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# SMALL SCALE FARMING AND THE WORLD FOOD PROBLEM: AN APPRAISAL WITH LESSONS FROM NORTHERN NIGERIA

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Shortfalls in food production and increased incidence of malnutrition are both familiar characteristics of many developing countries. While grain supplies have increased on the world level (mostly due to favourable growing conditions and bumper harvests in North America and the Indian subcontinent), large food deficits are still projected for many developing countries (World Bank). It is apparent that food production in developing countries is not keeping pace with demand.

It is now generally accepted that developing countries, if they are permanently to meet their food demands, will have to rely on their soil, their other resources, and their farm economies. Many developing countries, with the assistance of international bodies, are now embarking on various strategies to attain food independence. However, considerable confusion continues as to the most effective way of meeting national food needs. There is still confusion and uncertainty as to whether increased agricultural production should be achieved through a complete overhaul or replacement of existing farming systems or through their modification with the aim of making existing systems function more efficiently.

Efforts to replace existing farming systems have to a large extent laid emphasis on rapid agricultural growth through large scale capital intensive production schemes. The frequent inability of many of these types of schemes to meet growth targets, and the increasing amounts of inequality associated with them, are causing considerable concern (Nkom). At the heart of this concern has been a growing awareness that in the majority of low income countries, even in those displaying the most successful records of growth, strategies of change have failed to meet the most basic objective of economic development—the reduction of poverty (Matlon).

The failure of this rapid growth, or "top down" approach to increasing agricultural development in developing countries (Hardin), has resulted in a rethinking of the appropriate strategy to pursue. Increasing emphasis is now being placed on modifying rather than replacing existing farming systems to meet national food and equity goals. This approach is often referred to as being "bottom up."

In this paper we seek to examine the potential of the "bottom up" approach to increasing agricultural production and to identify obstacles inherent in it. Although the focus of the paper is on technologies currently existing or being introduced in northern Nigeria (a semiarid zone), we hope that the lessons from our analysis will prove useful in other parts of the world.

## Farming Systems in Northern Nigeria

The bulk of agricultural production in northern Nigeria is undertaken by small scale farmers. Most of the labour force, management, and capital originate from the household. Output is usually consumed on the farm or traded in local markets. Although the decisionmaking process is hampered by imperfections in marketing and political institutions, there are indications that there are considerable logic and rationale behind the way the small scale farmers live and grow their crops (Abalu and D'Silva).

The existing farming system is, however, incapable of meeting the food requirements of the country. This fact is highlighted by a huge food import bill. Food imports have increased dramatically from nearly 44 million naira in 1963

to over 468 million naira for the first six months of 1977 (Abalu and D'Silva). The need for a workable strategy to increase agricultural production and diminish poverty is therefore very obvious.

### Small Scale Improved Technology

A vast amount of improved technologies is already available and being used in many parts of the world. It is now generally accepted that adoption, however technically feasible, often proves to be inappropriate in terms of equity in the distribution of the benefits between households and families.

National planners and international donors are becoming increasingly committed to the idea of "growth with equity." Matlon reports, however, that in spite of this new commitment, efforts to incorporate equity as an operational planning objective have often floundered due to insufficient knowledge of how to design, implement, and measure the attainment of equity oriented policies. In the rest of this paper, we examine the potential of some equity oriented technologies in northern Nigeria and identify the obstacles to implementing them.

Two levels of technology are examined—a traditional level and an improved level involving small scale farmers. Data used in the analysis are based on surveys involving two groups of farmers from villages in the area. Technologies aimed at improving the income and poverty situation of small scale farmers were made available to one group of farmers and not to the other. The difference between the improved and traditional technologies lies in the improved seed variety used, the application of recommended amounts of fertilizer, the adherence to planting specifications, and the timeliness of farm operations.

Without minimizing the well-known limitations of production function analysis, the impact and potential of the improved level of technology is analysed by treating total factor productivity as an index number, and computing it as a shift in the production function. The traditional level of technology is chosen as a base for comparison. Production functions for maize, sorghum, cotton, and groundnuts were estimated using the Cobb-Douglas form. Rates of change from the traditional level of technology were then calculated. (See Abalu for details on the procedures used in the calculation.)

### Empirical Results

The average levels of output and inputs under the two levels of technology under consideration are presented in table 1. Ordinary least squares were employed to estimate the production functions. The coefficients appearing in each of the regression equations are given along with their standard errors of estimate in table 2. The corrected square of the coefficient of multiple correlation and the sample size are as given in the table. The rates of change from the traditional level of technology to the improved small scale technology are presented in table 3, together with estimates of output per man-hour that were obtained as a result of the change in technology and the value added net of the change in technology.

The results from table 3 suggest that a "bottom up" approach to increasing agricultural production has good potential in the Nigerian context. Adoption by small scale farmers of these equity oriented technologies implies a rate of technological change of 33 percent for maize and groundnuts, 36 percent for sorghum, and 61 percent for cotton. These figures represent impressive improvements and suggest that there may not necessarily be a conflict between growth and equity in increasing agricultural production in the area.

However, experiences from northern Nigeria suggest that efforts to incorporate

Table 1. Average levels of output and inputs under traditional and improved technology levels

Variable	CROPS							
	Maize		Sorghum		Cotton		Groundnuts	
	Tradi- tional	Impro- ved	Tradi- tional	Imro- ved	Tradi- tional	Impro- ved	Tradi- tional	Impro- ved
Output (kg)	924.87	1201.69	1272.52	1088.21	633.56	1178.11	426.77	1178.11
Capital (ha)	0.40	0.43	2.02	0.81	1.94	1.57	0.49	0.52
Labour (man-hours)	162.63	149.5	316.00	252.32	459.37	648.50	342.50	285.32

a) Land in hectares was used as a proxy for capital due to high correlation between capital and land.

Table 2. Estimated coefficients of production functions for improved technology levels

Independent Variable	Crops and Coefficients <sup>a</sup>			
	Maize	Sorghum	Cotton	Groundnuts
Intercept	154.20*** (.36)	16.21** (.51)	7.33** (.19)	10.28** (.48)
Capital	0.04 (.27)	0.57*** (.19)	0.34** (.19)	0.58*** (.11)
Labour	0.41*** (.15)	0.76*** (.21)	0.75** (.15)	0.76*** (.19)
R <sup>2</sup>	.12	.44	.64	.67
n	39	43	60	27

Note: Standard errors in parentheses

\*\*\*Significant at the 1% level; \*\*Significant at the 5% level

\*Significant at the 10% level

Table 3. Technological change and labour contribution to output growth for maize, sorghum, cotton and groundnuts

Crops	Technological Change (%)	Labour Contribution to increased output <sup>a</sup> (kg/man-hour)	Value added net of Technological change <sup>b</sup> (kg/man-hour)
Maize	33	8.03	6.04
Sorghum	36	4.31	3.16
Cotton	61	1.82	1.12
Groundnuts	33	1.84	1.38

a) Average output per man-hour obtained as a result of the shift in the production function.

b) Corrected value added net of technological change. Estimate represents increase in output per man-hour attributable to increase in other factors of production.

the small scale farm sector into this type of strategy have met several obstacles, prominent among which are obstacles with regard to implementation. In the next section, we examine some of these obstacles.

### Obstacles to Implementing Improved Small Scale Technologies

The rationality of farmers, at least of those in northern Nigeria, is not in doubt (Abalu and D'Silva). If a suitable technology is developed, if it adds greatly to the yield, and the added yield can return a relatively secure profit beyond the enhanced costs of the new technology, farmers would adopt the technology provided that the following other requirements are met (Hays and Norman):

1. Technical feasibility--the technology must be capable of increasing productivity given the technical elements.
2. Economic feasibility, dependability, and compatibility with the farming system--the technology must be profitable and exhibit a level of risk the farmer can accept as well as have attributes which enable it to fit into the farming system.
3. Social acceptability--the technology must be compatible with community structures, norms, and beliefs.
4. Infrastructure compatibility--the technology must have attributes which can be accommodated by the present level of infrastructure.

The technologies we have described above would appear to meet the first two requirements. However, efforts to implement them have floundered in the past because national planners and donor agencies have had insufficient knowledge about the operation of community structures, norms, and beliefs, and have been unable to provide adequate infrastructural support systems.

These community structures play a crucial role in the success of equity related technological change. Northern Nigeria has a strong hierarchical and stratified community structure dominated by a few local officials responsible to traditional rulers. Consequently, the success or failure of equity related development will depend to a large extent on how successfully the effort performs within existing social structures. The difficulties in working within existing structures are often so great that many agricultural planners and donor agencies have, by default, gradually but conspicuously moved their emphasis away from equity and toward growth. For example, initial attempts to achieve both equity and growth in an agricultural development project in northern Nigeria have ended up concentrating most effort on "progressive farmers," since it is not the project's responsibility "to start social revolutions" (Huizinga).

The second obstacle to successful implementation of equity oriented technologies has to do with the provision of adequate infrastructural support systems. Even if the technologies were technically and economically feasible, difficulties of implementation would arise unless a set of infrastructures compatible with the technologies evolved. The infrastructures in the area have failed to provide adequate support for the technologies being developed. The quality of market channels is still hampered by lack of timely information, lack of grading and standardization of agricultural products, lack of storage facilities, and poor communication. Extension efforts have largely been imported versions of successful efforts created elsewhere to provide answers to problems and aspirations of farmers who already had access to land, social status, and political and economic power. In northern Nigeria, where the average farmer does not

live much above a culturally determined subsistence level and has little economic and political power, the end result has not been very promising (Abalu and D'Silva).

Farmers will also be encouraged to adopt a new technology if they are reassured that they will receive the necessary new inputs at the right places and the right times, and if the financial resources they need to pay for the improved technology are available when they need them. Recent studies in northern Nigeria indicate that there are major problems inherent in the input distribution systems, prominent among which are problems of procurement and equitable distribution (Huizinga). Inadequacies in all these infrastructural elements have contributed to the failure of even well-meaning equity related agricultural projects.

### Conclusion

In this paper we have attempted to examine the feasibility of rapidly increasing agricultural production in northern Nigeria through the small scale farm sector. Our analysis suggests that equity related technologies have good potential for increasing food production in the area even if they are "bottom up" in their structure. There are, however, many constraints to this "bottom up" strategy, the most serious of which appear to be those related to social and infrastructural compatibility. These constraints would need to be removed if equity related development projects in the area are to be able to achieve their welfare objectives.

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Abalu and D'Silva present evidence to illustrate the gains in productivity and equity to be expected from introducing simple technological changes within the reach of the small scale farmer. They show that by using timely planting, improved seeds, and fertilizer, a small scale farmer can substantially raise the output of various crops. It is then suggested that if thousands of small scale farmers employ these simple technical changes, they can produce substantial food surpluses which will not only help alleviate the world food problem, but will also help reduce inequities in income distribution. This proposition sounds very appealing and plausible, but the authors themselves immediately start complaining about the problems involved in the implementation of the programme.

While I agree with their submission, it does not go far enough. We are all witnesses to the dramatic performance of the small scale cocoa farmers in Nigeria and Ghana and the groundnut producers in Senegal and Nigeria. Why have the successes of the midfifties eluded our food producing farmers in the seventies? I suggest as reasons: the neglect of the farmers by policy makers who preferred to hold down domestic food prices; the lack of incentive for farmers to stay and work hard on farms when apparently less effort in urban areas yielded what appeared to be better standards of living; the progressive decline in the number of farm labourers; and the lack of capacity on the part of the farmers to plan and manage large scale farms. In their anxiety to satisfy the wishes of the politically articulate urban pressure groups, policy makers opted for large scale state owned farms that were badly managed with woeful results. They compounded the problems by allowing imports of food crops like rice and maize to compete with local production. Thus rather than improve the rural infrastructure, Nigeria spent huge sums on food imports to alleviate the suffering of the city consumers. It has been very difficult to assure farmers a reasonable share of the economic boom in the country and the younger ones have deserted the countryside.

There is no doubt that marginal improvements by thousands of small farmers will greatly increase the country's total output. But attention must be focused on the difficulties in assembling, processing, and distributing the increased output, and on ensuring that the producer receive a fair share of the consumer's dollar. Persistent inefficiency in this area will continue to result in failure to meet the food needs of large concentrations of urban populations and in recourse to imports to bridge the gap, assuming that other countries, notably developed countries, will continue to have the exportable surpluses, that developing countries can pay for them, and that food is not used as a political weapon. In addition, technological change which requires more labour appears doomed to fail in the Nigerian context as the hard core of devoted farmers declines rapidly. The rural to urban drift and the dislike of drudgery are much in evidence. Even if yields and total production increase, can the increases be handled advantageously?

My suggestion is that more farmer cooperatives be established so that farmers can (1) develop the countervailing power needed against the exploitative middlemen, and (2) form powerful lobby groups to influence government decisions. In this way farmers can obtain higher income and greater equity in income distribution. The farming population must no longer leave its fate in the hands of urban based politicians, but must participate to get what it needs. Do the small farmers merely want to subsist? Or are they more interested in the good things available to urban dwellers? If the latter is the case, would it be fair to continue holding down farm prices? It is of great importance that agricultural economists work to ensure that farmers participate in shaping their own future.

Increased management complexities follow the introduction of tractors to small scale farmers. New sets of decisions have to be made on inputs, harvesting, marketing of surplus, and maintenance of tractors. The small farmer may not have adequate management capacity for new tractor efficiency. Tractors must be introduced selectively only by those who can use them profitably. In developing countries, cars have been serviced adequately, but tractors have not, because terms of trade do not favour farmers; that is, they can not adequately pay for service. The motor industry has shown the way, but without improving the terms of trade, mechanization will not appeal to small farmers. The implementation of mechanization brings problems of improved seeds, improved planting methods, and management. Importation of rice and maize, farmers leaving the land, and the needs of cooperatives are additional problems. To subsist or improve must be the farmer's decision.

We need to think of food problems of urban as well as rural people and whether the excess of food over consumption is affected by new technology changes. Rice self-sufficiency changed the technological problem of maize and millet. Work is currently being done on the increased output of food provided by new technology.

Livestock should be brought into the studies because of the complexities and advantages of integrating crop and livestock production and the effect that livestock production has on the distribution of income. In Nigeria, livestock is produced by nomads, crops by farmers. Bringing these two groups together appears to be a good idea, but the difficulties are many. In Libya, it is difficult to improve the small farmer in desert areas if the big problem is machinery use and lack of knowledge. It may not be possible to generalize the lessons from Nigeria to other countries.

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