside of the country.

These are only some of the questions for planners concerned with human resources. The end product to which the organized information would contribute at this point is an overall manpower plan. In the best of circumstances, this would be an integral part of a development plan for the NARS.

Staffing

It is likely that new staff will need to be added to a NARS almost every year, either to maintain staff stability or to achieve planned growth. The management activities involved include the development of specific job descriptions, and the recruitment, assimilation, and deployment of new staff. A redeployment of some existing staff is almost always necessary to accommodate to the addition of new staff in a NARS. The major questions on staffing to which organized information can contribute to management decisions are:

1. What are the specific positions which need to be created and/or filled to meet the task requirements of the system?

Following identification of tasks that need to be performed, it is necessary to develop job descriptions and to identify the numbers of positions and locations where NARS staff will be deployed. The information required comes from: the human resource inventory and the report on human resource deployment which are derived from the HRIS, civil service regulations (for grades and steps), budgets, and detailed program requirements of each unit in the NARS. The output to which the HRIS will contribute is a set of job descriptions for specific positions in the system which show the education, skill, and experience levels required.

2. Where can qualified new staff be obtained for the NARS?

In most cases, NARS either include or at least have working relations with universities and colleges from which they recruit both scientists and technical support persons. Under certain circumstances it may be helpful to develop a separate recruitment data base which maintains information on potential candidates from those institutions who might be suitable for future positions in a NARS. This data base can be an abbrieviated version of a file for an existing staff member and include similar information. This information can be utilized for a recruitment plan as well as a basis for collaboration with other institutions with research and training capabilities.

3. How can a new staff member be effectively assimilated into a NARS?

New staff need considerable information at strategic points of an induction period into a NARS. This includes information about: personnel policies which affect them; the mandate, objectives, and programs of the NARS and unit to which they are assigned; the specific job expectations for them; their relationship to supervisors, colleagues, and staff in other units; and performance evaluation criteria. It is recommended that research managers provide this information in an organized and strategic manner for persons in each position or unit.

4. What shifts in staff location and position are necessary to meet program objectives for the next time frame?

New program objectives, staff attrition, staff promotions, new staff employed and returning trainees together result in significant human resource changes within a NARS each year. The inevitable result is the need to re-deploy several existing staff in terms of physical location and/or position within the organization. Information from the HRIS report on human resources deployment will facilitate the process of reassignment to meet projected program objectives.

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The information needed for staffing relates primarily to the process and effects of hiring and deploying new staff. The remaining tasks of development, compensation, and evaluation relate to modifications which effect exisiting staff to meet program requirements. The following explains how organized information can be utilized for detailed planning and action for: researcher development, compensation practices, and researcher evaluations.

Development

One of the major and often initial uses of data bases in a NARS is for coordination of staff development (training) activities, particularly in heavy growth periods with donor participation. Staff development includes: in-house apprenticeship training, internal and external degree training, internal and external short-term training, and attendance at national and international conferences. The major staff development questions to which organized information can facilitate appropriate management responses are:

1. What new knowledge and skills are needed and when?

Changes in program priorities, turnover of staff, and requirements for new research methods and techniques contribute to a need for continued staff development. It is recommended that a training needs assessment survey be conducted annually as part of the performance appraisal. The survey would yield information about the need for short-term training in skill areas like breeding techniques, FSR methods, economic and statistical analysis, etc. It would also identify the need for degree training and for organizational behavior training to develop leadership capacities for research program management. An analysis of the information contained in the needs assessment survey will permit the manager to develop an organizational training plan for the year. The training plan would prioritize needs by training activity and form the basis for budgeting or discussions with donors prepared to support local and foreign training.

2. Who should be trained and what type of training is appropriate?

The HRIS provides data on past education and training activities for each researcher in the form of a training assessment report. This information allows the manager to select individuals for appropriate education and training. Selection criteria will, of course, include factors about individuals such as age, future potential, mobility, etc. The output is a training plan for each researcher to be activated, based on availability of training programs and financial resources.

3. What training opportunities exist in the NARS, the country, and abroad?

In larger NARS where several researchers may be involved in development activities, it may be appropriate to develop a data base of information about specific training activities within the country and elsewhere. Information about foreign opportunities is often available in organized, published form from donors who sponsor the training. Within the country, universities and private groups often are prepared to conduct training on demand. Identification of these researcher development activities in advance facilitates the process of matching needs with program opportunities.

4. What progress is being made by researchers involved in degree training?

An HRIS can be used to monitor research staff involved in training, particularly in institutions abroad. This will allow for better planning in relation to their return and the utilization of their expertise. Recruitment plans can also be improved by the addition of this information.

Compensation

The compensation schemes for research staff are often controlled by civil service or other outside agencies. Payroll and expense records are usually maintained by the NARS for administrative purposes. An HRIS can utilize this and other data and information to facilitate career planning, to make policy and program decisions on costs, and to seek major and minor changes in salaries and other benefits. Information from a compensation review report generated from an HRIS can help research managers address the following questions:

1. Is the scheme of service adequate for retention and motivation of staff?

A critical factor in retention of researchers is the potential for regular promotion in the system, including adequate increases in salary and other benefits. An HRIS can help monitor rates of promotion and identify problem positions. Persons who remain in a position too long may become stagnant and lack motivation for improvement.

2. What are the costs of staff in absolute and relative terms?

One of the critical factors in research management is to maintain control of costs. The HRIS can be used to focus on personnel costs. Other cost information will enable the manager to see if researchers have sufficient support to be effective and productive.

3. Are researchers being rewarded for exceptional performance?

Information from performance reviews can be combined with salary, grades, and promotions to determine if the system is rewarding those who are most productive.

Evaluation

One of the most difficult, but important tasks of a manager is performance appraisal, particularly of scientists. The task is made easier if developed as a performance planning and appraisal system and conducted as part of a larger planning exercise for a NARS. An hRIS can be used not only for individual performance information, but also to analyze specific elements for planning and action (e.g., to develop a training plan and activities). Management questions on staff evaluation include:

1. Have individuals met performance expectations? If not, why?

If a NARS has established norms and expectations for researcher performance and conducts regular performance appraisals, it is possible to summarize data from the HRIS which indicate a level of performance or rating for each researcher. Since this is recorded for professional, personal, and administrative performance, the information is useful for counseling, promotions, staff development, and re-deployment of staff.

2. Is overall staff performance consistent with organizational and program plans and objectives?

The relation of researcher output to program objectives and priorities is a major concern of agricultural research managers. Summaries of publications and other indicators of performance can be generated from the hRIS to compare with program planning documents. This allows the manager to monitor and evaluate actual versus planned performance of staff.

3. What motivates staff to improve performance?

Information relating to researcher performance comes from the performance appraisal data for each individual in the HRIS and from a non-attributable survey completed periodically by research staff. Researcher performance reports from the HRIS provide basic information about levels of performance. The survey provides more direct information about perceptions of staff and about critical factors which motivate them

to improve their performance. The output of these two sources is a researcher performance report which contributes to policy decisions relating to human resource recruitment, deployment, compensation, and development. It is also useful for counseling and crisis management.

4. What actions are required to assist staff in meeting performance expectations?

Performance appraisals and surveys yield information about the reasons for a particular level of performance. Some of these relate to researchers, but often they relate to the organizational and program environment conditions over which a manager has some control. An effective information system will allow managers to evaluate the effects of policies and procedures which influence staff performance.

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Summary

Effective research management requires a continuous flow of information, particularly about the utilization of human resources in relation to changing program objectives and priorities. It is important that this information be useful for planning and management purposes, reasonably accurate, comparable from year to year, and from unit to unit. It should be easy to obtain, update, and analyze for specific actions and should be presented in a clear, easily understood format. Also, the information should be readily accessible to and functional for managers at all levels at which human resource decisions and actions are required.

Research managers require reasonably accurate data about the following: the number of research personnel available in various categories, the qualifications and maturity of these persons, past experience and future potential for recruitment, the deployment of staff, levels of training of staff, program activities of research staff, and the level of staff productivity.

An effective system organizes information in anticipation of the annual planning/budgeting cycle and, thereby, is effectively integrated into a planning, budgeting, and monitoring system. This means, for example, that the process of performance reviews would yield information for the system about allocation of staff time to a particular activity and/or commodity. Given a change in activity and/or commodity focus in the next planning time frame, such information would form the basis of decisions about recruitment, training, and re-deployment of staff.

A minimum data management system specifically designed to allow comparisons between various units at all levels within a NARS can be readily established in a NARS. Such a system incorporates standard items of data and includes some standard types of analysis and reports. One advantage of the system is that it shows norms and ranges for several management factors such as ratios between scientists and technical support personnel. The structure of the system makes it possible for

institute managers to compare specific management factors for their organization with those for other institutes and for NARS managers to do the same with respect to other NARS. The system would contain standard statistics which allow for the monitoring of changes from year to year.

Reference

1) Casio, Wayne F. and Awad, Elias M., Human Resource Management: An Information Systems Approach. Reston Publishing Co. Inc., Virginia, 1981.