NEW EXTENSION METHODS TO SPEED UP DIFFUSION OF AGRICULTURAL INNOVATIONS

By

Siegfried Schönherr

and

Erastus S. Mbugua

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INSTITUTE FOR DEVELOPMENT STUDIES
UNIVERSITY OF NAIROBI
BOX 30197
NAIROBI, KENYA

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ABSTRACT

This paper is based on field experiments carried out by researchers at the University of Nairobi's Institute for Development Studies in collaboration with Kenya District Agricultural Offices. The research has aimed at developing more efficient methods for stimulating diffusion of agricultural innovations and at the same time reducing the dualistic pattern of rural development.

The governments of many developing countries have based their agricultural extension services on the diffusion theory of E.M. Rogers (Diffusion of Innovation, New York, Free Press, 1962), directing their efforts to the 'most progressive' farmers, with the expectation that the adoption of innovations would trickle down to the majority of farmers -- the 'less progressive'. Yet many researchers and planners have realised that under conditions of dualistic development agricultural innovations are rarely communicated in this direction, and furthermore, when extension efforts are directed towards the most progressive farmers the division in rural society is actually aggravated. Thus researchers and politicians in Kenya have sought alternative approaches to agricultural extension which will reach the majority of farmers without requiring a greatly expanded level of investment.

The research has shown that in a situation of dualistic rural development communications from more progressive farmers to less progressive farmers tend to break down. However, there is intense communication of agricultural innovations among farmers on the same or similar level of progressiveness, and more progressive farmers also readily adopt innovations from less progressive farmers if they perceive that it is to their advantage. Thus diffusion is maximised when innovations are introduced through less progressive farmers, even though it is more difficult to make less progressive farmers successful first adopters of an innovation.

This paper reports on experiments carried out within the government extension organisation to find out how this can be done. The results are considered clearly encouraging.

There are in most developing countries government institutions to promote agricultural innovations. These institutions, often called extension services, are organised centrally and cover the agricultural areas with a network of sub-units. Usually, they employ several thousand extention workers or instructors, who as innovation agents are used to advance agricultural development. Generally the extension services are encouraged to cooperate with other institutions, i.e. agricultural research stations, agricultural training centres, credit and marketing institutions, etc. The most common methods used to introduce innovations in agriculture are the running of demonstration fields and the transmitting of relevant agricultural information to the farmers both in oral and written form.

THE PRACTICAL PROBLEM OF EXTENSION SERVICES

Even in countries with well-staffed extension services such as Kenya (with one instructor for less than a thousand farmers), only a small number of farmers can be reached directly. When introducing a new crop, each instructor can supervise no more than a dozen farmers effectively. Of course it is not the task of an instructor to introduce a new agricultural innovation to each farmer individually. His function is more to introduce an innovation to a certain area, to present it to people and to stimulate a diffusion process which will then work independently.

Those working in agricultural extension generally believe that an increase in the efficiency of extension activities can only be achieved by reaching more farmers directly. This popular belief has led the experts to concentrate their extension activities on the most progressive farmers since these farmers have a stronger motivation to adopt innovations and they are easily supervised. Moreover, it is often thought that the function of the best farmers is to set a good example to the rest.

In fact, the success of extension services depends primarily on how the innovations introduced directly to a small group of farmers are passed on to all the other farmers who cannot be supervised directly. It is generally accepted that this diffusion process is much too slow so that the innovations introduced by the extension service reach too few farmers. Thus agricultural extension workers find themselves in a dilemma: they cannot reach significantly greater numbers of farmers directly, and there also seems to be no way to speed up the spontaneous diffusion process whereby information introduced directly to a few farmers reaches the others.

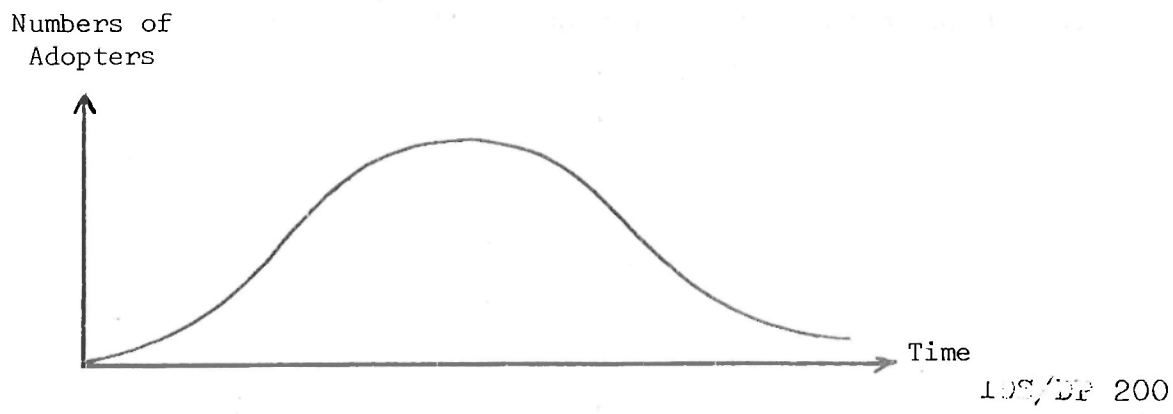
ANALYSIS OF EXTENSION PROBLEMS WITH THE HELP OF INNOVATION THEORY

A comprehesive literature has been produced on the process of adoption and diffusion of innovations. E.M. Rogers contributed a well-known summary of the innovation theories in 1962 which also became a basis for subsequent research. It will not be necessary to quote all the theoretical aspects of diffusion here, but a few points are particularly relevant to the problem of speeding up the diffusion process for agricultural innovations which could lead to a more efficient extension service.

(a) The diffusion of an innovation in a social unit occurs primarily through communication and interaction between persons.

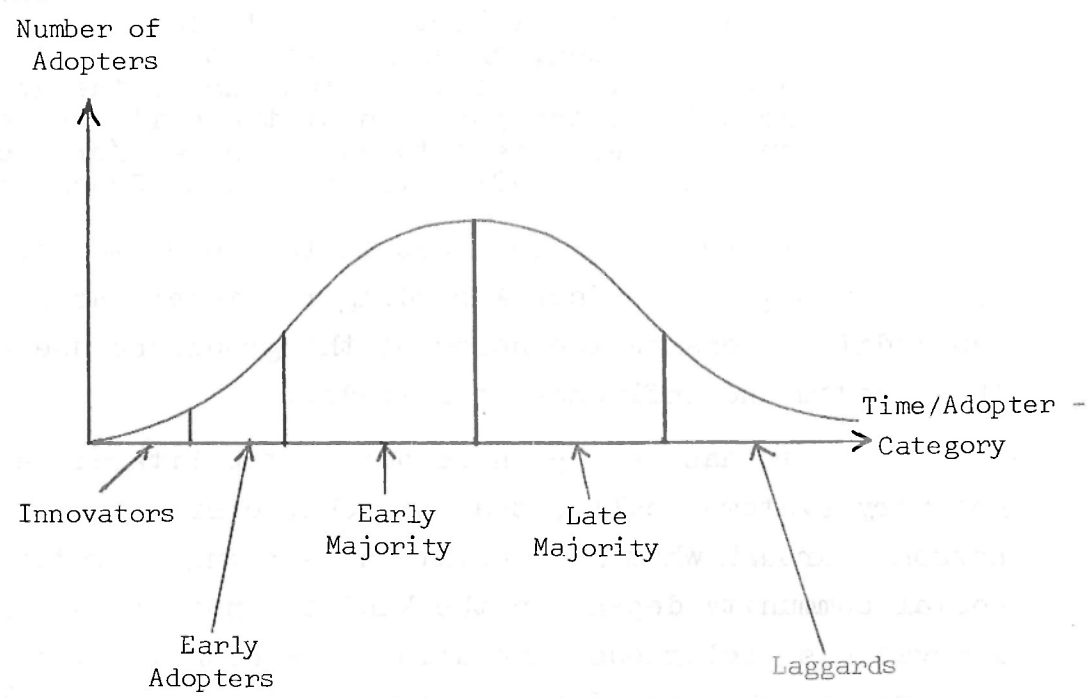
(b) An innovation is at first adopted only by a few. Others follow and more and more are converted in a snowballing effect. Thus the speed of the diffusion process increases, reaches a peak based on the number of members in the social unit and then declines until finally the last ones are reached.

Figure 1. The Normal Course of Diffusion of an Innovation.



(c) An innovation does not spread to different members of a group at random. People with certain psychological, social and economic characteristics are first to adopt an innovation, follow later or come last. Rogers classified these types of persons as follows:

Figure 2. Adopter Categories According to Rogers.



(d) Once a certain section of a social unit (Innovators and part of the Early Adopters) has adopted an innovation, it spreads automatically as indicated in Figure 2, as long as the diffusion process is not interrupted by intervening factors.

Special importance is attached to persons through whom an innovation finds entry into a social unit. This importance can be illustrated when one thinks, for example, of an idea for specific social reform. It is very important to know whether an idea for social reform was proposed by a student, a teacher or a powerful politician.

In the literature, one finds contradicting statements concerning the characteristics of innovators. Some authors are of the opinion that the innovator is more of a deviant than a leader, a marginal, maladjusted person.[1] Only through innovators do opinion leaders adopt innovations. In most cases the latter belong to the Early Adopters. K. Kiefer points out the problem of this hypothesis, starting from E.E. Hagen who associates this deviant behaviour of the marginal person always with the degree of the violation of norms.

> As long as this irregular behaviour occurs only in peripheral sectors, such as consumer habits, it is tolerated.....If the system of values is challenged however, this would question the self-understanding of the group as well as the position of the elite in power and exposes itself to sanctions and/or social isolation. (4,50f., translated by Schönherr)

Therefore Kiefer sees in the innovator not a deviant but a prestigious leader.[2] According to Kiefer the innovator can modify or change the norms of the group because he has the freedom and influence of a leader.

It has been pointed out in the literature, although not very systematically, that the characteristics of the persons through whom an innovation is being introduced to a social community depend on the kind of innovation. Political innovations, religious innovations, fashion innovations or for example the use of television - they all were introduced through different types of persons to their respective social units.

In contrast to political, religious, social reforms or revolutionary innovations, in the case of agricultural innovations aimed at increasing income, usually no direct barriers are to be expected from the more powerful in the

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1) 'Impersonal friends, reluctant participants,.... cronic dissenters as escapists.....marginal individuals." (2,p.380)" Deviants." (7,p. 193) "Innovators are ... by-products of failure in socialization in a society." (5,138)

2) Lionberger characterises the innovator similarily: "Innovators are the first to introduce new ideas or practices, and generally have a reputation in the community for doing so. "(6,p.53)

social system. An improvement in agricultural yields usually does not lead to conflicts of interest. On the contrary, higher income for the masses leads to increased tax incomes for the Government and promotes local business. These income changes are not perceived by the people as a challenge to existing social structures. Another factor which would limit barriers in the way of the agricultural innovation process is the explicit interest of the Government in the diffusion of agricultural innovations. Agricultural innovations, especially those promoted by the extension service, relate mostly to "peripheral" sectors (Hagen) of the social system where innovative behaviour is more easily tolerated.

This means that the introduction of agricultural innovations can be brought about in many ways and not just through "filters" and narrow "channels" (e.g. prestige leaders). In the case of agricultural innovations it seems that there are very few obstacles to adoption, whether innovations are introduced through marginal individuals, deviants, prestige leaders or average farmers. Furthermore, the activities of the extension service instructors who introduce innovations are normally at least tolerated and often actively desired by the rural population. The function of the innovators in the innovation process, namely to search actively for innovations and present them to the public, is met for the most part by the instructor. He is a professional innovator, trained and employed for this purpose.

Therefore the following hypothesis can be made:

(1) The extension service does not need to go through special types of persons (i.e. innovators) for the introduction of agricultural innovations.

The introduction of agricultural innovations into a social unit if promoted in the right way by the extension service can be done through all types of persons.

THE DIFFUSION OF AGRICULTURAL INNOVATIONS BY MEANS OF INTRODUCTION THROUGH MOST PROGRESSIVE FARMERS

At present, the extension service introduces agricultural innovations for the most part through the most progressive farmers. The primary reasons for this are that

(a) the instructor's efficiency is highest - he is able to successfully supervise more farmers, and (b) one assumes that the most progressive farmers set a good example for many others. Another way to state this second point is that the more progressive farmers favourably influence the diffusion process. This could be also supported by the commonly held view of the innovation theory, that the most progressive farmers belong to the Innovators and the Early Adopters. Therefore they are more susceptible to innovations - they react first to chances for innovation. They are also in a better position to test and process innovation opportunities critically. The introduction of an innovation through the most progressive farmers conforms to the "natural" process of the diffusion of innovations. From the Most Progressive the Early Majority takes over, and then the Late Majority follows and behind them the Laggards.

The innovation concept suggests that an optimal diffusion of the innovations through the social unit occurs through the existing communication and identification network, but this view presents problems. In the diffusion system described there are implications which in fact apply only to certain types of innovations. The actual role of innovators varies considerably. For example, the more active members of a political party press to spread their ideas. The Early Adopters in the fashion sector may seek attention for their innovative behaviour and may act as idols, but generally they do not pursue diffusion actively. Finally an industrial enterprise which develops a technical innovation very often has it patented to prevent diffusion. Therefore we can conclude that the diffusion process depends on the role assumed by the Innovators and Early Adopters themselves. An innovation can be promoted by them actively, they can behave indifferently, or they can actively try to prevent diffusion.

What is the situation in the case of the most progressive farmers? The most progressive farmers in developing countries are especially distinguished by having many outside contacts, i.e. with the extension service, businessmen and many institutions. They are able to read, write and calculate. Therefore they are able to estimate their

own costs and they know the situation at the local markets. The most progressive farmers have already adopted several innovations. They also, in most cases, have sound financial backing and their social status is usually high. A differentiation occurs in many agricultural areas of developing countries, between those fully participating and those only marginally touched by the agricultural development process, so that the most progressive farmers are elevated to the elite after only a few years. Here one has to keep in mind the situation of the developing societies. The majority of the farmers are illiterate, and their daily work revolves largely around the subsistance of their families. Capabilities, such as receptiveness to innovation, readiness for risks and experimentation, empathy, questioning of conventional economic patterns, practice in accountancy, rational management and systematic marketing analysis; or conditions, such as security if trial fails, sources for additional inputs and marketing provisions, are not very highly developed or do not exist at all for a great many farmers.

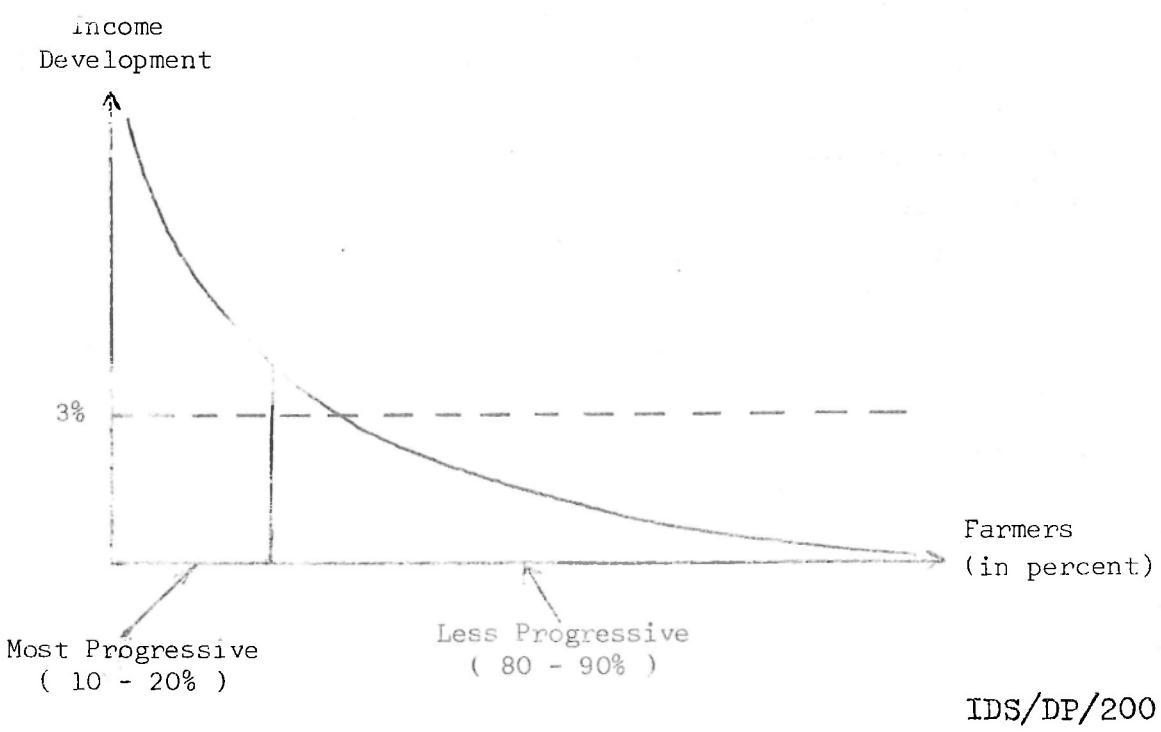
The distance between the most progressive farmers and the majority of non-progressive farmers increases rapidly during the course of development. The most progressive farmers in most cases do not find time to look after other farmers. Since they are individualistic, they do not actively diffuse agricultural innovations. On the contrary, their experience with innovations and their awareness of marketing has taught them that an agricultural innovation is particularly valuable only as long as it is not adopted by many. Individual supervision from Government authorities and businessmen and high prices are only guaranteed as long as the innovation remains exclusive. At this stage it is to be expected that the most progressive farmers will try to restrain diffusion, i.e. through incorrect information regarding difficulties in cultivation and risks involved. They also may try to use whatever influence they have in favour of marketing regulations (cultivation quotas, seed supply restrictions, etc.).

The diffusion process is slowed down because there is little communication of agricultural innovation between the progressive farmer elite and the other farmers. Agricultural innovations are usually rather complex, so that in most cases occasional observations are not enough to enable a farmer to adopt innovations himself. The most progressive have little time or interest for explaining to others in detail the problems and tasks of new cultivation methods. The others do not readily call upon the most progressive farmers because of the social distance between them.

Lastly, the average farmers do not identify with the most progressive. The average farmers believe that the most progressive ones are in a position to adopt innovations because they understand all about these things, they have the necessary contacts and are financially secure. The average farmers feel that their own situation is incomparable to that of the most progressive farmers so that the agricultural innovations adopted by the progressive farmers are irrelevant for them. Thus it is not surprising that the extension services by their method of contacting the most progressive farmers not only diffuse innovations less efficiently, but also aggrevate the income disparities already existing in rural society.

The following graph shows this situation.

Figure 3. Income Development through Accumulative Innovation Processes with the Assumed Diffusion Obstacles.



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An agricultural growth-rate of 4.5% (Kenya) and a population growth of 3.3% (Kenya) by no means solves the problem of population explosion. The rate of growth of 4.5% is very strongly influenced by the most progressive farmers. The situation of most farmers is still getting worse, because for them the rate of income growth lies below that of population growth.

(2) The extension service that chooses as target for its activities the most progressive farmers proves inefficient with regard to the diffusion process of agricultural innovations in developing societies.

THE INTRODUCTION OF AGRICULTURAL INNOVATIONS THROUGH LESS PROGRESSIVE FARMERS

Between 1970 and 1973 a research team from the Institute for Development Studies, University of Nairobi, carried out field experiments to explore whether the extension service would be able to influence less progressive farmers to adopt innovations, given the limited financial resources available for extension. (Jansen 8) These experiments have shown that the less progressive farmers can be engaged successfully through existing institutions to adopt innovations.

First 798 less progressive farmers were chosen, their progressiveness status defined by the number of innovations already adopted with different scores for each innovation and taking into account the time since adoption. On the whole the progressiveness status of these farmers was a little lower than the statistical average for the farmers in the region.

The innovation introduced in the experiment was hybrid maize. About 30% of the farmers in the region (largely the more progressive) had already adopted hybrid maize, but none of the 798 farmers tested had cultivated hybrid maize before. Besides the normal extension activities of the instructors, the subjects were divided into groups of about 50 and taken to Farmers Training Centres. Their instruction at the centres lasted for three days and was aimed at:

(a) motivating the farmers to plant hybrid maize, and

(b) providing them with the necessary know-how to do so.

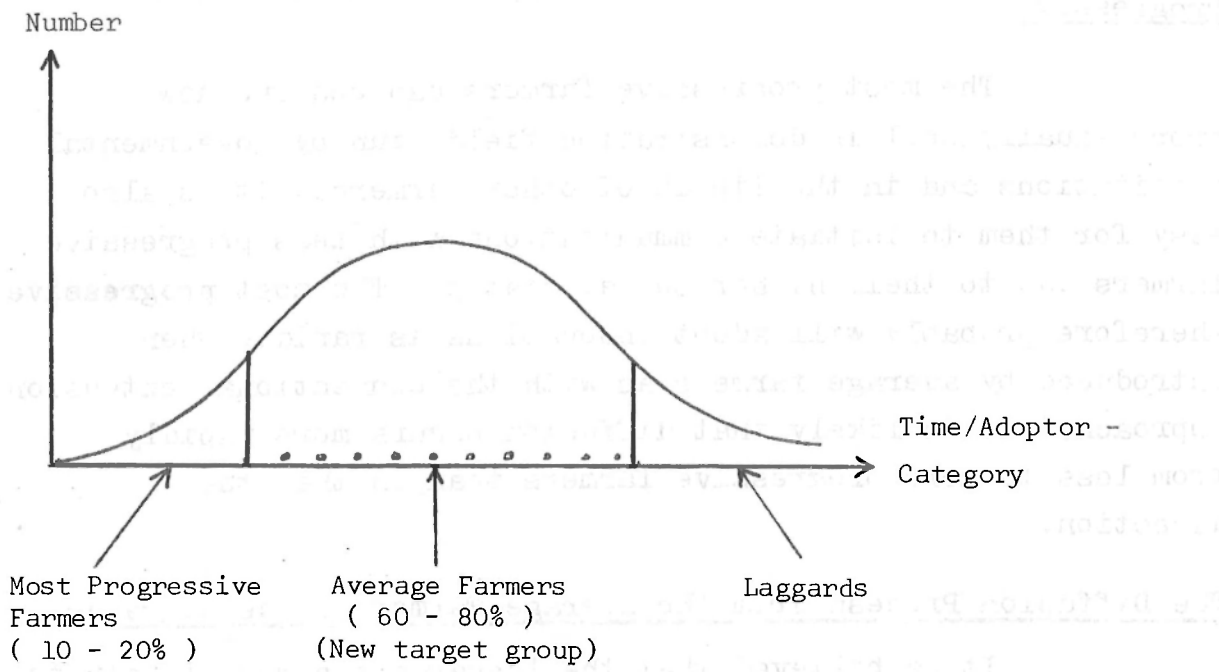
The inputs (seed material and fertilisers) were provided for the subjects in the form of a credit, and the marketing of their hybrid maize crops was assured.

The result of this trial was that 97% of these less progressive farmers were able to cultivate hybrid maize successfully. A final random survey covering about 60 farmers showed that on average during the first cultivation period about three additional farmers were taught by each participant and began planting hybrid maize, even though these later farmers had to finance their inputs themselves. This was empirical evidence that the diffusion process for agricultural innovations is greatly improved when the innovations are introduced by less progressive farmers.

THE DIFFUSION OF AGRICULTURAL INNOVATIONS BY MEANS OF INTRODUCTION THROUGH LESS PROGRESSIVE FARMERS

Based on this innovation concept we have to examine the diffusion processes to be expected if the extension service drops its conventional target group, the most progressive farmers, and focusses its activities on the less progressive farmers. To simplify this examination we will reduce Rogers's five adopter categories to three: Innovators and Early Adopters put together under the category of most progressive, and the remainder (less progressive) divided into average farmers and laggards. Our analysis starts out with the assumption that the extension service has selected the average farmers as its new target group. The following graph illustrates this concept:

Figure 4. Average Farmers - the new Target of the Extension Service.



We have shown that average farmers are capable of adopting innovations directly from outside (extension service) through a packaged application of extension methods, training and input/marketing organisation. Now the diffusion process will be examined in three directions: Among average farmers, from average to more progressive farmers and from average farmers to laggards.

The Diffusion Process Among Average Farmers

Quantitatively this is the most important diffusion process. Colleagues of the same status communicate more intensively with each other, usually with least communication barriers. They identify with each other: Whatever one is capable of doing, the others assume they can do also. Thus the success of one person is more likely to stimulate

competition among others of the same social status. Furthermore, farmers of the same status are subject to more intensive social control from their colleagues, preventing individualisation and separation.

The Diffusion Process from the Average Farmer to the Most Progressive

The most progressive farmers can observe new crops equally well in demonstration fields run by governmental institutions and in the fields of other farmers. It is also easy for them to initiate communications with less progressive farmers due to their higher social status. The most progressive therefore probably will adopt innovations as rapidly when introduced by average farmers as with the conventional extension approach. It is likely that diffusion occurs more rapidly from less to more progressive farmers than in the other direction.

The Diffusion Process From the Average Farmer to the Laggards

It is believed that the laggards are more likely to adopt an innovation from the average farmers than from the more socially distant most progressive farmers.

In conclusion the following hypothesis can be stated:

(3) The extension service can raise its efficiency considerably with regard to the diffusion process of agricultural innovations in developing societies if it succeeds in introducing the innovations through the average farmers.

A NEW EXTENSION PROTOTYPE PROPOSAL

The extension concept described above can be developed into a practicable extension prototype. First we will look into three components of this prototype in more detail.

Selection of Average Farmers

In practice it is very difficult to control which farmers are selected by the instructors. A practicable and relatively reliable selection method is to take clusters of farmers all of whom are neighbours. One can be safe in

assuming that if twelve neighbouring farmers are selected, they represent the majority of average farmers. Another advantage in selecting a group of neighboring farmers is that supervising such a group is relatively easy. The farmers can be instructed as a group meeting in the field of one farmer where demonstrations can be carried out. Then the farmers will return to their own fields and repeat for themselves what they have learned.

The experiments carried out by members of the Institute for Development Studies in 1973 and still going on have proven particularly successful when such groups were not selected by administrators or instructors, but by the villagers themselves during village meetings (Barazas). This involvement of the entire population in an extension programme favours the communication and interaction essential for the diffusion process. Additionally, the selected persons are subject to an intensified observation and control by the village society. This influences their own innovative behaviour positively and also increases the interest of the other village members in the innovation being introduced.

Training of Average Farmers

Additional training is made necessary when the target group is changed from innovative to average farmers to compensate for their smaller experience with and capacity for innovation. This training is carried out by a team consisting of both teachers and instructors. This means the deployment of specialists in adult education (the teachers) as well as in appropriate agro-technical skills (the instructors). Each team should be prepared specifically for each extension project in a one or two week preparation course given in existing farmers training centres (if not available in adult education centres).

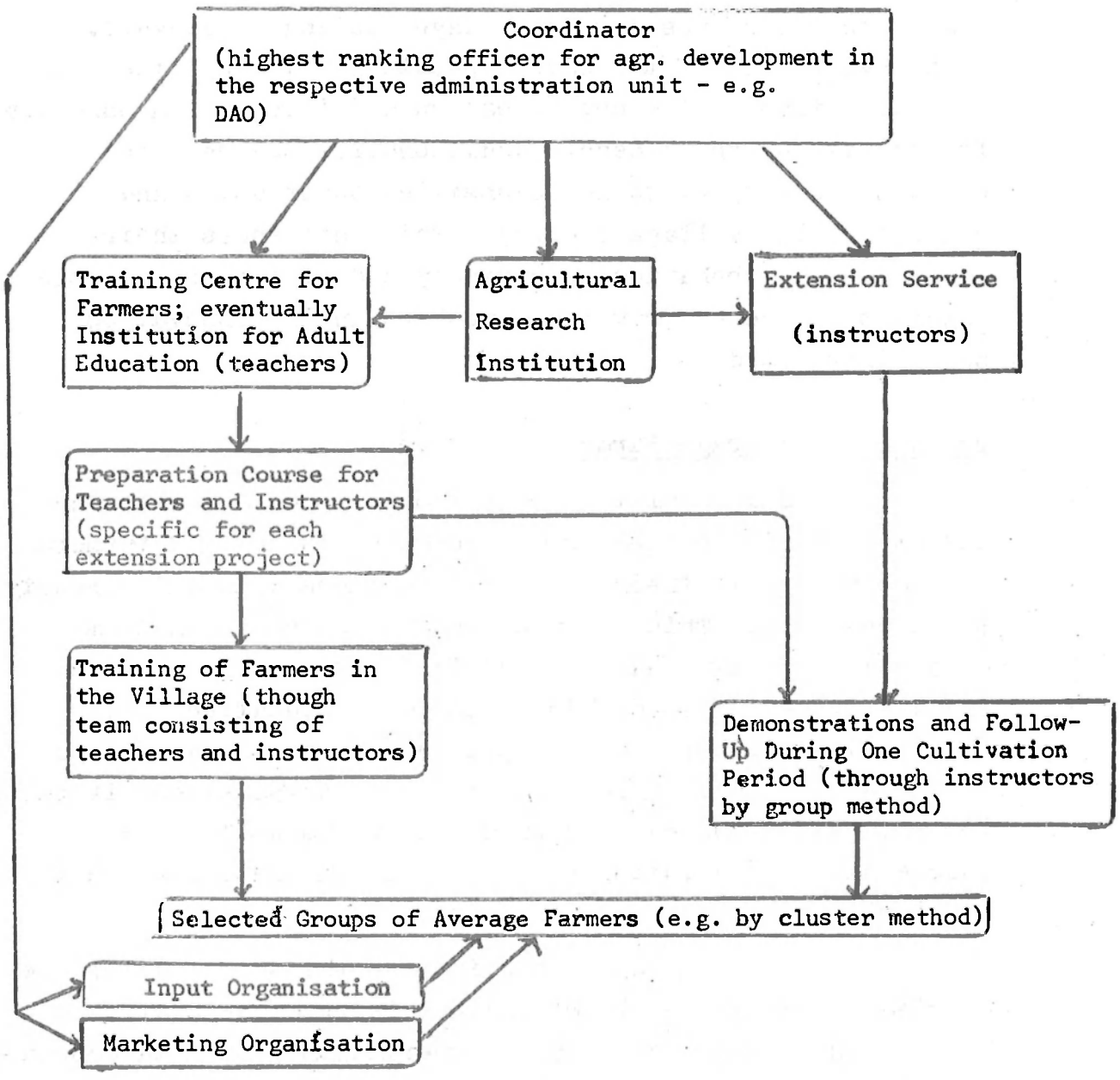
The training of the farmers themselves should be carried out in the villages and not in training centres as has been shown very clearly by experiments with both approaches. In this way more farmers can be reached, the farmers are more highly motivated to join the training programme and it is

less expensive for them and more convenient.

Coordination of Services

The following diagram illustrates the minimum services that are necessary for the change of extension target groups. Other services, such as credits and cooperatives, are useful or even necessary (i.e. credits in the case of innovations requiring extensive capital). These services can only be fully utilised if they are coordinated. Institutional arrangements for proper coordination are therefore necessary for the new extension approach described here.

Figure 5. Structure of the Extension Prototype for the Target Group of Average Farmers.



This prototype was tested empirically by researchers from the Institute for Development Studies during 1973/74 in collaboration with the government administration and training institutions. This was a test of the introduction stage of an agricultural innovation, and the officers, instructors and teachers involved found the new method highly efficient. The testing of the efficiency of the diffusion process is being carried out in a comparable manner with control groups and over a time span of three cultivation periods. The results of these tests will be available for systematic evaluation in 1975.

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