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Administrative Principles and Procedures of the Agricultural Experiment Station

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The successful agriculture of the United States is in part the result of the productive effort of the agricultural experiment stations. Students from different countries, throughout the world, have visited the United States to learn and observe the programs of the various experiment stations with the hope of being able to develop or foster similar organizations in their own countries.

The purpose of this study was to acquaint the author, a student from Colombia, with the organization, administrative procedures and guiding philosophy of the agricultural experiment stations, typified by the Oregon Agricultural Experiment Station. This study was accomplished by an evaluation of ideas and concepts gathered from personal visits with staff members of the Oregon Agricultural

Experiment Station and by a review of the pertinent literature on the operation and development of such institutions.

This study includes a review of the development and organization of the agricultural experiment stations and relates the relationship of the stations to the Cooperative State Experiment Station Service of the United States Department of Agriculture. The duties and qualifications of an administrator of an agricultural experiment station are discussed. The role of the research scientists and their contribution to the agricultural experiment station program were evaluated. The importance of effective communication, proper budgeting and organization were stressed.

This study concludes with an attempt to review the current status of the agricultural experiment station in Colombia with suggestions on the improvement of this program based on the author's limited knowledge and experience gained from this work.

Administrative Principles and Procedures of the Agricultural Experiment Stations

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INTRODUCTION

The successful agricultural technology of the United States of America reflects in part the productive effort of the agricultural experiment stations. Students from underdeveloped countries have come to the United States to learn and become acquainted with the techniques and knowledge that has made this agricultural development possible.

Three historic acts of the United States Congress were instrumental in creating the atmosphere and providing the support for the agricultural experiment stations. The first of these acts was signed by President Lincoln on May 15, 1862, creating the United States Department of Agriculture and providing the cooperative framework of organized agricultural research. The second important act, later on more widely known as the Land-Grant Act, was signed into law on July 2, 1862. The Land-Grant Act donated public lands to the several states and territories so that colleges could be established for the benefit of agriculture and mechanical arts. Finally, the Hatch Act was passed into law on March 2, 1887. This act created the agricultural experiment stations for the purpose of acquiring and diffusing useful and practical information on subjects connected with

agriculture and to promote scientific investigation.

The purpose of this study was to acquaint the author with the administrative principles and procedures of the agricultural experiment stations. Such a study would create a better understanding of the development, the functions and the guiding philosophy of these successful institutions.

This study has been accomplished by an evaluation and synthesis of ideas and concepts from staff members of the Oregon Agricultural Experiment Station and by a review of the pertinent literature on the operation and principles which have contributed to the development of these institutions.

This study includes the purpose and program developed and carried on by the agricultural experiment station to acquire and diffuse useful and practical information on agricultural matters, as well as the principles that govern its organization and the administrative procedures.

For the purpose of this review, an agricultural experiment station is defined as an institution which seeks the improvement of agriculture through careful and constant research on plants, animals, new technology and economics of production and distribution. The results obtained from the scientific and economic research are diffused among the people for the betterment of mankind.

PURPOSE OF THE AGRICULTURAL EXPERIMENT STATIONS

After the Land-Grant colleges became a physical reality beginning in 1862, the staff of these colleges started searching for scientific answers to questions which could serve as the basis for agricultural improvement. The variation in climate, soils, crops and natural conditions in the different states required a varied interpretation of knowledge to be applied to a particular area (20).

Once the Land-Grant colleges began to function, it became evident that there was a vital need for the agricultural experiment stations in order to do field experiments which could serve as the base for agricultural improvement. The need for these agricultural experiment stations was emphasized in a series of conferences and discussions throughout the different states.

The campaign for the establishment of the agricultural experiment stations culminated in 1887 with the Hatch Act which created the agricultural experiment stations ".... in order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture and to promote scientific investigation and experiments regarding the principles and application of agricultural science...." (20).

The purpose of the agricultural experiment stations according to Allen, Beal and Steece (4) is to carry on organized research

for the advancement of agricultural knowledge. This means that research cannot be fragmentary, disconnected or independent. The agricultural experiment stations are independent units with common interests and responsibilities, conducting their investigations after careful selection of subjects. The research scientists of each of the stations should work as a team, with consciousness of membership in an organized body.

The objectives of the agricultural experiment stations, according to Jardine (19) are:

1. Make discoveries for improvement of agriculture.
2. Secure facts which will answer questions and solve problems confronting agriculture now or in the future.
3. Gather facts to make teaching and agricultural practices more effective.
4. Keep a bank of facts to be checked out by resident teaching and Extension Service for the benefit of students, farmers and all the people.
5. As publicly supported institutions, the agricultural experiment stations are obligated to develop agricultural technology which, in turn, will contribute to the welfare of all classes of people and of the nations.

The agricultural experiment stations are institutions in which scientific and practical investigations are made to improve the

methods of agriculture and introduce new crops and industries. They are primarily scientific institutions in which research is seeking more accurate information and its application for the betterment of the farmer (27).

Allen and Schulte (5) stated that the agricultural experiment stations are institutions for research and investigation related to broad subjects of agriculture. True (27) described the agricultural experiment stations as an organized effort of science to aid the farmer.

The work of the agricultural experiment stations is directed toward the improvement of agriculture in the fields of Agronomy, Animal Science, Horticulture, Forestry, Soils, Bacteriology, Agricultural Economics, Marketing, Entomology, Agricultural Engineering, Food Technology and so on. This requires a thorough knowledge and association of the basic aspects of many sciences, such as: mathematics, physics, chemistry, geology, sociology, psychology and anthropology.

The agricultural experiment stations should:

1. Act as bureaus of information on many questions of interest to the farmers in their localities.
2. Seek new methods of agriculture, the introduction of new crops and livestock and the establishment of new industries.

3. Aid the farmer in his fight against pests that plague his crops and livestock.
4. Investigate the interaction of air, water, soil, plants and animals to find out the principles which can be applied in order to make optimum use of the available resources (27).

Jardine (19) stressed that the agricultural experiment stations must find more efficient crops and animals, more effective methods of eliminating animal and crop pests and better methods of soil management. Furthermore, the agricultural experiment station must put the facts in various forms suitable for different needs and uses of the agricultural community and to assist the extension workers and farmers in applying these facts. The agricultural experiment station should work out methods and standards of grading, sorting and standardarizing agricultural products to secure reliable data on production costs and to study problems of orderly marketing.

According to Alexander (2) the present trend of the agricultural experiment station is toward the effect of science and technology on mankind. This means that research is more and more concerned with toxicological effects on the entire ecosystem as is the case of the application of chemicals and their effects on water and air pollution, which in turn may affect mankind through their effect on animals, plants and human beings.

COOPERATIVE STATE EXPERIMENT STATION SERVICE

The Cooperative State Experiment Station Service was established in 1888 by the Secretary of Agriculture and was first named the "Office of Experiment Stations." This name was changed in November, 1955 to State Experiment Station Division, Agricultural Research Service. In August, 1961, the name was changed again to the present one: Cooperative State Experiment Station Service (32).

The Service is responsible for determining if the federal grant funds allocated to the agricultural experiment stations of each of the states are used in accordance with the statutory regulations. The Service is also responsible for coordinating the grant-fund projects of each station with related research projects in other stations and the United States Department of Agriculture. It also takes part in planning cooperative regional research projects carried on by a group of stations, sometimes in cooperation with the U. S. D. A.

The duties of the Service and its relations with the agricultural experiment stations, according to Jardine (18) are:

1. To advise and assist the agricultural experiment stations in planning their research programs.
2. To offer suggestions, based on annual comprehensive reviews of research projects.
3. To cooperate with the agricultural experiment stations

in planning and adjusting research projects for the solution of problems that extend beyond the borders of any one state.

4. To assist the agricultural experiment stations in obtaining needed funds, equipment, buildings and supplies.

The relationship of the Service to the agricultural experiment stations is of an advisory and supervisory nature. The advisory function provides for: assistance in matters pertaining to the organization and to the conduct of the station affairs; suggestions to projects and investigations; aids in locating suitable administrators and investigators; and adivises in a great variety of other subjects (5).

The supervisory function of the Service is to administer the station under the regulations of Public Law 352 and to supervise the use made of these public funds. Although the agricultural experiment stations are under state law and are administered locally, the Service should supervise the research programs of the stations, particularly those research projects supported by federal funds. At the same time, the stations retain complete individuality and freedom (5). True (28) remarked that the supervision or inspection carried out by the Service has a broader character than the term would imply. This means that the Service does not become involved in small operational details. It only concerns itself with the

adequate operation of the agricultural experiment stations and in seeing that they follow the correct policy.

A representative of the Service makes annual visits to each agricultural experiment station in order to examine its accounting records and the progress of the projects. The Service has to determine each year in terms of the law if the respective agricultural experiment station is entitled to receive its share of the annual appropriations (5). In addition, to this inspection at the end of the fiscal year, the agricultural experiment station submits a sworn financial report to the Department of Agriculture which in turn is passed on to Congress (30).

In administering the Federal-Grant Acts, the Service has the following responsibilities:

1. To approve each research project financed in whole or in part by federal funds in order to assure efficient and legal use of the funds.
2. To make frequent consultation with the agricultural experiment station administrators and station workers on research and administrative problems.
3. To make annual field examinations of the research and expenditures of each agricultural experiment station under the respective Federal-Grant Act.
4. To recommend annually which station is to receive the

Federal-Grant funds.

5. To prepare an annual report to Congress on the agricultural experiment station research.

6. For the technical staff of the Service to take an active part in planning and coordinating the overall research program in the various states (29).

The Service keeps a current record of federal and non-federal research projects, by title, with sufficient annotations on the scope and character of the work to permit classification according to subject matter (30). A copy of each one of these project cards is sent to each agricultural experiment station in order to complete a file for easy reference.

ORGANIZATION

The importance of the organization of the agricultural experiment stations has been explained by Allen, Beal and Steece (4) who stated that an effective organization with adequate administration is as necessary for the successful operation of an experiment station as it is in any other comparable enterprise. As the agricultural experiment stations grow in size and complexity, the administration of the station becomes more important. Adjustments in organization must be made so that new areas are not left without administration.

The organization of an agricultural experiment station must have the following fundamentals clearly defined:

1. Relationship between the governing body or board of trustees and the station officers. The functions of the board of trustees are legislative while those of station officers are executive. The board adopts plans and station officers carry out these plans. These two functions are mutually exclusive. Failure in distinguishing the nature of their responsibilities creates serious administrative problems.
2. Relationship between employer and employee. It is difficult for the same individual to hold an administrative position and at the same time be a member of the board

of trustees (33).

The organization of an agricultural experiment station has to be well defined and flexible. The organization has to take into consideration the research scientists since they are the ones who will determine the success or failure of their research projects. With this in mind, the organization has to coordinate all individual programs into a well-balanced productive effort. This also applies to the relationship between the agricultural experiment stations, Cooperative Extension Service and resident teaching programs (4).

As the agricultural experiment station developed, the complexity of the organization increased and a division of work was necessary and thus came about the need for department of divisions. The division and subdivision of the total program in an agricultural experiment station can be called the Organizational Structure. This structure depends upon the needs of the station, the strength that is desired to give to each department, the region or location of the station, and the main problems of the region. This brings about the need for a hierarchy in the administrative organization (4).

An agricultural experiment station draws its strength from the departments. These often employ facilities in common and together work on problems whose complexity is increasing and which requires expansion into new fields (4).

The structure, according to Brown et al.(11), must have:

1. Unity of program.
2. Unity of direction. This means well-defined lines of authority and no staff member should received direction from more than one person. This avoids uncertainty among research workers.
3. Program flexibility. Problems in agriculture are shifting every day. The agricultural experiment station must be ready to confront any of these situations of change. Flexibility should be such that it is possible to adapt the job to the man, rather than the man to the job. It is easier to change the job than the man. Henderson (16) remarked that the structure should be so flexible as to be able to make the decision as closely as possible to the point of origin of the problem. This prevents the misinterpretation of facts by avoiding a series of reports which could be misinterpreted or misunderstood.
4. Basis for external relations with other related agencies in the field of agriculture such as the Department of Agriculture and commercial companies.

It is necessary that the duties of each department be well defined in order to avoid problems especially when an older administrator retires giving way for the placement of a younger man with new ideas. Unity of direction and coordination of staff effort are

necessary to achieve goals.

DELEGATION OF RESPONSIBILITIES

Delegation of responsibilities is a matter of entrusting part of the work of operation to others. Every time an administrator delegates work, there is a new link in the chain of command (24).

The objectives of delegation of responsibilities, according to Anderson et al. (8), are:

1. To enable the administrator to maintain effective supervision over the entire organization.
2. To allocate responsibilities to staff members which are commensurate with their ability.
3. To develop leadership on the part of members of the staff.

Every time an administrator delegates responsibilities, there are three actions, either expressed or implied: the administrator assigns duties, grants authority and creates an obligation (24).

When the administrator assigns duties, the work to be done should be clearly explained and the work should fit with the objectives of the overall program.

The delegation of a responsibility also implies authority. Along with the assignment, some rights are granted, such as supervision of personnel, to spend funds and to make the decisions necessary to fulfill the assignment.

The delegation of a responsibility creates obligations. In

accepting the duties or assignment, the subordinate assumes an obligation to his superior to complete the job. This is the moral compulsion felt by a subordinate to accomplish his assigned duties.

No delegation of responsibility is complete without a clear understanding of duties, authority and obligation. Each depends on the other two, no two can stand alone.

Anderson et al. (8) described the procedure of delegation of responsibilities in the following way:

1. The administrator must consider the entire organization and the objectives in the delegation of responsibilities.
2. The delegation of responsibilities must be such as to enable the administrator to function at the top administrative level.
3. The administrator should recognize the terms of the delegation of responsibilities and maintain a complete line of communication with the person who received them. The person who received responsibilities should have full confidence in the administrator.
4. The necessary controls should be established to provide the administrator with an accounting of performance by reports and conferences.
5. Adequate job description of duties and responsibilities for every staff member is very important.

6. All personnel should be acquainted with the duties and responsibilities of every staff member.

The main barrier of an administrator in order to delegate responsibilities is the lack of confidence in his subordinates, due to insufficient personal knowledge about them, and about their capabilities. If the administrator is afraid to take a risk, or if he thinks he can do a better job personally, a serious barrier is created (9, 13, 24). To become acquainted with the responsibility of his personnel, the administrator must assign the individual several duties and if he does a good job, there is a gain of confidence, thus, allowing the administrator to delegate more responsibility.

The number of persons an administrator can supervise depends upon his abilities. Cowan (13) suggested a maximum of 20 and Newman and Summer (24) suggested that it could vary from 6 to 15. An administrator should not be overtaxed with work so that he can retain his vigor, enthusiasm and alertness, in order to be able to encourage his subordinates, coordinate work within departments, assign tasks, help solve problems and answer questions. Furthermore, the administrator needs time for the man-to-man personal communication which is absolutely necessary in leadership. If the administrator fails to talk frequently with his subordinates, he becomes less effective and his personal satisfaction in the work may be lowered.

Supervision of research scientists must be in such a way that they are stimulated, their creativeness motivated and given new ideas.

Supervision or control is absolutely necessary each time a responsibility is delegated. The administrator should know whether or not the work is performed satisfactorily.

Research scientists may not like excessive control or supervision because they may think that controls are unreasonable, they have too many regulations and show lack of confidence.

ADMINISTRATION

Effective administration of an agricultural experiment station is both an art and a science. Art in being skilled in working with people, providing them an opportunity to use their talents to a maximum by challenging their initiative, giving counsel and support in order to develop a sense of being members of an efficient team. This art may be an inherent characteristic of the personality of the administrator and is always sharpened and perfected by experience, study and observation. The scientific aspect of administration can be improved when based on facts, tests and proven principles (11).

Administration as a separate individual entity does not work. The function of administration is to correlate the internal and external interests of the institution. In theory, all administration means delay and some necessary interference with individual initiative. A minimum of regulations is better for individual workers, but they must recognize that it is necessary to have organization and organization involves administration (34).

Allen, Beal and Steece (4) stated that the administrator must be sympathetic toward research and studious in promoting intellectual activity. This is one of the highest qualifications. In the administrator's office centers all the agricultural problems and the activities related to research.

The administrator rarely functions as a specialist, but he functions as an organizer. The administrator should have a broad understanding and sympathies with agricultural science and practice. The administrator must be intimately acquainted with the general principles and essentials which pertain to all research. From the administrator's judgment will come the selection and adoption of a working staff who will determine the programs of research. An administrator serves as a coordinator to see that the main purpose of the program does not become lost in a maze of details. Naturally, the details belong to the specialist, but the administrator must know whether or not the projects or programs are going forward effectively (4).

According to Alexander (2), an administrator is a kind of a catalyst in an environment involving related topics. He trys to keep all the staff working with each other and at the same time stimulating cooperation and coordination in order to get maximum benefit from each.

The chief functions of administration with respect to research are:

1. Help determine in advance whether the proposed research is feasible and altogether advisable from the standpoint of the public.
2. Assist in determining what programs or projects of

research are relative to solving the problems.

3. Help determine whether the work is best carried on by one individual or by a group working in conjunction and having a complete understanding of mutual duties, rights and responsibilities.
4. Once the plans of the experiment is decided and funds are provided, the role of administration is over until results are obtained (34).

The administration of an agricultural experiment station depends largely on the influence the administrator has upon the research workers. Research workers change their attitude, initiate new programs or experiments because they usually are encouraged, not ordered. Furthermore, encouragement allows opportunity for a give and take communication, keeping for each one the sense of independence.

The interest of the administrator in individual problems and interests of the research scientist should be evident. Although this interest seems to retard the success of the work of the station, in reality is accelerating it by creating more interest, more desire to accomplish the objectives by the research scientist who sees himself a member of the group.

Apple (9) stated that in order to have influence on people, an administrator must:

1. Gain their confidence, this is one of the most difficult tasks because a superior is a superior. The authority that an administrator brings in himself may inhibit people to readily give their confidence.
2. Try to find out what each man is like and how he can be treated. There are persons that are perennially resistant to authority.
3. Know their social peculiarities. This is very important in order to stimulate them.

In respect to administration, Allen and Wilcox (6) remarked:

1. The administrator must inspire and give encouragement and definiteness to the research workers.
2. The sympathetic and friendly interest and understanding are of such inspirational value as to make differences in the rate of progress and decisiveness of results.
3. Having a better supervision and administration of the work brings about better cooperation between the different departments or different research scientists.

Allen, Beal and Steece (4) commented that many specialists skilled in their own subject do not comprehend its relation to other subjects. The administrator must look for the greatest use of these talents by using wisdom and understanding.

Duties of the Station Administrator

The duties of an agricultural experiment station administrator have been described by Allen, Wilcox and Schulte (7) as:

1. A thorough and deep understanding of the needs of agriculture in his state is essential.
2. The administrator must be able to appreciate the relative importance and urgency of the problems which are presented to the station.
3. The administrator must allocate funds to the more important problems and the development of the station as a whole.
4. The administrator must be in a position to represent the station at any time before groups of people.
5. The administrator must exercise general directions over the research work of the station. The station suffers when time and energies of the administrator are spent on other matters.
6. The administrator needs leisure time for thorough reading in connection with the development and the general program of research in the station.
7. The administrator needs intellectual understanding of agricultural matters coupled with good organizational and

administrative ability. Also, he must understand other subjects related to agriculture in order to appreciate the relationships between agriculture and other fields.

8. The administrator must be a source of inspiration to the research workers needing scientific training. Furthermore, the administrator must have a fine sense of fitness and proportion.

The duties of an agricultural experiment station administrator can be described as follows (31):

1. Planning the overall programs of research according to the needs of the state, in cooperation with research workers.
2. Selecting and maintaining suitable personnel.
3. Planning and arranging the operation to carry out details of the approved research program with the personnel.
4. Maintain conditions and relationships favorable to productive research.
5. Supervision and approval of all the expenditures under the approved budget.

Characteristics of an Administrator

The most important characteristics of an administrator, according to Peterson (25), are:

have courage, be honest and especially, be fair. Furthermore, it is necessary to build confidence and moral in the group by employing good judgment and fairness.

Allen and Schulte (5) described the characteristics of an efficient administrator as:

1. Gives a feeling of fairness, justice and reasonable security.
2. Stability in policy.

The administrator should encourage initiative and stimulate cooperation which is essential for the growth of agricultural research. To do this, it is necessary to give the research workers large responsibility and freedom in the field of their specialty. Furthermore, it is necessary to give them the feeling of membership in that important body.

An important characteristic of an administrator is to be patient. The administrator must not react immediately when something was not done well or was done late. It is necessary to seek the reasons in order to be acquainted with the situation and be fair in the judgment (14).

According to Henderson (16) an administrator should not stop an idea in its formation. Ideas are like flowers and they should not be "nipped in the bud." It is necessary to allow them to bloom to see how they are. The buds often do not show how pretty they are going

to be when they finally flower. The immediate reaction to a new idea, according to Goetze (15), can be classified in one of these three classes: (a) The idea will not work, (b) the idea may work, let's try it, and (c) the idea is wonderful.

Newman and Summer (24) stated that the important characteristics of an administrator are:

1. Knowledge of subject matter and capacity to understand.
2. Decision-making talent with analitical ability or capacity to break down a problem into parts. Be able to identify the more important facts and interpret them. The administrator should have intuitive judgment and an open mind in order to receive new ideas.
3. Self-reliance and self-assertion in satisfying and solving problems.
4. Social sensitibity or empathy to understand imaginatively the thoughts, feelings and reactions of other persons.
5. Emotional stability. The administrator must be able to react to obstacles always looking for new solutions, with a desire to succeed and not become depressed.

Ways to Be Fair

The ways an administrator can be fair, according to Albrecht et al. (1), are:

1. Avoid the personal likes and dislikes in the dealings with individuals.
2. Advise employees in advance about developments that are going to affect them.
3. Evaluate employees' work objectively.
4. Provide the best possible working conditions for all employees.
5. Tell employees the basis for salary adjustments.
6. Involve staff members in policy determination. This builds morale.
7. Work out procedures that provide for full two-way communication.
8. Help the staff member recognize his abilities and limitations.
9. Make a fair distribution of opportunities for advancement.
10. Recognize individual need for advancement above institutional needs.
11. Give credit when credit is due.
12. Provide the staff members with opportunities to say what help they need or want from other persons.
13. Develop the idea that supervision is necessary.
14. Indicate willingness to give needed training.

RESEARCH SCIENTISTS

The success of an agricultural experiment station depends on its research scientists. The research scientists are the ones that are going to develop new varieties, new systems of culture, new methods of controlling pests, study the economic feasibility of a practice or machine and so on. The importance of the research scientists is discussed by Allen, Beal and Schulte (3) who said that scientists, methods and money are the prime essentials for the growth of investigation in the order named, but they need to be combined to assure success. Money alone means nothing, methods without investigation means mechanical routine, scientists, then, are fundamental.

The research scientists selected should possess the highest degree of mental accumen and integrity. They will need vision, initiative, perseverance, resourcefulness and cooperative attitude.

A good research scientist needs good training and this is expensive and takes time. Allen and Wilcox (6) remarked that men must be brought into harmony and understanding of their environment before much confidence can be place in their ability.

Training of the research scientists must be inspired by the administrator. The administrator is the one who must know the individual best. The administrator must know the motives, attitudes,

work habits, and problems of the research worker (1).

The individual must be trained by building his self-confidence. The administrator must try to make him recognize his limitations and help him overcome them. The administrator must tell the research scientist when he is not doing a good job and the reasons why he is not doing a good job (14).

The training of research scientist includes sending them to other institutions to take advantage of the facilities and of the knowledge of other research workers to acquire ideas for further development of the research programs under their direction.

Allen, Beal and Schulte (3) stated that a well-trained research scientist should be skeptic in that he should not admit anything without proof. The research scientist should seek the facts before accepting proposals. The research scientist should be an observer and a student. The research scientist is the questioner and the doubter until the evidence compels belief. The research scientist should be cautious, exacting and schooled in his thinking.

Stimuli

The stimuli that the agricultural experiment station has for its research workers are in direct association with the permanency of research scientists at the station (1). Allen and Wilcox (6) remarked that the permanency of personnel must receive careful

attention because training men on research is expensive and a scientist that has been at a station with some ability is a greater asset than a better trained scientist new to the locality, provided that the old research scientist can be encouraged to secure the advanced intellectual conditions and equipment which the research scientist needs to keep up with the growth of his work.

Among the different kinds of stimuli are:

1. Salary. The salary is the most valuable because it is tangible. The research scientist can see it, can touch it and can see the materialistic effects. Furthermore, salary is the standard stimulus. Individuals need their salary to get other things for their satisfaction. It is very important in the development of their work, because research scientists desire a feeling of security (13, 14). Money is also a symbol of status and a source of self respect that sometimes is more important than its purchasing power. Allen and Wilcox (6) observed that salary has been a way to keep research scientists in their programs. When a research scientist moves to another institution, this causes problems to the institution and sometimes is of little benefit to the new one.
2. Promotion or rank. Promotion is a reward for accomplishments, good work and enthusiasm that the

research worker has showed. By promotion, the research scientist gains prestige and a step in the hierarchal scale of the institution (13).

3. Freedom to work or independence of initiative. An independent person is more pleasant and works more intensively. Freedom brings a feeling of achievement and encourages personal initiative (1, 21).
4. Friendly relations with their employers. All persons need constructive criticism of their work by a fair and honest administrator. Every one appreciates congratulations for his accomplishments. The administrator should show his satisfaction in order to build morale, creating the feeling of accomplishment, and interest and willingness for cooperation (13, 14, 21).
5. The research worker's merits and efforts should be rewarded (14).
6. It is very important for the administrator to have in mind the research worker and his needs. The problems of the research scientist are of primary importance in the development of research work. They affect the kind of work that the research scientist does.
7. A feeling of security in his work. This feeling in association with the other stimuli gives the research scientist

a sensation of security. This helps to attract and retain the best men (5).

8. Make available means to increase knowledge in their subject matter by sabbatical leaves and assistance to attend scientific meetings.

Ways to Build Morale in Research Scientists

According to Albrecht et al. (1), the ways to build morale are:

1. Giving recognition by:
   a. Involving many research scientists in committes and using their reports.
   b. Providing opportunities to attend professional meetings.
   c. Providing agents to do special jobs that require extra judgment and skill.
   d. Crediting the work done and not the research scientist who did the work.
   e. Giving status and recognition.
   f. Promoting from within the ranks.
2. Be a fair administrator.
3. Stimulate self-development by:
   a. Encouraging staff participation in professional societies.

b. Help individuals develop special talents.

c. Encourage reading and studying on the job.

d. Provide guidance in planning, sabbatical leave and graduate training.

COMMUNICATION

Communication may be defined as the giving and receiving of information, signals by talking, gesturing or writing. Communication, then, is an exchange of facts, ideas, opinions or emotions by two or more persons, but this is only successful when a mutual understanding results.

Communication should exist in both directions, from the administrator to the research scientist and vice versa. A great deal of exchange of information and ideas should exist at the agricultural experiment stations. The development of new ideas, new projects, are due to friendly and constructive discussions involving an exchange of information. Furthermore, by communication, the administrator gives the research scientists a feeling of interest, stimulating their desire for more research.

Often the general criticism of the administrators at the agricultural experiment station is lack of communication, never have they faulted by excess (13).

Communication should follow hierarchal channels created by the organizational structure, but these channels should be easy to follow. When the communication channels are complicated, the research scientists do not want to communicate their ideas.

Two types of communication are commonly used at the

agricultural experiment stations: written and oral.

The written communication has:

1. The standard forms established by the institution such as: progress reports, annual reports and technical bulletins. These must be easy to understand by the people who are going to use them. The institution should specify deadlines for completion, the way they are to be written, and the persons to whom they must be forwarded (24).
2. Letters are another very important form of written communication, but they have the problem of failing to carry feelings, since they are not sincere in many respects (13).

Oral communication is the most important type of communication at the agricultural experiment stations. Oral communication has several advantages over written communication. It provides an opportunity to respond immediately to clarify the meaning of a report, exchange feelings and finally accomplish a mutual understanding.

The most important oral means of communication are:

1. Society meetings. Society meetings are annual meetings and they bring the opportunity to exchange ideas, feelings, ambitions with other research scientists, especially when it is difficult to meet with them during the year. Furthermore, the discussion of technical papers brings the research scientists up to date on the more recent

developments and work underway. At the meetings, research men have the opportunity to be acquainted with what is being done, not what has been done, because this can be read at the publications (4, 26).

2. Regional meetings. Regional meetings have the same advantage of society meetings although they are carried at regional level. These meetings open the way for more cooperation, avoid unnecessary repetition of work and increase their effectiveness (12).

3. Project leaders and staff meetings. Meetings of project leaders and staff members of the agricultural experiment station allow for a review of local research work and efforts currently underway. The research scientists get to know each other better and this gives the opportunity for research scientists to understand the efforts and problems of the others within the institution. By being aware of what other research scientists are doing and the discussion of their problems, more cooperation results (13).

4. Committees. The committees can be considered as another form of oral communication that helps the administrator a great deal in the solution of many problems. Usually, the members of the committee should be the

ones more affected by the problem.

5. Two way personal communication. Encouragement is expressed only when ideas, feelings and decisions are discussed with mutual understanding and appreciation. The administrator must be sensible as a receiver as well as sender of the meanings and feelings of research scientists. Newman and Summer (24) stated that the feelings that a person wants to transmit sometimes do not correspond with those that are received, "I understand what I heard, not I understand what you heard yourself say." Other difficulties in accomplishing a clear understanding reported by these authors are:

   a. Words have different meanings to different persons.
   b. The subordinates screen the information, because they want to be in accord with their administrator.
   c. Half listen to what the other person says. The administrator is so busy with his own thoughts that he only gives attention to what he expects to hear.
   d. The meaning that a person gives to an idea may make communication difficult.

An administrator must listen carefully and emphatically to what the other person says. The administrator must try to avoid that his emotional state of mind will affect his receptiveness to new

messages. Two way personal communication develops mutual understanding, mutual respect, confidence and trust that permits frank discussion of personal feelings and problems.

Public relations or communication with outside persons is very important for the agricultural experiment stations. The agricultural experiment stations are supported by Federal and state money. That is, they are tax supported institutions and as such every individual has the right to know something about them. Furthermore, if people know that the agricultural experiment stations are doing, they will give them better support.

Jardine (19) stated that public support is given to the agricultural experiment station for two reasons:

1. All people are concerned with the problem of an adequate and suitable food supply. People who live in the city depend on the surplus crops that farmers do not need for their family use.
2. Experience has proven that scientific research is needed in agriculture. The agricultural experiment station discoveries can not be patented as industrial discoveries because every day there are more serious animal and crop pests. Research must be done by public welfare and at public expenses.

A carefully planned public relations program is indispensable

for the agricultural experiment stations in order that adequate funds will be appropriated to enable the agricultural experiment stations to accomplish their objectives.

COOPERATION

Cooperative or joint effort at the agricultural experiment stations is the evidence of a desire for combined study of important problems to hasten their solutions (3).

The cooperative effort on research has the following advantages:

1. The cooperative effort of different individuals working in different environments builds a broad foundation of knowledge, makes it easy to interpret data and shortens the period of experimental study.
2. In cooperative research, special tasks can be selected by those who are best fitted to undertake them.
3. The cooperative effort helps to accomplish a better use of facilities. It gives the research workers an opportunity for more accurate work and to improve the "esprit de corps" among research scientists.
4. The cooperative effort hastens the recognition of the dignity of research as well as the responsibilities of the research scientists (23).

A cooperative effort at the agricultural experiment station results in:

1. Reduction of jealousy among research workers.

2. Prevention of duplication.

3. Saving of funds.

4. Greater accuracy.

5. Uniform methods of experimentation for purpose of making comparisons.

6. Increase friendly relations among research scientists (26).

Cooperative effort opens the way to attack many regional or national problems. When several agricultural experiment stations have mutual interest in a problem, a cooperative effort combines experience, viewpoints, and facilities for a better solution of the problem. The cooperative effort avoids unnecessary duplication and supplies duplication where it is necessary to make the results comparable (4).

A cooperative effort facilitates a more effective use of special qualities of research scientists, such as: experience, practical knowledge, mental ability and imagination. These qualities can be employed with a great deal of advantage for research. A single research scientist never can do the kind of work done by several research scientists working cooperatively (4, 26).

The cooperative effort implies a division of the field on large or complex problems, facilitating an intensive and comprehensive study beyond the boundaries of separate departments (4). The interrelation of the sciences involved in agricultural research makes

interdepartmental cooperation not only desirable but imperative (3).

The cooperative effort and its coordination are the greatest need of agricultural research in order to get a more comprehensive and effective study of the main problems. This avoids unnecessary repetition and directs the effort toward the facts that must be considered before the problems are solved. Cooperative effort instead of being a question of subordination of individual initiative and independence is a challenge to originality (4).

The main problems in cooperative effort are:

1. Jealousy of different workers.
2. Desire of individual to work alone.

The administrator of an agricultural experiment station can develop willingness to cooperate by:

1. Better communication. A proper understanding of the objectives, goals, purpose and aspirations make the individuals cooperate to achieve desired goals. Communication helps to reveal that jealousy is unjustified and the solution of points of friction is facilitated. Most of the major problems between individuals start with small things, as Henderson (16) stated: "a small mole can make a mountain."
2. Fairness and honesty of the administrator.
3. Joint programs of research. Develop research teams.

4. Stimulating seminars in order to have every one informed of the success and problems of all programs. Ignorance is one of the major reasons for lack of cooperation.
5. Informative letters, such as informative staff newsletters.
6. Committees are a tremendous help in reducing ignorance increasing cooperative effort.
7. A thorough understanding of all the problems by the administrator helps to develop cooperation (10).

BUDGET

Budget is the expression in terms of money of the cost of research. Budgets are based on research plans but conduction of an experiment will have a large margin of unforseen costs, unless it is very well planned. Even so, it is very important to have flexibility in the budget in order to reallocate new funds to those projects which are short of money from those who have a margin of excess.

Research budgets are prepared in the following manner. The research scientist makes an estimate of the things he will need for a successful development of his program. After the research scientist develops his budget, the project leader works on the project budget in order to prepare a budget at project level. From here, the budgets get to the department or division for discussion and review. At this point, the budget is increased to provide the administrative expenses which the department or division considers necessary. These are expenses that research scientists do not consider in their budgets and they involve supplies, personnel, and administrative aspects (13).

Departments send their budget estimates to the Dean of the School or to the Director of the Station for a review. The dean or director makes the modifications that are considered necessary.

Since the agricultural experiment stations are both federal and state supported institutions, the budget has to be submitted to the

appropriating agencies of the state or county. Usually, the Legislature and the executive men adjust the budget before they approve it. After the budget is approved, it follows the same steps down and finally it reaches the research scientist, who must adapt his program to the new and real budget (13).

The administrator must supervise the expenditures regularly in order to see the distribution of expenses by the different projects or departments. The administrator must help the projects to solve the problems and to get more money when it is necessary (13).

When an agricultural experiment station has been operating on a given type of budget and the budget suffers a strong cut in funds, the research scientists cannot accomplish their plans, they become discouraged, the morale of the personnel drops and this can be one of the major problems for the administrator.

EXPERIMENTAL FARM

The experimental farm is the most important laboratory of the agricultural experiment station and is the place where all the experiments with crops and animals are carried. The name of the agricultural experiment station originated from an experimental farm.

An agricultural experiment station generally has several farms, one that can be called the main farm located close to the administrative buildings and which has most of the research scientists and a series of branch stations in which replication of experiments is to be conducted, in order to study the effect that changing environment, soil and climate have on the different experiments. Generally, the branch stations are located on representative places of the microclimate of a given region.

At the experimental farm, work on plants and animals is carried on. The experimental farm is divided in ranges which must have a detailed history to determine the influence that different treatments of the land would have on the results of the experiments.

The experimental farm needs a complete organization and a superintendent responsible for having all the fields ready for the different experiments that research scientists plan to do.

The facilities that an experimental farm should have are:

1. Land to carry out the experiments.

2. A shop with tools, mechanics, carpenters and facilities to modify or construct the experimental equipment when it becomes necessary.
3. Buildings with facilities for storage of the varieties and strains of crops, laboratories, seed cleaning rooms, cool rooms, dryers, weight rooms and so on.
4. Machinery necessary for the preparation of the soil. Experimental plots require different management which in turn require different types of implements.
5. Irrigation for most of the plots or ranges.
6. Living facilities for the Superintendent and other staff.

The work conducted at the experimental farm is affected by the policy of the agricultural experiment station and the availability of funds to carry out the experiments. When it is necessary to have some commercial crops in order to provide part of the funds, this may be contrary to the aims of research and a friction point with research scientists may be created. It may be necessary to make decisions about who is going to have priority of the facilities: the experimental work or the commercial crops.

The branch stations are similar to the main station. Their objective is to carry out research under different environmental conditions and on agricultural problems of the area (9, 12, 13).

Although the branch stations are independent in their

operations, cooperative effort is absolutely necessary for better results. The obligation of a branch station is to cooperate with the main station as the main station has to cooperate with the branch station in the solution of the problems (9).

Cooperative effort and coordination between the main station and the branch stations are the basis for integration of functions, in order to obtain the highest benefits in all fields.

Cooperative effort of the research scientists from the main station with those of the branch stations is developed through:

1. Research planning conferences in which different experiments are planned.
2. Joint appointments between research scientists of branch stations and those from the main station.
3. Development of cooperative research projects and work plans with delimitation of responsibilities (13).

THE SUPERINTENDENT

The Superintendent of the experimental farm or branch station should be a qualified person in order to provide all the services and facilities that research scientists need in their work.

The Superintendent is a person who has to work with people, crops and animals, and weather (22). In relation to people, the Superintendent has to understand each one of the research workers, the importance of their jobs and especially the individual himself because each individual is different. It is necessary for the Superintendent to know what the research scientists mean when they express their thoughts and opinions. The Superintendent must be able to discuss the problems and get cooperation from research scientists all the time.

The Superintendent should know how to work with crops and animals and which are the critical periods in order to make decisions, and he should be able to cope with the weather conditions in order to grow the crops according to the objectives of the experiment. The Superintendent must have all the facilities necessary for establishment of new field plot experiments.

Traits of a Superintendent

Since the Superintendent is a person involved in

administration, he must have many of the characteristics of an agricultural experiment station administrator. The author considers the following characteristics very important for a Superintendent:

1. Ability to get along with people. Ability to work easily with research scientists.
2. Willingness to learn about all the projects and different experiments research scientists are carrying out. This is very important and helpful when the Superintendent has to make decisions.
3. Keenness in observation and perception in order to do a good planning of his work, having all the operations and facilities ready for research scientists when they will need them.
4. Resourcefulness and imagination to find the best way to do things, find possible solutions to the countless problems and details of the experimental farm.
5. Confidence and analytical ability to make decisions and forsee the possible problems the solutions will bring.
6. Ability to lead and inspire loyalty and confidence to the personnel under his command and to the research scientists.
7. Ability to keep confidential information, interests and objectives of research scientists and their problems.

8. Ability to coordinate and integrate the different jobs under an established policy of providing services and facilities to research scientists, so that they can be successful in their accomplishments.

The duties of a Superintendent can be listed as follows:

1. Carry out the philosophy of the agricultural experiment station.
2. Provide the services necessary for adequate research at the farm.
3. Keep machinery and equipment in good condition, ready for use.
4. Keep a stock of materials commonly used.
5. Provide good service at the shop and adequate supplies.
6. Organize and plan all the operation facilities (irrigation, labor, equipment) necessary to do good research.
7. Keep a record of the different ranges or plots, in order to facilitate information when research scientists need it.
8. Cooperate with research scientists on any of the problems they have.
9. Keep buildings, laboratories and storage facilities ready for use. Keep the experimental farm ready to be showed to visitors and be able to explain to them the work being done.

10. Make a budget for materials, equipment, machinery and maintenance, needed at the experimental farm.

11. Maintains his professional efficiency.

12. Keep close contact with research scientists concerning the work they are doing in order to plan his own work and never make the mistake of directing the work of others, only research scientists know what they want.

DEVELOPMENT OF THE AGRICULTURAL EXPERIMENT STATION IN COLOMBIA

Present Situation

The Colombian Agricultural Institute (ICA) was created by Decree No. 1562 on June 15, 1962, and was ratified by Law Decree No. 3116 in 1963. I. C. A. is a corporation with legal status and administrative autonomy created to stimulate, coordinate and carry out research, teaching and agricultural extension in Colombia (17).

The purpose of the I. C. A. is to integrate teaching, research and extension. Teaching, research and extension in the past have been conducted independently and often lacked cooperation and flexibility for an effective use of their limited available resources. Research and extension in the past were under the Colombian Ministry of Agriculture but existed as separate entities without coordination of efforts. Research and extension were also conducted by other institutes under similar conditions, without any kind of cooperation. Agricultural education was part of the National University, and some vocational and normal agricultural schools were under the Ministry of Education. These schools were completely disconnected from research and extension (17).

The system of research, teaching and extension integration in I. C. A., in general, follows the pattern of the Land-Grant system of

the United States with certain adaptations to Colombian conditions. This integration is accomplished by a series of cooperative contracts with the different institutions. It is presumed that strengthening research, teaching and extension will result in a greater contribution to the agricultural sector and, in turn, to the economic development of the country (17).

I. C. A. is administered by a Board of Directors, an Executive Committee, a General Director, and a Technical Committee. The General Director is the legal representative and the one responsible for the administration of the Institute. I. C. A. is divided into three technical divisions: teaching, research and extension, which advise the General Director in all matters relating to technical aspects and serves as a source of coordination of the three fields of work. The directors of these three fields form the Technical Committee (17).

As a result of the cooperative contract with the National University, I. C. A. initiated a graduate school in February, 1967, at the National Research Center of Tibaitata in Bogota.

I. C. A. possesses 13 experiment stations strategically located so as to furnish land and climate for almost any kind of experiment that should be done on plants and animals in Colombia (17).

Future Trends

An adequate and complete integration and strengthening of

teaching, research and extension is the major goal of I. C. A. The future development of Colombian agriculture depends on the effective integration of these efforts.

To accomplish these goals, it will be necessary to expand the facilities of I. C. A. and the centers of education, and to coordinate their efforts for a more efficient use of limited available resources. This will take time, planning and a lot of patience in order to solve all the problems, but the task is not an impossible one. The development of the cooperative effort will present a challenge to all individuals involved. It will also require a well planned effort by the administrators to coordinate and direct all of the individual efforts in order to attain the desired goals.

I. C. A. is a very young institution with a great responsibility to the country and a great desire to fulfill its responsibilities.

The author is of the opinion that his main task on return to Colombia will be to help put in practice some of the things that have already been planned, help develop a common cooperative effort and collaborate with the administration in making some of the things possible for the Institute. The author believes that the following proposals will help in the growth of I. C. A. toward achieving its primary goal:

1. The creation of an office which will be responsible for:
    a. The administration of cooperative contracts between

the different institutes and centers of education.

b. Seek ways by which cooperative efforts can be developed and stimulate new cooperative contracts to attack regional or national problems.

c. Keep a record of all the research work, with sufficient annotations in order to have current information on the work underway. Furthermore, the office must send a copy of the research projects to the institutes and centers of education in order that they may have a file for easy reference and consultation when a new project or experiment is being planned.

2. An expansion of the facilities to train more personnel in research, teaching and extension. Actually, the most critical need is the training of individuals in agricultural extension. This will help accomplish one of the goals of I. C. A., that is, the diffusion of knowledge among the people. I. C. A. must have facilities for its own printing service for the preparation of bulletins, newsletters and the materials required for an effective extension service.

3. A plan to train individuals who are going to be in administrative positions must be developed. The administrators must acquire training in personnel management. They must learn the principles of motivating and stimulating

personnel, and ways to develop good relations and a sense of belonging and loyalty. A national program can be developed by:

a. Providing means for the administrators and directors of the experiment stations to have periodical meetings. In this way, they will become acquainted with the problems and solutions at the different experiment stations.

b. Providing facilities to the administrators to attend meetings to increase their knowledge on agricultural matters and the relationship of agriculture with other fields.

c. Developing a better communication system which will stimulate cooperative efforts and increase the knowledge of the way other experiment stations are being developed.

4. The research scientists should have more opportunity to attend scientific meetings. A system similar to the sabbatical leave in many U. S. universities should be established in order to stimulate training, and study.

5. The establishment of a good public relations program by which all people will be informed of the work of I. C. A., will help considerably in the fight to obtain an adequate

budget not only to strengthen the work actually underway but to adapt to new problems and needs that a growing institution will have.

6. Finally, the author believes that in order to complement the 13 experiment stations located in the western part of Colombia, it will be necessary to establish some experiment stations in the eastern part of the country. These new stations should study the introduction of crops and animals and systems by which the land can be brought into cultivation. The eastern part of Colombia only has two percent of the total population and is larger than the western part. If an orderly study is started, it will stimulate new settlers to go to this promising region.

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