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THE ORGANISATIONAL CONSEQUENCES OF
SOCIAL AND ECONOMIC CONSTRAINTS
AND POLICIES IN DRY-LAND AREAS

By

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DISCUSSION PAPER NO. 214

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December, 1974

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This paper was prepared for the Second Annual Seminar on Change in Agriculture, sponsored by the University of Reading and the Overseas Development Institute, and held in Reading, England, September 9 - 19, 1974. The Seminar papers and plenary lectures will be published in a proceedings volume to be released in 1975.

Views expressed in this paper are those of the author. They should not be interpreted as reflecting the views of the Institute for Agricultural Research, the Institute for Development Studies or of the University of Nairobi.

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ABSTRACT

Discussion in this paper is limited to an area within 100 miles of Zaria in northern Nigeria. Although this area is considered generally representative of many other parts of northern Nigeria, it is considered necessary to focus on one specific area due to the basic premise underlying the paper, namely that administrative institutions should be attuned to the physical, technical, social and economic environment and therefore must be location-specific.

The paper attempts to show that it is initially essential to understand the physical and human environment of an area. With this kind knowledge it is then possible to develop the technology relevant to the farmers' needs and to create administrative arrangements which are effective in bringing about change. It has been suggested that the relationship between the type of technology and institutions required is close and that financial and manpower constraints may prevent complex institutional arrangements. In such cases a plea has been made for the development of intermediate-level recommendations which do not require high levels of institutional support.

THE ORGANISATIONAL CONSEQUENCES OF SOCIAL AND
ECONOMIC CONSTRAINTS AND POLICIES
IN DRY - LAND AREAS.

Discussion in this paper is limited to an area within 100 miles of Zaria. In general terms this is considered representative of many other parts of northern Nigeria. The necessity for delineating a particular area is due to the basic premise underlying the paper. This is that the administrative institutions should be attuned to the physical, technical, social and economic environment and therefore must be location-specific. After briefly reviewing the physical and human environment of the Zaria area, the paper discusses the importance of developing relevant technology and the influence of that technology on the type of administrative institutions required to create conditions conducive to its adoption. Finally, four different administrative strategies are briefly discussed, of which two are in operation at the present time, one is currently being considered and one is suggested for examination by government authorities.

THE ENVIRONMENT
Physical and Human

In the Zaria area, the mean annual rainfall of about 43 inches, which falls during the period April to October, results in a severe water deficit during the dry season and surplus during the rainy season. Mean monthly temperatures fluctuate from 72° F in January to 84° F in April. The natural vegetation is savanna woodland, which as a result of human activities has been largely replaced by parkland.

Agriculture forms the principal means of livelihood for 75 per cent of the working population in the Zaria area. The predominantly illiterate rural population consists of two main segments: the nomadic pastoral Fulani who roam throughout the northern part of Nigeria with their herds of cattle, and the settled, primarily crop-farming population of both Hausa and Fulani origins. Attention in this paper is confined to the biggest group of people, i.e., those settled farmers belonging to the Muslim faith who tend to live in nucleated villages or well-defined hamlets. The traditional society is strongly autocratic, with village heads exercising considerable authority.

The Farming Enterprise

The types of crops grown in any area are determined by three and sometimes four fundamental factors, i.e., physical, 'social', economic and political considerations. The major crops grown on the rain-fed upland are

sorghum, millet, cowpeas, groundnuts and cotton, while sugarcane predominates on the limited areas of lowland which permit year-round cultivation of crops. Over 70 per cent of the cultivated upland acreage is devoted to crop mixtures grown on farms averaging 9 . 1 acres, which consist of 8 . 1 acres upland and 1.0 acres lowland. Farms use only hand labour. The bulk of this labour (i.e., about 82 per cent) comes from family sources, the average size of family being about eight persons. Due to the dominance of the Muslim religion, women tend to be kept in seclusion and male adults contribute about 89 per cent of family labour on the farm. Because of the seasonality of farming, an average male adult spends almost 40 per cent of his time on off-farm activities. These receive particular emphasis during the dry season, while over 26 per cent of the total time spent on farm work occurs during the weeding bottleneck period of June and July.

Livestock receive little emphasis in the economy. Cattle, mainly owned by the nomadic Fulani, are sometimes corralled on the fields of farmers to provide a source of manure. Fields near residential areas are usually continuously cultivated, with soil fertility being maintained with manure and compound sweepings. Fertility of fields further away is maintained through fallowing. Traditional practices still predominate, with the net return per acre (i.e., excluding labour costs) of sole crops and crop mixtures on rainfed upland averaging N16.10 and N23.56 respectively.¹

Farmers face many problems which are not mutually exclusive. Farmers in the Zaria area usually invest little in farming. Many reasons, some of which will be mentioned, can be advanced for this, but the result is that little improved technology has been adopted by farmers. Indeed this low investment imposes a constraint on the expansion of the scale of farming even using traditional practices. The seasonal variation in rainfall means that agricultural activity has a distinctive peak during weeding in June and July and little activity during the dry season when only low lying land can be cultivated. Since investment in agriculture is low, and therefore little hired labour is employed, the amount of upland a family can handle during the June - July period determines their level of agricultural activity during the rest of the year. (Ogunfowora, 17; Norman, 15). The low investment in agriculture means that family incomes are low (i.e., an average disposable income of about N200.00).

Wharton (21) has clearly illustrated the implications of these low incomes. Under such conditions, the range between the actual level of living, the subsistence standard of living and the physiological minimum necessary for

1. N1.00 equals approximately U.S. \$ 1.50.

survival tend to be much narrower than in a higher income environment. Consequently, farming tends to be subsistence in orientation and farmers tend to regard security or risk minimisation as of paramount importance. This is because any adverse circumstances could result in incomes below that necessary to sustain a minimum subsistence standard of living and, in extreme cases, even of survival. The goal of most farmers in such a setting is likely to be one of profit maximisation subject to stringent security constraints. They tend therefore to have a conservative attitude towards change.

Introducing change is made more difficult by the fact that very few farmers (probably less than 1 per cent) have received formal education, although many have been exposed to the religious Koranic schooling, which is informal in nature. In addition, although the leadership in the villages tends to be autocratic, there is considerable individuality when it comes to decisions over farming matters. (Fine,7) Therefore there is little pressure that can be brought to bear to force farmers to change rather than convincing them. In any case, the leadership does not always act in the best interests of the community. The very individuality of farmers makes it difficult to conceive of group ownership of equipment, etc. Although there is the traditional practice of communal labour, which is now becoming less common, and the extended family system, there are no obvious natural groups of farmers which can be used to aid the introduction of change.

Agricultural Administration

Government policies in the northern part of Nigeria, to date, have mainly tended to support the philosophy of small changes over large areas rather than large changes over small areas. It appears, as Bunting (3) has observed in many other parts of the world, that the general institutional and administrative environment of agriculture was largely historically determined. (See also De Wilde, 5) Until recently there has been little flexibility in adapting administrative instructions to the local situation. Traditionally, governmental agencies have been involved in subsidising improved inputs, fertiliser distribution, granting of credit mainly through cooperatives, limited improved seed multiplication and distribution, and providing tractor hiring units and extension workers. Delays in the ordering and delivery of fertiliser to the governmental stores and the ensuing problems of distributing it to a very dispersed clientele have made this function of only limited success. Poor repayment of loans has reduced the credibility of cooperatives and loan schemes generally, while the low density of extension workers (1 per 2,000-5,000 farmers) has inhibited dissemination of information to farmers.

Tractor hiring units have of course been localised in their influence. In terms of improved seed multiplication and distribution, apart from groundnuts in Kano State, only cotton has been reasonably successful.

More recently, government has tended to pay attention to more concentrated, location-specific projects affecting limited numbers of people. Examples of these include capital intensive irrigation schemes and consideration of proposed integrated agricultural production projects on upland. There would appear to be in both types of projects some disillusionment with the lack of change brought about using the more traditional approaches described above. Commercial firms have, with respect to tobacco and tomatoes, been permitted to use an integrated approach with farmers in order to get the crops grown.

Later in the paper the administrative arrangements of these and other approaches will be examined in more detail. First, however, it is necessary to establish whether there are relevant technologies available that will improve farmers' incomes and what types of administrative institutions are necessary to encourage their adoption.

RELEVANT TECHNOLOGY

Without relevant technology to disseminate there is nothing the extension worker can do to help the farmer. The determination of what is relevant will depend on the physical and human environment, i.e., whether the technology is technically feasible and economically profitable for farmers to adopt, and whether it is socially acceptable to farmers.² These questions can only be answered by examining the farmers' existing situation, attitudes and constraints and by testing the technology at the farmers' level to ascertain whether it is consistent with their attitudes and helpful in overcoming their constraints.

Much work has been carried out at the Institute for Agricultural Research, Ahmadu Bello University, Zaria, on the development of technology. In terms of the usual simplistic criterion of net return per acre, it would appear to be profitable. But is it relevant? Taking into account comments made earlier in the paper, two of a number of points that would need to be taken into account in determining the relevance of the technology to farmers in the Zaria area would be these:

2. In this paper discussion is confined to types of relevant technology that involve the use of improved technological inputs and/or methods. However, it is possible under certain circumstances to conclude that it would be most relevant to expand the use of land and/or labour resources employing traditional practices. (Ogunfowora and Norman, 18)

1. For most farmers labour availability, particularly during the June - July period, is a more limiting factor than land. Therefore the technology that is most relevant is that which increases the productivity per unit of labour during the peak labour demand period and/or does not require much higher labour inputs during the labour bottleneck period for other crops.³
2. The technology must be profitable to encourage farmers to adopt it. The level of profit required to attract the attention of farmers will depend on two interrelated factors: the degree of change required in the prevailing farming system for its adoption, and the dependability of the return from that technology. Ceteris paribus, the smaller the change required and the more dependable the return from the technology, the more likely the change is to be acceptable to farmers. The degree to which farmers would be willing to relax these assumptions will depend on the level of potential profit from adopting the technology and the gap between their level of living and their minimum subsistence income. Since in the case of the Zaria farmers this gap is small, it is unlikely that they would be willing to permit a relaxation of these conditions.

In the Zaria area, cotton is a good example of a crop for which the technology is not relevant. According to recommendations, it should be planted earlier than is done traditionally. Although it shows much greater profitability per acre under improved technological conditions, the earlier planting brings it into conflict with the weeding bottleneck for food crops in June and July, with which it is not so competitive. (Norman, Hayward, Hallam, 16) On the other hand, the technologies for maize and tobacco do appear to have relevance. Maize yields can be increased substantially as a result of improved technology. Although the demands on labour clash with the peak labour demand, the productivity of that labour is high, resulting in high and, with proper supervision, dependable profits in relation to other crops requiring labour at the same time. (Institute for Agricultural Research, 9)

The above examples pertain to single crops. However, one of the reasons for the traditional popularity of crop mixtures is that they permit a great deal of flexibility in the timing of farming operations and can help alleviate the demands of the weeding bottleneck period. (Ogunfowora and Norman, 18). The development of technology relevant to crop mixtures may be able to exploit this advantage and at the same time be more acceptable to farmers.

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3. Sometimes certain types of technology can simultaneously increase the productivity of both land and labour (e.g., fertiliser). This is in contrast to other types of technology (e.g., ox drawn equipment), which primarily increase productivity of labour.

Another basic type of technology that would be relevant to farmers in the Zaria area would be that which is specifically orientated towards alleviating the June - July weeding bottleneck. Possibilities exist in the form of herbicides and oxen. The practice of growing crop mixtures would, however, necessitate the development of herbicides tolerated by a wide range of crops, and in term of mechanisation, would involve change to some system in which plants are not grown in the furrows e.g., alternate row cropping. (Andrews, 2)

CHANGING THE FARMER

Once a relevant technology has been established, relevant administrative organisation that is necessary will vary according to the type of technology and according to the environment, particularly the human aspects. Simplistically however, at least three elements have to be considered for getting the farmer to adopt the technology. These are: first, convincing the farmer of the value of the technology; second, ensuring that he has the necessary financial resources; and third, ensuring that the necessary inputs are available on time.

Convincing the Farmer

It is the farmer's subjective evaluation of the technology, rather than objective evaluation, of the research worker, which will be important in determining whether or not he will adopt it. (Wharton, 21) Objective evaluation by the research worker of the relevance of the technology at the farmer's level is however still important in ensuring that the extension agent, who is faced with the task of convincing the farmer, has something credible to sell.

A number of factors will influence the process of persuading the farmer. For example, the simpler the message is, (e.g., single-trait rather than package-deal approach), the smaller the change required in the farming system, the higher the profitability and the more dependable the profit, the easier it will be to convince the farmer.

The degree of extension concentration needed will depend to some extent on the ease of convincing the farmer; ceteris paribus, the easier this is, the lower is the concentration of extension workers required. However, the more complex the technology is and/or the more sensitive the level and dependability of its profitability is to timing, quantities of inputs, etc.,

4. Unfortunately, as Jones (10) and Eicher (6) have emphasised, single trait innovations with a high payoff are rare and therefore research workers are usually pushed towards advocating the more complex package-deal type of approach. (Millikan and Hapgood, 13)

the greater is the importance of the managerial expertise with respect to the improved technology.

Another element is the price which the farmer will obtain from the product produced. Where considerable fluctuation in prices exists from year to year and/or there is strong evidence of middleman exploitation, obviously a strong case can be made that some realistic minimum assured price be offered.⁵

Financial Requirements

Whether an institutional credit programme is necessary or desirable should depend on the month-by-month costs of adopting the technology in relation to the level of total income and the liquidity position of the farmer at the time when the inputs are required. Institutional credit schemes which are expensive and require considerable supervision would not appear to be justified in situations where the financial costs of adopting the technology are small or where the marketing outlets are not limited, as is the case with tobacco.

Distribution of Inputs

Even if the farmer is convinced of the value of the technology and has the necessary financial backing he will not be able to adopt it if it requires inputs that are not available. Although this is widely recognised, implementation is often inefficient. Yet, if the technology requires inputs which need to be distributed, this element is probably more basic than the other two discussed in this section. These inputs are required even if only a low concentration of extension work and no institutional credit is required.

Administrative Arrangements

There are in any society limited financial and manpower resources for the institutions necessary to encourage farmers to change. The problem is to decide what are necessary and the degree of emphasis to be devoted to each. Unfortunately, bringing about change involves many factors and therefore probably a number of different administrative institutions. An attempt has been made in this section to delineate three essential elements. It has been emphasised that these elements are linked, and failure in any one of them will

5. The danger of the next logical step, a fixed price, is that of exploitation by the monopsonistic purchasing agency in paying artificially low farm-gate prices. An example would be the relatively recent marketing board pricing policies in Nigeria (although it should be noted that the institution is not strictly monopsonistic, since a limited domestic free market also exists).

result in a failure to bring about change. Further, since these elements are linked, coordination of the administrative structures will be needed. Unfortunately this is not always possible.

EXAMPLES OF ADMINISTRATIVE ARRANGEMENTS

The previous section has established the conceptual framework for relevant administrative arrangements. However, the details of how these should be undertaken should be determined by the environment in which they are to be used. It should, of course, be remembered that there is a limit to which it is feasible to attune administrative institutions to local variations in the environment. (Hunter and Bottrall, 8)

In the concluding sections of the paper four examples of administrative arrangements are critically examined.

Tobacco Growing

The Technology: In order to grow tobacco successfully seed beds are prepared at the beginning of July, mulching and shading provided, plus 12:24:7 compound fertiliser at a rate equivalent to 4.3 cwt/acre, applied together with Aldrin and Dithane. After 42 days the seedlings are transplanted, 100 lbs per acre of 10:30:10 added a few days later and the field cultivated two or three times. Harvesting takes place six weeks after transplanting, with two or three picks. The tobacco leaves are dried under shade for up to three months before being marketed. Yields of up to 700 to 750 lbs per acre are possible if handled properly. Net returns (labour not included) of N60 to N70 per acre are usual.

Administrative Arrangements: Tobacco growing in the Zaria area is an example of integrated management, with two commercial firms each providing full control of the complete process which includes the research, extension advice, inputs, credit, and graded marketing and processing of the crop. Extension work is done primarily through the appointment of master farmers, who are selected by the tobacco company as being, according to their criterion, good farmers and who are respected by other farmers in the community. The village head and the power elite in the village are informed about the individuals chosen, but usually play no part in the selection process. The master farmer has 50 to 70 farmers under his jurisdiction, each growing about one half acre. In addition to providing extension advice, he is usually expected to provide the seed bed and seedlings ready for transplanting, to distribute the fertiliser and other inputs (i.e., Aldrin and Dithane for seedbed, and twine for the drying process) which are given on credit, and to arrange for the delivery of the product to the company's depot in Zaria. For these services he receives a

9.2 per cent commission on sales at the depot. An average master farmer receives as a result almost N200 in commission, from which various costs (e.g., transport) have to be subtracted. The value of the credit, which is interest free, is subtracted from the farmers' proceeds from the sale of their tobacco.

Evaluation: Casual observation of the tobacco growing enterprise in the Zaria area suggests that it has to date been the most successful programme for improving farmers' incomes. Many factors contribute to the success of this programme but three of the most important are undoubtedly the following:

1. The technology, as well as being very profitable compared with other crop enterprises in the area, also fits in very well with the monthly demands of other crops, since most labour is required after the weeding bottleneck period.
2. The technology is not very complex and the whole programme is centred on a single product which has very limited market outlets, thereby increasing the possibility of recovering the credit at marketing time.
3. A strongly coordinated approach is possible in the administrative arrangements with respect to extension (through the master farmer), provision of inputs and credit, and control of the marketing channel.

Three problems have caused some concerns:

1. The uncertainty of the rainfall in September can cause some variation in the yields of tobacco, thereby reducing the dependability of the profit.
2. Up to 50 per cent of the yield of the crop never reaches the company depot. Maybe two-thirds of the deficiency arises as a result of poor handling of the crop after harvesting. The remaining third may pass through the other two limited outlets for tobacco (the rival commercial firm or for making local cigarettes). Such leakages could make it more difficult to subtract the credit debt from the proceeds to which the farmer is entitled. In general, however, this has not been a serious problem.
3. A rural middle class elite is developing in the form of the master farmers. This is considered by some to be potentially dangerous, since it opens up the possibility of such individuals exploiting their position to their own advantage.

However, when one examines the apparent improvement in the well-

being of farmers as a result of participation in tobacco growing and the eagerness of more farmers to join the scheme, one must conclude that the benefits of the programme outweigh the costs.

Tomato Growing

The Technology: For the rainy season crop,⁶ seed beds are prepared in April to June and transplanting takes place in May to July. Fertiliser applications are fairly high, with 4 cwt of 12:24:12 and 2 cwt of nitrochalk. Spraying with Didigam and Difolatan is undertaken, while mulching and a number of cultivations are necessary to obtain high yields. Harvesting occurs from August to October. The labour requirements for good yields are very high, while yields average about five tons per acre. In a case study of a local farmer the estimated net return per acre was about N98 if labour costs are excluded and N25 per acre if they are included. (Quinn,19)

Administrative Arrangements: The project started with the establishment in Zaria of a factory for processing tomatoes into puree. Initially much of the responsibility for ensuring that the tomatoes were produced by farmers for the factory was in the hands of government. Later this proved to be impractical and as a result the commercial firm has become more heavily involved in the tomato production stages. Suitable areas of land are selected in villages by government in consultation with the firm, and the district and village heads are approached for permission for the land to be used for growing tomatoes. The land is usually in large blocks of eight to ten acres and therefore is usually cultivated by more than one farmer. Each block of land is initially cultivated with equipment supplied by government and commercial tractor hiring units run by government. The cost of this is deducted from the value of the total production when the product is purchased by the firm. The same applies to the spraying materials and fertiliser. The actual spraying operation is carried out by the firm. Extension agents are supplied by both government and the firm. The tomatoes are collected at the production site by the firm.

Evaluation: This system of tomato production has the following advantages:-

1. It is a profitable crop which appears to offset the intensive demands for labour, which occur partly during the busiest time of the farming year (i.e., June to August).

6. There is also a dry season crop which has many advantages over that grown in the rainy season. For example, it is undertaken during a period when farming activities are low, and it is both much more profitable and dependable since there are fewer disease problems. However, since it is an irrigated crop, it is beyond the scope of this paper.

2. There is a concentration of administrative arrangements (i.e., provision of improved inputs, credit to purchase them, and a concentrated extension service).

However, at the same time it has the following problems (Agbonifo,1):-

1. It is a complex technological package which, without expert guidance, can result in considerable variation in yields. Disease and nematode problems can be particularly important.
2. The land acquirement system is not very satisfactory since benefits of participation in the project are often inequitably distributed in favour of the power elite in the village.
3. Because two organisations, government and the firm, are involved, there is sometimes evidence of inefficiency and poor coordination.
4. A serious problem exists with respect to the possible marketing outlets. A large market exists for fresh tomatoes which at present command a price up to four times that offered by the firm. As a result there is a large leakage to the open market, further encouraged by the policy of subtracting the value of the credit from the proceeds given to the farmer.
5. The firm itself is faced with the problem of trying to ensure a continuous supply of fresh tomatoes for processing purposes. The organisational problems of trying to dictate to farmers exactly when to plant and harvest are immense. Such farmers are not used to external discipline in farming matters.

Compared with tobacco growing, rainfed tomato production seems to have considerable problems. The technology is more complicated, more expensive, less profitable and dependable, and requires labour at a busier time of the year; the necessary organisational arrangements are more complex and less satisfactory; less control is possible over the marketing outlet; and timing of delivery of the product to the factory is far more critical in the case of perishable tomatoes.

It is difficult to see exactly how the existing situation can be greatly improved if the small farmers are to continue being involved in the production process. For example, government could hand over all the administrative arrangements for producing tomatoes to the firm, thereby releasing its overstrained resources to other uses. The danger of this is that, as long as tomatoes are forthcoming, the firm will probably not be so concerned with the equitable distribution of the benefits. Government could also permit the firm to set up its own nuclear plantation to ensure that a steady supply of tomatoes

is forthcoming, with the attendant risk that farmers producing tomatoes would be increasingly neglected and that fewer would gain. Alternatively, government could go to the other extreme and insist that more farmers should benefit from the project. One way, which would be detrimental to the viability of the firm, would be to insist that it forgo economies of scale in providing the land preparation, contract spraying and supervisory services by permitting tomatoes to be grown on smaller plots.⁷

With reference to poor credit repayment and leakage to the fresh market, there appears to be little that can be done except to follow the policy now being adopted of excluding the farmers concerned from the project in the future, and allowing the fresh market to be saturated with tomatoes. This, in fact, is likely to happen in the very near future. The potential for raising the price of tomatoes for processing is very limited, since prices offered on the world market are substantially lower.

Integrated Agricultural Development

The Technology: Serious consideration is being given to a project that will concentrate on increasing production of five crops, mainly maize and cotton, but to a lesser extent sorghum, groundnuts and cowpeas. For all crops except cowpeas and groundnuts, two levels of technology are to be extended to farmers: intermediate and advanced. The advanced recommendations involve a higher cost of improved inputs and sometimes a more complex technology. Apart from cotton, which involves planting earlier than is done traditionally, the planting and harvesting dates approximately correspond to traditional practices. All five crops require labour during the peak June - July period. All require some increase in labour over traditional practices (i.e., for fertiliser application for all crops except cowpeas, for increased weeding, for spraying in the case of cowpeas and cotton grown according to advanced practices, and for harvesting the increased yields). The expected net returns in ₦ per acre (excluding labour costs) are as follows:-

Crop	Level of Technology	
	Intermediate	Advanced
Cotton ^a	11.34	21.46
Groundnuts ^a	20.24	-
Maize	42.91	87.04
Sorghum	46.96	63.97
Cowpeas	23.08	-

7. This would of course not be possible in the case of the dry season crops since big blocks of land are necessary for an efficient irrigation system.

a. The net returns for these crops do not reflect the recent substantial increase in prices announced by the Northern States Marketing Board for 1974.

Administrative Arrangements: It is anticipated that the scheme would have its own project manager but that it would come under the jurisdiction of government. The scheme would cover an area of 7,500 sq. kms. with a population of nearly 100,000 small farmers. The project would initially involve considerable emphasis on the construction of roads, dams to provide water for domestic uses, and village service centres. Later improved seeds would be multiplied and distributed to the village service centres along with fertiliser, insecticides, seed dressing, etc. Sale prices to farmers, particularly of fertiliser, are expected to reflect an element of subsidy approximately in line with present government policy. Up to 75 per cent of the sales are expected to be on seasonal credit terms. An interest rate of 10 per cent is likely to be charged plus a surcharge of 1 per cent per month for each month the loan is outstanding beyond the twelve months period of the loan. Each borrower will be expected to have completed a simple form of loan application which will serve as a farm management plan and promissory note and will have to be approved by a specific senior extension worker. One of the two credit assistants at the village service centre will, on the basis of this, calculate the farmer's credit requirements and establish his creditworthiness with the group of farmers he will be associated with. Groups of farmers will be formed based on a hamlet, village or farmers' association. Once the group has confirmed the creditworthiness of the borrower, then the group as a whole becomes responsible for settling any arrears in the case of failure of any person in the group to pay off his loan. If defaults are still not made good, then future credit will be withheld to all farmers in the defaulting group. To enable the credit to be used productively, a complex and concentrated extension service will be built up, with much of the training being undertaken within the jurisdiction of the project. Eventually it is anticipated there would be one extension worker to about 220 farmers.

Evaluation: It is impossible at this point to evaluate this project since it is still only in the planning stages. However, it would appear to have the following good points:-

8. A somewhat similar approach of group responsibility was tried by the Department of Agricultural Economics and Rural Sociology in one village during the 1973 season and was found to work well. Farmers did not like the idea of group responsibility but accepted it once it was clearly stated as a condition for receiving credit.

1. It is the first attempt by government in the area to show that there could be a high return to farmers from rainfed land providing that the right support systems, which are often taken for granted in irrigation projects, are created. The potential ramifications of this project, if it is successful, are considerable, since the capital-intensive irrigation schemes which are receiving a lot of emphasis at the moment will only be able to absorb a small percentage of the farming population.
2. The project, by concentrating on up to five crops, is explicitly recognising the options facing the farmer in allocating his limited resources and his security strategy which encourages him to diversify his production patterns.
3. An attempt has been made to attune the administrative arrangements as far as possible to the environment. Conceptually the administrative framework seems sound and a strongly coordinated approach is suggested which includes the three elements mentioned earlier in the paper.

There is some doubt of the relevance of some of the technology, particularly as to cotton, and the proposed hybrid sorghum and suggested practices on cowpeas have still to be tested at the farmers' level. Finally, the use of hybrid seed will pose considerable problems, e.g. in educating farmers to appreciate the characteristic of degeneration, and in the multiplication and distribution of the seed every year.

A more general criticism is that the project will cause a considerable drain on the administrative capacity of government. This could possibly lead to a neglect of areas outside the project, and might make it impossible for government to replicate this project in other areas.

Remaining Farmers

The three programmes discussed above will affect not more than perhaps 30 per cent of the farm population. All are using or are planning to use coordinated and expensive approaches involving concentrated extension, a credit programme and an efficient input distribution system. The costs of running such programmes are very high and the benefits need therefore to be correspondingly large. Consequently, it is essential to encourage the adoption of very profitable technology. Such technology can be called advanced recommendations with the economically optimum input. Sufficient supportive administration is present to help overcome farmers' reservations about large changes in the farming system, to provide the necessary financial resources and inputs, and to reduce through good management the variability in the return.

Obviously, however, it is not feasible to use these methods in approaching all farmers. Far less recognition has been given to the various elements that might encourage farmers to change in an environment where such support systems are not available.

A more rational approach to encouraging change in such areas is to start from the principles laid down earlier in the paper, bearing in mind that manpower, money and administrative capacity would be very limited. The following strategy is suggested:-

1. Priority should be given to more research on innovations that will readily be adopted by farmers without the need of much extension effort. Relevant technology in this context would probably have the following characteristics:-
 - a. Its adoption would not involve radical changes in the farming system (e.g. could be used in the traditionally popular intercropping system, would involve improvements with late sown cotton, etc.);
 - b. It would be simple to adopt; and
 - c. It would not involve a high investment in improved inputs.

Faced with these constraints, it is unlikely that the research worker will be able to evolve technological improvements which will result in spectacular payoffs. However, a farmer is more likely to adopt a technology with a low profit if it has the above characteristics. Dependability of that profit is also important and for this reason it is suggested that the level of input used (e.g., fertiliser), for intermediate level recommendations, should be at the point where the average value product is at a maximum.⁹

2. The greatest emphasis must be placed on efficient and timely distribution of inputs right down to the village level. It would be desirable to involve commercial firms in the distribution process; but it is unlikely government would be able to completely give up distribution, since commercial firms will only be interested in operating in the more promising areas.
3. Extension workers should, until the manpower shortage is overcome, largely confine their activities to organising demonstration plots on farmers' fields. These demonstrations should demonstrate the type of technology discussed in recommendation 1 above.

9. This is analogous to the approach suggested by Collinson. (4)

4. No governmental seasonal credit should be given until the level of extension is increased. However, the present subsidies on inputs should be retained to encourage farmers to purchase them for cash.¹⁰ Credit for purchasing oxen plus equipment should only be given by government when adequate extension staff are in the area to supervise the training and management of oxen. There may however be a case for organisations with special knowledge of the area (e.g., voluntary agencies) arranging both seasonal¹¹ and medium credit institutions. However, in such cases, their special knowledge may permit them to push farmers to adopt the advanced level recommendations, since presumably they have in effect an informal concentrated extension system. In conclusion, as extension manpower increases, more consideration can be given to credit based on group responsibility.¹² and farmers could then be advised to adopt the advanced level recommendations.

It is assumed here that government will continue to emphasise the construction of all-weather roads and will coordinate the various programmes aimed at the rural areas by setting up a Rural Development Bureau which will consist of representatives of all ministries involved in work in the rural areas.¹³

CONCLUSIONS

The paper has attempted to show that it is initially **essential** to understand the physical and human environment of an area. With this knowledge it is then possible to develop the technology relevant to the farmers' needs and to create administrative arrangements which are effective in bringing about change. It has been suggested that the relationship between the type of

10. For this and other reasons it would be preferable not to raise the prices offered by the Northern States Marketing Board (as has been done for 1974) for cash crops, but rather use the trading surpluses to continue heavily subsidising the inputs. (Rural Economy Research Unit, 20)

11. This was in fact done by the Department of Agricultural Economics and Rural Society in one village during 1973. There were no repayment problems.

12. Cooperatives in theory should also be able to serve **as an alternative** type of institution for the purpose of advancing credit. King (12) at present is studying the problems of these in the northern Nigeria context. Certainly in the past the autocratic traditional societal system has created problems for the democratic member-participation ideal of cooperative institutions, with the result that the power elite has received most of the benefits.

13. This in fact has been done in North Central State but suffers from the problem of no fulltime manpower and a minimal budget, therefore lowering its effectiveness.

technology and institutions required is close and that financial and manpower constraints may prevent complex institutional arrangements. In such cases a plea has been made for the development of intermediate-level recommendations which do not require high levels of institutional support.

A point which has not been considered explicitly in this paper is the possible inconsistency between short and long term strategies.¹⁴ In the short run it might be cheaper and more effective to work through individuals or existing village governing institutions than to try to build an expensive viable new grouping. In the long run, however, once a new institution adapted to change is formed (e.g., farmers' cooperatives or associations, village development committees), subsequent changes can also be channelled through it at less cost. On the other hand, organisations formed by commercial firms to answer a specific need are unlikely to be adapted to introducing wider changes.

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