the demand for good-quality dairy products. This, in turn, will encourage production.

3. Final considerations. When we speak of the problems facing Latin American education in the agricultural field, it is difficult and sometimes impossible to generalize, because of the diversity of conditions which exist in different countries. It must be emphasized that there are exceptions to the observations presented here, but, in general, they portray the situation in Latin American agricultural education, and especially that concerning dairying.

Today most of the Latin American countries are awakening to the urgent need for greater development in the various fields of production, especially agriculture and industry.

During recent years some progress has been made; however, this growth has not always been sufficient and harmonious. In this respect, agriculture has been in almost every case relegated to a very slow process of development.

The existing situation has not furnished a favorable environment for the development and progress of education in agriculture. I believe that very little progress will be achieved in this respect if we do not have the understanding and cooperation of the governments, the farmers, and the communities to place agriculture on an equal footing with the other production activities of Latin America. Only in this manner will Latin America overcome the acute problems arising from our insufficient food production.

TRAINING NEEDED FOR LEADERSHIP IN DAIRYING IN LATIN AMERICA

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As far as possible, these ideas are based on objectively observed facts.

In essence, these views express two main lines of thought: First, training for leadership in animal production can be accomplished in Latin America more effectively and forcefully than by the colleges doing it. The situation can be much improved if outstanding teachers are given the essentials of stability, continuity, and opportunity for research. Thus, they can maintain an understanding of the ever-changing scientific field.

A second problem is that although many outstanding young men are needed by colleges and experiment stations in Latin America, few of them are able, because of financial, or administrative difficulties, to prove the worth of the new trainees. Despite the excellence of their background, the new trainees must fit themselves into situations where progress is often impeded by traditions or financial limitations. They must be pioneers not only in their technical fields but in human qualities as well.

However desperate may be our efforts to bring about a change, it will be slow and painful. Despite the ample field and the multiple theoretical opportunities for work, many of our best trainees are going to find it very difficult to locate suitable jobs where they can develop to their expected potentials.

The pattern as it exists now. Even though each Latin American country has its own peculiarities, there is a general pattern of development that applies everywhere almost equally. Most of them have facilities for teaching in agriculture. Some of the institutions were founded almost a century ago; many are more than 50

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year old. A study made by FAO and the Inter-American Institute of Agricultural Sciences revealed there were 46 colleges of agriculture in Latin America in 1957 and more than 60 today. Many of the early colleges were founded under French and Belgian influence, and were usually government-sponsored, but only recently have become a part of university systems where some leadership in dairying is now being provided. But a cursory examination reveals that, as far as dairying is concerned, the training offered is deficient. Of the 60 agricultural colleges the author is acquainted with 21, only two of which have facilities for dairy manufacturing work. Among the others, facilities and budgets for dairy research are almost nonexistent. Only two have published specific papers on research findings in dairy production in the last 5 yr and no publications on dairy manufacturing have appeared in the last 10 yr. The pattern is similar if we exclude publications from schools of veterinary sciences.

Specialization is not offered in the Latin American agricultural colleges. Typical is the Ingeniero Agrónomo degree, which is granted on completion of a single type of general curriculum followed by all students for 5 yr. The present tendency is toward a slight amount of specialization. For example, in a questionnaire about specialization, used in Chaparro’s study and answered by professors, students, and alumni, animal production was recognized as one of the most desirable agricultural majors. However, only nine of the 148 people who filled out the questionnaire mentioned dairying as a separate major from animal production. Animal husbandry occupied 11.1% of the time of students enrolled in agricultural colleges in 1955. Of 21 colleges that gave details about their animal husbandry courses, only six were giving courses in dairying. Dairy manufacturing courses were not listed separately by any of the colleges. [Chaparro, (2).]

From this brief look at the situation, it is obvious that the educational system is doing little to provide leadership in dairying in Latin America. It might not be so serious if the state of economic development were such that there were no demands for changes in the dairy industry. But such is not the case, for industrial development and rapid increases in the population of Latin American cities are creating a strong demand for quality dairy products. Many Latin Americans are investing in equipment for dairy manufacturing. The author knows of at least ten attempts to establish modern dairy processing plants in cities of Honduras, Mexico, and Colombia that failed completely for lack of technical knowledge on the part of the operators. Frequently, the dairies have survived and are operated either by European-trained plant managers or by local people who have learned the essentials through trial and error.

In one of the richest countries in South America, the largest dairy manufacturing and distributing firm, which owns many pasteurizing plants and a huge collection and distributing system, employs not one man trained specifically in dairy manufacturing. Some of the huge losses that have been incurred from time to time by this company are compensated for by the large price differential paid by the consumer. It might not be amiss to mention that this large company is North American-owned. In all cases where manufacturing establishes itself on a purely commercial trial and error basis, frequently protected by laws that prohibit the sale of unpasteurized milk, the relations between producers and manufacturers are strained. Wherever state regulations for the sale of milk are enforced by people with no knowledge of dairy production, the friction that ensues is especially evident, and cooperation from the producers is highly jeopardized.

Obviously, a new type of leadership is urgently needed for the dairy industry in Latin America. Some tentative solutions have been put into operation that are worthy of close examination. Outstanding among the solutions are the attempts at technical assistance and the training of Latin American students in countries with more advanced dairying systems.

Technical assistance in dairying. Several types of technical assistance in dairying have been attempted in Latin America. These can be subdivided into assistance rendered by international organizations, such as UNESCO, FAO, or the Inter-American Institute, to which the author belongs; assistance rendered through agreements between local governments and the U.S. Department of State; and assistance rendered through the foundations. Another type is the assistance rendered to regional or national projects by United States college contracts. This is also handled financially by the State Department, but few dairying projects have taken place under these agreements. [Adams and Cumberland, (1).]

In relation to the amounts of money invested, the results obtained have been rather disappointing. However, this is not the occasion to make a detailed analysis of the causes responsible for such meager success. Moreover, we are concerned with only a single aspect of agricultural technical assistance, that of dairying. One assistance plan that concerns dairying specifically has been the UNICEF-FAO scheme to provide facilities for producing, dehydrating, and distributing dried skim milk for schools. Large sums of money have been spent in this project in equipment, buildings, and personnel. The failures have been more outstanding where huge plants were constructed in areas that had no experience in dairying. Better results are likely to be obtained where the dehydrating plants were organized as part of cooperative enterprises made up of dairy producers.
Frequently, when foreign technical assistance is given to Latin Americans, one finds the native technician or even the public at large highly critical of the capabilities of the men sent by the more advanced countries. The barriers of language, social customs, and traditions are slow and difficult to overcome. When the foreign technicians set up a separate shop from the local institutions and are personally protected by diplomatic privileges, assimilation into the local scene is more difficult. Constant routine transfers of personnel, not only within Latin America but to and from other totally dissimilar areas, have aggravated the problem of assimilation into the local environment.

Sending foreign technicians to solve dairying problems in Latin America is a sort of substitute system in lieu of national leadership. From an altruistic point of view the idea is commendable, but from a practical point of view it may be unsound. At best, it provides only a substitute for the permanent leadership required. Presumably, local leaders would come later. But when the foreign technician is not located in teaching institutions, and does not participate in the local life, the possibility of his influencing future generations is slim indeed. Perhaps all technical assistance schemes should be constructed with the awareness that no country has a surplus of brain power; also, it should be recognized that because brain power operates satisfactorily under one set of circumstances, there is no guarantee that it will function equally efficiently under another.

Training of future Latin American leaders in the United States or Europe. The undergraduate level. The North American college is an institution designed to give the most useful and practical training in the shortest time to the man who is going to work in the United States. Herein lies its greatest quality, its practical, down-to-earth approach and ability to direct research findings toward the solution of practical problems. But the very practical nature of college training in the United States, so useful to the man who will apply the principles in the vicinity of the college, may turn out to be a liability for the man who tries to apply a set of solutions in totally different situations. Since the local situation may need a complete readaptation of principles, it takes a deeper knowledge of these principles before the adaptation can be made. Too often I have seen United States- and European-trained Latin American technicians become totally discouraged and despondent when they fail to make a success at their first efforts to improve production under primitive or difficult conditions. While many personal qualities (or the lack of them) may contribute to this failure, I would also blame the lack of depth in scientific principles as one of the underlying causes. Obviously, agricultural science has a greater share of these unadapted foreign trainees than the exact sciences, such as engineering and mathematics or even medicine. The solutions to many of the latter’s problems obey universal rules, they are not modified by levels of soil fertility and the interactions of soil fertility with history, tradition, and social structure.

The postgraduate level. If I am making an appeal for depth in scientific principles as a means of overcoming the problems of adapting research findings to new situations, postgraduate training should provide the answer to my plea. Many of you will immediately protest that postgraduate training is for the few, and that too many leaders are needed in Latin America to make the Ph.D. degree a requirement. But since I am convinced that quick, improvised solutions will not help us, I would aim for a slower but more certain action—one in which we would prepare the men who will train the leaders in their own countries.

To be able to do this, the man with an advanced degree must be given a chance to prove the worth of his scientific knowledge in the local situation. Before we turn him loose we must give him a period of protection, so that he may produce results of local significance.

I see no better place for our well-trained man to prove his ability and influence future leaders than in the Latin American colleges themselves. These are the colleges that we find so inept and poorly organized now. But they are the ones we must work with. Only progress from within can be long-lasting and important. Our leader, once trained and back on a job of importance, must make his own fight to obtain a budget for research in his institution, and for modernizing the teaching responsibilities given him.

This means that, for postgraduate training, preference should be given to the young men who have the contacts with and acceptance of their local colleges. It may also require some support and subsidy from a college to develop postgraduate training there. Postgraduate studies for those in Latin America should be locally developed. This is a deviation from American practice but, with the speed of present-day travel, the supervision of work done thousands of miles away is not difficult, though somewhat costly.

I also recommend that the Latin American candidates for higher degrees be rigorously selected. Only the very best should be given the time and attention that good personal training requires. I would ask you to be completely dispassionate in this selection and, if anything, apply more rigid standards than usual because, as foreigners, they will have to develop and prove their worth under more trying circumstances than your own countrymen. The time spent in obtaining a Master’s degree is an appropriate measure for selecting those best suited for further training. In fact, since postgraduate training at the Master’s level is being offered
now by some Latin American institutions, I would recommend that the American graduate school consult these institutions and heed their word in the selection of candidates.

Since our local colleges are so poor financially, the new leaders, or the institution itself, might need assistance to effect the changes that are so urgently required. I would say that money is well spent when it develops the sort of leadership that is self-perpetuating. I would certainly favor this kind of support over providing elaborate, expensive, superficial foreign leadership for the Latin American countries.


DISCUSSION

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There are no special courses for dairy husbandry in Brazil. Animal husbandry occupies a small part of the veterinary and agronomy curricula, and only a few hours a year are assigned to their teaching and training. Students in veterinary and agronomy colleges have no opportunity to work on farms or in dairy plants to gain first-hand knowledge of the problems of dairy farming. Theoretical schooling rather than practical training is more frequently provided. Technical high schools that give better training than colleges operate in some states, but their level is still too low to provide adequate leadership in dairy husbandry. In Latin American countries both veterinarians and agronomists are often in dispute about their relative positions but, in truth, neither is sufficiently prepared to perform the job satisfactorily.

Brazil is an unusual country, with peculiar problems and conditions that differ in several aspects from those of other countries in the temperate zone. Dairy husbandmen in this country, which is both tropical and subtropical as are many other large areas of Latin America, must be prepared to face a number of outstanding problems, some of which are: climate, malnutrition, poor management, and diseases. To deal with these adverse environmental conditions, the dairy husbandman must understand animal reactions to high temperatures and humidity, animal physiology, and animal acclimatization. He must know how to raise animals resistant to the hazards of these environments, as well as ways to compensate for the effects of the environment. Furthermore, he must be well acquainted with cattle nutrition procedures, pasture grazing, and pasture improvement. He must be accomplished in the skills of hygienics and sanitation. As a rule, he should understand the economy of his area and be prepared to deal with inexperienced people.

In Latin America there are no specialized courses such as dairy husbandry, animal breeding, nutrition, or dairy industry. Few of these matters are dealt with in veterinary or agronomy courses; thus, veterinarians and agronomists have to invest much additional time to be able to execute their duties effectively in these fields. Obviously, the country is in great need of well-prepared experts in animal husbandry, nutrition, and dairy industry. These subjects should be taught in the schools of Brazil, and intensive research carried out; new curricula should be designed.

Technical schools and colleges need to change