The Role of Agricultural Colleges in Modern Society
- - The University as an Instrument in Social and Economic Development —

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Among the most important institutions in the revolutionary development of agriculture over the last 50 years are the colleges of agriculture. As brain center for agricultural progress, they provided with their research efforts the scientific knowledge base, their training increased the quality of the human agent of production, and in many cases, their extension activities brought new knowledge down to the peasant.

In spite of all the contributions made by agricultural colleges in recent times, there is a growing discussion on the role of colleges of agriculture in modern society which, so far, culminated in the World Conference on Agricultural Education and Training, organized by the United Nations at Copenhagen, and in its follow-up meetings. There seems to be an increasing awareness that the changes in agriculture and the requirements of a modern economy require certain adaptions in the understanding of agricultural colleges as to the role they have to play.

In order to reassess the role of agricultural colleges in modern society, we will first elaborate on the two main determinants for the role of agricultural colleges, i.e. the role of agriculture and the role of universities in modern society. On this basis, conclusions will be drawn on the teaching and research activities of colleges of agriculture needed to meet the requirements of today.

1. The role of agriculture in modern society

Agriculture provides the basis of subsistence for the population by production of food and raw materials. Traditionally, the inhabitants of each country or region depended on the bread-basket filled by the farmers, i.e., everybody depended on agriculture and was interested in its fate. In recent times, regional and international trade have reduced the dependence on home agriculture, and the quantity of available food is less a function of the harvest than of the political decision on the amount of food imports.

To meet the requirements of the ever increasing population with its higher purchasing power, and this despite less and less manpower because of the high outmigration from rural areas, agriculture increased its outputs and productivity, a process which had consequences for the price of agricultural products. The more people live in the cities and have to buy food at the market, the more agricultural prices became a political issue. The interest of urban society in agriculture is an interest in low prices, and the request of the primary sector for price increases is a regular nuisance for the urban population.
The increase in output and productivity of agriculture could only be achieved by division of work and specialization. Today only part of the production process takes place on the farm, while, in addition, agriculture uses industrial products like fertilizer, pesticides, machinery and equipment, the services of the tertiary sector like banking, insurance etc. and hands its products over to other sectors for packing, processing, or distribution. Today, agriculture is deeply interwoven with other sectors of the economy. It cannot produce anymore without their inputs and services, and acts itself as a customer to these other sectors, thus providing work and income outside of agriculture.

These changes in agriculture had consequences for the agricultural population. Many people from rural areas migrated to the cities and filled the ranks of workers in the secondary and tertiary sectors. For the remaining rural population, agriculture changed from a way of life to a profession in which technical know-how plays an ever increasing role. Frequently, the structure and organization of the farm changed. New forms like part-time farming arose. In areas with very tiny holdings and poor soil, rural-urban migration reached the stage, where only the aged live in the village. Particularly under such conditions, the responsibility of agriculture for the preservation of nature adds to the roles it plays today.

The changes in agriculture — briefly outlined here — bring with them new tasks in training and research for colleges of agriculture. The process of agricultural production has become increasingly complex and requires therefore scientific help in research and extension. The need for optimizing the allocation of inputs has given agricultural economics importance, especially in the field of farm management. Necessary changes in the agrarian structure require special studies. The application of inputs in agriculture have created new tasks in fields like agricultural chemistry and engineering, and the processing of food has become a new area of specialization. Such a highly differentiated organization of agriculture requires professional associations. Finally, the provision of food for the population with so many contributors and interest-groups can be achieved only with a functioning marketing and distribution system as well as a sound agricultural policy.

For all these tasks, persons have to be trained, and research has to provide the necessary scientific basis. The changes in agriculture have broadened the role the colleges of agriculture have to play as training and research institutions.

2. The role of universities in modern society

The traditional functions of universities are teaching and research. In their teaching activities, universities provide the professional training for high-level jobs, as well as the education necessary for the development of the personality. University research increased the body of theoretical knowledge as well as its application to practical problems.

The traditional university restricted itself mainly to a close circle of professors and students from the upper strata of society and lived in relative isolation, the proverbial „ivory tower“. It produced the elite of the nation, and society — so to speak — had
to adopt to the elite. Research was the privilege of the professors, determined to a large extent by personal interests and their contacts among each other.

We all know of the brilliant performance of this traditional university which laid down the basis for the progress of mankind. But too much concerned with itself, this university lost contact with society until it was completely isolated and did not understand the issues of its surroundings. This, however, meant a reduction in performance: the ultimate yardstick for measuring the success of a university is the improvement in the lives of the people it serves. The full benefit from a university can be obtained only if the university and society are organically linked together. Raised in another way, the needs of society have to be at the center of a university’s activities, and a flexible adjustment to changing needs is necessary but lacking — more or less — all over the world.

The current universities were developed in a bygone era to satisfy the needs of that time. In industrial countries, the today’s main issue is to open up the elite university to the masses of young people and to adjust to today’s democratic, pluralistic society, and at the same maintain the standard of teaching and level of research. In developing countries universities have been built more or less according to Western models and, sometimes, even as branches of old European institutions. However, the subjects and methods of science correspond to the society in which they were generated: American and European universities meet the interests of current or past American and European industrial societies. Research projects and methods are centered around Western problems, needs, and conditions. As a consequence, universities all over the world face the same transition, from being universities for only a few, to universities for many. But, it must not be overlooked that the universities in developing countries face additional responsibilities.

2.1 The process of planned socioeconomic Development brings new and additional roles

A rapid improvement in the well-being of the population requires the streamlining of all available resources of a nation. The universities are among the most important of these resources. National development is the result of two simultaneous processes — growth and change, and both can be influenced decisively by science and technology in all its forms. This requires a university taking the leading role in the efforts for development and placing the needs of the development process at the center of its teaching activities. Among others, this would mean:

— to relate training in contents, level and number to the requirement of the development process;
— to concentrate research on problems related to the reality of the country and the needs of the development process;
— to transform internationally available knowledge and make it available and applicable to local conditions;
— to contribute to the discussion of development goals, the selection of means, and the evaluation of achievements;
— to participate in a lively communication between university, the public, and politicians.

By fulfilling the above goals, the university would leave its ivory tower, become an instrument of national development policy and regain its social significance.

2.2 The universities in developing countries work under different conditions

There are certain preconditions to be fulfilled in order to change universities into an instrument of socio-economic change:

— the society must be ready to let new knowledge influence its values and goals,
— the society must allow universities to participate in the process of forming values and setting goals.

Needless to say, it is not the task of universities to decide on values and goals — this is a field of political institutions —, but it should prepare the material and intellectual basis for the decision and contribute to the discussion. It is not unproblematic for universities to play an active role in the development process. The university must contribute, discuss, and even criticize, but should not enter a situation of dependence. An antinomy between freedom and self-determination of science and the demands of government and society may come up. Each society has to find its formula to use scientific knowledge for gearing the development process and profit from the university's competence without giving up the primacy of the political institutions. A society will attain full value from its university only if society and the university are linked together and confront the realities of today and the development needs of the country. This requires a transition from the traditionally introspective university to a university playing an active role in the process of change in the economy and society.

The new and much broader role of a modern college of agriculture has implications for its teaching and research activities.

3. Teaching in a modern college of agriculture

In the past, there was little discussion on the fundamental objectives of training in agricultural colleges, and the changes in the economy and society caused only slight adjustments in the contents and methods of training. Graduates of today's colleges of agriculture work at a wide spectrum of jobs. They are farmers and extension officers, foresters and horticulturists, scientists in research laboratories and functionaries in professional organizations, businessmen and managers in agricultural industries, food-technologists and government officials, market managers and development planners. The list could be continued for a long time. It is noteworthy that few graduates work in agriculture, while most work on agriculture and its problems and products. Most of them, in one way or another, are involved in planning and problem solving or in the implementation of new ideas and processes. Another important factor for training is the fact that the requirements of the labour market change simultaneously with changes in the economy. We do not know what the requirements will be 25 years from now when today's graduates are at the peak of their career.
The necessary adjustments in training to meet new requirements demand answers to three problem areas.

3.1 Practice versus theory-oriented training

Traditionally universities are biased towards theoretical work, and its application to problems of the real world is looked down upon as Jess scientific" and, sometimes, below the dignity of a real scientist. On the one hand, theory is the basis of scientific training which cannot be waived. It is fundamental for the development of science and for research. There is nothing more practical than a good theory. On the other hand, the scientist's problems are not society's problems and the real world situation is usually different from the assumptions made in many theoretical models. Therefore, while theoretical training is fundamental at the university level, the application of theories towards solving practical problems has to be taught and exercised in addition, if not only a few scientists, but graduates are to be trained for a wide spectrum of jobs.

3.2 Broad training versus specialization

The early colleges of agriculture offered broad training in general agriculture to prepare farmers and extension officers for their occupations. With the changes in agriculture and the increasing number and type of jobs, the universal trend towards professional specialization did not exclude agricultural colleges, and today easily 8 or 10, sometimes rather narrow curricula are offered. To a certain extent, this is a logical consequence of the ever increasing differentiation in workplaces and requirements. Food technology and plant breeding have little in common, and an agricultural economist will hardly work in a plant pathology laboratory. A general training may not accomplish anything in many cases because of insufficient depth. This has, however, limitations. The extreme specialization in our times requires a certain introduction to the problems of agriculture as a whole to enable the graduate in his leadership role to understand his place and his contribution so that specialization will not turn into narrow-mindedness. In addition, the degree of specialization depends partly on the level of the development in agriculture. It appears that many developing countries have taken over the American model with relatively high specialization without taking into consideration the different patterns of agriculture. A farmer with a bachelor degree in agriculture requires a highly trained specialist as his advisor. For the general problems, he has been trained himself. A poor peasant needs an advisor who understands all the facets of the farm and who can help him in all aspects. Under such conditions, a specialist risks obsolescence. As a consequence, each country — not each college — needs in addition to training in specialized fields, possibilities for training in allround agriculture to cater to the needs of the future farmers, farm managers, extension officers, etc.
3.3 Training with disciplinary focus versus job training

In the past, professors passed on their knowledge to their students, i.e., the university offered training in a certain field of science. The fact that today a number of professors with different fields teach in one curriculum did not bring about a principal change, because the increasing number of professors often reflects only the increasing division of fields and specialization of teachers. By and large, the division of universities into faculties, and the curricula taught within a faculty corresponded to scientific fields and subfields. As long as the graduates from such a curricula work afterwards as scientists, in their field, no harm is done, but that is the exception. For the majority, training along fields of science does not meet job requirements, and there is a gap between training and and the labour market. The majority of students go to universities to prepare themselves for high-level jobs, not to eat from the tree of science. Jobs usually require more than knowledge in one field of science. For many jobs, knowledge in two scientific fields is necessary, often in two faculties. The owner of a food-processing plant, for instance, requires knowledge in food-processing and food-technology as well as business management. The animal nutrition advisor working for the extension service needs training in animal sciences as well as in extension methods. The cooperative credit specialist needs agricultural economics as well as finance and banking knowledge and, perhaps, some training in law. For the majority of jobs, the best applicant has not only to be trained in one scientific field but has to gain sufficient knowledge in at least one other field as well. This extra knowledge often tends to be management of one kind or the other.

As meeting job requirements is not only necessary for the easy placement of students but to make the best possible contribution to the development of the economy, the modern college needs flexibility in its curricula so that the student has a chance to broaden his training beyond the boundaries of a single field of science or department. The variety of personal interest and circumstances, the peculiarities of the current labour market, and the difficulty of predicting the future labour market makes it difficult to decide on the most suitable mixture of subjects. In this situation, the decision is best placed in the hands of the one who has to take the risk, the student, provided safeguards are taken to prevent choosing the easiest path and students receive proper counselling.

To summarize, it appears that for all three problem areas, i.e. practice versus theory-oriented training, broad training versus specialization, and disciplinary focus versus job training, there is no definite answer for one or the other choice. In each case, both are necessary, depending on future career plans. The modern college of agriculture, therefore, requires great flexibility in its curriculum requirements so that the students have a certain choice corresponding to their personal interests above and beyond certain obligatory courses.

Training students to meet the requirements of our times requires adjustment not only in the content, but also in the method of training. The traditional lecture is unavoidable because it is the most timesaving means of teaching fundamentals of the field. Therefore they have their place, especially in introductory courses. However, they need complementary forms of instruction because of their limitations. The classical lecture tends to induce memorizing, repeating, and copying. The university graduate of our times, however, should be capable of critical thinking. He should question the so-
called facts. We want him trained in the creative use of science to achieve objectives, not just in memorizing the principles. Most jobs require daily solving of arising problems, and the solution often lies in the combination of different pieces of knowledge. To train students for these requirements, other teaching methods than lectures are necessary. Exercises, in which students try to find answers to given problems, are an example. Short papers on specific topics may be beneficial and give exercise in one of the day to day requirements of working life: to compile and write a paper in a precise, comprehensive, short manner. Bringing students out to the villages and into the factories means teaching and working in the real world where problems are not isolated as in laboratory experiments, but practical aspects like the availability of labour, costs, and time often play a decisive role in determining the solution.

In working life, due to the complexity of the problems, solutions are often the result of the co-operation of a team of specialists of which everybody contributes with his particular knowledge. While such interdisciplinary work has been discussed very often in recent years, students training during most formative years emphasize only individual work and achievement. It might be worthwhile to consider the value of comprehensive topics to be dealt with by a group of students. While each deals with one limited aspect according to his fields, he recognizes his contribution as part of the whole task and learns to appreciate the limitations of the individual field towards solving practical problems.

The university as an instrument in socio-economic development cannot limit its training activities to the students proper. The improvement in the level of teaching over the past makes today's graduates much more qualified than former ones. This calls for retraining of alumni in order to give the economy the necessary manpower at the required level. In addition, sciences are developing so rapidly today that learning cannot end on the day of graduation. What other institution than the university is in the position to give in-service training at the university level, an urgent necessity in an economy expanding its scope and productivity.

Finally, there are numerous persons playing leading roles in the development process of the nation who would benefit from short courses and do afterwards a better job for the society. Needless to say, the benefit is mutual. Training not only students, but adults who are in the midst of their career and have excellent experiences, gives the university impressions as to „where the shoe hurts“ and how problems look to the eyes of a farmer or an engineer. It guarantees that thinking at the university develops parallel to the needs and wishes of society and, thus, improves the social significance of teaching activities.

One final comment on teaching: it belongs to the role of agricultural colleges to teach other faculties, what modern agriculture is and what role it plays in the society. The fewer people are engaged in agriculture, the more important is it that leading personalities of all professions have a basic understanding of the problems and conditions of this shrinking sector of the economy and society.
4. Research at a modern college of agriculture

Research, by definition, is creative work undertaken in a systematic way to increase the stock of scientific and technological knowledge and to use the stock of knowledge to devise new applications. This is what makes an institution of higher learning a university. It is indispensable if teaching is to remain alive and inspiring. Only the possibility of conducting research will attract high-level professors, and research gives the university international recognition and reputation.

A fundamental question for the modern college of agriculture is: what kind of research should be carried out and who determines the goals of research activities? Internationally there is a tradition of academic freedom which includes the freedom of research. The researcher defines the topics of his research work and tends to resist intervention from superiors or colleagues. He wants to select a topic which satisfies his curiosity and which he believes to be important, scientifically rewarding, and, thus, would promote his careers. Undeniable, most original research results came out of this system, and many urgent problems have been solved because a certain researcher took it up and spent years of efforts finding a solution:

Today, however, certain factors all over the world cause doubt in this system of almost unlimited freedom in research:

- the spiraling costs of research make a laissez-faire policy towards research question able;
- today we have in most countries not one or two universities with a limited number of professors, but an expanded system of academic learning with a large scientific staff,
- in view of the complexity of today’s problems the extreme diversity of university research usually has little impact.
- national development plans bring along a certain order of priority in research topics which may not correspond with individual research interests.

The larger the research funds involved, the larger the manpower engaged in research, and the more urgent the development needs, the more important is a research policy with sound formulation of objectives, means to define priorities and reliable methods of evaluation. The prime consideration of such a research policy is research for the benefit of the public, not for the benefit of the researcher. In a modern college of agriculture, research activities have to be re-oriented to meet the development needs.

This will not take place without causing friction. First, there may be a conflict between research goals, determined by development requirements, and interests in promoting scientific knowledge. Second, both the university and the researcher are involved in international competition for their reputation. If they are interested in gaining international recognition, they should turn to Harvard and Oxford for examples of research programmes and goals. The more they do so, the less they will probably contribute to the development of their country because the relevant issues are different. Universities have to find their way out of the difficulties arising from their two-fold membership. On the one hand, they are part of the national community which support them, on the other hand, they are part of the international scientific community which not only influences intellectual life, but makes it at all possible.
There are three aspects of research at the modern college of agriculture which require some discussion.

4.1 Basic versus applied research

Colleges of agriculture, because of their subjects, are institutions of applied research. After all, agriculture is the application of science to the process of food and raw materials production. Within the process of agricultural development, in addition, the agricultural college has the task of adopting existing knowledge to the particular conditions and needs of the country and to the regional differences. This transfer of existing theoretical knowledge into practical application is possible only within the country itself, while basic research can, in principal, be conducted anywhere in the world. Basic scientific knowledge is transferable, while the application of science to real world problems tends not to be transferable because of differences in the natural economic, political, and cultural environment. Therefore, theoretical research is of less importance in countries giving high importance to speeding up the process of development. There is danger that too much emphasis is put on basic research and not enough work spent on immediate problems. Researchers all over the world feel that doing basic research leads to a higher professional standing than being engaged in applied research, and often the most creative and imaginative minds have moved to the area of „tool-building“ rather than „problem-solving“. For sure, there is no clear dividing line between basic and applied research, and basic research may come up with very practical results tomorrow. The personality of the researcher plays a role as well. Therefore, agricultural colleges should have their pure science, but pure science must not monopolize research. In general, applied research topics meet to a larger extent, the immediately relevant requirements of society.

4.2 Monodisciplinary versus interdisciplinary research

Experience has shown that particularly in agriculture the greatest gains do not come from an improvement in a single process, but from the interaction of suitable combination of improved practices and that fragmented research efforts often prove ineffective and costly. The enormous interaction of factors within farming-systems makes applied agricultural research especially suitable for a comprehensive approach of several disciplines, in problem diagnosis as well as in problem solving. Monodisciplinary solutions of practical problems can easily prove to be impractical at the farm level. For sure, not each and every problem requires an interdisciplinary approach and often, after a joint diagnosis, individual sciences have first to do homework, but afterwards an integration of subject matter contribution is necessary, if laboratory research is to be made applicable at farm level. In spite of this situation, growing scientific knowledge leads to fragmentation and specialization and over a long time has created almost insurmountable boundaries between disciplines and departments. If a college of agriculture wants to contribute to solving the problems of the farming population, it has to find ways and means which make co-operation between departments and subjects normal and not in need of special arrangements.
4.3 Financing agricultural research

The future of research and, thus, the scale to which a college of agriculture can contribute to the development of agriculture, depends on the amount of financial resources. Research is expensive, and the more sophisticated the research projects are, the higher the costs, especially in science fields. This creates a financial problem all over the world, especially for private universities which cannot readily rely on the government budget. Universities usually face these problems when they develop from the undergraduate to the graduate level. With the introduction of graduate training, research is no longer a hobby of the professor, but an integral part of the activities of the university because graduate-training is training in, and by, research.

Governments and governmental institutions will partly have to step in and contribute to the research funds, perhaps by special contracts by means of which they tap the resources of equipment and expertise to get part of their research requirement done. With a view to the amount of the needs of research and the limitations of resources, a type of co-operation between governments and universities should be possible which gives governments the necessary control over the use of their funds and the universities the necessary freedom within a frame-work agreed upon research contract. Governments are not the only possible research contractors. Numerous small and medium food and agro industries cannot afford a research department like big companies, but require research to improve their products, production processes, quality controls, etc. Here, ways and means of co-operation have to be developed for mutual benefit. If, for instance, graduate students take over such assignments with guidance from their professors and payment from the industries, not only are the scholarships for the graduate students and the research costs for their theses taken care of. This research, by necessity, is related to practical problems and the student is introduced to problems of his possible future working place. Again, problems of independence and research ethics have to be solved, but such arrangements might help financing research, while such research is at the same time a contribution towards economic development.

The costs of research can vary greatly, according to the way it is conducted. Whenever feasible, venyl houses, for instance, are cheaper than green houses. For colleges of agriculture, many research objects require fields for experiments, cultivation tests etc. Instead of buying expensive land for university farms, arranging experiments in the villages on the peasants’ fields is much cheaper, even when the peasants receive compensation. At the same time, experiments are more related to the real world. But, such arrangements are not feasible for all types of research.

The question of a modern college of agriculture’s contribution to the needs of society is not completely dealt with without some comments on the extension of results from research work. While in industrialized countries a highly developed infrastructure links the universities with other public and private institutions and guarantees the immediate spread of new knowledge and research findings, this sort of an infra-structure does not exist in developing countries, at least not to the extent required. Therefore, the university does not readily turn into an agent of socio-economic development, and special measures are necessary. A spectrum of possibilities like publications, public lecturers, training courses, newspaper articles, etc. are available to assure that universities’ findings are passed on to society as soon as possible.
The paper at hand tried to elaborate on the role of agricultural colleges in modern society and discuss some possibilities in teaching and research activities by which they could increase their contribution to the socio-economic development. Not all the points that have been discussed are feasible in every case, while there are certainly many other possibilities. In any case, there are great opportunities for agricultural colleges to increase their significance for the greater society and play an active role in the development of the nation. Great opportunities are a great responsibility.

Summary

Changes in agriculture and the requirement of a modern society require certain adaptations in the understanding of agricultural colleges as to the role they have to play. This is the more the case in countries which strive for rapid socio-economic development.

The paper first discusses the two main determinants for the role of agricultural colleges, i.e. the role of agriculture and the role of universities in modern society. The conclusion is, that a new and much broader role has implications for the colleges’ teaching and research activities.

Teaching problems are discussed under three headings, i.e.
— practice versus theoretical training,
— broad training versus specialization,
— training with disciplinary focus versus job training.

Research at a modern college of agriculture is discussed in chapters on
— basic versus applied research,
— monodisciplinary versus interdisciplinary research,
— financing agricultural research.

It is concluded, that colleges of agriculture have many possibilities to increase their contribution to the socio-economic development.

Zusammenfassung

Veränderungen in der Landwirtschaft und Erfordernisse der modernen Gesellschaft machen Anpassungen im Verständnis der landwirtschaftlichen Hochschulen über ihre Rolle notwendig. Das trifft umso mehr zu in Ländern, die schnelle sozialökonomische Entwicklung anstreben.

Der Aufsatz diskutiert zunächst die beiden Hauptbestimmungsgründe für die Rolle der Agrarhochschulen, nämlich die Rolle der Landwirtschaft und der Universitäten in der modernen Gesellschaft. Eine neue und viel breitere Rolle hat Auswirkungen auf die Lehr- und Forschungsaktivitäten.

Die Probleme in der Lehre werden in drei Abschnitten diskutiert:
— Angewandte versus theoretische Ausbildung,
— Breite Ausbildung versus Spezialisierung,
— Fachorientierte Ausbildung versus Berufsvorbereitung.
Die Probleme der Forschungen werden diskutiert unter den Überschriften

— Grundlagenforschung versus angewandte Forschung,
— Monodisziplinäre Forschung versus interdisziplinäre Forschung,
— Finanzierung der landwirtschaftlichen Forschung.

Es wird die Ansicht vertreten, daß die Agrarhochschulen viele Möglichkeiten haben, ihren Beitrag zur sozialökonomischen Entwicklung zu erhöhen.

Annotations

1) Inauguration lecture at the opening of the new building for the College of Agriculture. Korea University, Seoul, Korea, on February 24th, 1977 (short version).

2) The term „college“ is used in this paper for a branch of a university (sometimes called „faculty“ or „school“), or an institution of higher learning with university level, specialized on agriculture.

3) Special problems arise, when a considerable part of the staff consists of expatriate professors, as for instance in many African universities. As this is not the case in Korea, these problems are not dealt with here.