Introducing Agronomy Students to the Concepts of Indigenous and Cultural Knowledge

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ABSTRACT

Indigenous knowledge is the knowledge of the practitioner based on generations of experience. While not scientific in origin, it is usually valid. When we ignore either indigenous knowledge or cultural knowledge, research and extension programs cannot fully succeed. Failure to recognize and utilize this knowledge is in part due to our training and heritage. Unless we educate the next generation of agronomists to consider indigenous knowledge, it will continue to be ignored, and help is available to agronomists to collect this information. Successful cooperative activities between ethnoscientists (those who study indigenous knowledge) and agronomists have been undertaken. New centers to address these issues are appearing on university campuses. Teachers need to give students examples of successes and failures to serve as an example in their future planning. Such efforts can lead to the development of agricultural systems that will be agronomically, environmentally, and economically sound, and because they recognize more than just the scientific viewpoint, will be more likely accepted from the human perspective of the practitioner.

FARMERS have always integrated environmental, social, religious, political, and family values into agricultural production decisions. Sometimes we understand and appreciate these influences. At other times, they are so much a part of us that we do not even recognize their influence on our actions. The knowledge of the practitioner based on years, indeed generations, of experience is referred to as *indigenous knowledge*. This experience is more often based on trial and error than on application of scientific methods.

We are the beneficiaries of, and to some degree the victims of, the way that we were trained. Most of us were not trained to include indigenous or cultural knowledge concepts in our thinking or planning. Agronomists and other agricultural scientists have often systematically excluded indigenous knowledge from their thinking. As a result, we have often failed to share the value of indigenous knowledge with our students. As long as we operate within our own society we automatically include cultural information in our thinking. But if we move out of our culture, for example while on a foreign assignment, we must consciously consider cultural knowledge. Only if we begin to actively train the next generation of scientists to give forethought to indigenous and cultural knowledge will they incorporate this knowledge in their planning.

WHY DO WE IGNORE INDIGENOUS KNOWLEDGE?

We often fail to see indigenous knowledge because we were never trained to look for it. Furthermore, it is often a hassle to seek out indigenous knowledge in order to include it in our thinking and implementation. We present three historic examples to show what happens when indigenous or cultural knowledge is not understood or is overlooked: colonial attitudes toward (i) race, (ii) gender roles, and (iii) native language skills.

Colonial Attitudes toward Race

Europeans colonized much of Africa. Warren (1987) describes how early anthropological scientists taught there were three main divisions of human beings: white—the civilized people; yellow, red, or brown—the barbarians; and black—the primitive or savage people. In the universities, scholars taught that whites were superior. Browns, yellows, and reds were a bit slower, but had potential. The black adult, in terms of intelligence and thinking skills, could never equal the ability of a white child.

With this attitude it never occurred to the Europeans that they could learn from the Africans. Rather than attempting to study local management systems, they set about educating Africans in European ways. The early colonizers identified the brightest black African youth at a very early age and placed them in local boarding schools. Eventually, the very best were sent off to Europe to be "truly" educated. By the time they returned to the village, they were poorly educated in their own culture. They had been physically absent from their home village at the age when indigenous knowledge was routinely passed on.

Warren (1987) further points out that in their writings, Europeans often claimed natives were not capable of attaining any degree of intelligence, in spite of the fact that these so-called barbarian Africans often did extremely well in European colleges. Today societies may be slowly overcoming their prejudices based on skin color. But we still tend to ignore indigenous knowledge.

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Published in J. Nat. Resour. Life Sci. Educ. 22:22-26 (1993).

Abbreviations: CGIAR, Consultative Group for International Agricultural Research; ICRISAT, International Crops Research Institute for the Semi-Arid Tropics; CIKARD, The Center for Indigenous Knowledge in Agriculture and Rural Development; PFI, Practical Farmers of Iowa.

Colonial Attitudes toward Gender Roles

Rogers (1979) points out that the British colonial system was dominated by males. British women were barred from overseas work in colonial offices. In most cases, only African boys were sent to local boarding schools and later many were sent to Europe for further education. This male-dominated structure failed to recognize that male and female "roles" in African societies were often very different from the gender roles of European societies. For example, she described a vegetable production project in Africa in which a local man was hired to set up and operate a demonstration vegetable garden, even though in the local culture women were responsible for vegetable production. By excluding women from the project, they did not reach the appropriate target audience and therefore the project failed. In this example the problem was not so much a failure to consider indigenous knowledge as it was a failure to recognize cultural traditions. The two are often intertwined, and unless we recognize both, programs will progress slowly if at all. Unless we consider both in project development, the very definition of success of a project may be inappropriate.

Colonial Attitudes toward Native Language Skills

Warren (1980) relates that Sir Alfred Ellis wrote a book about the people of the Gold Coast in 1887. It became one of the principal guidebooks for European government officials and teachers who were sent to Africa for the next 40 yr. Ellis suggested that the native people had very limited communication skills: "There is, as is commonly the case with language of the lower races, a great paucity of abstract terms. One word has to serve a variety of meanings." Ellis further stated that the local languages contained only 350 to 400 words and their language prevented them from counting past 10. It was easy to conclude that individuals with such limited language skills would not be capable of understanding the complex ideas of the European world.

Warren (1980) notes that Johann Christaller of the Basel Evangelical Missionary Society worked in the same area as Ellis. In 1881, 6 yr prior to Ellis' publication, Christaller published a dictionary of the Asaite and Fante languages. In 1875, he had published a book on the grammar of these two languages. The dictionary contained 4000 words and the grammer described the sentence structure of the languages. With their biases, Ellis and his associates had failed to recognize that the local tribes used a tonal language. Where European ears heard one word with many meanings, the indigenous people heard several words each with a clearly understood meaning. The vocabulary described by Christaller contained 10 times the words as the vocabulary described by Ellis.

When the colonial rulers went to Africa, their association of intelligence with skin color, their failure to recognize sex role differences, and their frequent inability to comprehend the nuances of a tonal language prevented them from understanding the world around them. It is easy to point fingers at these colonial rulers. Is there a message to be learned by today's scientists? Are we continuing similar errors today?

OBTAINING INDIGENOUS KNOWLEDGE TODAY

Richards (1980) describes a joint project conducted by the Centre for Overseas Pest Research and the University of Ibadan in Nigeria on the variegated grasshopper (*Zonocerus* spp.). It was a two-pronged study carried out cooperatively by entomologists and by ethnoscientists. Ethnoscientists study indigenous knowledge. This joint study produced four categories of knowledge.

Some knowledge discovered by the entomologists was not known to the local people. For example, the entomologists gathered valuable data about egg mortality under various temperature conditions. They discovered chemical attractants valuable in insect control and documented the activity of the grasshopper during those parts of the year when it migrated out of the local area. The local indigenous people knew none of this information.

Secondly, some knowledge discovered by entomologists was related to the indigenous knowledge of the local people. The local producers knew that conditions favorable for the growth of a weed known locally as "Akintola" (*Eupatorium odoratun*) also promoted grasshopper development. However, they did not know the specific environmental conditions that stimulated the development of both the weed and the grasshopper. The entomologists discovered this information.

Thirdly, some knowledge obtained by the entomologists was similar to the indigenous knowledge. Farmers could describe typical egg laying sites, food preferences, and the impact of grasshoppers on casava (*Manihot esculenta* Crantz). This knowledge was confirmed by the entomologists. Farmers are more likely to understand the activities of animals that are visible to the naked eye, such as grasshoppers. The activities of smaller animals, microbes, or visible animals that live predominantly below the ground are often less well understood by farmers.

Finally, the ethnoscientists discovered some knowledge that the entomologists did not. The local farmers knew historic information on the extent of pest oubreaks in the past. They knew the plants that grasshoppers could damage, and which of those plants were of economic importance to them. But very significantly, the ethnoscientists discovered that grasshoppers are part of the diet of the poorest people in some parts of the study region. Grasshoppers were in fact sold in a few local markets at some seasons of the year. So one needs to question the wisdom of treating the grasshopper strictly as a pest.

The entomologists learned a lot by studying the insect, but they would have missed several key points if the ethnoscientists had not been part of this study. Local knowledge may not be sufficient to understand problems, but local knowledge cannot be ignored. How often are agronomic studies carried out in the confines of a research station where we fail to consider the local farmer's perspective?

Are We Doing Enough?

The Consultative Group for International Agricultural Research (CGIAR) recently evaluated the activities at the various international research centers throughout the world. The study suggested that gathering indigenous knowledge has not been sufficiently important in the planning of many of the research projects at the leading international research centers (Biggs, 1989) and expressed the opinion that too often the international centers tend to think of farmers as the targets of technological transfer. Scientists applaud those who accept their ideas and look upon the nonadopters as conservative or traditional. Mechanisms to gather native input and feedback are too often limited to uncovering the reasons why new technology was not adopted. This is hindsight research. What is needed is *foresight research*, that is, research that will predict outcomes rather than explain past events. Furthermore, these studies tended to focus on the reasons farmers did not adapt the new technology. Biggs (1989) claims that too often scientists assume that the reasons farmers did adapt the new technology were obvious and need not be studied. He suggested that in some cases it might be more valuable to understand why some farmers adopted a practice than to know why other farmers rejected it.

Atte (1989) reminds us that farmers are no different than anyone else. They respond positively to opportunities that are rational from their perspective. The key then is to start by understanding the farmer's perspective.

Biggs (1989) indicates that although intellectually we know better, in practice we sometimes do not recognize that today's practices result from generations of on-farm research. Atte (1989) points out that indigenous farmers have an inherent knowledge of their environment and they make use of it to develop their management strategies.

The complex system of rotations, and multi-, mixed-, inter-, and sequential-cropping systems reflect the depth of knowledge of indigenous farmers. These demonstrate a deep appreciation for the interrelationship between soils, crops, climate, and their seasonal changes. Indigenous knowledge can suggest what works. Wojcik (1989) quotes Larry Butler of Purdue University, who suggested that the outcome of many scientific research projects is to understand and appreciate the scientific basis for traditional solutions rather than the development of innovative scientific solutions. We develop an appreciation and an understanding of why local practices work.

As an example, Butler pointed out that farmers traditionally soak sorghum grain [*Sorghum bicolor* (L.) Moench] in wood ashes. Some thought it was a silly exercise. Then, biochemists discovered that the alkali conditions produced by this treatment caused a chemical change in some of the proteins in the seed. This increased the digestibility of the sorghum. Another study explored the practice of applying wood ashes to fields infested with witchweed (*Striga lutea* Lour.). The study showed that the alkali in the wood ashes inactivated the chemical that signals the striga seed to germinate. The most important contribution of the scientist is often to discover how to adapt traditional practices into modern practice.

PROBLEMS IN OBTAINING INDIGENOUS KNOWLEDGE

How does one seek out indigenous knowledge? A literature search of indigenous knowledge concerning soil classification systems brings three basic problems to light.

First, while some commonly read journals include articles on indigenous soils knowledge (Acres, 1984; Taylor-Powell, 1991; Osunade, 1988), more often they are found in what librarians called *fugitive literature* as opposed to mainstream literature. One finds appropriate articles in *World Archeology* (Wilshusen and Stone, 1990), in a report by the Save the Children Federation (Tabor, 1988), in a progress report from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (Dvorak, 1988), and in research station reports from Zambia (Dolva et al., 1988; Kerven and Sikana, 1988). As one looks over the references cited by these authors one notices that the words *limited distribution* are commonly included in parentheses at the end of the citation. Thus, relevant articles are often not published in the journals that agronomists regularly follow. Furthermore, they are often not available in our libraries nor indexed by the common indexing services agronomists use.

Secondly, the studies are often carried out by anthropologists, archaeologists, or ethnoscientists who realize the importance of soils knowledge in the decisions made by farmers, but they are not trained in soil classification. Studies of the soil classification systems used by villagers often reveal that indigenous classification systems are quite complex. The extent of local understanding of the limitations and potentials associated with each soil class is well-known to the local people. But two problems exist. First, the investigators' lack of soils knowledge often limits the questions asked in village surveys. Second, it restricts the conclusions drawn from the study.

Even more important to agronomists is there is rarely any correlation to an appropriate *scientific* classification system directly beneficial to agronomists. Thus, it becomes very difficult to know how to use the soils knowledge gained from these ethnoscientific studies. In those cases were comparisons are made between indigenous and scientific soil classification systems, a problem may still exist. Too frequently the author provides little evidence that trained soil classifiers were employed to place the soils in a scientific system. Thus, even when comparisons are made, one must question their validity.

Some researchers undertook studies of indigenous knowledge to understand previous agricultural systems (Hunt et al., 1990; Sandor et al., 1986). These studies have uncovered some interesting management approaches used in a former era, but it is not always easy to utilize this information to address current problems.

A noteworthy exception to this is the work reported by Sandor (1989) in which he described a cooperative effort with several anthropologists working in the Colca Valley of Peru. Their joint anthropological and soils

study is revealing the nature and extent of agricultural practices of the past. These findings appear useful in developing new management systems that will incorporate past practices that have been lost over time. Trained soil scientists meticulously classified the soils of the study area in soil taxonomy.

HOW CAN WE BENEFIT FROM INDIGENOUS KNOWLEDGE?

Warren and Cashman (1989) describe work with the "fertilizer bush," an alley cropping program introduced in Nigeria. Alley farming alternates a row of trees {usually a leguminous tree such as leadtree [*Leucaena leucocephala* (Lam.) deWit]} with rows of grain or vegetable crops. The trees provide N, the leaves provide surface mulch, and the wood can be used as stakes, building materials, or firewood. Extension programs failed to result in the adaptation of this technique by villagers. Further studies showed that in this region of Nigeria, men farm the tree crops such as rubber (*Hevea brasiliensis* Muell-Arg.), cacao (*Theobroma cacao* L. subsp. *cacao*), and citrus (*Citrus* spp.). Women cultivate corn (*Zea mays* L.), yam (*Dioscorea rotundata* Poir.), and other vegetables. Women would not plant trees because by tradition men have all rights to wood produced from trees. Men would not plant trees on women's land. After this important difference between "men's agriculture" and "women's agriculture" was recognized, the trees planted in alley farming were renamed "fertilizer bushes." Although women would not plant trees, they could be persuaded to plant bushes with their vegetables. With this understanding, an extension program to promote this scientifically sound technology was developed. This again points out the importance of combining indigenous knowledge and cultural knowledge to develop programs.

Diwaker relates an incident from central India where local farmers have developed two ways of agriculture appropriate for the local soils (B. Diwaker, 1986, personal communication). Farmers plant Alfisols in the early wet season. During the rainy season they are weeded and tended. The crop benefited from the rains and the farmers harvest them at the end of that season. The farmers find Vertisols, on the other hand, too wet and sticky to tend during the rainy season. Traditionally they lay fallow during the rainy season and are planted at the end of that season. These crops benefited from the rains that fell in the rainy season. The high water holding capacity of the Vertisols allowed for the storage of water from the rainy season. The plants also benefit from periodic rains that fell in the first couple months of the post-rainy season. Under these practices there is a period of nearly 1 mo toward the end of the rainy season when there was little field work to be done. It became the custom of the people to hold elaborate marriage celebrations at this time.

Researchers at ICRISAT developed a technology that allowed double cropping of Vertisols. New concepts and equipment allow farmers to plant Vertisols in the late prerainy season. Little field work is required during the heart of the rainy season when the physical properties of Vertisols are so poor. The rainy season crop can be harvested in time for the traditional planting of post-season crops. However, this system requires intensive management and considerable field work, which must be completed in a narrow window of opportunity near the end of the rainy season. This fell during the traditional time for marriages.

The research was solid. It did not conflict with indigenous knowledge, but it did conflict with local cultural practices.

- Was it inappropriate for ICRISAT to spend so much effort on this program?
- Once the management program was developed, was it appropriate to develop an extension program to disseminate the information knowing of this cultural conflict?
- Should the local farmers be informed of the possibility and let them decide if the benefits of this technology are important enough for them to consider changing their traditions?

The answers to these questions are not clear. It is essential to study the local cultural sufficiently so that one recognizes the dilemma we sometimes place on the local people.

A LOOK TO THE FUTURE

A new center, The Center for Indigenous Knowledge in Agriculture and Rural Development (CIKARD),[1] was established at Iowa State University in 1987 to help gather indigenous knowledge to aid scientists. Working links have been developed between CIKARD and similar organizations in Europe, Africa, and Asia. One of their important goals is to gather, catalog, and index indigenous knowledge studies, with special emphasis on fugitive literature. Although such efforts are commendable, lack of funding support restricts progress.

The focus to this point has been on the international scene: the indigenous farmer in a village in some far-off land. It is easy to point out the shortsightedness of someone else in a previous era. But what is the message for today's agronomic scientist in the American heartland? Agronomic research impacts the farmer, the consumer, indeed all citizens. To what extent do today's agronomists attempt to understand the indigenous knowledge of their constituency?

There is a move today to relegate the moldboard plow to agricultural museums because of its negative environmental impact. A century ago the moldboard plow was welcomed as the tool to revolutionize agriculture. Farmers believed that stirring and aerating the soil was essential. If we now totally eliminate the moldboard plow, might we lose some of its benefits?

Many of us learned indigenous knowledge from our grandparents. Crops and vegetables were planted by phases of the moon. What were the benefits of these practices that were developed over time? We know some of the answers, but should we look further?

[1] For more information, contact D.M. Warren, Director, CIKARD, Curtiss Hall, Iowa State Univ., Ames, IA 50010.

While many agronomists strive to include farmer input in their research design, others too often feel that we do not go far enough. Some funding agencies are beginning to require evidence that farmers, environmentalists, and others are included in project development.

As a society we need to encourage young scientists to maintain a broad perspective. More and more we see agronomists cooperating with environmental advocates. In the same manner, agronomists need more joint projects with social scientists. This will not be easy. Agronomists tend to want to go to the field or to the laboratory, and repeat an experiment several times until they are comfortable that the data is valid. Social scientists have a tendency to conduct a series of interviews, or distribute a questionnaire, draws their conclusions, and move on to another study (Schafer, 1989). These differences in approach need to be recognized and addressed when joint projects are designed.

Organizations such as the Leopold Center for Sustainable Agriculture at Iowa State University are an attempt to move in this direction. The State of Iowa and other supportive groups funnel research funds through the Leopold Center. Both traditional and nontraditional research groups compete for these funds. Cooperative efforts between traditional and on-farm research are given a higher priority. Many of the funded proposals are designed to investigate the scientific basis for traditional low-tech approaches to agricultural problems.

The Practical Farmers of Iowa (PFI) was formed by farmers interested in ways to use low-tech practices to maintain and improve the fertility and tilth of the soil and to combat pests while producing good yields with an economically sound program. The Cooperative Extension Service at Iowa State University in cooperation with this group, hired an individual whose primary job is to work with PFI to develop appropriate research and extension programs. This program brings together in a cooperative mode individuals who might otherwise drift into divergent camps.

CONCLUSIONS

Today's agricultural practitioners have many insights into what will and will not work on their farm. Only if we consider indigenous and cultural knowledge will we be able to develop the most appropriate agricultural systems for the future. In the last century individuals failed to recognize that skin color was unrelated to intelligence, that words that initially sounded identical were in fact distinct sounds and distinct words to someone who understood the tonal language, and that cultural roles of the sexes vary considerably from culture to culture. Will today's agronomists, 100 yr from now, be accused of some equivalent faulty thinking? To avoid this risk, we need to systematically gather and utilize indigenous and cultural knowledge. We can start by including a discussion of the value of this knowledge in our classes as part of the internationalization efforts that are now being promoted on our campuses. We can give examples of how one includes indigenous knowledge in research projects and in extension programs. Indigenous knowledge is not just the knowledge of the practitioners of Africa, it is the knowledge of practitioners everywhere. It is important that we learn to look for it.

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