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The Decision to Adopt or Reject New Technologies: A Case Study of Agricultural Development Projects in Zaire

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Abstract

This paper seeks to examine the process by which African farmers arrive at their decisions to adopt or reject new agricultural techniques. In recent years, there has been a tendency among foreign project organizers to attribute the local farmers' decisions to socio-cultural factors. The farmers, on the other hand, explain their decisions in terms of perceived economic benefits. The author conducted a comparative analysis of the reception of proposed agricultural innovations from four development projects in the Kwango Kasai plateau of Zaire. The purpose of this study was to isolate variables affecting the local farmers' decisions and to determine their relative importance. The findings show that there is considerable interaction between socio-cultural and strictly economic concerns. On balance, however, economic considerations emerge as the most important factor.

Resumen

Este ensayo busca examinar el proceso por el cual los campesinos africanos llegan a sus decisiones de adoptar o rechazar técnicas agrícolas nuevas. En años recientes, ha habido una tendencia entre los organizadores de proyectos extranjeros a atribuir las decisiones de los campesinos de la localidad a factores socio-culturales. Los campesinos, por otra parte, explican sus decisiones en términos de los beneficios económicos percibidos. El autor condujo un análisis comparativo de la recepción de las innovaciones agrícolas propuestas desde cuatro proyectos de desarrollo en la maseta Kwango Kasai de Zaire. El propósito fue aislar los variables que afectan las decisiones de los campesinos locales y para determinar su importancia relativa. El estudio muestra que hay considerable interacción entre preocupaciones socio-culturales y preocupaciones estrictamente económicas. En balance, sin embargo, consideraciones económicas emergen como los factores más importantes.

Introduction

Between 1964 and 1976 a number of church-related extension programs introduced new animal and crop husbandry techniques to the local farmers in the Kwango Kasai plateau of Zaire. Some of the new techniques were successfully adopted and others were not. While working with the extension programs mentioned above, this author became aware of a discrepancy between the way in which farmers understood their own decisions to adopt the new techniques and the way in which these decisions were perceived by the extension workers.

Most extension workers suggested that the socio-cultural attributes of the techniques were the most important in determining which of the techniques being introduced should be adopted. Fremont Regier, for example, tells the story of how some farmers ended up raising rabbits--not to sell on the market for profit or to eat, but simply to show the extension workers, and presumably other farmers, what a large number of rabbits they had. He has another story about one farmer who kept raising rabbits, not so much for the meat, since wild game was abundant where he lived, but primarily to feed the extension workers when they came to visit him (Regier, 1977; p. 46-47). Peter Kroeker, working in the same general area with a cattle cooperative program, also concluded that socio-cultural variables, such as prestige, played the most decisive role in the adoption of the cattle program. Economic considerations, though mentioned as important, were not perceived as determining factors in these decisions.

The local farmers, on the other hand, seemed to be more concerned with the potential economic benefits of the different techniques introduced. One lady explained that she began to invest in a small chicken raising project because she hoped to make some money. However, she

discovered that she was losing money with the kinds of chickens introduced by the extension program. According to her, the operating costs were too high: the chickens always needed someone to look after them and give them water; unlike the traditional local chickens, they needed vaccinations and medicines, which required a day-long trip to the city, and nonetheless they frequently contracted diseases and died. Another farmer admitted that he earned very little money, and indeed often operated at a loss. In general, farmers reported that their revenue from the sale of eggs, chickens or rabbits tended to be spent on feed, medicine, and the costs of the transportation cooperative. What little remained went to pay labor costs: They claimed that there was almost nothing left for themselves.

While the extension workers believed that farmers were mostly influenced by socio-cultural factors, the farmers themselves believed that they were basing their decisions on economic considerations. Such a discrepancy calls for a deeper investigation. It is important to reach an understanding of the whole process involved in choosing new agricultural techniques for the following reason. In the last forty years many efforts have been made to improve African agriculture and very few of these efforts have been successful. Several new agricultural techniques have been introduced, some of them were readily adopted but in the long run the majority were rejected.

Based on empirical research in the Kwango-Kasai plateau of Zaire, this paper tries to determine which variables play a role in the decision to adopt or reject new agricultural techniques. It also specifically addresses the question of the relative importance of economic vs. socio-cultural variables. Before addressing these questions, it may be useful to look briefly at the history of agricultural innovations in tropical Africa and the different ways in which they have been studied.

Agricultural Innovations in Tropical Africa

Tropical Africa has traditionally been quite open to innovations in food and agricultural practices. Many of the crops in most African countries were originally introduced from abroad. For example, bananas were introduced to Africa from Asia; maize, peanuts, cassava and sweet potatoes came from the New World. Plows, for the most part, were introduced by the colonial administration. In other words, it is evident that African farmers do not close their minds to the possibility of innovation.

The literature suggests some lines of inquiry to pursue in order to discover which factors significantly affected the farmers' decisions. All of the above innovations have particularly advantageous characteristics which may help to explain their successful adoption. First, most of them were technically efficient. Cassava and sweet potatoes, for example, are not as easily attacked by pests as yams; they store well and have a large return per acre and per man/woman day. Secondly, on economic grounds, these innovations had a high cash return and high demand. Maize became a very successful crop in the Tonga Plateau of Zambia because of the potential for economic gain. Similarly, more peanuts were grown as more markets became available. Thirdly, from a social perspective, these innovations fitted in well with both the traditional farming system and with cultural food preferences. Cassava and sweet potatoes could be put in as the last crops in the rotation. A particular type of plow became adopted in the Teso District of Uganda and in the Tonga Plateau of Zambia because of the abundance of cattle in these regions. The success of maize in Zambia and Tanzania (Sukumaland) is often attributed simply to the fact that local people liked the taste (Anthony, et. al., 1979).

It should be mentioned that there were some failures: Mechanization and mixed farming are among the most frequently mentioned in the literature. Here, the reasons for failure seem to be mostly economic (Anthony, et. al., 1979).

Traditional Theoretical Approaches to Innovations

Studies of agricultural innovations have tended to concentrate either on technical efficiency, on economic function or on a sociological approach. Scholars concerned with technical efficiency view innovation in terms of improving the performance of the technical system, with improvement defined as increased output for the same level of input. For example, the introduction of plowing techniques in the Tonga Plateau of Zambia, the Teso District of Uganda and in the Katsina region of Northern Nigeria is often studied in terms of the increase in the cultivated acreage per person which rose on the average from 1 acre to 1.7 acres per person. The use of tractors in the Mwea/Tebere scheme in Kenya increased the amount of land under cultivation and reduced the time for land preparation, which helped to complete operations on time. The adoption of cassava, sweet potatoes and new varieties of cotton and corn in many tropical African countries is studied in terms of the larger returns per acre or per man/woman day of effort that were possible with these new crops.

The economic approach assesses innovations according to their potential for saving on labor, capital inputs and/or increasing the value of the output. Mechanization in agriculture is studied as an introduction of labor saving techniques. Vulcanization techniques in the treatment of rubber are credited with having increased demand for rubber by improving the quality and thus making it more attractive than available chemical

substitutes.

In contrast to both of the previous approaches, researchers using the adoption and diffusion approach study innovation in the social context, attempting to see the decision process through the eyes of the people involved. For example, social values such as family commitment and kinship are viewed as solely responsible for the decision to adopt cash crops in West Africa. Even though this approach makes an explicit effort to include the social aspects in the studies of agricultural innovations, researchers nevertheless imputed reasons for adopting or rejecting techniques on the basis of their own limited understanding of local people and conceived most of the research in terms of narrow disciplinary approaches.

These approaches have provided numerous insights into factors related to agricultural innovations; however they do have limitations. One could argue that both the technical efficiency and the economic approaches are inadequate to explain successes and failures of agricultural innovations because they ignore the human element: How do farmers themselves decide which innovations to adopt and which to reject? This paper accepts that it is extremely important to take these decisions into account, and addresses itself precisely to the study of factors which influence the farmers who make these decisions. However, the sociological approach, as evidenced by the comments of the extension workers mentioned at the beginning, may tend to overemphasize cultural and social factors at the expense of considerations of efficiency and profit. That is to say that these very considerations may be important, even dominant influences on the farmers' decisions.

A technology always exists in a broader environment that provides

the resources for the inputs and receives its outputs as final products. There is an interrelation between the technical, economic and socio-cultural variables. For example, a given production function reflects the level of knowledge and techniques available at a given time for the making of a given product. A change in technical knowledge can provoke a shift in the production function.

This paper takes a fresh look at the acceptance or rejection of innovations from the farmers' point of view, and tries to suggest and investigate the various factors which affect their decisions. Attempts of this sort have been made before; but one could agrue that they have not gone far enough. Previously Rogers and Shoemaker have proposed that five characteristics of innovations are relevant to the adopted decision. They are: observability, trialability, complexity, compatibility and relative advantage. Observability is defined as the degree to which others can see the benefits of a given innovation. Trialability is defined as the extent to which an innovation can just be tried on a small scale. By complexity is meant an innovation that is relatively difficult to understand and use. It can already be seen that the characteristics of innovations and adopters, as indicated by Rogers and Shoemaker, are not simple variables but categories of several variables that have not been clearly or easily defined. The definitions of compatibility and relative advantage are just as complex as they are non-operational.

Essentially the study of the variables affecting farmers' decisions requires an integrative and simpler approach. What is needed is a model simple enough to operate and produce practical results using the time-frame and financial resources available, but which, at the same time, does not distort the complex reality of the world.

Discriminant Analysis

Discriminant analysis can achieve both goals: integration and simplicity. A discriminant analysis takes into account all aspects of a technical innovation: It helps determine the relative importance of each variable; it distinguishes more frequently adopted techniques from less frequently adopted ones. The discriminant analysis can help predict what specific innovations are likely to be adopted.

The discriminant function can take the following form:

$$Z = w_1x_1 + w_2x_2 + \ . \ . \ . \ + w_nx_n$$

or

$$Z = \sum_{i=1}^{n} w_ix_i \qquad i = 1, 2, \ldots n$$

with x_i = innovation attributes
w_i = weights

The relative importance of each attribute means the contribution of that attribute to the average difference between the group of more frequently adopted and less frequently adopted technologies.

$$Y_i = w_i \bar{x}_{i_{MA}} - w_i \bar{x}_{i_{LA}}$$

with MA = more frequently adopted technologies
LA = less frequently adopted technologies
w_i = the weight for attribute i

$\bar{x}_{i_{MA}}$ = is the mean for the more frequently adopted group of innovations

$\bar{x}_{iLA}$ = the mean for the less frequently adopted group of innovations

Assuming that the co-variance of the attributes is zero, the weight can be calculated using the formula:

$$w_i = \frac{(\bar{x}_{iMA} - \bar{x}_{iLA})}{(V^2_{iMA} + V^2_{iLA})}$$

x_{iMA} = the mean for the i_{th} attribute in the more frequently adopted group

x_{iLA} = the mean for the i_{th} attribute in the less frequently adopted group

V^2_{iMA} and V^2_{iLA} are the respective variances

The significance of the difference between the two groups is tested using the formula

$$D = \bar{Z}_{MA} - \bar{Z}_{LA}$$

From this value (D) and the degree of freedom a test of significance can be found. In some cases the statistical test based on D can be meaningless. (See Morrison, 1969 and Robertson and Kennedy, 1968).

Methodology

In practice, the following steps were involved.

(1) Seven innovations dealing with crop and animal husbandry were chosen from four rural development projects in the Kwango Kasai plateau of Zaire. The projects were Centre de Développement Communautaire

(CEDECO), Programme Protestant Agricole (PPA), Service de Développement Agricole (SEDA) and Projet Anonyme pour le Développement Rural du Kasai (PADRUKA). These projects are typical of about 30 similar church- supported projects. The innovative techniques included new ways of raising cattle, pigs, rabbits, chickens, soya, rice and fish. Several sources of data were used, including project documents, recorded interviews and recorded direct observations. Project documents included project reports, financial reports, evaluation reports and general correspondence. Twenty-four people were interviewed in depth, half of them extension workers and the other half local people.

(2) The adoption rate of these innovative techniques was chosen as the dependent variable on the basis of which innovations were put into two groups, more frequently adopted and less frequently adopted.

(3) Various attributes associated with the innovations were used as independent variables. They included prestige, taste and cultural preference, continuity with local culture, profitability, extension efforts, marketing and credit, profit, investment costs and operating costs. These variables were chosen on the basis of interviews and on the basis of the literature (Rogers and Shoemaker, 1971; Niehof, 1967).

(4) Four independent judges assigned scores on a scale of 0-10 to all the proposed innovations with respect to the various independent variables. Two of the judges were local and the other two were foreigners. They were chosen on the basis of their familiarity with the projects and were required to have at least four years experience.

(5) Weights and means were calculated for each independent variable or attribute, using the formulae introduced in the preceding section. The relative importance of a given variable can be calculated as a

percentage of its contribution to the total difference between the two groups of innovations.

Results

Two major results emerged out of this study. First, both groups of variables, both economic and socio-cultural, intervene in the adoption decision process. Secondly, economic variables, chiefly profit, seem to have played the most decisive role.

Before any systematic presentation of the results, it should be said that these results need to be interpreted carefully. On statistical grounds, they may be unstable and hard to interpret. First, the number of observations is very small. There are only seven techniques for the whole analysis. Secondly, some of the independent variables, such as actual profit and perceived profitability of a technique, are correlated. The same is true for taste and cultural preference and continuity with local culture. Third, the difference in sample means and variance cannot be tested with any certainty. On design grounds, the problems of confounding variables cannot be dealt with successfully, since it is very difficult in real projects to control the effect of other influences. Also, one could add that interviews and ratings used as initial data have a certain level of subjectivity. In general, for the reasons mentioned above, the results may have a limited internal and external validity.

Despite these limitations one can still accumulate valid findings from the study. First, the findings are not interpreted in isolation. They are related in context to other results. Secondly, people's perceptions and direct observations are based on long and intimate experience with many of the techniques. Ultimately, all statistical analyses provide one with a form of probability statement. In a study like this, one is not looking for

certainty, but for plausible propositions on which to base one's actions.

In terms of the presentation of the results themselves, the table on page 12 contains the mean values, weights and relative importance for each characteristic or attribute.

Mean values suggest a possible profile of the adoptable agricultural innovation, at least in the context of the projects under consideration. Less frequently adopted techniques seem to be high on investment and operating costs and low on profit, perceived profitability and the level of continuity with the local culture. Average scores for less frequently adopted innovations on the above attributes are 7.33, 8.66, 3.33, 3.33, and 3.33 respectively. More frequently adopted innovations, on the other hand, seem to be high on profit, perceived profitability and taste, but low on operating costs. Average scores for more frequently adopted innovations on these variables are 7.75, 8.00, 8.00 and 6.75 respectively. The two groups also seem to differ with respect to prestige and marketing and credit structure. With respect to those two attributes, more frequently adopted techniques have slightly higher scores of 6.50 and 7.25; while for less frequently adopted techniques the corresponding scores are 4.33 and 6.33. The perceived amount of extension efforts did not differ significantly between the two groups. In conclusion, there is a suggestion here that a technology that is not widely adopted will tend to be costly to run, not profitable and somewhat strange from the point of view of the local culture, while a more widely accepted technology is likely to make money and fit into the local people's ways. In other words cultural appeal and money-making possibilities seem to be the main ingredients of a successful and innovative agricultural technology.

Mean Value, Weights and Relative Importance*

Characteristics	N=4 More Frequently Adopted	N=3 Less Frequently Adopted	Weight	Importance	%
Prestige	6.50	4.33	-0.54	-1.17	0
Taste and Cultural Preference	8.00	5.00	-0.72	-2.16	1
Continuity with Local Culture	6.75	3.33	2.96	10.12	5
Profitability	8.00	3.33	-4.44	-20.73	11
Extension Efforts	7.75	7.33	-.019	-0.07	0
Marketing and Credit Structures	7.25	6.33	-1.48	-1.36	0
Profit	7.75	3.33	34.00	150.00	79
Investment Costs	7.00	7.33	-1.66	-0.21	0
Operating Costs	6.75	8.66	-1.30	2.48	1

* Difference between means significant at $p < .05$ (T test)

** Because of rounding, the percentage total is less than 100%

With respect to weights and relative importance, table 2 shows profit as the most important attribute, followed by the perceived profitability and the continuity with local culture.

Discussion

Having established that both economic and socio-cultural variables contribute to the decision to adopt new agricultural techniques and also having determined the relative importance of both groups of variables, it would be interesting to give a more detailed picture of experiences that informed the adoption decisions. As already noted, mixed farming is not a tradition and these projects have not made any attempt to introduce it. Therefore, most farmers will tend not to choose combinations of different agricultural techniques; they will tend to specialize -- in raising large animals, or small animals, or raising crops -- but will not, on the whole, combine any of these three alternatives. So, for a farmer considering some technical adoption, the choices will fall in one of these three groups: large livestock, small livestock or crops. Let us take a closer look at some alternatives within these three groups for the purpose of comparison. For each comparison, the innovation will be examined with reference to economic as well as socio-cultural variables.

1. Soya and Rice

Rice was initially very popular, and remained so throughout the period under discussion (1965-1975) for all the project areas. The soya was generally rejected at first; it attained a brief popularity around 1969, but quickly declined. We shall now examine the background against which these choices were made, paying special attention to the relative importance of socio-cultural and economic factors.

In terms of socio-cultural variables, the case of soya as compared

to rice is a little complex. As a food item, rice is more prestigious than soya. On the other hand, the project innovation -- growing paddy rice -- is a less prestigious activity because it is associated with women's work roles, while growing soya is thought of as a male cash-generating activity. The tradition of cultivating rice is relatively old, having been introduced by Arabs, Belgians and the French between 1830 and 1930 (Miracle, 1965). Rice cultivation has been mostly an upland activity, one which allowed intercropping and which has been chiefly male work. Lowland paddy rice technology can be considered just as new to these people as soya growing technology. With the introduction of paddy rice, it became important to locate rice fields close to a water source and in a swamp-like field. Cultivating paddy rice involves a channeling, a "domestication" of water, which is considered feminine.

When soya was introduced, its cultivation did not have these women-associated characteristics. Men could grow it the way they did upland rice. Moreover, cash crops have been associated with men -- money and prestige. So that on the whole, growing soya is more prestigious than growing paddy rice although eating rice is still more prestigious than eating soya.

Taste-wise, rice is more valued by the local people than soya. For most of them, soya has an odd, unfamiliar taste. However, people have been trying to consume soya either as beans or as flour mixed with their traditional staple. Many people among the local elite have started to use it as food for their children or as a cream in their tea or sometimes as a main dish (Regier, 1977). At the hospitals and dispensaries, soya flour is given to sick or undernourished children as a source of protein. In some families, soya flour is used as baby food to replace powdered milk. In the SEDA project area, it is reported that people put soya flour in their tea to drink. Some even prepare hot drinks made of soya and sugar. Soya has

made some advances toward being accepted as food, but nonetheless rice is still the more accepted staple.

Let us now look at the economic picture. Soya costs less than rice in terms of initial investment. To grow paddy rice one must prepare the field bed and the water system. Depending on the situation, the costs may range from $300 to $500 per acre (Kamuanga, 1978). For soya, on the other hand, the preparation of a forest field with good rich soil may cost something like $50 per acre (Legast, 1969). Sometimes when the soya is planted for the first time in an area, the farmers may need to insert certain amounts of soya innoculent -- bacteria -- into the soil if the soya plants are to grow. The innoculents are used only once and cost approximately $25 per acre. But even with the costs of innoculents, paddy rice takes far more capital investment than soya.

Operating costs for both soya and rice included the costs of labor, seeds and spray, or chemical products of some kind. Labor usually included forest clearing, selection of seeds, weeding, harvesting, drying and threshing. Soya requires 110 days of labor per hectare, while rice takes 263 days (Legast, 1969; Kamuanga, 1978).

Total production costs are $0.06 per kg. for soya and $0.08 to $0.10 for rice. It happens that both crops are attacked by diseases, but this has not been singled out in the project documents or in interviews with the people involved. In any case, spray products have been included in the production costs for both rice and soya. Included in the operating costs are processing costs. These are admittedly quite high for soya, but generally, the total cost of raising paddy rice nonetheless is significantly higher.

The case of soya and rice may not be easy to settle. This is a case in which socio-cultural variables themselves were at odds with one another. Prestige and familiarity, for example, cut both ways. Soya is

prestigious to grow but not to eat. In the case of rice it is the other way around.

So here we have a complicated situation in which taste emerges as the dominant factor.

How strongly were the farmers influenced by economic factors? Superficially, it would appear that taste again was more important: Rice is actually slightly more expensive to grow than soya and yet, in the long run, most farmers decided to concentrate on rice. However, we must not forget that economic and socio-cultural factors are interrelated. Taste preferences affect demand which affects profitability. It could be argued that farmers changed their minds about soya when they realized that the project-subsidized attempts to convert people to its taste were not having much success. Rice might be more expensive -- and less prestigious -- to grow but it did offer a secure prospect of profit.

Let us now turn to two more comparisons in which the interplay of socio-cultural and economic variables is somewhat less complex.

2. Pigs and Cattle

From a socio-cultural point of view, local people attach greater prestige to cattle than to pigs. In all four project areas, cattle are used for important celebration occasions and also as the items of highest value one person can give to another. In the PPA project area, each time there was a festival, government officials asked for a bull from the project rather than a pig. In the same area, after the chief had given land to PPA for project activities, she asked for five head of cattle as compensation. Pigs on the other hand do not confer status. People look on the pig an an evil and dirty animal, associated with uncleanness and taboo. It is sometimes believed that pigs host bad spirits. In some places, according

to Fremont Regier, taboos even prohibit women or children from eating pork. Regier also tells a story of how a man who had died of tuberculosis away from the village was found partially eaten by pigs. This fact confirmed people's belief that the pig is evil and they should not eat pork.

With respect to taste, both beef and pork are preferred over non-meat foodstuffs, but beef is more valued than pork. In all the project areas, beef is a more popular meat. Cattle are butchered every market day, once or twice a week. In the SEDA project area local people even dug up a cow carcass and ate it. (The animal had been buried after the veterinarian had condemned it because of tubercular lesions.)

In terms of continuity with local culture, raising cattle in the way the projects proposed was more familiar to local people than swine husbandry. This statement may sound surprising, since local people do have a long tradition of raising pigs. In the local tradition, however, people let pigs run wild to look for their own food and water. In the project concept, pigs had to be fenced in, housed, fed, vaccinated, dewormed, watered -- in short, cared for. In these respects, swine husbandry was a completely new concept. By contrast, the local tradition of raising cattle was not quite so new, having been introduced by the colonial administration some thirty to forty years before. People knew about the needs for corrals, cowboys, grazing and watering. Consequently, in all four project areas, some people were already raising cattle in a way similar to that which the project was proposing. (Some of the extension workers actually came away with the somewhat crude impression that people preferred raising cattle to pigs just because it was easier.)

Undoubtedly, people were directly influenced by these socio-cultural factors, but it must be remembered that these also have an indirect but highly significant influence in that they can be translated into economic terms. Beef is more popular, prestigious and familiar, therefore

therefore it commands a higher price. A live cow will always fetch considerably more than a pig, if sold at market.

The main considerations influencing people's choices in this case were profitability and operating costs. The initial costs of cattle are actually higher than those of pigs. Cattle cost between $200 and $250 which includes the price of the animal, costs for the corral, the cattle chute and the training of the local cowboy. For pigs, the total initial cost would be between $150 and $200 per animal including the cost of a solid shelter with a cement floor and the cost of a fence.

The real difference, however, for the local farmer has to do with the upkeep costs of the two animals, especially labor and feed costs. To look after four cows costs about $60 a year; four pigs would require twice as much -- $120 for labor. Cattle feed is essentially grass, supplemented with a block of mineral salt. The grass is practically free and the mineral salt costs approximately $15 a year. (At one point the mineral salt block was made locally to reduce its cost; normally it was imported.) The feed for pigs, on the other hand, is more expensive. Pigs need a high protein feed, the same as the local human food, including manioc, corn, voandzéa subterranea millet and the like. At times, feed for pigs is scarce as well as expensive, especially during periods of drought, but this was not an important factor in determining choice. Veterinarian services were subsidized in all of the projects. On the whole cattle needed more veterinarian attention -- dehorning, castration, etc. There were many cases of brucellosis (scours) and some deaths. However, the incidence of death among pigs was about 50% higher than that among cattle. This was a crucial determining factor in the choice.

In general, it can be concluded that the decision to raise cattle rather than pigs may have been determined more by economic than by socio-cultural variables.

3. Rabbits and Chickens

In the case of rabbits and chickens, people seem to have made similar choices for similar reasons. As we saw in the introduction, it was often assumed that many farmers chose to raise rabbits for socio-cultural reasons. In fact, on socio-cultural grounds chicken is more acceptable than rabbit. There tends to be more prestige attached to raising chickens. Chickens are more appropriate to kill for different festive occasions, such as births, deaths or weddings, and chicken is the most prized meal with which to honor a guest. Chickens are more than just a valued source of food! They are used in ritual healing; they are suitable sacrifices to the spirits of dead ancestors, and a person whose dreams are troubled by bad spirits may obtain peace of mind by transfering the evil thoughts to a white chicken.

Rabbits, on the other hand, have no such significance. At the beginning of the SEDA project at Nyanga several people did not like the idea of raising rabbits in the community; they wanted chickens. According to Terry Ellard, at the beginning of PADRUKA many local clients came only for chickens. When project workers tried to talk them into raising rabbits, they did not show much enthusiasm. In PPA, a project worker reports that one day the district commissioner came into the project area for a visit. The American project director proposed giving him a rabbit. The local associate director replied that a chicken would be a better gift. Another project worker reported that when he killed both a chicken and a rabbit for local guests, the guests always started with the chicken first, and if anything was left over, it would always be rabbit. (It is possible, however, to find among those who have become used to eating rabbit some that prefer rabbit to chicken.)

Local people have a tradition of raising both chickens and rabbits. However, there is marked discontinuity between the traditional way of

raising chickens and the ways proposed by the project. When local people raise chickens in their own style, the chickens are on their own. They look for their own food and water and at night they come to the owner's house to sleep. Usually rabbits are confined to a pen, and a daily supply of feed and water is brought to them -- in other words, not so very different from the proposed new method.

From a socio-cultural point of view there are significant factors on both sides. Chickens have far more prestige but the project methods of raising rabbits was closer to the traditional method.

Looking at economic variables, investment costs for rabbits are a bit higher than for chickens. To raise chickens, participants were asked to build a shed for the birds, to go through an extension course, and then to buy between ten and twenty young chickens or chicks. The total initial costs came to around $35. Requirements for rabbits were similar. A house had to be built and the participant had to attend an extension course before buying five to ten rabbits. The total initial costs, however, were approximately $80. Although one could use local material to build houses for both chickens and rabbits, rabbits were required to be off the ground, which might require expensive imported materials: nails, boards, wires and the like. Even though initial costs for these small livestock are lower than for pigs and cattle, they are still high if one takes into account the fact that the local average annual income is very low -- less than $100 a year -- and that cash is very scarce.

Operating costs for both rabbits and chickens included veterinarian services, feed and labor. Veterinarian services for most projects were cheap, and in some cases they were free. Chickens presented more problems than rabbits. Every year chickens were hit by the "bomb" (pseudo fièvre aviaire), Newcastle coccidiosis, internal parasites and even cannibalism. At one point, the situation was so bad in PPA that the project

management decided to burn everything and start over. It was not always easy for the local project participants to deal with the health problems of their chickens. Although vaccination was cheap (two cents per bird), it was still high for the local people. Sometimes, even when they had money, the medicine was not available. People complained that project chickens required medical attention that they could not provide. (One woman gave aspirins to her chickens because that was the only medicine she had in the house.) Rabbits had fewer problems. Cases of coccidiosis, vitamin D and mineral deficiency and occasional cannibalism were mentioned. In general, however, the epidemics that hit chickens were far more devastating than the problems encountered in raising rabbits.

With respect to feed costs, chickens required a very expensive high protein content feed. Some chicken raisers tried to skimp on chicken feed and lost their chickens. All four projects tried to do something about the high costs of feed. PPA decided to have a feed mill operated locally. In SEDA, research was done to find a local feed concentrate that project participants could buy at a lower price. Despite these efforts, the price of chicken feed remained high. With rabbits the feed situation was much better. Rabbits, to start with, ate local greens, which only involved labor costs: The only imported feed element necessary was a small quantity of mineral salt. When different projects tried to improve rabbit feed, they also found good local solutions. In all of the project areas, they found that pueraria and stylosantes grew well and were not just good rabbit feed but also a good crop rotation legume. Thus, rabbit feed became much cheaper for the local people than chicken feed could ever be.

In terms of labor costs, care for chickens and rabbits was roughly the same, with slightly higher costs for chickens. Chickens require a great deal of attention, especially when they are young. (One lady complained that with chickens she always had to be there to watch over them, which was not practical for her, since she had to spend about eight hours a day in the

fields during the agricultural season.)

Even though initial costs were slightly higher, rabbits were a more secure and more profitable investment. Although less prestigious and less palatable, rabbits were chosen over chickens entirely on economic grounds.

Conclusions

Two main conclusions can be drawn from this study. First, decisions about adopting new agricultural technologies seem to be determined by both economic and socio-cultural variables. Often because of too much emphasis on narrow expertise in most studies of projects, there is a tendency to concentrate on one set of variables at the expense of others.

In reality one finds that these situations are complex: socio-cultural influences work both ways, similarly for economic considerations. Perhaps most important, socio-cultural and economic factors coexist in a synergetic relationship.

Secondly, and more specifically, this study has found that, contrary to the hypothesis that local farmers are totally dominated by their socio-cultural values, it is in fact economic concerns which emerge as the most important determinants of the decisions of the local clients. This is not to say that they make purely economic decisions in isolation from their cultural environment. But we do wish to argue against the false picture of the farmer as mistrusting the stranger, resisting change and thus failing to take advantage of the economic opportunities offered. Local farmers usually turn out to have sound economic reasons for adopting or rejecting proposed innovations. Consequently, in cases of project failure the emphasis should not be put on blaming local clients, but on the need for

serious technical and economic studies of the proposed innovations in the proper context.

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