

AGRICULTURAL EDUCATION

AND

AGRICULTURAL EXTENSION

IN

DEVELOPING NATIONS

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IN

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INTRODUCTION

Agriculture education, in its broadest context, has existed since the first man practiced the most elementary rudiments of cultivation. There may have been no conscious effort made initially to instruct in improved agricultural production techniques, but the bulk of the cultivators observed, learned from and followed the examples of the innovators. Throughout the ages the cultivators improved their production techniques through trial and error, accident and pre-meditated effort. As cultivators learned to adapt production practices more effectively to their environment and cope with the ever present problems they built up a store of knowledge. This knowledge was passed from one cultivator to another and from generation to generation by informal, unstructured instruction.

As the world's population turned from being wandering hunters and gatherers to more or less settled cultivators the major importance of agriculture demanded attention to more effective methods of transferring the store of agricultural knowledge. From this demand organized, formal instruction in the agricultural sciences and the agricultural teacher evolved. The degree of excellence, the appropriateness of the instruction for the existing conditions, and the emphasis on agricultural education vis a vis general education varies from area to area and country to country. Many developing nations for a variety of reasons have failed to give agricultural education the prominence it deserves in their education programs.

The agriculture teacher is charged with the responsibility of providing meaningful instruction in the agricultural sciences which will result in more efficient agricultural production. The level and specialization of the instruction varies from informal on-the-farm instruction, to general agricultural instruction in elementary and secondary schools, to highly specialized instruction as the students progress through the university to advanced degrees.

The effectiveness of the agriculture teacher depends on his ability to communicate and transfer his knowledge to the student and the extent to which he keeps abreast of new developments in agriculture. Yet, irrespective of the excellence of individual teacher the effectiveness of the agriculture education program will be in direct proportion to the emphasis and the quality of effort placed on the program by the society or the nation.

The majority of the world's population lives in rural areas of the developing nations and is dependent upon agriculture for its livelihood. Agriculture is also the major natural resource of these nations. Therefore, it is logical that the majority of the developing nations' educational efforts, capability and funds be expended on agricultural education. Since this is not so it must be assumed that these nations' educational efforts are designed for the elite minority rather than for meeting the needs of the majority of mankind. This inequity is further compounded because much of the agriculture education offered does not respond to the basic social, economic, political or technical problems besetting and inhibiting agricultural development. Rather it educates youth away from agriculture and rural life and raises their expectations for non-existent urban employment.

The unrealistic employment expectations and aspirations raised by ill-adapted educational programs encourages and rural-urban drift and results in frustration, conflict and strife. The educational program of a society, if it is to be of maximum benefit to the total society, must accommodate to the priority needs of the society. Therefore, in predominantly agricultural/rural societies the educational program must be appropriately biased to agriculture and respond to the immediate needs for attaining production self-sufficiency and economic development.

For millennia man had no alternative to a nomadic hunting life until he learned the rudiments of agricultural production. Agriculture, settled society's oldest production activity, permitted the establishment of settled agricultural communities. Yet, agricultural production has remained at the subsistence level in many developing nations since the dawn of this activity.

The natural resources of many developing nations are often limited to agricultural potential, therefore, the agriculture sector will have to sustain these nations' overall economic and social development. It is imperative that the developing nations achieve dramatic improvements in their agricultural management and production practices. Paradoxically, accomplishing the necessary innovations in the agriculture sector presents these nations with one of their most difficult problems.

There is a widespread, erroneous concept in the developing nations that agriculture is inherently a primitive industry and that abundant natural resources insure agricultural development. This false concept must be corrected. Agricultural development requires adequate natural resources, but trained and motivated human resources must develop the natural

resources. Through research, experimentation, education and training the human resources must develop and apply appropriate agricultural technology to realize maximum agricultural production. Agricultural/rural education, in its broadest context, is indispensable for the human resources development needed for the transformation of subsistence agriculture to market agriculture. Since these countries have limited means available for human resource development they must establish priorities for the development and the effective use of these resources. And since their economic development is dependent upon the development of the agriculture sector, agriculture education should be one of the top priorities. Agriculture education, at its various levels of instruction, is responsible for producing technically competent personnel to man the research, teaching, and government and private services, providing farm management/production training for farmers, and developing a positive attitudinal climate and motivation in all concerned conducive to agricultural/rural development.

Efficient, economic market farming is an extremely complex business enterprise. It is more the choice and management of inputs and outputs than mastering the physical skills to grow crops and animals. The importance of the production skills cannot be over-emphasized, but subsistence agriculture grows crops and animals; barely enough to subsist on. The difference is the net yield per production unit. Therefore, the transformation from subsistence to profitable market agriculture requires the proper choice between alternatives, the management of inputs and outputs, and the application of improved production skills. Agricultural development requires that the producers, generally unformed or illiterate and/or indifferent farmers develop this management ability, the why, concomitant with learning the technology and production skills, the how. This management/production training for the farmers should be provided through agriculture extension or similar activities and is discussed in a later section.

The professional and sub-professional personnel require formal education, because effective application of technology requires a knowledge of the principles upon which the technology is based. The best formal education to provide this knowledge and bolster agricultural development is that provided by a strong curriculum in the sciences, heavily biased to agriculture. And, in addition to class room instruction in the sciences, theory and principles, the students must understand the practical application. Training for related occupations, i.e., agricultural services, agricultural businesses, processing, marketing and distribution must also be as an integral part of the program.

The public school programs in the developing nations are generally academically oriented with emphasis on preparation for higher levels

of formal schooling, and/or urban occupations and living. Yet, the majority of the population and the priority training needs are in agriculture/rural occupations. Therefore, it is imperative that the educational programs in the predominately agricultural/rural societies be reoriented to satisfy the major needs of that society.

Vocationalizing the curriculum is not the solution, i.e., transferring, with little modification, a proto-type US vocational agriculture program, teaching handicrafts, or so forth. Neither is it realistic to assume that the spread of primary and secondary education will necessarily greatly increase literacy or competency in the rural areas. The rural schools make a limited contribution in transforming rural areas by turning out literate children, some of whom may remain in the area. But the school programs do not prepare youth to appreciate the possibilities and potential in their home areas, and they tend to drain the more talented and ambitious young people from the countryside to the cities. Thus, the schools may simply be an instrument for siphoning off the best talent to the urban areas. It is questionable whether education, as now oriented, is a positive force in many developing nations' rural economies.

The agriculture education program, regardless of the academic level, must strive for the end results of increased agricultural production, the profitable disposition of these products, and the development of related services to justify its existence. This is germane to the development of the agriculture sector. A multitude of prerequisite, complementary factors must also be interwoven into the effort: a general public attitude of respect instead of contempt for agriculture and the farmer; the farmer's own appreciation for his role and opportunities in the society; the formulation and support of means to improve the farmers' situation, rather than taking advantage of the situation; appropriate incentives - improved rural infrastructure, favorable markets, and availability of inputs; and favorable policies - reliable, equitable prices for products, an efficient marketing system, and land tenure. However, efficient production for a favorable market remains the primary requirement, and must be achieved. Unless agriculture education achieves success in its major role in this responsibility the program becomes merely one of continually multiplying recurring expenditures of scarce revenues.

The interweaving of these factors will require coordinated efforts from various sources. The efforts to change attitudes towards the production end of agriculture demand a joint nation wide effort by the government and private sectors, the educational and training institutions; the public and private mass media, etc. The policies are

the responsibility of the legislature and ministries concerned with agriculture and the rural population. Appropriate governmental policies, influence and support would provide the incentives essential for changing attitudes and initiating development. The educational institutions are responsible for training in improved technology, management of inputs and outputs, production skills, and the agricultural sciences. Coordination of these efforts will do much to assure increased production. Conversely improved technology and management will not be applied at the production end of agriculture unless the proper attitudes prevail, or if policies impinge upon, rather than foster incentives.

Educational expenditure weighs heavily on Government in development and recurrent expenditure. These expenditures do not yield immediate economic returns. They lead to increases in recurrent costs. The demand for funds decreases the resources available for directly productive services. Agricultural education must repay the investment through increased agricultural production to justify priority consideration.

The social, economic and political customs and governmental policies have a very profound effect upon, and may impede, or prohibit as well as give direction and support to development. Therefore, these non-technical agricultural, but extremely important factors must be given thorough consideration in developing the agricultural/rural educational philosophy. They must form a basic part of the curriculum and program. Ignoring these factors has generally produced marginal results or failures in the agriculture education programs introduced throughout the developing world. Some of the more obvious factors will be reviewed. The evident conclusion is that the implications for, and application of these factors to the program must be analysed and researched to derive the bench marks and guidelines from which an appropriate program can be formulated.

The following paper discusses agriculture education in the developing nations and the problems by which it is beset. These problems are not educational problems alone but arise from a variety of sources social, cultural, traditions, economic, political, technical and governmental policies. The educational program must be formulated from a properly balanced interweaving of all these factors into a philosophy and curriculum that copes with and solves these problems and results in increased and more efficient agricultural production.

SOCIAL AND CULTURAL FACTORS

The pattern of society remained relatively unchanged for thousands of years; the traditional society. Children retraced the steps of their parents, socially, politically and economically. They were initiated into stable ways and ritualized routines, and maintained a basic familiarity with place and family. Then about 300 years ago the masses in the presently developed nations began voicing dissatisfaction with inequalities of society and demanding social and economic reforms. These reforms meant drastic changes in society and violent disruption of the established pattern. The traditional, comfortably familiar way of life began to vanish and new social and economic patterns evolved compatible with the changing conditions as these nations developed.

Concomitantly the developed nations have experienced a radical rupture with the traditional or subsistence society and the population has adapted to a future of constant change, new technologies and developments. Subsequently, this requires constant upgrading of skills, learning new skills, and possibly a complete re-education over the working life span to enable the individual to keep pace with today's fast evolving technical, economic and social environment. This is substantiated by the extreme changes that have and are taking place in the nature of the family in the developed nations. In the traditional society work and home life were inseparable. The family was also the setting for nearly all the other social functions, welfare, recreation, education and religious instruction. The developed nations have witnessed the separation of the family as the primary institution from most of these functions. There is a separation of home life and family enterprise, the home-shop combination; or family professional and occupational traditions, medicine, law, carpentry, fishing. Education and preparation of a more enlightened and productive society has been taken over almost entirely by the schools.

The people in today's developing nations are now making the same demands for economic and social reforms to break the stifling bonds of the traditional society. These nations are experiencing the throes of disruption in the family and the established social pattern, and the transition from the traditional to the modern society. Furthermore, this must happen in a very short period compared to the time the developed nations had to make the transition, requiring that centuries be compressed into decades and years.

This development or modernization requires changes which may in turn be partially realized through education and training. The traditional society is one in which each new generation learns what the older generation already knows and approves, tolerating very little change. Education for development, however, introduces people to new knowledge, new skills, and new ways of doing things. Education for development, available only to the young, introduces conflict between the younger and the older members of society. The new ways learned by the young have to compete against the authority and the prestige of the elders.

In the developing nations technological change disrupts the traditional society. These changes usually displace workers and disrupt existing social relationships. The threat to the displaced individual is immediate and pressing, while the reward is tentative and distant. The human reaction is resistance. The cultural traditions and customs of these societies must be disrupted with substantial changes in the peoples' attitudes, or development will not result. Such societies have accepted that nature is beyond influence, except through ritual. Development requires attitudinal changes and acceptance that nature can be manipulated. Social customs have evolved to provide insurance against disaster. Such an extremely conservative orientation prohibits risky experimentation and capital formation, and must be modified. Formulating methods for coping with these barriers to development are essential.

There is no magic formula. A country which begins independence with ninety percent of its workers in subsistence agriculture, with no industrial base, and with limited natural resources other than agricultural potential cannot be transformed over night. Agriculture is the primary economic resource in most of the developing nations. Therefore, the development of these nations will be accelerated or slowed-down in almost direct proportion to the rate of development of the agriculture/rural sector.

The urban-elite strata is a complicating factor in most of these countries. This ruling or governing group tends to look upon the farm population as inferiors in a contemptible occupation deservedly subject to all manner of social, political and economic discrimination. In general these attitudes inhibit agriculture/rural development. The elite strata needs first to be convinced that natural resources alone do not insure agricultural development; that agriculture is not inherently a primitive industry suited only to illiterate people; that agriculture must have priority attention, considerable investment, extensive training, increased prestige, and first rate leadership; and that special consideration is essential for providing favorable policies and incentives, and the first rate leadership. It is essential to achieve a break-through regarding the production end of agriculture; the farmer on the land.

Increasing agricultural production to satisfy the future demand will require a break with subsistence farming, the development of efficient management capability, and the application of improved farming practices and technology. Agriculture extension type short-course training for the young adult and adult farmers, and emphasis on meaningful formal education for the youth are two effective means of accomplishing this. Assuming appropriate technology is available, the level of technology applied in the agricultural sector will increase and improve in proportion to the level of education and training of the rural population who must apply the technology. However, this change cannot be accomplished by education and training alone. Many other inputs will be required. Rural

development depends on progress in a variety of interrelated matters. There is limited value in forging ahead with education and training, improved technology and credit facilities without corresponding markets for the agricultural products. Access to supplies and equipment, adequate transportation, and other incentives for the farmers are needed. Otherwise, the rural population, especially the youth, will continue the rural-urban drift, increasing the existing surplus of non-productive urban consumers.

Subsistence agriculture and the attendant life sentence to a stagnant rural life has little holding power for people with ambition. Furthermore, a love for the land cannot be developed in the youth through changes in the school curriculum alone. Education should sensitize people to opportunity. It should not induce them to accept stagnation. Thus, a dramatic transformation and modernization of rural life must be the central objective of any program if the growing labor surpluses are to be effectively utilized in agricultural production and related occupations. The fledging industrial/business sector can utilize only a limited proportion of the population for the foreseeable future. The agriculture/rural sector must absorb the great bulk of the labor force if this force is to be productive.

The dis-incentives generally associated with the traditional society and subsistence agriculture drive the youth away from a farming occupation. Incentives must be provided to attract and hold youth in the rural areas. In conjunction with an educational policy to develop an agriculturally biased curriculum, it is essential that favorable governmental policies be formulated and implemented in land reform and rural/agricultural development, i.e., an equitable land tenure system; agriculture and credit; markets and pricing policies that assure fair return for labor and investment; and improved rural infrastructure, and living and working conditions.

The Ashby Commission concluded that the chief weakness in Nigeria's agricultural education program was not the agriculture schools themselves. It was the reluctance of the students to enroll in agricultural training chiefly due to the nature or lack of incentives provided for in the agriculture sector.

The youth may have an ambivalent attitude towards agriculture. They may not dislike farming per se, but to be an attractive occupation it must demonstrate that it can pay reasonable cash returns. Many young people have an underlying respect for the land, and farming skill lingers and can be aroused as indicated through rural youth agricultural clubs.

In societies where tradition and adults have extreme influence, the youth, upon completion of the maximum education available to them individually follow one of two general courses. They relapse to tradition

and conform or make a clean break and leave the area. Support and guidance in the form of youth clubs, magazines and radio programs have proven successful in some areas and should be actively supported. However, agriculture must demonstrate visual proof that it can provide more than a subsistence living before it can compete with regular or even part-time income urban jobs. In areas where families are large and land is over-committed or unavailable subsistence agriculture is a non-starter. The school leavers (graduates) and drop-outs must see the possibility of favorable return for their efforts, or they will continue to seek other means of earning a livelihood. The status quo policies must be modified to provide incentives, and there must be a substantial break-through from subsistence farming to profitable market farming.

Most of the problems discouraging the youth from returning to the land to apply their agricultural education training are not basically educational. The problems are social/legislative/governmental policies over which the Ministry of Education, the schools, and other educational training institutions have little or no control, i.e., systems of land tenure, land use and development, agriculture credit and marketing, agricultural commodity pricing, research, and tribal customs and traditions. The schools can do little directly to solve these problems, but they can train and prepare youth for productive employment in agriculture. The final application of this training requires that the public and private sectors provide the incentives and encouragement that will attract youth to farming.

CRITICISMS OF AGRICULTURAL EDUCATION IN DEVELOPING NATIONS

Agricultural education continually comes under criticism for what is implied as its failure to increase production and transform the agricultural/rural sector of the developing nations. Some of the criticism is justified, but generally it is not well founded.

There are serious problems to which agricultural education must address itself, the rural-urban drift and its corollary unemployment, the various conditions which cause this, and the alternative means by which the drift can and cannot be reduced. Few educators subscribe to the simplistic view that the rural-urban drift problem can be solved by simply introducing agricultural subjects into the primary school curriculum, or by developing an extensive system of post-primary vocational agricultural schools, and are aware that this is not the answer for the future. The fact that these problems exist where agriculture education programs are offered does not mean that public school agriculture education has been a failure - the vocational agriculture education fallacy.

Conversely the priority requirements for a concerted agricultural development program are improved rural living conditions and at least a minimum of the incentives for encouraging rural youth to choose an agricultural career. These incentives include land reforms; expanded and improved

agriculture education/extension services; creation of reliable networks for supplying modern agricultural inputs, and for guaranteeing equitable marketing of outputs; conscious changes in the terms of trade for agriculture; and improved rural infra-structure and living conditions. Therefore, regardless of how much love of the land the youth may have, or an agricultural curriculum may instill in the pupil, until the agriculture career opportunities are clearly demonstrated, the rational choice will be to seek the more obvious opportunities in the urban areas.

There is no evidence that agricultural education alone will keep the people on the land, or that vocational agriculture education is either a necessary or sufficient condition for creating modern productive agriculture. Any attempt to solve the rural-urban drift by changes in the education alone would result in a considerable waste of resources. Yet, neither is there evidence that because few agriculture students remain in the rural areas as farmers the program is a failure and should be eliminated. This is tantamount to throwing the baby out with the bath water, particularly before substantially answering the question, is education really the primary cause of the failure? Most knowledgeable people agree that incentives are essential, but are generally non-existent to encourage youth to remain in the rural areas, which contradicts the assumption that education is the primary cause of the failure.

An extremely relevant question arises at this point as to whether agriculture education has failed if the youth do not remain on the farms, or production is not increased, or whether the failure has been primarily due to other factors and activities over which education has no control, and very little influence? It is as unreasonable to conclude that because the students who enroll in an agriculture course in the public schools do not become farmers that the agriculture education is a failure, as to conclude that mathematics or history courses are failures if the students who take these courses do not become mathematicians or historians?

As a case in point, the Vocational Agriculture Secondary Schools in the Philippines in the 1950s produced numerous graduates who sincerely wanted to farm. However, this required land, carabao (work animals), farm equipment, supplies and capital, none of which the students had, plus the necessary credit they could not get. Furthermore, other incentives were virtually non-existent, agricultural policies were unfavorable, and few off-farm inputs were available. Certainly, an evaluation of the Philippines Agriculture Education Program based on the number of graduates who became farmers would brand the program a failure. But the failure was due less to the education program than to factors and policies not controlled or influenced by education?

If measured only in numbers or percentages of students who returned to or entered farming, the public school agriculture education program throughout the world had been a failure. Tanzania enthusiastically included a rural science/agriculture curriculum as a part of its rural primary and middle school programs for a decade. It was then abandoned because only two percent of the school leavers from these schools returned voluntarily to farming. During the first eight years that agriculture was included in the school certificate examination in Nigeria only seven candidates sat for the paper. The distinct agricultural/rural curriculum in rural teacher training colleges has been abandoned in Jordan. Continuous examples can be cited to support the contention that agriculture education has been unsuccessful.

Ironically, the essential non-education factors involved are almost totally ignored when the conclusions made above are drawn. The educational system can provide training to help prepare the youth for employment in agriculture. But the educational system cannot substitute for unavailable off-the-farm inputs, the lack of essential incentives and equitable policies, or the lack of a sincere public or private sector concern for the plight of the farmer.

The rural-urban drift and the reluctance of youth to become farmers are problems of tremendous magnitude requiring corrective measures of equal magnitude. The schools can play an important part in formulating and implementing these corrective measures. But the effort must be fully coordinated with and supported by other government agencies and the private sector. The effort will require an appropriately developed and enlightened curriculum for which education has the responsibility, and the corollary incentives, favorable policies and corrective measures for which other government ministries and agencies have the responsibility. Regardless of the quantity and quality of the curriculum, the teaching, the total educational activity, the schools can accomplish little alone. The rural youth will voluntarily remain in the rural areas, in rural occupations, in direct proportion to the quality and quantity of the educational system's efforts, and the incentives provided by the public and private sectors.

The educational system is also blamed for the non-employment of the graduating students. Yet the educational system is in the education business, not the employment business. It is charged with educating and training people for employment, not with employing them. The educational system employs only the teachers and staff needed for the business of education. The basic problem and real need is for two-way or inter-communication and cooperation between the employing sectors, the school system and the population.

The agricultural sector should determine the kind of training needed to prepare the students for productive employment and communicate this to and cooperate with the education sector in developing training programs to this end.

The agriculture sector is, and for a long time to come, will be the largest single employer of people in the developing nations. The potential employees need education and training. Thus, there is an employment problem. But there is little justification for blaming the schools because school leavers or drop-outs do not return to the farm, or do not seek employment in agriculturally related occupations. Decrying this as the agricultural vocational fallacy is witch hunting; someone has to be blamed. There is very strong evidence that the real barriers, rather than being educational, are national policies that favor the urban consumer at the expense of the rural producer; levy excessive taxes on agriculture for development and maintenance of other sectors of the economy; and provide few if any incentives, reasons or opportunities for the farmer to change.

Youth will consider farming an occupation of last choice until incentives are provided, conditions of employment are more in line with non-agricultural employment, and farming attains at least a semblance of prestige in the national attitude. Farming will not attain prestige in the absence of the incentives and favorable conditions of employment.

This is a case of cause - few incentives, and effect - rural-urban drift. It is fallacy to ignore the cause and decry the effect. Much more would be accomplished by the same amount of effort expended to correct the cause, along with some sympathy and understanding for those who react in a very human manner, resulting in the effect. The rural population in the developing nations is well aware that agriculture provides a large share of the revenues for their country's budget. They are also well aware that precious little of those revenues are expended in the rural areas from which they are extracted. Few people faced with the same situation would follow a different course of action.

There is a growing conviction that agricultural development requires large scale highly mechanized farming. This is refuted by development in Japan, Taiwan and other countries. In fact, large scale mechanized farming serves to intensify unemployment, rural-urban drift, and discontent. Agricultural development does, however, require proper management of inputs and outputs, improved technology, motivated efforts and competence. And these require education and training sufficient to enable the professional agriculturist and the farmer to comprehend and implement them.

It is frequently proposed that most of the agricultural training, up to the sub-professional level, required by developing nations can be provided outside the schools in actual working situations. However, this is not within the realm of practical possibility at the present time. The subsistence farmer is just that because he lacks the very attitudes, skills and competence the youth must master to transform subsistence agriculture. There are not enough farmers in the cash economy to provide this training service. Even if there were their primary objective is production not training. It is extremely doubtful that the private farmers, estates or corporation farms would accept the task of providing on-the-job training for anything beyond their own needs. Providing such training on special training or government farms in turn requires expenditures to develop new training institutions which seldom are as capable and proficient as the present system.

Incentive is closely tied to salary. School teachers, in most developing nations, are notoriously low paid in comparison with other employment requiring equal education or training. Yet it is often propounded that because teachers are paid on civil service scales the high wages makes expansion of the secondary school system very expensive, resulting in educational costs rising faster than school enrollment. However, teachers' salaries are not the only factor limiting the number of places in the secondary schools for the elementary graduates thereby forcing the school leavers, in large numbers, into the labor market. This fails to give adequate consideration to the other factors. It also implies that only teachers' salaries within the civil service system should be lowered. If in fact, the civil service salaries are out of line with the general economy, they should be lowered. But forcing only one group or sector of the society, the teachers, to accept the honor of a lowered salary for the national cause is unreasonable and unworkable. Problems of equal or greater severity are the lack of qualified teachers to staff additional secondary schools, the initial cost of constructing and equipping the schools, and the maintenance costs other than salaries.

Few developing countries retain the civil service salary scale at the same level as that received by the former colonial or expatriate, and should not attempt to do so. On the other hand, unless the teachers' salaries and prestige compare with other occupations the prospective teachers will continue to look elsewhere for employment where conditions of employment are more favorable.

Agricultural civil servants in developing countries are low paid, but often receive higher salaries than teachers with equal qualifications.

Developing nations and limited human and economic resources are synonymous, thus, it is imperative that educational priorities be determined in line with a nation's level of development and priority developmental needs. In a developing nation with 85-plus percent of its population engaged in agriculture, and whose major economic resource is agriculture, it is logical that agriculture education be a priority development effort. This includes all levels of education from short course agriculture extension type training for farmers to post-graduate degrees for professional agriculturists. It is also logical that the latter offering await the corollary development of the human resources required for such high-level undertakings.

An important segment of the agricultural education aggregate can be provided through the public schools. The public school program should be named agricultural education or agricultural science rather than vocational agriculture education to avoid the connotation of a terminal education program. The general concept that vocational education is terminal severely restricts a major contribution the program can make to the continuing education and welfare of the nation. Rather than terminal, the program should be heralded as an essential part of the overall continuing education and development of the human resources; another input for more appropriate total education of the population; and the motivation of a cultural value system, man does not live by bread alone.

The program should have as major goals, providing a basic agricultural orientation and practical and technical agricultural training for those who eventually become farmers, professional agriculturists, or inter-related occupations; making the public aware that the land and agriculture are the nation's natural and economic resources of greatest importance; providing the school population with a broader understanding of agriculture and its importance to the general welfare of the nation; taking the lead in making public school education more practical and responsive to the economic and social development needs of the nation; and laying the foundation for an attitudinal climate of respect rather than contempt for agriculture and rural occupation.

Instruction in agricultural sciences, management, technology and husbandry practices is essential. But this must be coordinated with serious efforts to improve a complex group of rural institutions and services, and social, economic and political factors to provide incentives and reasons for changing attitudes. Therefore, the program must be more than the transfer of a foreign agriculture education program, or an intellectual exercise by outside experts. It must be based upon a country's needs; give adequate consideration to that country's attitudes, beliefs and policies to develop agricultural production and management capabilities within the country; effectively foster progressive rural development sufficient to convince some of the youth to remain in the rural areas as farmers, in related occupations, or to become professional agriculturists; and be developed

through relationship with and involvement of the parents and community to make them feel responsible for and a part of the schools' efforts.

Regardless of the quality of the curriculum or its attention or relevance to existing conditions and needs, the program will fail to induce the youth to engage in farming or other rural occupations in the absence of appropriate incentives. Nor will it solve the problems of unemployment, the rural-urban drift, or the need for more and better farmers to satisfy the increasing demand for agricultural production. The educational effort to develop agriculture management and production know-how, resulting in productive and meaningful use of rural human resources, must be coordinated with and supported by the capital and credit, and economic and social institutions with which to put the know-how to work.

Students in the developing nations identify farming as a job well-suited to uneducated people. They tend to feel farming and most rural occupations are residual occupations one turns to after failure to find other employment; not very conducive to rural development. The schools can help in achieving attitudinal changes. They must orient the youth toward rural occupations and educate them to be efficient farmers and dedicated professional agriculturists, rather than developing in them the attitude that rural/agricultural pursuits are beneath their dignity. The school program alone cannot endow farming and rural occupations with enough prestige to stop the rural-urban drift, but with appropriate effort they can do much to elevate the students' concept of these and reduce the drift.

Except in rare cases, the existing educational systems were introduced into the developing nations by foreigners, rather than by the rural communities attempting to improve their own lot. The first economic effect was the identification and siphoning-off the brighter students for clerical and white-collar positions. This siphoning-off, at least so far as the students' preferences are concerned, will not change until farming and rural occupations offer equivalent financial returns and stability with the clerical, white-collar jobs. It is essential to the development of the rural areas that some of the brighter youth be motivated and channeled to rural occupations. Conversely, frustration arises due to the constantly decreasing number of clerical white-collar jobs open to these students. For the majority it is join the masses of urban unemployed or return to the land which so often they have been educated away from.

Visual evidence that farming really pays is the one thing most needed to help the schools change the traditional attitude of the rural youth school leavers towards agriculture. This attitude will not be fundamentally changed just through revisions or alternations in the school curriculum, although this will help and should be done. Incentives, motivations and opportunities must be provided. Where the incentives exist the rural-urban drift is not a serious problem. Studies in

Africa show farming in some localities is accorded prestige ahead of some white-collar jobs. These are localities where farming is a lucrative proposition, the visual evidence that farming pays, the incentives.

In many of the introduced educational systems there was a strong bias towards urban and industrial life with very little appreciation instilled for the importance to life and society of rural occupations. Such educational systems and philosophy must be reoriented, planned and implemented to instill this appreciation; to emphasize the importance of scientific and technical knowledge to agricultural development and future progress; and to make more than a passive effort at providing the academic, scientific and practical training in agriculture.

Many parents realizing the inadequacy of primary education as preparation for an occupation are demanding secondary education for their children. The parents' sentiment of wanting a better life of their children is as common in the developing nations as anywhere else in the world. And when available land is scarce, brothers and sisters numerous, and rural employment opportunities outside the subsistence sector non-existent, further education becomes imperative if at all possible.

In an honest effort to satisfy a broad range of needs the most popular solution has been secondary schools with multiple goals education to prepare for the university, salaried white-collar or technical position, and education for unsalaried farming, and an enlightened attitude towards rural occupations. But most subsistence farmers and/or rural parents perceive the schools as a means of escape from the hardships and privations of rural life for their children. They care little about the educator's hopes for, or the official goals of education. Attempts to establish rural schools with a curriculum deliberately designed to keep the rural children on the land thwarts the parents' ambitions and aspirations for their children, and the parents' insurance for old age. In this the parents are reacting to their own experiences with subsistence farming hardships, and the lack of incentives to alleviate the drudgery of their situation. In developing the philosophy, it is essential to consider these factors and formulate means for coping with developmental barriers erected by such long-standing problems of the rural subsistence environment.

The parents' and the students' attitudes must be thoroughly considered in formulating means to accomplish attitudinal changes toward agricultural and general education, and rural occupations. During the years of formal education the students must be given some preparation for rural occupations since the school leavers are generally unprepared for even semi-skilled, off-the-farm jobs. At the same time a limited education has created a gap between the pupil and his family. They consider him prepared for a clerical job in the city, the salary from which would help support the family. This situation results in a massive imbalance

in the society and unrealistic job hopes on the part of the school leavers. Seldom can more than ten percent of the primary school leavers find regular income employment. Since these countries are basically agricultural, farming is about the only productive employment open to the majority of the school leavers, and most other new entrants into the labor market. They have little alternative to earning a livelihood as self-employed farmers, or in other farm related occupations and services. The alternative is unemployed, non-productive consumers in the urban areas where public service occupations, businesses and industry are not expanding fast enough to absorb them.

Traditionally, the primary schools look upward to the secondary schools, and the secondary schools look upward to the university. However, all the hopeful upward-looking students cannot satisfy the minimum academic qualifications. Other extenuating circumstances may also intervene prohibiting advancement to the next level. Rather than looking only upward for the small percentage who can continue, the schools must modify their goals. They must look downward and outward and prepare for gainful employment the other ninety percent of the population.

A study of unemployment among elementary school leavers in Uganda concluded that students completing the seventh grade do not as a rule remain on farms to engage in manual tasks. Many accepted employment on modern agriculture enterprises, but for the majority, subsistence farming was an undesirable last choice.

Regarding what he feels has been a general failure of educational policies and curricula in the developing nations, established for the express purpose of training students to return to the farm, Griffiths ^{1/} states: "First, teachers are unlikely to have the support of parents in this part of the curriculum. The parents often find it hard to believe that rural studies or activities can be given equal weight in the examination with the traditional literary studies, and they generally have little faith in the practical knowledge of a teacher about agricultural matters. The easiest way to get one's pupils through an examination is to cram them with the facts and let them learn off model answers. Many teachers know this is bad education, but what is the alternative when advancement and reputation depend on the examination results of their school? The value of experimentation and practical activities in developing a pupil's powers of thinking and his personality are not something the public usually appreciates. Parents want their children above all to get the paper qualifications. This is one of the main obstacles to the success of rural/agricultural features in schools."

^{1/} Griffiths, V. L., the Education of Young in Rural Areas.

This is another example of the educational philosophy and objectives being developed with little regard for the aspiration or objectives of the parents and public directly concerned, and with little apparent attempt to modify the attitudes or objectives of the public. It is axiomatic to state that education should accomplish change. However, officially decreed educational goals which are inconsistent with the public's aspirations and goals have little chance of success particularly if no effort is made to explain the official position to the parents and pupils.

Part of the schools' efforts in the education of the public will require better trained, more capable staff. Only appropriately trained and motivated agriculture teachers who demonstrate their practical knowledge and ability in agricultural matters can gain the confidence of the parents in this respect. This will require that the agriculture teachers receive, comprehend, and apply technical training in agriculture relevant to the conditions under which the farmer earns his livelihood.

Concomitant with modifying the public attitude, the educational system must also modify the traditional philosophy and objectives of agriculture education. A major objective of an agriculture education program should be to increase agricultural production. The program should not espouse the unattainable and unrealistic major objective of pre-training, orienting and motivating young men towards agriculture, narrowly interpreted only as training boys to return to the land as farmers. A much broader interpretation is necessary if the program is to succeed.

It is unrealistic to assume that the major percentage of the rural public school graduates in any country, with or without agricultural training, will become farmers. If measured by this criteria alone, the U.S. public school agriculture education program would have failed. In addition to those who became farmers other successes of the U.S. program were that more individuals were influenced after participation in the program to continue agriculture studies in the university and become professional agriculturists; enter agriculture-related occupations; or become involved in farm services, marketing, processing and distribution. Regardless of the career chosen by these former agriculture students whether farming, agriculture-related occupations or services, or non-agriculture-related occupations, they had gained a better understanding of the importance of agriculture and natural resources conservation, and they had more empathy and sympathy for the farmer and agriculture.

Even though students in the developing nations take the maximum of agricultural instruction, spend many hours at field work, and then upon graduation go into non-agricultural employment, their education cannot be considered as wasted. Few people would contend a student's time was wasted if he studied chemistry or physical education and participated in

sports, and then upon graduation did not become a chemist or an athletic coach. Yet these same people contend that when the students who enroll in an agriculture course do not return to the farm, the school, the agriculture curriculum, and the teachers have failed.

In developing nations where the land and agriculture are the major, and in some cases virtually the only natural and economic resources, it is imperative that emphasis be given to agriculture education; that improved farming and conservation practices be implemented; and that some of the brighter, more innovative youth remain in the rural areas as farmers, in related occupations, or as professional agriculturists. However, all the population will not and cannot farm, or be employed in rural occupations. It is equally important that the majority of the society, in a nation dependent upon agriculture, be aware of the importance of agriculture and rural occupations to the welfare of the nation. A public school curriculum biased to agriculture for the total student body will alert future public leaders and citizens to the nature, problems and potentials of agriculture in a developing nation. The philosophy and program should encompass and strive to attain this important objective.

At the secondary level the stress should be on multi-functionality of education rather than specialized training for specific occupations. It is generally true that schools do more to identify who will be eligible for particular occupations than give specialized training to perform them. Furthermore, the schools perform a major role in identifying and molding the elites of the society. However, the role is more one of identification than molding because education alone does not assure high positions. The schools can provide the basic skills and tools for the individual. How the individual uses the tools determines his usefulness to society.

The effectiveness with which other agencies complement and coordinate with the schools' educational program, and use the graduate, will have more influence upon the contribution the schools make to a nation's development, than how specifically the schools' curriculum is structured to preconceived economic ends. This has particular significance for agriculture because there is more drift out of agricultural jobs than into them. This drift is influenced more by the conditions of employment than the content of the instruction. Therefore, the policy/philosophy must be concerned with these all important factors which go beyond the pale of curriculum content and days of instruction.

Much of the sub-professional training is provided in two and three years post-secondary institutions. These institutions and the training they provide are essential, but the overall planning and coordination are often inadequate to realize their potential contribution. Institutional fragmentation and extreme specialization at the post secondary level

results in dilution and dissipation of scarce human and natural resources. The establishment of multiple, small institutions to offer duplicate training, or for extreme specialization, compounds already serious problems and shortages of human and economic resources and increases the mediocrity of the end product, the student.

The cost of constructing and maintaining four separate institutions with 200-student capacity each is much greater than the cost of constructing and maintaining one institution with capacity for 800 students. Providing qualified staff is an even greater problem than the initial construction costs. The lack of trained personnel is one of the most severe handicaps the developing nations have to overcome. Staffing fragmented, multiple institutions results in the unnecessary duplication of this scarce trained manpower in the several institutions. Several separate, specialized institutions require a science faculty for each institution, whereas, one science faculty can provide the science instruction for all faculties in large consolidated institutions.

The advantages of institutional consolidation are reduced construction, operational and maintenance costs for the physical plant; fewer administrative instructional staff, and reduced salary costs; more fully and appropriately utilized instructional staff; more favorably balanced student-teacher ratio; much broader subject matter course coverage; greater staff subject matter specialization; and fewer and better equipped laboratories.

RESEARCH

Research is an essential component of agriculture education programs in developing nations, but has been largely ignored to date. Volumes of hypotheses, conjecture and pet theories have been written and spoken, but few of these have been substantiated by definitive research. Research will identify developmental inhibitive factors and problem areas and permit corrective measures to be developed.

Educational programs in predominantly agricultural/rural societies must accommodate to the needs of that society. Curricula and syllabi must be developed which are relevant to, and arising out of the indigenous culture, conditions and needs of the society, and must focus in the rural environment. Official educational policies and goals formulated in the central office which ignore or are inconsistent with the public's aspirations and goals vis-a-vis education accomplish very little.

The social, economic and political customs and policies have a very profound effect upon and may impede or prohibit as well as give direction and support to agricultural development. Therefore, these non-technical agricultural, but extremely important factors must be given thorough consideration and form a basic part of the curriculum when developing

the agriculture educational program. Development requires attitudinal changes and acceptance that nature can be manipulated without resort to ritual.

In most developing nations the elite tend to look upon the farming population as inferiors in a contemptible occupation, deservedly subject to all manner of social, political and economic discrimination. Yet contradiction exists. Many ex-rural people: teachers, professional agriculturists and others purchase farms after having "escaped the rural life" to earn a livelihood in an urban setting. Appropriately conducted environmental research should identify the factors that cause rural life to hold this attraction.

Research is essential to identify factors influencing attitudes towards rural life and occupations. What makes rural life and occupations attractive or unattractive; what are the incentives and rewards or inhibitive factors; and how can attitudes be molded and innovation and change result? Research, properly planned and conducted, can provide the information and guidelines on the behavioral patterns and attitudes that need to be modified, on what should be taught, and how it should be taught.

The agriculture education program, regardless of the academic level, must strive for the end results of increased agricultural production, the profitable disposition of these products, and the development of related services to justify its existence.

The curriculum must emphasize, train for, and lend prestige to rural occupations. It must provide training in agricultural production, farm management and related occupations. The amount and sophistication of this training must be attuned to the existing and foreseeable problems and demands in agricultural production, processing, distribution and marketing. The manpower training needs will change as the agriculture sector develops requiring continuing evaluation and modification to satisfy these changing demands. Therefore, the curriculum must be correspondingly updated and modified to respond to a wider range, or a more sophisticated level of activities. Concomitantly, the program must respond to and cope with the social/cultural realities of the society.

Properly planned and conducted environmental research is essential to identify the problem areas and formulate means for coping with them; to identify the favorable factors and build upon them; to assure the training is attuned to the needs and problems of agriculture and the society; that it is a positive force in bringing about favorable innovation and change; and that this is accomplished at minimum social cost.

There are vast differences of opinion regarding the value of school farms to the agriculture education program. Yet opinions are as often personal biases as they are the result of painstaking observation and evaluation.

The size, use, value and justifiable emphasis on school farms requires careful research to evaluate their educational, economic and attitudinal developing values.

These unanswered, but extremely important questions regarding agriculture education require carefully conducted research to provide guidance and avoid costly mistakes.

DEVELOPING THE CURRICULUM

General Agriculture

In a predominantly agricultural/rural society, the school curriculum must be developed to emphasize, train for, and lend prestige to rural occupations. Of these, farming will for some time be the major activity. Since initially the greater proportion of the population will necessarily be employed as farmers in the agriculture sector, priority attention should be focused on agricultural production and management training. With increasing stages of developing, farming will demand increased services and supporting businesses. This will result in a corresponding demand for manpower in the related occupations and services. Therefore, manpower must also be prepared for these related services and occupations. This aspect of the curriculum must be attuned to the level and sophistication of the agricultural services and occupations operating or emerging in the rural area. Constant evaluation will be required to update and modify the curriculum as the stage of development demands attention to a wider range or a more sophisticated level of activities. But agriculture education, regardless of the academic level of the institution offering it, must have as its final goal increased agricultural production and the profitable disposition of these products. This is germane to the development of the rural areas of the developing nations.

The training provided may be production and management skills for the farmer for direct application on the farm. It may be for the public school students, some of whom may become farmers, professional agriculturists, or inter-related occupations. And it may be for diploma college or university students who will become professional agriculturists and apply the training indirectly through the farmers. Regardless of the source, level or location of the training, or who the trainee may be, the farmer must make the final application or innovation. Yet the farmer may be several educational levels removed from the original instructional activity, i.e., the university professor teaches the university students who, in turn, become the agriculture teachers of the extension agents. The agents then teach the field service staff who, in turn, take the training to the farmer. At each level the syllabus must be designed for the capacity of the trainees to assure they comprehend the implications of the scientific and technical, and can apply the appropriate technology and innovations to their own situation. Therefore, the professor must comprehend the chemical

or biological interactions of fertilizers, plant breeding, etc., and the practical application of the scientific principles. The farmer need comprehend only that by application of the proper crop husbandry practices, fertilizers or improved seed he realizes increased production. The public school agriculture curriculum should be balanced between the two extremes.

In addition to the proper level of instruction the schools must also determine the ratio of practical to academic experience as the students move up the educational ladder. Over-emphasis on practical application unrelated or uncoordinated with the classroom instruction creates a dislike for agriculture within the students. It also restricts the time for essential instruction in the agricultural sciences, technology and management. Under-emphasis results in students who can regurgitate the theory and pass the written examination, but who lack a functional knowledge of agriculture.

Literate youth, inadequately trained for urban occupations, are fast swelling the ranks of the unemployed urban masses who are non-productive consumers and a drain on the national economy. Three factors contributing to this serious problem are the attitude of looking down on agriculture, unrealistic job hopes resulting from unrealistic expectations raised by ill-adapted education; and the lingering problem that the successful completion of primary and secondary school formerly offered good urban employment possibilities, now it offers very few.

The large bulk of the literate inadequately trained are the primary school leavers. Thus, repeatedly, it has been decided that the primary schools develop programs to concentrate on basic and applied agricultural production skills. This, according to its adherents will provide these youths who have inadequate skills or training for white-collar jobs or for very many other alternative types of employment with the basic skills for earning a livelihood. However, instruction in agriculture, as in other subjects, requires minimally trained teachers whether the instruction is basic production skills or advanced agricultural chemistry. A serious shortcoming of such primary school programs in the past has been the captive labor gang use of students on school farms, unrelated to classroom instruction, and void of any planned skills training schedule. This situation developed because few teachers were prepared to teach agriculture and did so only because ordered to do so. The end result has been complete defeat of the purpose of the program.

The severe lack of professional agriculturists will continue for some time. Other demands for their services have higher priority than elementary school agriculture education programs. Furthermore, there is still considerable question regarding the value of a specific agriculture curriculum in the elementary grades. Research and evaluation is needed on this. Even if it is found to be feasible, agriculture should not be offered in the elementary schools until it can be properly

taught. The bad education and resulting negative attitudes of the students will compound rather than alleviate the existing problem. Such a program, if offered, must be delayed until there are teachers with the appropriate training, interest and background to teach the subject. On the other hand, teaching a curriculum biased to agriculture does not require specially trained agriculture teachers.

All the elementary schools, not just the rural elementary schools, should be provided with a curriculum biased to agriculture in all possible ways. Nature studies should be interwoven in the curriculum. Science, arithmetic, drawing, etc., could use examples from agriculture and rural life. The curriculum should continually draw the students' attention to the extreme importance that natural resources conservation and agricultural development have to the development of the country as a whole. References to, and discussions about, agriculture should always be in an emphatically positive manner stressing that farming, related occupations, and professional agriculture are essential and honorable occupations. The students immediately detect and are adversely influenced by hints or a disparaging attitude towards agriculture displayed by teachers.

As the students advance into secondary school their possibility of continuing to higher education is greater. The curriculum emphasis should shift proportionately, year by year, for those electing to study agriculture from a course biased to agriculture to one including the agricultural sciences, economics, management and supporting academics. A corresponding shift in the methodology and practical training is also essential, but should be limited to well planned field application of the agricultural sciences and management taught in the classroom to assure the students comprehend them and can apply them to field conditions. This shift absolutely must not be to agriculture, a la the large school farm operated by the captive labor gang. A proper balance between academic and practical experience must be maintained.

As with the elementary schools, modification of the secondary school curriculum to include agriculture and rural development is deemed essential in nations whose major economic resource is agriculture. In addition to the agricultural sciences, economics and management curriculum for the students opting agriculture, the general curriculum, within reason, should be biased to agriculture. Such a curriculum would still fully prepare the general student body for further non-agricultural education, and non-agricultural occupations following secondary school. At the same time the students would gain a better understanding and appreciation for their country's major resource. And, those students who continue their education in agriculture or enter agricultural occupations will be much better prepared.

There are few secondary school subjects that could not draw examples from agriculture for laboratory and other instructional activities.

The physical and social sciences, mathematics, history, geography, and current problems could all develop a wealth of material to demonstrate and emphasize the importance of agriculture, rural activities, and natural resources. Furthermore, community development, adult education, mass communications media and similar activities could also develop such materials and foster this concept at all educational levels in the school and out-of-school population.

The chemistry course could analyze fertilizers, soils, plant nutrient content, insecticides, and pesticides for laboratory work; give instructions and demonstrate how the different pesticide compounds react on the insects and pests; what minerals are required on deficient soils and what fertilizer to apply to soils for increased production and nutrient content; and demonstrate general application of the dusts, sprays and fertilizers on crops. The same could be done with animal internal and external parasites or fertilizers. Instruction in botany could be closely coordinated with the chemistry syllabus and human and animal nutrition, emphasizing farm crops. Problems in mathematics could use examples in farm and agriculture weights, measures and records.

Modification of the existing curriculum, introducing an agriculture curriculum as some refer to it, would not in and of itself solve the rural-urban drift. Changes in educational emphasis alone cannot do this. Such a curriculum, properly developed and taught, will however contribute a great deal to this and will be much more effective if the policies and other inhibiting factors which impinge upon farmer incentives are given equal attention by the responsible agencies.

It is essential that the efforts and plans of the education sector be closely coordinated with other sectors--agriculture, commerce, industry and manpower, social and economic, and development planners--for the most feasible allocation of resources. Rather than being identified, planned and implemented in isolation, the priority of all development activities should be comparatively determined by appropriate economic and technical feasibility analysis. This will permit emphasis on those activities which will provide the maximum benefit for the country.

The most efficient allocation of educational resources will require competent educational planning, or sectoral analysis, to avoid the costly mistakes of misplaced emphasis on educational activities. This planning must be done in close cooperation with the sectors of the economy that employ the products of the schools. And it is essential to determine the types of trained manpower that production and professional agriculture, and the related occupations and services most urgently need. The manpower and training needs will change as the agriculture sector develops requiring continuing evaluation and modification to satisfy the changing demands. A prime requirement will be two-way communication between the schools and the employing sectors regarding manpower requirements upon which to structure and formulate curriculum and training programs.

Barriers may exist where least expected--within the educational administrative and supervisory structure. The attitude persists among some educators that agriculture is not a fit course to be included in the secondary school curriculum. Therefore, acceptance and integration of agriculture into the school program may present problems. During the early years in various programs, Kenya is one example, some administrators discouraged the students by telling them they might not be able to pass the national examination and attain a graduation certificate if they enrolled in agriculture.

Students in these schools were required to decide at the end of their second year whether to prepare for the examination in agriculture, or some other subject, as an option. In some schools this option was between agriculture, history, and Bible knowledge. In other schools it was between agriculture and the sciences (biology, chemistry and general science). The course schedule and requirements should be less subject to the whims of the individual school administrators, and agriculture included on a par with other courses. Such problems would be largely avoided by a standardized course schedule, having a core of mandatory courses, i.e., language, geography, mathematics, general science, biology, chemistry, physics and history, plus elective courses which would also count toward graduation, i.e., agriculture, art, woodwork, industrial arts and religion. After completing the mandatory course requirements, the students could choose elective courses to satisfy the balance of the requirements for graduation. Students must not be forced to choose between agriculture (an elective course) and chemistry, biology or mathematics (mandatory courses). The choice should be between elective courses. Furthermore, thorough grounding in the sciences is an essential prerequisite for agriculture.

It follows that if students do not complete all the mandatory courses they can neither sit for the national examination nor gain entrance to the university. Educational policies or practices that force students to avoid agriculture in order to obtain a secondary school certificate and enter the university perpetuate the attitude of contempt towards agriculture. Such policies channel many students with potential and ability away from agriculture who otherwise may have chosen to continue on and become professional agriculturists. Development and maintenance of an efficient, productive, self-sufficient agriculture sector requires more capable manpower than school drop-outs, mediocre graduates, or those who enroll in agriculture as a third or fourth choice.

Another barrier is posed by strict adherence to a rigid national examination. When such an examination, prepared by someone other than the teacher, is a requirement it is human nature to teach the national examination rather than the student. And under such restraints teachers

seldom use experimentation and practical activities to develop the pupil's powers of thinking through problems. Furthermore, high grades in the examination require cramming with facts and model answers. This method of teaching conditions and trains the student to memorize and regurgitate in parrot-like fashion. It does little to develop his faculties for thinking through the alternatives and assimilating the decision-making process. Education should create within the student an inquisitive nature, and condition him not only to accept change, but to seek and demand change, resulting in the improvement of society.

An agriculture curriculum developed for all schools, based upon passing a common test becomes a rigid, impractical teaching guide particularly when the type of agriculture varies from school to school, and region to region. Rather than a common rigid curriculum and examination for all schools the agriculture program in each school should be adapted to the needs of that area.

Education is most effective when related to experiences or examples drawn from the environment of the students. Flexibility should be built-in to allow curriculum development by the agriculture teacher, adapted to local conditions, to make the agricultural training more meaningful and understandable to the students. Instruction in the agricultural sciences per se would be standardized since chemistry, biology, or botany are exact sciences. However, the type, use and practical application of insecticides for insect or parasite control would be different in range/livestock areas from that in intensified cropping areas.

Curricula and syllabi must be developed which are relevant to and rising out of the indigenous culture, conditions and needs of the society. Basing the curricula and syllabi on imported educational systems, which are appropriate for the highly developed societies from whence they came, have little relationship to the local situation and generate unrealistic job hopes and expectations. Such educational programs educate youth away from their home environment and in fact often result in making them ashamed of their home environment.

A great contribution the schools can make is a consistent effort to equate farming with other skilled occupations, and with other subjects offered in the schools; present the image of farming as a modern occupation; and emphasize the need for skills in farming which are also required in clerical, technical and managerial jobs. This can be fostered by changes to incorporate these ideas in the curriculum, school syllabi, and textbooks. Some studies indicate that it may be the low estimate of farming's demands, as much as its rewards, which discourage the youth.

The schools are an effective means of molding attitudes for two basic reasons. Youth are easier to influence and accept change faster than adults, and during their formative years they spend more time in school than in any other activity.

All countries use their schools to accomplish change and develop attitudes for the national purpose, some to greater extremes than others. This is evidenced, for example, by the purposes to which the schools were put, and the results accomplished, by the Hitler regime in Germany. The end result of the effort may be good or bad, as evaluated by world opinion. However, this does not alter the fact, nor the potential for change which exists. The extent to which the objectives are attained depends primarily on the quality and quantity of the effort exerted.

Social and cultural traditions and customs in most developing nations are a greater barrier to agricultural/rural development than the difficulty of teaching specific production skills. It follows then that a vastly increased effort must be directed to changing attitudes which in turn provide the impetus for motivation. The education system can have a greater influence on shaping the concepts, attitudes and future behavior of the youth of the nation than any other single activity. Students frequently and willingly do things their teachers suggest after having hesitated to do the same for their parents. To this parents can attest. Properly informed and motivated teachers, supported with the necessary teaching materials and aids, can do much to shape attitudes and motivate the youth in line with national goals. Therefore, it is imperative that the national goals be realistic and in line with the priority needs of the nation.

School Farm

The school farm, demonstration plot, or garden has been discussed a great deal. Very little serious study, however, has been made of its actual educational value to the program, or to the students involved. The theory that the school farm is the agriculture course's laboratory for applying the work-study, learning-by-doing philosophy, requires careful study and evaluation. The practical application of this theory frequently results in students' grievances and problems. The general reaction is, "we came to school for an education, to learn books, not to do farm work."

This problem is likely to be greater in areas where the people historically have been herdsmen. They traditionally have not cultivated crops and look upon the required manual labor as below their dignity, much the same as the early U.S. Western cattlemen viewed the sodbuster.

The school garden must be used only for well planned practical application of the sciences and technology taught in the classroom; never for volume production requiring redundant student labor to teach them how to farm. The students soon recognize the difference between planned practical application of classroom instruction to learn production and management skills, i.e., following through a crop from seed bed preparation to marketing, and being used as free, captive labor. After the students have mastered a production skill(s), continuing them in the redundant application

of that skill(s) to attain a school farm production quota ceases to be education. The students perceive themselves as a labor gang. Careful planning and constant evaluation are essential to determine the optimum amount of practical experience required to master the improved husbandry and management skills and technology. The size of the farm and the amount of production must be limited to these instructional requirements.

The agriculture students, furthermore, must not be singled out to produce food for the school cafeteria, the staff, or as a source of income for the school. This is contrary to good educational procedures and invariably has a negative effect upon the students. Often in boarding schools a large portion of the farm is used to produce food for the cafeteria. Where this is done, all the students, not just the agriculture students, must be required to do the work to produce for the cafeteria. However, a national policy prohibiting the use of school farm produce in the cafeteria, by the staff, or as a source of revenue for the school budget would avoid such student exploitation and other negative practices. An equitable plan would be to sell all the farm produce on the open market through a student cooperative, and compute the total income against the combined students' hours of labor. Each student could then be paid a proportionate share for the hours he spent on the farm. Records for this purpose would not be difficult to keep, and would be a valuable educational experience if kept by the students. Another alternative would be to place the revenue in a student fund to be used only by and for student extra curricular activities.

Rural schools in the Far East frequently have large farms where the students spend more time providing free labor, under the guise of education, than in the classroom. By graduation time many students develop a hatred for farming, more because they were exploited than because of any real dislike for farming before coming to school. This practice also reduces classroom instruction time leaving some of the students unable to qualify for enrollment in the university which further embitters them. Practical application of agricultural technology, like other things which ought to be good just because they are thought to be good, can be overdone and backfire cancelling the positive aspects. Furthermore, the attitudes which develop due to such exploitation rob the country of many who may have otherwise chosen an occupation in agriculture.

The size, use, value, and justifiable emphasis on school farms need to be determined by a thorough study of their educational, economic and attitudinal developing values as perceived by education officials; and as perceived by the students, parents and community. The latter, more than the former, will determine the lasting educational contribution the school farm makes. A positive contribution will be much more likely to result from a program properly planned with and accepted by the latter, than from a decree by the former.

The students', parents', and community's social values placed on education, their concept of the role of education, their aspirations, interests and objectives regarding education must be priority points of consideration in planning educational programs. An official policy determined in the capitol and implemented by decree may have very limited success. This will be particularly so if the policy is not accompanied by adequate incentives to provide motivation; if it is not at least partially in line with the aspirations and goals of the people involved; and if it is not explained to the people involved.

It must be demonstrated on the school farm, or elsewhere in the community, that at least as good a living can be gained from farming as from off-farm employment. Otherwise, there will be little evidence with which to change attitudes or convince skeptical youth that farming offers them anything except subsistence drudgery. This, they are determined to escape. The school farm program must be skillfully planned and implemented to teach the students the application of improved production skills; the management of inputs and outputs, to select alternative choices (the decision-making process); and to demonstrate that greater productivity per acre can be obtained through the use of improved methods. Such lessons can be learned on small school farms, requiring a minimum of labor, as well as on large farms.

It is difficult to lay down a definite size for school farms. This should be determined by the type of agriculture practiced in the community. Area officers of the Ministry of Agriculture should be very helpful in laying out the farm and planning the program. The farm should be big enough to implement important crop husbandry practices in the area, but not larger in size than the holding of a local energetic farmer. Care must be taken to avoid unnecessarily repetitive demonstration lessons. Where the use of production equipment is being advocated, the size of the farm should justify the use of this equipment. For example, where an ox-plough is used for cultivation the plot would be larger than where a hoe and man-power are used.

Unless very carefully planned school holidays may occur when it is disastrous to leave the farm untended, and the crops cannot be placed in a state of dormancy. Few students would willingly give up their holidays to tend the farm. Furthermore, large school farms are potential income producers and frequently degenerate educationally into being used as a source of income for the school first, and as a teaching technique second.

One apparent requirement is a school farm planned and developed around the type of agriculture prevalent in the area, demonstrating improved technology and increased profits. Writing-off financial loss on the school farm to education does little to convince the students or local farmers that agriculture education pays off.

Emphasis must be placed upon sound agricultural practices, 'on a limited scale', leaving the quantity production of crops to the farmers in the community. The syllabus should be applicable to the local agriculture production potential and limitations, and in line with the district agriculture policy. The hours and periods of practical work on the school farm should be flexible, but more important they must be limited to the actual work necessary to meet the educational objectives and the application of classroom instruction and mastering essential skills. Extra work on the school farm, as a means of punishment, must be forbidden. This practice, more than any other, destroys any vestige of the dignity of farm labor.

Individual agricultural home projects may also be considered in conjunction with, or in lieu of a school farm. Such projects can be an effective and useful activity. However, many secondary schools in the developing nations are boarding schools which essentially eliminates home projects. Providing areas on the school farm for each agriculture student to have a crop or animal project may also be very difficult, if not impossible. As with the school farm, the individual projects will require some very careful study and investigation to determine whether, and to what extent, the activity should be incorporated into the curriculum.

In some cases it may be possible to combine the students' practical experience training with community development involving the school, community, agriculture extension agent, agriculture cooperatives, the community and the agriculture teacher. Properly planned and coordinated projects of this nature could have very beneficial effects on the acceptance and support of the program in the community.

Farm Shop

Agricultural mechanization and maintenance and repair of farm equipment and buildings are important to agricultural development. However, the degree of, and the speed with which agriculture will be mechanized in a given country should be the guidelines used to determine the content of the farm shop curriculum and program. The curriculum should be developed to teach those skills required for the level of agricultural mechanization and development of the country. However, too often, the farm shop curriculum in many developing countries has been the adoption, without adaptation, of the proto-type U.S. farm shop program, including the full array of electric-powered equipment and tools.

The farm shops in the Far East and Kenya secondary agriculture education programs were equipped with electric-powered table saws, drill presses and hand drills, hacksaws and arc welding equipment, and gas welders and cutting equipment. Yet, such equipment existed outside the schools only in the urban industrial centers. Therefore, little application could be made of these learned skills unless the agriculture students sought employment in industry. These schools were also equipped with tractors and

tractor-drawn machinery, and instruction in their maintenance and repair formed a very large part of the farm shop program. Yet, only a minute percentage of the total farm land in these countries is cultivated by tractor and tractor-drawn machinery.

Few rural areas in the developing countries will have electric power in the foreseeable future. The logic and justification for superimposition of a sophisticated farm shop program on a traditional agricultural sector is questionable. The farm shop curriculum should be based upon a realistically projected, immediate future level of mechanization and development which the agricultural enterprises (the average to best farmers in the area) can possibly attain or achieve. The farm shop curriculum should initially be developed and the shops provided with equipment and tools of comparable sophistication to teach the skills required to operate and maintain that farm equipment. The curriculum can subsequently be upgraded sufficiently to maintain and operate future sophistication levels of mechanization, and to encourage constantly increasing use and application of modern farm mechanization technology. This same procedure should be followed regarding the farm electrification, farm building, soil management, etc., sections of the farm shop curriculum.

Instruction in tractor and machinery operation, maintenance and repair for a rural population who, it is hoped, will advance from hoe-farming to using animal power has little application or value. Likewise, teaching skills requiring electric-powered equipment and tools has little application or value on farms where electricity is not and, will not be available for the foreseeable future. Although agriculture education should lead the way to improvements in agricultural technology, production methods, mechanization, farm management, marketing and a myriad of other inputs, it must first satisfy the currently felt needs of the agricultural sector. The two are usually identical. However, it is essential a balance be maintained. When the gap between the level of technology the farmers in the area can reasonably grasp and apply and the level taught and encouraged by the school becomes too great, the students/farmers are discouraged, not encouraged. Little is gained by proposing technological practices or mechanization beyond that which the farmer can accomplish with the resources readily available to him. This is true regardless of the practice, technique, input or output proposed.

Teaching farm shop skills requiring electric-powered or other high-cost equipment or materials has about as much practical and possible application for the subsistence economy as instruction in pesticide application by aircraft. Both are beyond the farmers' means of acquisition and do little except convince them that the agriculture teacher does not understand the rural area's problems; that the teacher is not interested in learning what the immediate problems are, or in trying to formulate ways of solving them. For example, teaching the students how to construct an

improved type poultry house, even a small model, from locally available materials, bamboo and grass, they can gather without cost, will have practical application and be within their means as farmers or be something of value to pass on to their parents or community. On the other hand, teaching the construction of a poultry house using sawn lumber and manufactured wire and roofing would be of doubtful value, particularly when most farmers live in a mud house with a thatched roof.

The development of the farm shop program in each locality should be preceded by a very careful survey of the farming practices and level of mechanization in the area. The syllabus should be formulated to solve the current existing problems while leading the way to improvements. The program must have immediate, practical application, be within the level of technology the students/farmers can comprehend and apply, and be within the means of acquisition of the individuals concerned.

PROFESSIONAL AGRICULTURIST TRAINING

Teachers and Field Staff

The agriculture teacher is the key to a successful agriculture education program. Top-notch teachers are developed from individuals who have a profound dedication to their profession; who understand its importance to society; who have respect for and patience with their students; and who have a well-grounded knowledge of the subject they teach. The prospective agriculture teacher must be carefully selected, appropriately trained and adequately motivated, and he must understand his own culture in relation to agriculture if the program is to realize maximum success. The quality and scope of the instructional program will develop in direct proportion to the degree the above criteria is satisfied.

Social, cultural and economic factors will influence, positively or adversely, the development of a strong professional agriculture teacher training program and the profession itself, and demands research to identify positive and negative factors and formulate methods for coping with them. The same will be true for an agriculture extension training program. A rural background and direct personal experience in agriculture provide the prospective agriculture teacher/professional agriculturists with insight and sympathy for farmers' problems that individuals reared in urban areas seldom have or develop. However, few secondary schools exist in the rural areas and other extenuating circumstances often intervene, resulting in a much smaller proportion of rural youth being able to attend secondary school, much less college or university. Since the urban population is afforded the greater opportunity to continue education beyond elementary school most of the sub-professional and professional agriculturists are urban reared. Subsequently, the individual agriculturist's concept of the problems of the rural areas and population tend to be

restricted, and often remains superficial. This also tends to influence the degree of sincere concern and sympathy for the farmers' situation.

The general public attitude that agriculture is inferior to, and offers less opportunity than other professions or occupations further aggravates this undesirable situation. The urban youth make every effort to enroll in faculties other than agriculture at the University. Failing in this, they enroll in agriculture as a second or third choice. Consequently, they become professional agriculturists primarily because other choices are closed to them; not a very motivating reason. Naturally, they are prone to develop the attitude that they are teaching students who have no better alternative than subsistence agriculture, or as professional agriculturists for earning a living. This concept and attitude is not conducive to agricultural development and demands solution.

Agriculture education has also had to depend upon seconded, temporarily assigned, and part-time teachers from the Ministry of Agriculture's field and administrative personnel to staff institutions. This system, inevitable in the early stages of development, does not provide a satisfactory basis for developing a permanent education staff and system. Effective agriculture education and teacher training programs cannot be developed when a majority of the professional staff are reared in urban areas; enroll in the faculty of agriculture as a second or third choice; or are part-time, or seconded, institutional staff.

A solid grounding in technical agriculture is the priority requirement for agriculture teachers. Therefore, the teacher training programs should be established in the faculties or colleges of agriculture. An alternative is to provide professional education courses at teacher training institutes after completion of a diploma or degree in professional agriculture. Regardless of the location, the majority of the training must be technical agriculture topped-off with the professional education, not the opposite.

The training should be based on a curriculum emphasizing preparation in the physical and agricultural sciences, agricultural economics and production, and farm management--the management of inputs and outputs. The courses must present relevant agricultural information with appropriate practical application of the sciences, techniques and practices. The curriculum in addition to agriculture and professional education should include rural sociology.

Appropriately balanced practical work experience is essential whether the students are destined for careers in teaching, research, other professional duties or farming. The students should be judged as much upon their ability to practice their profession as upon their ability to pass

written examinations. However, undue stress on methodology and practical training is likely to result in a large number of rather poorly, technically trained individuals. Time is a limiting factor and it is frequently impossible to arrange and implement practical work experience during the college or university course because the time-table, in term time, is full. These considerations lend particular importance to the need to plan and arrange practical work experience and its proper supervision and assessment with great care. As with the secondary school students no useful purpose is served by requiring university students to spend long periods on dull repetitive farm work. The aim of the practical application must be to stimulate an intelligent awareness of the complex processes of farming, to develop the ability to analyze and assess the factors involved, consider the alternatives, and plan as every good farmer has to do.

It is important that the prospective professional agriculturists comprehend the scientific principles and their application. They need also to master the corresponding basic skills and technology to realize increased, efficient crop and livestock production, and as appropriate the use and care of machinery. It is equally important that they learn to study, critically and intelligently, the agriculture systems of the areas in which they live. Developing the capacity to observe, record systematically, analyze data, and present findings in a clear and concise manner should be an important part of the training at the university level.

Since teachers tend to teach as they were taught, a major revolution in educational methods is required. The rote learning method and regurgitation in parrot-like fashion, the lectures without demonstration or discussions, and similar poor education practices must be replaced with well planned demonstrated lectures, full class discussions, problem-solving techniques, and emphasis on the decision-making process.

Some basic instruction in rural sociology is essential to provide the professional agriculturists with an understanding of the rural society, its traditions and customs, thought processes and taboos. Unless the teacher and the agriculture field staff acknowledge an understanding of these by their mode of action and attitude in dealing with the students and rural population they will achieve little. People who believe that nature can be influenced only by ritual are very skeptical about adopting scientific answers and technology for this purpose. An agriculturist who understands the cultural and social traditions and customs can through sympathetic, intelligent and patient effort formulate methods to cope with these development inhibitors to bring about acceptance of innovations and change. Ignorance of, or ignoring these deep-rooted factors is an almost sure road to frustration and minimum accomplishment.

The agricultural diploma colleges would be an excellent location for teacher training programs. However, the restriction placed upon the academic mobility of diploma college students needs revision to provide them with increased academic opportunity. The diploma colleges, practice-wise, if not policy-wise, are terminal education programs. Thus, diploma college graduates are in effect restricted in future educational and professional attainment. They are seldom, if ever, permitted entrance to an African university upon completion of the three-year diploma program. This prohibits them from earning the academic degrees upon which advancement through the professional ranks is based. On the other hand, individuals selected from the top ten-plus percent of the graduates from diploma colleges in Africa have completed requirements for degrees in U.S. universities. They can do likewise in African universities.

The vertical integration of education should be given very high priority in educational planning. The diploma colleges should be included as an integral part of the higher education system. This would permit the individual to move from the bottom (certificate institutes and diploma college) to top (university faculty) to the extent that he is capable, and circumstances permit, without being blocked by arbitrary cut-off points. Therefore, within the limits of the individuals' academic capacity, the certificate holders could go on to the diploma college and possibly on to the university. Likewise, diploma holders could go on to the university.

The certificate (two-year post, fourth form and secondary) and diploma college students (three-year post secondary) who demonstrate the capacity deserve the opportunity to enroll in subsequent level higher education institutions. This would foster the gradual improvement of the applied technical competence of agricultural workers; attract and allow more rural-reared and often higher caliber students to agriculture; and do much to avoid turning out totally academic/theory-oriented, clean-hand agriculturists, whose usefulness and productivity is questionable.

The educational product, the student, would be further improved by such additions in the educational system as teacher evaluation, student cumulative records and quartile ratings. The teacher training program should provide instruction in both these activities.

Teacher ratings properly conceived and implemented would classify the teachers according to their comprehension of the agricultural problems; personal motivation and efforts to foster development in the school's service area; ability to influence and motivate the more capable students to study agriculture; and ability to impart relevant knowledge to the students. The teacher ratings could then be used as the basis for an incentive program by basing teacher promotion on the ratings. The evaluations would be prepared by the school administration and the agriculture education supervisor from the Ministry.

The student cumulative record and quartile ratings would provide a readily available progress and comparative capability record on the individual student. Such reports would provide valuable information for student guidance and placement as he progressed through the educational system.

It is essential that analysis and review of the agriculture education program be conducted on a continuing basis to assure that the training is meeting the needs of the teacher in the field. As changes are indicated, the pre-service training should be modified to meet these needs. The teacher training program should also include in-service training to keep teachers in the field abreast of new developments and to provide them the opportunity to work towards bachelors and post-graduate degrees. The in-service program found generally to be most effective is the intensive two to three-week course offered during the school vacation period.

Interdepartmental or school visits are another effective technique for teacher improvement. This provides the teacher an opportunity to compare notes on problems and observe how and what their fellow teachers are doing.

Teaching materials of appropriate nature and applicability are extremely important and are usually in very short supply. The development and distribution of such up-to-date teaching materials should be a priority activity. This can be handled either at the teacher training department, a curriculum center at the Ministry, or a combined effort between the two. The other aspects of teaching materials are training the teachers how to use them, how to supplement or adapt general information publications, and how to develop their own from resources on hand.

AGRICULTURAL EXTENSION

IN

DEVELOPING NATIONS

Introduction

Two decades ago it was assumed that the agricultural technology of the developed nations could be quickly and easily transferred to the developing world. This transfer was to result in rapidly increased agricultural production and improved rural living conditions. It was also assumed that one or another single technique could solve the organizational problems of bringing new technology to subsistence farmers. Promising techniques were tried in numerous areas. However, the gap in per acre and per capita yields between the developed and developing nations is widening rather than narrowing. The record to date is generally one of marginal progress, rarely of sufficient success.

Then, one decade ago, industrialization was championed as the key to economic development at the expense of support for agricultural development. The supposition was that if industry developed other sectors of the economy would follow. Industry advanced in parts of the developing world. But agriculture, being comparatively neglected, could not produce enough of the raw materials upon which primary industry is based. And it was unable to supply the higher level of nutrition which is the first-priority use of higher incomes in the developing nations.

Since World War II it has also been amply demonstrated that the agricultural problems cannot be solved in the laboratory or at the conference table. Assuring the world a decent supply of food, man's most basic requirement, will require a gigantic effort. Although this will be expensive, money is probably the easiest need to fill.

Little of the developed nations' agricultural technology is applicable, without modification, to the developing nations. This encompasses several interrelated, but specific, problems. Appropriate agricultural technology must be developed through adaptive research, trial and error, and sustained effort. Another problem of consequence will be training the agriculture field staff and subsistence farmers in husbandry and production skills and practices. The lack of management capability is a problem of great magnitude. Management know-how appropriate for varying specific needs is essential. Development of the agriculture sector requires proficiency in the management of farm inputs and outputs, the choice between alternatives, and applying improved technology. There

must be a break with the subsistence attitude. Production and management skills must be applied to be useful. Such innovations will occur only when the attitudinal climate is conducive to change.

The traditions and customs of the subsistence society have precluded rather than fostered change. Any one attempting to move ahead of the accepted mold of the society was viewed as a threat to the society. Conform rather than change was demanded. Personal initiative to innovate and improve one's situation was harshly dealt with. This frame of mind, this attitude of the traditional or subsistence society perpetuated the subsistence society. The supreme barrier to development, the problem of greatest magnitude is such attitudes within the rural population. Similarly improper attitudes within the elite strata, the professional agriculturists and non-farm population inhibit agricultural/rural development.

The physical requirements of most production or management skills can be learned in a relatively brief period. But these skills will not be applied unless the individual's attitude is favorable. The first change must be made in the mind. Initially at least in the traditional society this means the collective mind of the community along with the individual farmer. This change of attitudes will require suitable incentives. Furthermore, agricultural development will require that many people, technicians, officials, and above all farmers be willing to accept and/or initiate a radical and often painful process of social change. This will be necessary concomitant with developing competence in agricultural management and production technology and related services and businesses.

Sustained growth in agricultural development requires technical, economic, attitudinal, and political transformations of the whole structure of the rural society. This cannot be accomplished quickly. A single decision, appropriately supported and financed by outside help, can result in the rapid construction of a dam, transportation system or industrial plant. However, the transformation of traditional agriculture requires such a multitude of interdependent changes, in so many aspects of rural life, that a perspective of decades is required. Although some changes may be made quickly the acceptance of innovations by the rural economy that will ensure sustained growth requires well planned approaches, patience, and very steady purpose. This is partially due to the concept of both the farming and non-farming population, that agriculture is a low-status occupation, an intangible characteristic posing barriers to its modernization. It is further complicated by lack of education, antiquated subsistence agriculture technology, the low-level of innovative attitude of the farmers, and few incentives to motivate change among the farmers.

The major inputs, unlike industry, are similar for all types of agriculture. These, combined with the outputs and the proper management of both, are inseparably intertwined with the economic environment. Cash market farming, regardless of what is grown, must be profitable. Markets for both inputs and outputs must be accessible to the farmer. All farming is time-consuming and requires some credit, with a favorable relationship between the costs of inputs and return for outputs. In most types of farming, and most particularly subsistence farming, innovations are seriously restricted by the high economic and social risks associated with the adoption of new practices. However, some of these risks can be reduced by appropriate governmental policies based on sound technology and management. Cash market farming requires higher levels of knowledge, training and skills of farmers and supporting services than those required by traditional agriculture. The level of the knowledge, training and skills required increases in direct proportion to the sophistication level of the farming.

Agricultural development is also characterized and complicated by an extraordinary degree of variation in its specific requirements for efficient production from country to country, from crop to crop, and from locality to locality within a country. There are few general rules regarding priorities, sequences, policy emphasis, or organizational structures that are applicable, without some modification, to agricultural regions. Furthermore, agriculture is practiced under a wide range of climatic conditions from the rainy tropics to the arid lands in the developing world. This diversity of physical, economic, institutional, and motivational situations in the developing countries, combined with their extreme interdependence in any particular situation, demands research and experimentation on these factors.

The need for biological research under local conditions is equaled, if not surpassed, by the need for research and experimentation on manipulations of the economic environment; organizational and institutional patterns; the types and complexities of knowledge that can be absorbed by the local population; education and training; and the other interrelated activities that constitute an agricultural program. This is not fully appreciated by many responsible for agricultural programs in developing countries.

Expanding reliable markets for the agricultural products are essential to a successful agricultural development program. Export markets will suffice for specialized crops. But internal consumption creates the major demand for farm production requiring a marketing system and pricing policies that do not impinge upon producer incentives.

Agriculture modernization and research services, production, processing, distribution and marketing will require the attention of a significant

number of the brightest and most imaginative, innovative and ambitious members of the rural community. However, these are precisely the individuals who equate farming with drudgery and join the rural-urban drift for what they believe will result in greater mobility, self-improvement and exciting challenge. The often referred to surplus or unemployed labor in the rural areas does not include the energetic and innovative individuals necessary to provide leadership for the modernization of agriculture. Development programs must deal with the problems of improving the status and challenge, as well as the technology and production of agriculture.

At least a minimal indigenous corps of competent administrative and organizational staff, trained in technical agriculture, is also an essential requirement. A training program to expand this corps at an adequate rate is necessary. The agriculture extension staff should be an integral part of this corps.

The extension service is charged with translating research agricultural policy, production program plans, farming skills, and the management of inputs and outputs into action programs, and training farmers in their proper application. The development of a competent extension service staff and leadership from director to junior-level field personnel demands priority attention. The staff must have administrative, professional/technical training. Equally, it must be filled with a sense of initiative and responsibility, and an awareness of the extent of the public interest and need for economic well-being.

Agricultural development and the rural population's economic well-being and social progress are essential corollaries to the developing nation's overall economic well-being and newly attained political freedom. The professional leadership competent to plan the extension program; to coordinate different technical approaches; to supervise extension field activities; to coordinate support from and participation with political authority, as well as from local leaders and other public and private agencies, and direct the program accordingly is essential. The agriculture extension service personnel must develop this administrative capability. Special administration and personnel management training programs should be provided for key and potential administrative policy-making personnel to supplement the technical and professional education and training being provided in schools of agriculture.

An innovative and experimental attitude by all concerned is essential for appropriate and timely determination and use of physical inputs, economic arrangements, organizational patterns, or research institutions. This attitude of experimentation, trial and error, continued innovation, and adoption of new ideas must be built into the whole fabric of the agriculture sector; from the farmer to the university and/or research

institute, and from the field extension agent to the Minister of Agriculture. It must permeate the rural community, the farm supply and marketing industries, the bureaucracy, and the intellectual institutions concerned with agriculture to bridge the gulf that often exists between the city and country, university and extension service, and Ministry officials and village officials and farmers. This will assure that continued development is built into the system. Otherwise, improvements in performance, though they may occur, will be halting and transitory, and will provide no lasting contribution to agricultural productivity.

Agriculture is dominated by interactions demanding that all of its operations, and the institutions that serve it, be studied and designed with that fact in mind. Agriculture is conditioned by localized combinations of natural resources requiring that great importance be placed on the decision-making ability and managerial skills of individual farmers. Agriculture is capable of dynamic growth, but the training of all engaged in it, farmers and professional agriculturists, must be geared to change if this growth is to be realized. The transformation of the traditional society and subsistence agriculture into the cash economy involves fundamental changes in the attitudes, values, and orientation of farmers, and of those who work with them. Research is needed on these factors.

The task of translating the research on this multitude of interlocking aspects, social, economic, political, management, production, marketing, and credit into action programs the farmer can comprehend and implement falls primarily to the agriculture extension service. Thus, the task becomes much more than just introducing production skills. The research results on all these influencing factors must be delicately mixed and balanced with the production inputs, and be presented in palatable form to the farmers by the extension service.

THE ROLE OF GOVERNMENT

The relation of government to agriculture extension institutional development is dependent upon the role delegated to the extension service within the government framework. A government committed to agriculture extension, as a development tool, must establish and maintain a positive relationship if the commitment is to foster development. Extension does not succeed by edict, nor by expressions of good intent. It succeeds by virtue of its capacity to perform services that will meet the needs and help solve the immediate social and economic problems of the rural population. Therefore, the role of a government committed to agriculture extension must be one of active concern for the development and improvement of the extension service's capabilities and relationship. Several problems require solution regarding government's role in initiating a new program, or strengthening an on-going extension service. What are the activities of government

that support and develop agriculture extension capabilities? How does government initiate supporting activities? How extensive can extension activities be under given financial and technical resources?

A most fundamental step is for government to assure that its agricultural and appropriate non-agricultural officials gain a basic understanding of agriculture extension, its application, relationships and benefits. Otherwise, the potential contributions of the program may be delayed or never achieved. Government must also establish a supporting framework that will facilitate the extension service's development and operation, training administrative, supervisory and field staff in agriculture production subject matter and production skills, management of inputs and outputs, and rural sociology to more effectively cope with the development inhibiting traditions and customs of the rural society; providing transportation; developing and implementing farmer training techniques and facilities; and developing and distributing agricultural information to the agriculture sector.

Most developing nations have initiated an extension service. Some of these countries, for reasons other than the effective capability to do so, have attempted to provide extension services on a total country-wide basis. These present a very bleak picture. Such programs too often consist of a large number of untrained junior field staff, many of whom are barely educated and thus cannot effectively translate to the farmers the information contained in the extension bulletins and other publications. They also have difficulty comprehending and passing on to the farmers technology and information received in staff training programs. This junior staff invariably is supervised by a very small number of low-paid, partially trained extension assistants; only in rare cases do the extension assistants have transportation or are imbued with minimum motivation and thus, cannot, or will not, effectively supervise the junior field staff. Farmers can hardly be expected to look to such an extension service for help.

One virtually disregarded, but hard fact of life must be faced in view of the limited trained manpower and revenues if an effective and credible extension service is to be established. When developing the extension program, the vacant positions on the staffing pattern must be filled only as individuals with adequate education and technical agricultural training and background became available. Very limited success has been realized in training extension field staff in modern agricultural technology and management skills when they have completed only four or five years of school. And once unqualified individuals fill the positions it is virtually impossible to replace them when qualified individuals become available.

When funds and trained manpower are inadequate to provide effective extension services to the total rural population priorities must be established. In such cases the program should be initiated, but must be limited to geographic regions with the following characteristics, areas with: the greatest potential for increased production; where some development has occurred; and logically where the farmers are most apt to accept change. These are the areas where the greatest impact and the fastest progress and results can be realized in the shortest time. As the staff in these limited areas gain experience and competence and additional trained manpower becomes available, but not before, the program should be expanded to new areas. But the expansion must be limited to the geographic and human physical limits that the trained staff can cope with. An inefficient, incompetent, over-extended extension service becomes an inhibiting rather than positive tool of development.

The success of the extension service, the effectiveness of the farmer training activities, the degree to which improved practices are applied, the increased agricultural production, and the improved living conditions in the rural areas will be determined by the weakest links in the extension service chain of operations, the least capable personnel. This is normally junior field personnel. Therefore, regardless of how well intentioned the senior staff may be, the program's accomplishments will be limited to the least capable field personnel's capacity to gain creditability and the confidence of the farmers during personal encounters with them.

THE EXTENSION PROGRAM'S SCOPE OF SERVICES

The agriculture extension program as developed and conducted in the United States is not appropriate for the developing nations. It does not provide enough services and collaboration for the vastly different needs of the subsistence farmers and conditions that exist in these countries. The U.S. program basically translates research results to the farmer. The U.S. farmer can go to the farmer supply and other outlets to obtain the inputs. Many of them have the requisite capital or can easily obtain credit. Except during periods of widespread financial depression market outlets are readily accessible and generally reliable.

The extension service in the developing nations must do much more. It must translate research and technology to the farmer; make certain the inputs are available, and in many cases deliver them to the area; arrange for and supervise the credit; often arrange for marketing and produce; and break through the barriers to development existing in the social and cultural customs. It is essential that the extension program in the developing nations provide this wider scope of services and satisfy the farmers' total needs.

Farmer training appropriately planned and geared to increase agricultural productivity and foster attitudinal change for short or long-range goals, cannot be over-emphasized. The training should include basic education (perhaps in conjunction with community development) and application of the basic principles of production enterprises and skills. It should also emphasize the interactions and the decision-making ability and managerial skill required at the place where production occurs--the individual farm. Discussion on production inputs and package programs in aggregative terms is necessary in planning national programs and goals. But the end result, production, is determined by the way the individual farmer accepts and applies the technology on his farm, appraises the consequences of the alternatives, and makes sound decisions. Thus, at all stages in the development process, regardless of the location or expertise of the farmer, information and technology must be extended to assure that the farmer learns the why, as well as the what and how of the innovation.

The extension agent, therefore, must accept change himself; collaborate with other rural development efforts; train the farmers in the management of farm inputs and outputs and encourage him in applying the new technology; become proficient as a practicing rural sociologist; discard superiority and assist the farmer as an equal; learn from the farmer's wealth of practical experience; and continually upgrade his own knowledge and skills through individual study, training programs, and observation of activities in his service area. He must bring not only innovation to the farmer, but must also sell the innovation to the farmer.

Very little transfer of technology can be accomplished unless the extension agent makes personal contact with the farmer. Personal contact is less likely to occur when the extension personnel are concentrated in the national capital, or other large cities, than when they are de-concentrated in the rural areas among the farmers. Posting extension personnel in the rural areas will demonstrate greater institutional effort and concern than leaving them in the cities. It will be more apt to convince the rural population the government has a sincere interest in their behalf.

The encounter between the farmer and the agent is crucial. Unless the encounter appears fruitful to the farmer, change does not occur. Since this encounter is a crucial point on which the success of the extension service and agriculture development depends, close study to determine the most appropriate manner and methods is demanded. The farmer must be approached in language he understands, in terms that are relevant to his experience and desires, and by people he trusts and respects. His customs and beliefs must not be ridiculed nor subjected to humiliation, red tape, and delay. It is essential that he be required to see a minimum

of people to obtain the new inputs and learn how to use them, and that he believes the inputs will be available when needed. The sincerity, dedication, competence and accessibility of agents in the field, not the table of organization in the Ministry of Agriculture, will decide the outcome.

The strain of innovation on the farmer is great, often excruciating. He is required to master new production and management skills, learn the use of credit, and accept unsettling changes in his social order, all in a limited space of time. Change is difficult at best, and to burden the subsistence farmer with further barriers in the encounter will alienate him rather than win his confidence. Thus, the training package must be so designed that the barriers to acceptance by the farmer are reduced to a minimum.

The package of tangible and intangible factors may be designed in the Ministry, but it must be implemented and guided, particularly the intangibles, by extension agents who are fully aware of and committed to the requirements. Success will be determined by the methods and manner the agents use in the encounter with the farmers and local leadership, and how effectively he bridges the gap between profitable market agriculture and subsistence agriculture. When the extension agents lack credibility and their level of technical competence is low it is difficult for them to bridge the gap. The villager in the developing countries is generally very distrustful. He has been conditioned by centuries of exploitation not to trust anyone from government, the extension agent included.

Extension programs invariably list increased production, improved living conditions, management of inputs and outputs, etc., as their objectives. However, these programs invariably slight or ignore these objectives when implementing the program and in progress reports, and show instead the man-days of training conducted for the staff and farmers, and the number of bodies assigned to positions in the staffing pattern. The man-days of training is important only insofar as it results in increased production and improved living conditions. The staff training function is a necessary, but not the primary, objective of the extension program.

THE EXTENSION AGENT

The extremely short supply of even inadequately educated, dedicated and agriculturally-oriented personnel to bridge the gap between modern technology and subsistence agriculture is a severe problem. Frequently, the field personnel have not completed an elementary school education. Five or six years of elementary education do not prepare them to cope with the technical knowledge which is an integral part of modern agriculture. Just the concept of fertilizer is not simple, and the agent must teach farmers how to use the correct fertilizer properly. Furthermore, farmers,

even more than off-the-farm workers, must acquire skills and knowledge drawn from science if they are to be effective in using modern agricultural technology to increase production.

The supply of trained human resources is less tangible than the sheer lack of numbers. If the extension agent is to effect change he must develop the skills and characteristics required of successful extension agents. He must be able to apply the technical aspects of his job or his advice will be of little value. This can and must be accomplished in his training. He must also be deeply committed to innovation and accept the painful personal adjustments that come with rapid change and social evolution. If he is content with the status quo, and his primary commitment is to his personal status, the agent will not be an effective promoter of innovation. Although easy to state, this principle in practice gets little attention, perhaps simply because it is an intangible. Past experience demands that it no longer be disregarded.

Teaching production skills to the subsistence farmer is the easiest part of the task since the actual physical aspects of the skills can be transferred relatively easy. However, molding the farmer's attitudes to assure implementation of the skills on his farm, particularly achieving the initial breakthrough, is a task of far greater proportion. This barrier to development is either neglected or relegated to minimum effort in comparison to physical production skills training. Changes must take place in the mind--attitudes--before actions change. There are indications that the key to creating interest in agricultural training and development is by stimulating pride first. Such stimulation is required for the extension agent as well as the rest of the agriculture sector.

The agent must not attempt to advise the farmer on a step or practice about which the agent is not certain. Being a professional agriculturist--the expert--does not mean the agent must know all the answers or he will lose face. If he does not know the answer it is imperative that he go to reliable experts or reference for help before advising the farmers on a problem. Giving the wrong answer is far worse than admitting he doesn't know, but he will find the correct information.

THE BUREAUCRACY

Values not conducive to innovation are sometimes prevalent in the bureaucracies of the developing nations. They are often characterized by elitist and authoritarian attitudes; rigid adherence to rules being valued over accomplishment; great concern with symbols of prestige and status; and the perception that the production end of agriculture is a despised occupation. Such attitudes and characteristics hinder the program.

The values prevalent in the bureaucracy should foster development of an extension service in which the exception, about whom the community comments, "if we had a few more like him our problems would soon be solved," becomes the norm rather than the isolated case. The behavior of government officials, like farmers, is conditioned by their environment. Thus, the human environment of the officials, like that of the farmer, must be favorable to change to assure development. Otherwise, the exceptional agent remains an exception.

This will require a system of values from which emanate attitudes and efforts that encourage improving methods and standards of performance. The bureaucracy must also improve its perception of the production end of agriculture if the extension service as a whole is to attain the level of performance approaching that of the exceptional agent. These are prerequisites for mobilization of such agents in the numbers necessary for agricultural development. Technical training of the extension staff, by itself, is not enough. The environment of the bureaucracy must exude the attitude and the will to develop itself as a precondition to agricultural development. The will to develop must be distinguished from the mere wish to develop. The wish is evident in the public statements and development plans. Yet, the statements and plans alone do not guarantee the will to overcome the barriers that often exist in the bureaucracy itself.

Institutional change is closely tied to its incentive system. Salaries in many countries are based on years of service, size of family, amount of education, and other factors that may have only casual relevance to the goals of development. The pay scales may be so low that some form of supplementary graft, or a second job, affecting performance on the primary job, is resorted to by the civil servant to achieve even a modest living standard. Usually, the pay scale for agriculturists is based on a civil service schedule that cannot be changed without inviting bankruptcy. This is especially true where the civil service is padded as an indirect form of social security. Thus, if the governmental will to develop agriculture is real, the only solution may be to offer bonuses in the agricultural sector. Since the extension agent must travel constantly in contacting the villagers and farmers travel expenses must be paid. If extension workers are expected to live in villages lacking in amenities important to family life they should either receive some form of hardship allowance, or rotation of village assignments should be a mandatory part of the career ladder.

TWO-WAY COMMUNICATION

Communication must not be all one way, down from research to extension to the farmer. When this situation exists, research does not listen to the lowly extension agent, and the educated agent does not listen to the

ignorant farmer. This magnifies the attitude that farming is a despised occupation fit only for those with no other choice for eking out a livelihood. Two-way communication between the farmer and the extension service is essential for bridging the gaps which exist between the producer and the agent, and between subsistence production and market production agricultural technology. Return communication from the farmer to the agent must be encouraged and valued.

Lack of two-way communication is one cause of the farmer's reluctance to accept service and innovate. Farmers often obtain higher yields than the research station. They usually know more about local conditions than the extension agent. But the agents tend to ignore this and wonder why the farmer does not value his advice.

The method of introducing change that clashes least with local customs or values has the greatest chance of success. The farmer rarely accepts advice that, in its form if not its content, is either offensive or irrelevant to his own way of life. This is particularly so with subsistence farmers who respond less to economic motives than farmers who have already begun the transition into the cash market economy. Reaching and convincing subsistence farmers that a better life is possible through innovation requires that the agent thoroughly understand the local culture, and the forces that motivate the people. Such an understanding can be gained only by lengthy dialogue, with the agent listening before he speaks and learning from the farmer as well as teaching him. Thus, research is needed to identify the cultural forces that motivate as well as which innovations respond to the farmers' felt needs. People of different environments perceive words and ideas in different ways. It is essential that the two-way communication be in terms that both the farmer and the agent perceive the utility of what is being offered.

The process of two-way communication must be institutionalized with the agents viewed as a class rather than as individuals. Exhorting the agents to listen will not be enough. If educated people as a class despise the farmer, the extension agents will be reluctant to listen to those they consider ignorant and primitive no matter what the agents are told by their superiors. The channel of feed-back must be built into the system. This function is as necessary as the instruction of the farmer. It may also require drastic changes in the values and attitudes prevalent in the educated strata.

Once an integral part of the system feed-back can automatically correct mistakes of research and extension. Bridging the communications gap between the farmer and the extension service will remove the barrier and encourage the flow of information and opinions from the farmers to the decision-makers. The decision-makers must then take the information and opinions from the farmers into account in their decisions. This is essential to assure that

policies are evolved and developed which are adapted to rural/local conditions and social structures, and respond to the farmer's felt needs. Mistakes can be more quickly identified and acted upon, and the innovations modified or varied to suit the local conditions with pressure from below.

DEVELOPING LOCAL LEADERSHIP

Local leadership can reduce the strain on the scarce trained manpower and is a corollary to bridging the communication gap. Using rural leaders can multiply the influence of the skilled manpower. Any technique that expands the effectiveness of the extension service helps a developing nation break a particularly tight bottleneck.

However, there may be two kinds of leadership in the rural areas, one with authority and one with influence. Although this combination may be found in the same individual often it is not. Making maximum use of local leadership requires that the agent recognize the natural leader when he is not the leader with the authority. If the local leader is to be elected the group must fully understand the requirements of the task so they can select the right person for the job. Authority cannot be ignored, but it can be supplemented with the natural leadership. People are frequently influenced and will follow the natural leader after refusing an identical suggested course of action by the leader with the authority.

In developing local leaders it is imperative that the agent remain in the background and encourage the local leaders to do the work, to share the duties with others in the group, and let them receive the credit. But the agent must guard against giving so much personal attention to the local leaders that the people become jealous. Developing local leaders should also result in stimulating village decision-making, and in releasing human energies bogged down in apathy. More than a technique of development, this is a goal itself, the goal of human development.

It is essential that farmers be given a role in deciding what is to be done, and in implementing the decisions. Force or paternalism are seldom appreciated. Development programs may require a constant input of initiative and new technology, ideas and skills from an outside decision-making center because spontaneous generation is unlikely. However, there must still be two-way communication and mutual respect between the extension service and the farmer. The effort to bring about change through the introduction of new ideas needs support from the top, but seldom happens just because it is planned and edicted from the top. People must want change regardless of the source or logic of the idea if change is to result. The usual important first change needed is for the top policy and planning personnel to be fully aware of the specific changes required, and to understand the requirements for making them.

These principles are unlikely to be put into practice without profound changes in attitudes. Successful innovation in agriculture ultimately depends on diffusing through the society a spirit that welcomes innovation. Applying these principles will at times prove painful for they may run counter to prevalent attitudes. Establishing two-way communication with farmers implies a respect, which may be lacking, for their opinions. Granting responsibility to local leadership means taking authority away from the center. Raising the status of the production end of agriculture implies lowering the prestige, at least in relative terms, of the elite. Such changes cut deeply into a society.

THE EXTENSION LOCALITY-UNIT

Access to and use of inputs, credit, and markets are essential to expanding agricultural production. Extension education must become a promoter of this process. Effective and profitable innovations spread slowly under almost any circumstances. Extension education can accelerate this diffusion by stimulating and encouraging individual farm operators to adopt new practices and helping them learn new husbandry and management skills. The form of the program or methods used to accomplish this depend upon several factors.

Seldom is there only one preferable form of locality-unit for extension education valid under all circumstances, or any one ideal amount of agricultural land it should try to service. Both the form and the area served should be determined in accordance with two controlling factors, the size and degree of previous commercialization of individual farms; and the laws of learning established by experience in extension education and the schools. These factors apply at two points in the extension education process in contacts between the extension agents and the farm operators; and in the training of extension agents.

Two general forms of extension education locality-units in the high-population, small-farm areas are the central training unit or farmer training center where farmers are assembled, and individual farm and village visits made by the extension staff. The central training units have substantial advantages in localities made up almost exclusively of small farms where individual farm visits to large numbers of farmers per square mile becomes prohibitively expensive and physically difficult.

Scarce resources in most developing nations dictate that the training centers be multiple purpose. The training centers should serve the training needs of the rural population in all aspects of change they need to make in themselves, their farming practices, and their living conditions. It is wasteful of resources to duplicate facilities and activities for rural development by establishing several kinds of training centers for these purposes. Considerable economy would be realized by establishing one rural training center in an area to serve agriculture; community development; adult education, etc.

Individual farm visits offer advantages in areas of larger farms, 10 acres and up, but even so the training center may still be advantageous. On farms of this size, usually more commercial, the farmers are often more prone to try out new methods with less joint agreement by their neighbors. This possibility is even greater when farm operators live in larger dispersed farmsteads where application of improved technology results in comparatively greater production. Under these conditions the individual farm visits become less costly in terms of potential increases in production.

Tanzania, Kenya and Uganda have all three evolved extension programs using central training units, or farmer training centers. These extension services state that certain phases of extension training can be accomplished more effectively in training centers with farmers in residence. Training centers with feeding and sleeping facilities solve the problems of housing and feeding the trainees in courses lasting longer than one day. The training centers bolster extension programs having field staff that is poorly trained and inadequate in number with respect to the rural population to be served. Training centers also permit more effective and efficient use of demonstration and training equipment and materials which are often in short supply.

Farmer training centers were established in Kenya in the late 1950's. The original plan was to remove a few selected farmers from the tribal environment, usually only one from a village or area; give them one year's concentrated training in improved crop and animal husbandry; transform them into progressive farmers; and return them to their home area to demonstrate and initiate improved production practices with the rest of the village or tribe. However, this plan gave little consideration to the strong social and cultural traditions and forces which historically have inhibited one member of the group from stepping out of the common mold and moving ahead. One individual was unable to bear the brunt and break through the opposition and tradition enforced by the tribal elders.

Later the plan was modified and several individuals were selected for training from each area to provide each other encouragement after completing the training and returning home. The training period was also shortened, fewer subjects and skills were taught, and the training was made more practical. Further modifications followed. As many farmers as possible from an area were included in the training programs, the training periods were again shortened to about one week's duration, and aimed at skills and management training in specific production enterprises of importance in the area.

As the need for more in-service training for the extension staff and others became evident the objectives of the farmer training centers were further modified to train the agriculture field staff, cooperatives personnel, farm leaders, farmers and their wives, and club leaders.

Thus, the extension effort in Kenya modified from the long duration courses on general agriculture which virtually ignored the social and cultural aspects to one which gave full cognizance to the social and cultural aspects; to shorter duration courses on specific skills with immediate application, which more appropriately answered the farmers' felt needs, and was more in line with his mental absorptive capacity; to training of rural women who do much of the farming; to training of rural leaders; and to upgrading the extension staff.

A recent essential modification has been assigning the district agriculture officer the responsibility of jointly supervising the farmer training center programs with the centers' principals. Such coordination is necessary to assure that the training is in line with the district's agriculture program, deals with the farmer's immediate problems, and provides the proper in-service training for the field staff.

The evaluation of training is an essential but largely ignored aspect of extension programs. Evaluation is imperative to measure the extent of change resulting from the training; determine modifications necessary to improve the quality and comprehension of the training; and to determine if the training is answering the immediate problems of the farmers. Continuing training programs that do not accomplish the above are an expensive waste of scarce human and economic resources.

Training is of little value unless there are opportunities for the trainee to apply and profit from the training. Particularly for the subsistence farmer training must have an immediate pay-off if he is to have continued interest in the instruction. Constant vigilance is essential to insure that the training realistically accommodates the resource limitations, immediate problems, and comprehension capabilities of the farmers.

Uganda's farmer training centers have been organized generally along the same line as those in Kenya. However, Uganda went an essential step further to evaluate the training.

Farmers who had attended courses one year previously were selected at random and interviewed without prior notice on their farms. The objectives of the evaluation were to determine the farmer's knowledge of improved farming practices; to what extent improved practices had been implemented following the course; the extent and quality of the innovation; when the improved practice was first started; what the farmer felt were the most important things learned at the course; and what skills or subjects he would like to learn more about in future courses.

The conclusions of the evaluation were that considerable time was spent teaching skills that had no immediate application, i.e., teaching oxen cultivation to farmers who had no oxen; there was a dire need for training

in basic farm management; too many subjects were offered and often only superficially taught; more training was needed on the use of labor-saving tools and small implements locally available at low cost; more emphasis was needed on nutrition and family gardens; few farmers were able to cope with the comparatively greater disease and nutrition problems experienced with a family flock of exotic poultry; that the emphasis should be shifted from general agriculture training to specialized courses for specific production and management problems; and many farmers made innovations then reverted to old practices due to social pressures exerted upon them.

(This again demonstrates the need for research in ways and means to cope with the social/cultural customs to overcome this pressure, and remove a major barrier to agricultural development.) Thus, the evaluation provided guidelines for modifying the training to respond to the immediate needs of the farmers which probably would not have occurred otherwise.

The evaluation determined there had been a very substantial increase in innovations following the training. It also identified modifications necessary to increase the effectiveness of future training. However, all the credit for the increased application of improved practices cannot be credited to the farmer training center courses: The field staff was concomitantly making farm visits and providing additional guidance and follow-up. The on-farm follow-up is very important and should be conducted to the maximum extent possible. Thus, even in the high density agricultural areas where farmer training centers result in the most efficient use of the extension services efforts some farm visits are imperative.

AGRICULTURE EXTENSION EDUCATION

Agriculture extension education consists of three phases and levels of training, the training of the professional administrative, planning, supervisory and training staff, some of which will be field staff; the training of the sub-professional field staff; and the training of the farmer.

Extension Personnel Training

The professional staff need comprehensive training at the university or college of agriculture. The training must be of sufficient magnitude and depth regarding the scientific, technical, social, economic and political factors previously discussed to provide them with the broad range of skills necessary for, and commensurate with their responsibilities. They must, in addition to comprehending the theory and the application of the skills themselves, be able to transfer these skills to the sub-professional staff.

The sub-professional staff will lack the prerequisite scientific and technical education to grasp the full scope of training of the professional agriculturists. Thus, the education of the professional staff must include training in paring down the scope of their knowledge to the comprehension level of the sub-professional staff without deleting the essential aspects.

The sub-professional in turn must pare down his training to the comprehension level of the farmer.

The professional must understand rural sociology and psychology, the sociological and cultural customs and values of the society, and how to cope with these factors to accomplish the program's objectives. The sub-professional need not comprehend this at the professional's level. He must, however, receive training in appropriate methods of working within the society to gain the farmers' confidence and initiate change. The farmer will perceive whether the extension agent does or does not insult his traditions and values and understands his situation. Based upon his evaluation of this the farmer will determine his course of action.

The purpose of an agriculture extension program is transferring knowledge and skills to farmers using extension principles and methods adapted to the society in which it operates. Therefore, the extension service staff must be well versed in agriculture extension philosophy, principles and methods and their practical application. But the staff training in the academics and theory of extension philosophy; principles and methods must be only the means to an end, increased production and improved living conditions for the rural population, not the major goal of the extension training program. The extension staff must also receive training in applying extension principles and methods to production and management skills in demonstrating to the farmer how to achieve increased production and improve his living conditions.

Farmer Training

Regardless of whether provided at the farm training centers or through individual farm visits, the training of the farmer must be in language he understands, at a level he comprehends, at a speed he can cope with, and for periods equal to his interest span. Using language he understands needs no elaboration.

The terminology and sophistication of the instruction must be at the level the farmer comprehends. The farmer may understand a language such as English sufficiently for limited conversation on matters with which he is familiar. He may have a very limited vocabulary particularly in technical and scientific terms. If the farmers have a vocabulary of 500 to 750 words of basic conversational facility, and the instruction is conducted at a level requiring 3,000 to 4,000 word facility, liberally laced with technical terms, they will gain little from the instruction. Likewise, instruction in the farmer's native language consisting of scientific and technical terms and words beyond his vocabulary level will profit them little. The instruction should be presented with a maximum of demonstration and visual materials to clarify and simplify it.

Little is gained by proceeding at a pace faster than that with which the farmer can cope. Patience and repetition for several meetings may be necessary for the farmers to grasp a full understanding of the minimum improved physical and management skills needed for one production enterprise. Therefore, training must proceed at this speed. Yet, three-day training meetings are often conducted to cover six skills, allowing one-half day for each skill. The main accomplishments of such meetings are complete confusion for the farmer, and the decision that he will waste no more time in such activities.

Semi-literate and illiterate individuals reach their mental absorption point relatively fast, a maximum of four to five days. They have extreme difficulty maintaining effective interest in concentrated instruction for longer periods in any given training meeting. A broadened interest span and the mental and psychological orientation to concentrate for long periods of instruction are acquired skills developed over extended periods in school or similar environments. At best, farmers in developing nations have been students only for short periods early in their lives. They have not developed the capacity to profit from long periods of instruction. Without this prerequisite basic education and acquired ability and experience they find long periods of instruction unnerving and frustrating. This situation is unlikely to change very fast. For the foreseeable future, few, if any, farmers in the developing nations are expected to have as much as a primary school education.

Establishing one large farmer training center in a district or region requires transporting farmers longer distances, justified only by long training meetings. In view of the foregoing it may be better to construct several small thatched roof buildings in a cluster of villages within bicycle riding or walking distance of the farmers in the area. This would justify shorter training meetings, and likely result in more effective training. While it is nice to have all first-class permanent buildings it does not necessarily mean better instruction.

THE PRODUCTION PACKAGE PROGRAM

There is a direct correlation between the degree of comprehension of the instruction by the rural population, and the number of instructional methods used by the extension agent. Comprehension is further increased by personal involvement, experience and observation of the skill(s) and practice(s) being taught. Thus the farmers, to the fullest extent possible, should be involved in method demonstration result efforts to assure maximum acceptance and application. If they are present or aware of each step and/or input in a new production package demonstration, are present when the crop is harvested, and observe the increased yield they are much more apt to adopt the package than if they just hear about it second-hand.

The introduction of improved seed for example should be presented as an integral part of a production package program consisting of the improved seed in combination with all the basic crop husbandry practices and production inputs required to realize maximum production possible from planting hybrid seed. It must be emphasized to the farmers that planting the hybrid seed without implementing the crop husbandry practices may result in no increased production at all. The use of improved varieties must not be perceived by the farmers as merely substituting improved seed for the indigenous seed in the traditional farming practices. The complete package of production practices and inputs, not the seed, gives the increased production.

The more complete the involvement and participation of the farmers and everyone concerned, from the initial research to the result demonstration, the greater the acceptance of the innovation. The more simple but complete the package of practices presented for the innovation the better. Implementing the several practices individually confuses the subsistence farmer regarding the importance of all the practices in combination required to obtain the promised results.

Although axiomatic, agricultural research is valuable to the degree it solves problems existing in the agricultural sector, and then is extended to and applied by the farmer. The best results have been realized when a package program has been presented to the farmers and the results demonstrated and translated in meaningful terms to the farmers. This approach has resulted in far greater acceptance and application of improved practices and increased production than single skill or input approaches.

Research to develop improved genetic materials has been an essential input in the increased crop production obtained by the developed nations, but the resulting improved varieties alone did not account for this. The hybrid maize seed as an individual input in the U.S. accounted for about 30 percent increase in yield, yet the average increased yield of maize since introduction of hybrids has been 100 percent. Thus, 70 percent of the total increase has been directly due to the farmers using proper management and crop husbandry practices and fertilizer. The research and development of improved seed and commercial fertilizer was essential to obtain the increased production. But the greatest proportion of the increased yield was obtained through the farmer's applying proper crop husbandry practices. Although the extremely high yields are not possible without improved varieties and fertilizer, the basic crop husbandry labor input practices result in more dramatic increases than the off-farm finance requiring inputs. Therefore, the extension service must emphasize the total package of improved practices starting with and emphasizing the basic crop husbandry practices.

The maize research and production program in Kenya concluded that increased yield resulted from the combined use of hybrid seed with the proper crop husbandry practices and fertilizer in the following descending order:

1. time of planting
2. spacing and plant population
3. variety and genetic make-up
4. cultivation and weeding
5. fertilization

The program also determined that the average yield per acre increased in direct proportion to the combined application of these practices in the same descending order. Thus, there was a direct correlation between the number and quality of basic husbandry practices and production. Furthermore, production increased from the application of fertilizer only in direct proportion to the number and quality of the basic crop husbandry practices applied.

The composition of the Kenya research program advisory board includes several farmers which provides the farmers the opportunity to voice their problems and suggestions for further improvement--two-way communication. The researchers maintain that the farmer inputs were extremely important factors; the cess they paid on maize marketed which provided the largest portion of the total funds, and their suggestions and comments. This served to keep the research effort on production needs, practical application and improvement rather than writing up articles to be published in scientific journals or filed. Thus, regardless of the nature of the activity in agricultural development, two-way communication is of extreme importance and must not be ignored or lightly considered.

Kenya has emphasized farmer demonstration plots, seminars for farmers and extension workers, and district tours to show the farmers what is being done by people with the same resources they have. The most effective factor in convincing Kenya's subsistence farmers to apply the package program was the farmer demonstration plots where the community observed a neighbor with comparable resources limitations obtain and use the necessary inputs and services to realize increased production and income.

The Kenya extension service and the maize research program, using the method demonstration result technique, have been successful in dramatically increasing the small farm per-acre yield and the total area planted with improved seed. The demonstrations, however, were conducted on the small farms, by the farmers, with guidance from the extension service, rather than on the research station or other government/institutional property.

The farmers were told that the maize production program, using the hybrid seed, was a completely new program rather than just the activity of substituting the hybrid seed for the indigenous seed. The activity was presented to the farmers as a package program consisting of improved crop husbandry practices, proper seed bed preparation, planting the seed at

the proper time, planting in properly spaced rows, optimum plant population, proper cultivation, weeding and timely harvesting; planting the recommended improved seed; and proper application of fertilizer and pesticides. It was emphasized that all these inputs and practices had to be done at the proper time and with proper thoroughness.

The better farmers in a given area were identified and encouraged to try the new program. They were assured that if they would follow the complete package program, as laid out step by step, they would realize increased production. But if they failed to follow through on any step or input, production would decrease proportionately.

The farmers who were selected and agreed to conduct a demonstration on their farms were provided with a packet of seed and fertilizer. Having the small farmer conduct the demonstration on his own farm avoided the usual comment when demonstrations are conducted at government institutions, "if I had the money government has, I could do that also." As other farmers in the area saw one of their neighbors increasing production with his own resources and labor they felt assured they could do the same. However, following the demonstration, as the other farmers began applying the improved practices, they were required to purchase their own seed and finance the operation. This was done to avoid the social problem of first providing something free, than having to change the farmer's attitude to purchasing something formerly provided free.

The farmer demonstration plots were very successful in encouraging widespread acceptance of hybrid seed as shown in the chart below. This, once again, demonstrates that subsistence farmers are economic beings, who must see results obtained within their resource limitations, receive the proper training and guidance, and have incentives for adopting new practices, then they will change.

Acres of Hybrid Seed Planted

<u>Year</u>	<u>Large-scale Mechanized Farmers</u>	<u>Small-scale Subsistence Farmers</u>	<u>Total Acres</u>
1963	390	10	400
1964	28,200	1,800	30,000
1965	54,700	20,100	74,800
1966	62,900	37,800	100,700
1967	130,300	131,700	265,000

Since fertilizer pays off in direct proportion to the use of basic crop husbandry practices, much could be accomplished by convincing the fertilizer distributors that their field men should encourage the farmers

to use proper crop husbandry practices with the fertilizer. Otherwise the pay-off from fertilizer will be minimum and the farmers may then become convinced the fertilizer is no good and buy no more. If used as part of a package and production is high, the farmers will return to buy more fertilizer. The fertilizer distributor profits, and at the same time assists in the agricultural development effort.

The lesson to be learned from this is that much of the increased production and agricultural development can be achieved with little financial cost to the subsistence farmer. Frequently this is ignored and effort is concentrated on improved seed, fertilizer and mechanization, finance requiring inputs. Extension must not relegate to second place importance the simple, obvious labor-requiring inputs, in its extreme enthusiasm for the importance of the modern, scientific, finance-requiring inputs. It is often the simple and obvious practices that give the most dramatic results. The proper combination of the modern and scientific, and the basic and obvious result in the highest yields. The fertilizer and new seed varieties produce minimum results under traditional practices. Although the modern and scientific may provide impetus to implement the obvious, they must all be presented and pushed as a package program. This is particularly important because the simple and obvious are primarily non-cost labor inputs, rather than financial inputs. Subsistence farmers have much more time than money.

Regardless of the innovation it must be within the resource limitation of the farmer. They must observe or be convinced that the requirements of the innovations in finances, labor and skill are within their resources limitations and capability. Telling the subsistence farmer, for example, that he should use oxen power, when he has no oxen, no money to buy oxen, cannot get credit for this purpose, and is convinced he could neither master the skills of using oxen nor provide the forage to feed it, accomplishes nothing. All the required production and management inputs, training and market outlets must be available and accessible.

SUMMARY

Few technicians with first-hand field experience in developing nations will refute the thesis that problems of development are more social and cultural than technical. Most assuredly, more specifically adopted technology on tropical soils management, agricultural mechanization, production practices, and a host of other techniques are a priority need. However, if even after these have been perfected they must be applied by the subsistence farmer before increased production and agricultural/rural development result.

It is an accepted fact in the developed nations that planting maize in properly spaced rows with the proper plant population will vastly increase production over that obtained when maize is broadcast. Yet maize is planted by broadcasting in many developing nations. Without the language

facility to communicate with the subsistence farmer in his language. Most experienced field technicians can teach the farmer the physical skills necessary to plant maize in rows. By actual demonstration a vine or string can be used to line out the row. Sticks can be cut for distance between the rows and distance between hills in the rows. The proper number of seeds to be placed in each hill and the depth to bury the seeds can be shown. Illiterate farmers can count. In a very short period of time, without a word of communication, the subsistence farmer can master these physical skills. Yet it may take years to convince this same farmer to change and to apply this simple technology and improve his farming. The attitudes of the farmers, and the effectiveness with which these attitudes can be molded and the farmers motivated to accept and want change, will determine the progress and development that will be achieved in traditional, subsistence societies. The change and development will not result from the certain knowledge of the change agents that modern technology will be beneficial to the farmers.

People historically have not made social change just for the sake of social change. Social change results from economic change, environmental demands and the firm conviction of the people directly concerned that the change is desirable.