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INNOVATION IN RURAL DEVELOPMENT

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ABSTRACT

The role of agriculture in rural development has recently been overshadowed by discussions about the role of rural industries, small scale business enterprises, growth pole strategies and diversification of other non farm income generating activities.

This paper re-analyses and attempts to establish the need for policies and programmes to accelerate agricultural technological development.

The study reviews the role of government research stations, extension services, mass media channels and training programmes in accelerating technological change whose advantages within a Kenya rural development context are laid out in the first section of the paper.

One the problems highlighted by this study is the fact that there is no adequate or relevant technology or the means to transfer any such technology to the small farmer and also those living in the medium and marginal farming regions of Kenya.

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INTRODUCTION

Rural development in Kenya is seen as a multi-sectoral interministerial, inter-agency, coordinated set of action programmes.

These programmes aim at:

- (a) Improving the incomes of rural people and stabilizing them from fluctuations due to weather, prices, diseases etc. through increased agricultural productivity.
- (b) Improving the welfare of rural households
- (c) Increasing employment opportunities of rural people and arresting the steady stream of people from rural areas to urban centres, through diversification of occupations in agriculture, industry and commerce in the rural areas.
- (d) Increasing local participation in all development activities for all citizens, to increase motivation, belongingness and positive commitment to national development.

Among other things rural development therefore can be seen as a strategy that encourages the introduction of the widest range of programmes to increase farm production through the fostering of better farming techniques by removing all obstacles in the way of the farmer. Some of these obstacles include:-

- (1) Lack of capital to buy farm inputs such as tools, fertilizers, seeds, hire farm labour etc.

- (2) Lack of marketing opportunities for new and established cash crops, and livestock products.
- (3) Lack of good economic alternatives for farmers in some disadvantaged regions of poor farming potential.
- (4) Poor transportation facilities.
- (5) An increased degree of non-farm community activities, removing farmers from their farms even when they are most urgently required. This upsets the timing of farm operations such as early planting (late planting reduces yields by 6% per day after 1st shower), weeding etc. Such community activities include communal labour, barazas attending ceremonies, going to hospitals or market places, self help functions etc.

It will be seen from this list that we have assumed that farmers will accept all technical advice and improve farming if all 5 factors are made right. But as will be seen later, the low rate of adoption of agricultural innovations is one of the major problems in rural development.

If Kenya's rural areas are going to respond to President Kenyatta's call "Back to the land", between 1968 and 1974, these areas should absorb about 80% of the total new entrants into adulthood. That is out of 925,000 new adults, wage employment will only absorb 200,000 and 30,000 will presumably become self employed. The remaining 695,000 would have to be absorbed in agriculture. Kenya's growing population too, will need to be fed and will continue to require more and better quality food.

It is against this background of increasing demands on agriculture that we must ask how can increased adoption of agricultural technology answer our problems? How can it be accelerated?

## I - AGRICULTURAL INNOVATION

### a) Technology Transfer

It has been argued that increased technology transfer to the peasant farm, farm (adoption) coupled with farmer training, farm loans and subsidies, would increase farm productivity. Increased farm productivity, it is agreed, would lead to the creation of more jobs

at the farm level. This would also increase incomes and household level of living, and thus alleviate our unemployment and low income problems. The reasons given are as follows:-

- (i) Increased technology transfer to peasant farms would lead to the introduction of new cash crops which would substantially increase incomes; or the introduction of practices which reduce crop and animal losses, or increase yields for small additional costs. These would stabilize and increase farmers' incomes. As farm incomes increase, farmers would become better off and withdraw from menial tasks, creating a demand for hired labour and thus increasing the population absorptive capacity of rural areas.
- (ii) Some of the technologies introduced would be labour intensive, especially as some cash crops create peaked labour demands at planting and harvesting, such as cotton, tea, tobacco, coffee and pyrethrum. Other technologies create peaked labour demands by increasing regularity of operations. Fertilizers increase weeding and harvest creating increased labour demands.
- (iii) Increased adoption of innovations, especially the adoption of new enterprises increases the range of enterprises per farm. This tends to increase the diversity of tasks performed and under stable wage rates would increase the farm labour capacity.
- (iv) Increased technological sophistication leads to better control over the farmer's physical environment and the possibility of more marginal land being brought into productive use.
- (v) Increased partial and selective mechanization would tend to remove drudgery and boredom from farm operations and attract more youth into farming and arrest the migration to urban areas.
- (vi) Increased farm incomes would increase the "purchasing power" of rural people and attract job creating business into rural areas.

The choice of technology for the farmer is conditioned by his environment and in computing returns, this should be taken into account. Table I shows some of the available choices.

TABLE I THE ENTERPRISE CLUSTER DICHOTOMY IN KENYA

A	1	2	3	4	5
Farm Type	Nomadism &	Semi Pastoral-	Pure	Mixed	Specialized
Enterprise cluster	Pastoralism	alim and Shifting Cultivation	Subsistence Food & Live-stock	Farming	Commercial Farming
B					
Subculture (tribe)	Masai Samburu Boran Rendille Turkana Galla Somali Pokot Suk Gabra El Molo Tugen Marakwet	Dry land Kamba Evuvori Mbere Tharaka Some Somali Kuria Pokot Masai Taita Digo Giriama Rabai	Found as developmental categories among:	Kikuyu Embu Meru Kamba Luo Baluyha Miji Kenda Taita Kipsigis etc.	
C					
Range of Innovations	<u>Animal Husbandry</u>		<u>Crop Husbandry</u>		
1.	Awareness of need to tailor number of animals to carrying capacity of the land.		Soil conservation and fertility build up, Crop spacing, thinning and plant population/water balance control.		
2.	Rotational grazing, resting grazing land.		Row planting & weeding regimes.		
3.	Improved pastures		Seed selection, seed dressing. Seedbed preparation. Timing of planting operations.		
4.	Fodder production		Farm planning & record keeping.		
5.	Rational use of water points		Mulching, weeding rates Pesticide, fungicide		
6.	Use of drugs - vaccines, dipping and de-worming agents.		herbicide and fumigants use.		
7.	Elimination of unproductive animals				
8.	Purposeful breeding				
9.	Use of artificial insemination				
10.	Purchase of productive animals				

Range of Innovations

Animal Husbandry

Crop Husbandry

- |   |   |
|---|---|
| 11. Hygiene in milk production                                | Ridging, terracing, furrow making .                   |
| 12. Cropping animals for sale.                                | Crop drying, threshing, grading and packaging.        |
| 13. Hides and skin preparation.                               | Crop storage, store construction and storage hygiene. |
| 14. Identification of livestock diseases and reporting.       | Pruning, grafting operations.                         |
| 15. Calf feeding and weaning.                                 | Irrigation technology etc.                            |
| 16. Feed selection, feed mixtures<br>Care of in-calf animals. |   |
| 17. Bush clearing etc.  |   |

(b) Returns to Adoption of Improved Technology

1. Katumani Maize Programme

An effective adoption of Katumani synthetic maize for the dry areas (over 80% adoption) would ideally reduce moisture requirement of the main staple - maize - from 12" per season to about 7" per season. Rainfall probability calculations for most sites in this zone show that this would reduce the incidence of crop failure and food shortage from 1:3 years to 1:8 years. This means a reduction of crop failure and food shortage rate from 33-1/3% to 12½%. What does this mean for famine relief?

Assume in District X, 50,000 people out of a population of 350,000 receive relief foods. Assume the cost per person is =/50 (fifty cents) per day, then:

Daily cost of relief:  $50,000 \times 50 = \text{Shs } 25,000$   
1 drought/season 6 months  $25,000 \times 6 \times 30 = \text{Shs. } 4\frac{1}{2} \text{ million}$   
Cost of transport + administration +  
storage  $= \text{Shs. } \frac{1}{2} \text{ million}$   
Shs. 5 million

In the long run, successful introduction of Katumani cuts this by 20-5/6% = Shs. 1.04 million.

Farm savings on seed  $50,000 \times 50 \times 30 \times 6 \times 20-5/6 = \text{Shs. } 957,500$

Total savings: 1,040,000/- + 957,500/- = Shs. 1,997,500 app. Shs. 2 million

Cost of Katumani programme per season (including extension, transport, production + building + depreciation, less returns from seed sales)

= Shs ½ million

Total savings/season in District X = Shs 1½ million

The same exercise could be carried with the adoption of hybrid maize, fertilizers use, insecticide use, early planting of cotton, cattle dipping, etc.

Famine relief should be seen as a programme which "dams" would-be beggars, unemployed rural emigrants and all those rural people whose stable way of life has been shattered by environmental calamity. The Katumani maize programme is a long term programme which replaces famine relief and reduces the potential for this human flood into urban centres and also saves the country capital for further development.

## 2. Income Gains Through Choice of Farm Technology in Central Kenya

TABLE II DIFFERENCES IN YIELDS AND GAINS FOR VARIOUS MAIZE PRACTICES

<u>Practice</u>	<u>Average differences in yield (bags/acre)</u>	<u>Gain per acre between treatments</u>
1. Early planting vs Late planting	9.3	325/50
2. Plants/acre	3.6	110/=
3. Type of maize (locals)	4.4	142/=
4. Frequency and depth of Weeding	1.2	22/=
5. 250 lb/acre single super phosphate	2.7	62/50
6. 270 lb/acre ASN	0.3	-69/50

Source: A.Y. Allan "Good Husbandry in Maize Growing"

K.F.A. Bulletin No. 7 1967 Weekly News 17.2.67.

Gain estimates @ 35/= /bag minus additional cost.

(c) - Non Adoption as Stable Phenomenon

Even with a very limited innovation range in Kenya, it has been shown that the adoption rates of farm technology are very low. Farmers do not appear to take up new ideas as quickly as is often assumed. Below are some examples. Table III indicates the level at which some very old innovations still remain unadopted by the majority of the small farmers.

In Nyeri, a high potential area, the non-adoption of grade cows, coffee, tea etc., by over 50% of the farmers is actually contrary to conventional wisdom. In Eastern Kenya the adoption of the early maturing Katumani maize would reduce the incidence of crop failure from 1:3 years to 1:8, a more normal situation for Kenya. The reduction of misery, starvation and the saving of money due to a more stabilized food supply would lead to accelerated development in this area. Yet of the total maize acreage, only 28% is planted to Katumani maize.

Non-adoption of programme is not serious, only at the farm level. Our research shows that in Eastern Kenya, over 80% of the community programmes introduced between 1948 and 1958 outside community self-help projects were never adopted. Among the livestock keepers, the adoption of new ideas, especially those related to settled farming or ranching, is very low. Studies done on the development of the Kaputiei group and individual ranches, for example, showed that after 5 years, of settled ranching a severe drought was enough to cause all Masai to abandon their permanent houses and their ranch land and return to a nomadic life in search of pasture and water.

Non-adoption of agricultural technology is caused by a complexity of factors which we are still studying and will not be exhaustively discussed in this paper.

TABLE III ADOPTION OF EIGHT INNOVATIONS IN NYERI\*

How long have you been planting crops, keeping grade cows, pigs?	Grade Cows	Coffee	Hybrid Maize	Pigs	Macadamia	Pyrethrum	Tea	Certificate Potatoes
Non Adopters	49%	54%	69%	70%	79%	88%	90%	97%
1 year ago from 1971	3	0	8	3	1	1	0	0
2 years ago from 1971	5	0	8	6	5	1	1	1
3 years ago from 1971	4	1	7	3	10	1	1	1
5 years ago from 1971	10	2	7	8	5	2	3	1
10 years ago from 1971	14	31	1	6	0	7	4	0
20 years ago from 1971	12	10	0	3	0	0	1	0
30 years ago from 1971	3	2	0	1	0	0	0	0
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%
Total Cases	354	354	354	354	354	354	354	354

\* Taken from Ascroft et al 1971.

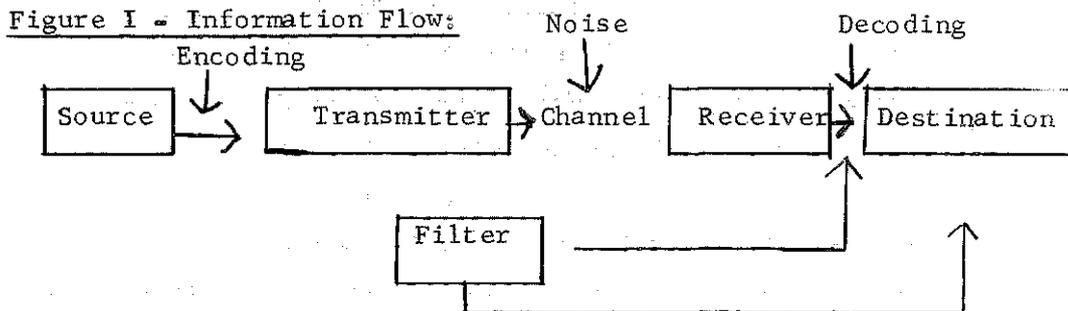
TABLE IV ADOPTION OF FOUR INNOVATIONS IN EASTERN KENYA

Do you follow the named practice in your Farm? Sublocation	Plant Katumani seed for all maize Crops	Plant Pure Stand % farmers	Plant Early % farmers	Use Sprays, Dusts
Shiakago	30%	12%	68%	6%
Karaba	25%	20%	24%	14%
Kimutwa	30%	9%	38%	4%
Tshiarra	-	10%	42%	3%
Riakamau	28%	8%	26%	8%
Average %	28	12	39	7
Total cases	259	259	259	259

## II - FACTORS CONSTRAINING THE ADOPTION OF TECHNOLOGY.

### The Communication Model

Communication theory gives a model of information flow where a source produces signals, symbols, or messages which are encoded in a language or form understood by the receiver and transmitted by a channel connecting the transmitter and the receiver.



The channel carrying the message and the encoding and decoding processes interfere with the transmitting process so that the message received differs from the intended one. Noise is the amount of transmitting error which is corrected by use of filters.

This model suggests that the following factors are constraints to the efficient flow of information from the research station to the farmer, and reduce the adoption rate of farming technology.

- (a) The nature of the message "innovation". If the research is designed on the basis of scholarly interest or in pursuit of interesting facets brought out in a chain of researches in Kenya, etc. then the findings may not be relevant or focused on high priority issues as farmers perceive them.
- (b) The language used in disseminating the research may not be understood by grass root extension staff or by farmers themselves.
- (c) The media or channel used to convey the message may be directed at a receiver whose attributes are such that there is no effective contact established with the small farmer. For example, an extension service with poor grass roots contacts may be such a channel, or the use of academic journals or English broadcasts may be another.

- (d) The interaction effect of a faulty channel reaching an expectant receiver or vice versa may lead to the alienation of both parties. The historical techniques of forced agricultural campaigns where the channels were administration chiefs and their police, forcing the adoption of better practices on to the farmers, has led to the creation of very negative public relations between extension services and farmers.
- (e) Receivers must be tuned to the wave length of the message which is influenced by the choice of transmitter and channel. Farmers do not have the same receptive capacity. Some farmers are illiterate and poor, have very small farms and large families. Others are rich, educated and progressive. The transmitter and channel must be selected to vary the message for receptivity by the various groups. At present, in Kenya, farmers are assumed to be homogeneous, and to have equal receptivity. Farmer training uses some techniques and content for small and large, progressive and laggard farmers. Extension agents use the same arguments on all farm visits.

Using the above model, we will review the major facets shown in the diagram. In the study of adoption of innovations, we cannot assume that the technology exists in the right form, or even if it is, it has been made available and it is only due to socio-economic constraints at the farm level that it has not been adopted.

A focus on the "socio-economic constraints" offers very low mileage since every aspect can be at the same time a constraint for adoption of one innovation and an incentive for the adoption of another. For example, it can now be shown that most communities who refused colonial programmes and were termed "conservative", "lazy", "apathetic" are the same communities adopting these programmes at greater sacrifices under Harambee self-help.

Therefore, approaches found to be important to the adoption of innovations are those which relate source of technology, nature of technology, channels and media of communication to the recipient system.

#### (1) Source of Technology

In Kenya, the main sources of technology for farmers and extension agents are Government research stations. These are normally self-contained institutions which have little or no ties with the extension service

except on a consultancy basis. Other sources are commercial firms such as Twiga Chemicals, the University and Egerton College and the Statutory Board's Research Departments, as well as EAAFRO at Muguga.

(i) How do Farmers Perceive these Sources? Research on attitudes and adoptive behaviour of farmers near research stations and those far away shows striking differences. Farmers who live near Embu and Katumani research stations, for example, were found to have lower adoption rates of hybrid-synthetic maize (the main research programmes of the two stations) than those who lived 20-100 miles away. Farmers felt that the research station was for 'wazungu' where "they do things like Wazungu used to do. They use 'Wazungu dawa' - fertilizers; they use tractors (we cannot afford them); they use aerial irrigation when things are tough (we wish we had the money) and keep too many books and records (who has the time?) They employ so many people their fields are overcrowded at planting and weeding times..." A follow up on some of the farmers who had attended a field day at one of the stations showed that they keenly felt the lack of relevance of the scale of operations at the research station to the small farms. "What they showed us is not really for my farm". The programmes were not divisible or adaptable as the officers emphasized "optimal combinations of resources" to "maximize output" without addressing themselves to the chronic scarcity of some resources at the small farm level. "Do you know, for that small pegged field that young man with glasses said they had put two bags of that expensive dawa and he suggested we do it on our fields! Where does one get that kind of money and how can we be sure the rains will come since we do not have that nice irrigation fountain?" To the rural farmer Kenyan research stations are ivory towers, useful as employment agencies, and good government shambas.

The use of the research station as a source for direct dissemination of technology is very poor. Where farmers have never seen a research station but receive information direct from extension agents or demonstration plots, the message is more neutral and farmers' basic cognitions vis à vis the technology are also simpler.

(ii) What Messages are Sent by our Research Stations? In his review of Kenya's Agricultural Research (Bhandari (1968) shows that Kenya's research has focused mainly on increasing farm income in the large scale sector and in the high potential areas. Thus, between 1914-1940, the research programme emphasized the introduction, field trials and agronomic research for the main cash crops such as coffee, cotton, sugar, pyrethrum, tea and maize.

Breeding research which began in earnest in 1955 focused on wheat, hybrid maize, livestock and A.I. and sugar cane and pasture research. Physical science research has been on very limited localities. For example, exhaustive soil surveys and full scale fertilizer trials have been carried only on two soil types in the Trans Nzoia (Havelock: 17:1971).

The gaps are obvious:

(a) Research for the small peasant farm which has a strong subsistence base and a small or non-existent cash crop base has been missing. Research on certain major food crops such as sweet potatoes, pigeon peas, bullrush millet, and small scale cash crops such as corriander, green grams, castor, miraa, etc. has received low priority.

(b) Research findings have been tailored for the large scale and not small scale farmers. Thus one finds research recommendations in quantities per acre and bulking of inputs in large quantities such as cwts., bags, drums or as 40 h.p. tractors, X horsepower water pumps etc. For a farmer who simply wants to grow  $\frac{1}{4}$  acre crop or  $\frac{1}{2}$  acre mixture of pulses and cereals there are no recommendations or available supplies or even appropriate machinery.

(c) The messages sent out from research stations are mainly tailored for large scale educated farmers, other researchers or overseas audiences. Articles are often sent to academic journals and never translated into a language understood by the small farmer.

## (2) Farm/Farmer Factors

(i) Farm Size: It has been shown that among rural peasant farms, government services, visits by extension agents, qualification for government loans and adoption of new technology are very highly correlated with farm sizes. Research in Tetu for example shows that extension officers visit most frequently only the 10% top farmers who are more educated, have larger farms and are more cosmopolite.

(ii) Social Status, Wealth and Prestige: These concepts are oriented toward the community values. In progressive agricultural communities in Kenya, those who monopolize social prestige are relatively wealthy and have or aspire to higher social status, tend to be opinion leaders and are also "progressive". On the other hand, although those who have social status, wealth and prestige in non-progressive semi-pastoral and pastoral communities, are opinion leaders, they tend to fill the role of tradition keepers too. Thus we find they measure wealth in number of livestock, women, children, land, harvest of food crops and channels of reciprocity. They are thus interested in maintaining the status quo.

(iii) Education: In our studies, formal education does not correlate at the lower and higher levels with innovativeness. The critical threshold appears to be numeracy rather than literacy. After 6 years of education, we find a retrogressive influence of education where substitution of farming to wage employment, trade, or other non-farm occupations cumulates.

(iv) Availability of Inputs and Services: The question of farm credit, markets, subsidies, etc., important in our discussion here are being considered elsewhere.

(v) FTC Training and Outside Contacts: Ascroft (1971) and Moris (1970) have shown that past employment experience in agricultural farms, travel outside the village to attend demonstration field trips and FTC training show some of the highest intercorrelations with progressiveness or high adoptive behaviour.

### (3) The Nature of the Technology

(i) Profitability: The extent to which an innovation is more profitable than existing practices has been shown to influence the rate at which all types of farmers adopt it. Profitability is obviously related to the cost of inputs, prices, and also the element of risk. In Embu for example, farmers who had a choice of growing tobacco and cotton phased out their cotton after two seasons as tobacco, though more capital intensive and "complicated to grow" was more profitable.

(ii) Complexity and Divisibility: Our studies on innovation (Mbithi 1971) show that innovations which are tied up in complex packages such as hybrid or synthetic maize or cotton are more difficult to adopt successfully. When one must do ten different intricate and expensive operations to grow a crop,

one normally chooses the crop that has fewer operations or reduces (divides) the operations. In growing synthetic maize for example, one must plant early before rains (you need to own a plough to do this), buy seed from the Kenya Seed Company and dress the seed with an insecticide (need money); plant in rows at a spacing of 3' x 1' or 3' x 2'; use phosphatic fertilizers with the seed, weed frequently, dust or spray young crop, thin crop and till gaps, spray with fungicide if necessary, etc. etc. It was found that farmers simply buy seed, plant late in a mixture with beans, sweet potatoes, cow peas, weed whenever they have time and wait for the crop to mature.

(iii) Compatibility: The degree to which the new technology (whether it be a new tool, crop or technique) does not threaten inputs available for food crops affects the rate at which it is adopted. Kenyan small farmers must produce food for their families due to (a) low farm incomes, making it impossible to support families on bought food and in addition pay school fees, taxes, etc.; (b) poor distribution of food, especially in poor seasons; (c) dominance of female labour and decision making on family food production and supply where traditionally women do not obtain wage employment.

#### (4) The Extension Agent

(i) Centralized Planning: Lacks feed back and the preponderance of Nairobi tailored programmes with set targets reduces the change agents ability to identify real farmer priorities. It also reduces the ability of the change agent to adapt programmes to local conditions. It further alienates change agents from his community as he often does not pay local influentials the right amount of homage. Such centrally planned programmes have low credibility

(ii) Training of Change Agents: The Kenyan educational system which produces graduates who are not trained to fit into rural communities often produces change agents with little empathy with the small farmer and his problems or needs. They often are members of our emerging elite who interact more with their counterparts, the rural elites - politicians, progressive farmers, school teachers - and rarely visit the small illiterate farmer. As shown earlier, this kind of extension contact accounts for only 10% of the rural farmers in the small scale sector and leaves 90% unattended.

Ascroft and Roling (1971) have shown that the average extension agent in Kenya is well trained in technical skills, but knows nothing about communicating ideas to the farmer. They cannot create a motivation for farmers to adopt or manufacture an optimal learning environment. They simply pass the message. Our studies have exposed a teacher-school children approach and a prevalent paternalistic arrogance of extension and administrative officials in their contacts with rural people. This tends to alienate change agents and reduce the effectiveness of communications.

(iii) Level of Training of Extension Agents: In a progressive mixed farming community, farmers expect an agricultural officer to give technical advice on a chain of farming enterprises, such as dairy, poultry, pigs, maize, beans, bananas, potatoes, tomatoes, sweet potatoes, cabbages, coffee, commercial table flowers, french and Mexican beans and so on. It is most unlikely to find an agricultural officer with adequate technical knowledge in all these enterprises. He might know something about each one, but not enough to be of any help to farmers.

The situation is further worsened by our agricultural extension administrative system. The District Agricultural Officer (D.A.O.) is as much of an administrator as he is a technical adviser. In addition the D.A.O. has a large staff working under him. When the D.A.O. is out in the field, he simply supervises and checks on what his subordinate staff have done. Consequently farmers do not get as much technical advice as they need to change their farming methods. The grass root staff, the Junior Agricultural Assistant (JAA) is not sufficiently well trained to interpret research station findings for the farmer so that the farmer can adapt it to fit his circumstances.

(5) Community Social Factors

Students of collective action show that group and individual participation is enhanced when the definition of their world - a world that is full of definite cognitions, values and beliefs - is consistent with the prescribed actions and prescribed sacrifices which are necessary to achieve some valued goal. Even non sociologists acknowledge the power of social control. Each one is bound to his society by prescribed forms of behaviour, and deviancy evokes punishment.

These social pressures are common where agricultural practices are concerned. Among livestock keepers, the "cattle complex" psychologically pressures one to maintain the status quo. One single change threatens to upset a balance upon which social values, livelihood and religious taboos are based. For example, agreeing to set up an independent ranch affects kinship and neighbourhood initiation rites, rules of reciprocity, age set solidarity, respect of the ancestors who set the old ways, etc.

Among farming people, we have exposed parallel indigenous agricultural practices. There were religious rituals for seed selection, timing of planting, seedbed preparation, weeding, pest eradication, harvest and storage. In my study (Mbithi 1968), I found that farmers did not live in a technological vacuum but had prescribed behaviour for all operations. These were interwoven with existing sex taboos and role specialization age dominance taboos. Thus there were operations such as ground breaking which reinforced and dramatized the masculine ego in a family. Others such as child bearing and cooking reinforced the femininity of women, their uniqueness and belonging.

The thesis advanced here is that new technology replaces indigenous practices and shatters the rubric of family and community life. New ideas are not sown in neutral ground but in an environment where the safeguarding of vested interests and a "way of life" is very conspicuous.

Change agents have often failed to sense these undercurrents and the adoption of new practices has often been temporary. In introducing change, we should be aware of these indigenous alternatives and present arguments to counter them rather than leave the farmer to grapple with them.

### III - SUMMARY OF FINDINGS

1. The source of small farm technology, the government research station is still considered by most farmers as an ivory tower, an expensive and fancy government shamba.
2. Research findings are often prepared for the large scale farm. Research recommendations are applicable to larger units. The packaging of inputs according to the recommendations is often on too large a scale for the farmer who wishes to grow only  $\frac{1}{2}$  acre of the particular crop. Research shows the packaging of fertilizers in cwt. bags discourages the small farmer who neither has the money nor the acreage to use such large quantities.
3. Dissemination of technical information is often aimed at educated farmers academic audiences and is in a language ill-understood by the grass root extension staff.
4. The District Agricultural Officer plays too much of an administrative role and the contact change agents, the Junior Agricultural Officers, are unable to advice farmers across a wide range of enterprises. Also these JAAs are not sufficiently trained to help farmers adapt the available technology to their circumstances.
5. Due to many social factors and the operation of the principle of homophily, change agents visit the top farmers more frequently and these are the ones who tend to obtain loans, and adopt innovations faster.
6. Formal education is not a critical factor in the adoption of innovations but farmer education, travel, participation in field demonstrations, numeracy and farm size are critical factors.

7. Innovations which are presented to farmers in complex packages of recommendations are more difficult to adopt.
8. Availability of credit and market outlets are great incentives to farmers for adoption of agricultural technology.
9. The choice of profitable compatible innovations is a crucial precondition for the adoption of innovations by farmers.
10. Centralized planning and supervision where grass root change agents are given targets and deadlines minimizes the role of feedback, continuous programme evaluation and adaptation and causes change agents to falsify reports and dramatize meagre achievements.
11. The grass root agricultural extension agent in Kenya is not trained in communication strategies and by virtue of his formal training has little empathy with the poor non-progressive farmer.
12. New ideas to farmers are not sown in a vacuum, but compete with existing indigenous practices, values, cognitions and beliefs. A transformation approach in the short run is likely to be less effective than phased development where indigenous practices are a base for new break-throughs.
13. Farmers still give high priority to the growing of food crops and this limits their choice of alternative technology.
14. Farm inputs such as fertilizers, seeds, insecticides and artificial insemination are often not supplied to agents or transported to remote areas in time.

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