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ANIMAL TRACTION AND SMALL UNIT FEEDING
IN CENTRAL WEST AFRICA

by

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Presented at the Seminar on West African Livestock Production and Marketing Development, U.S.A.I.D., Department of State, June 2, 1978, for the Center for Research on Economic Development, University of Michigan. This is a brief summary of: "An Economic Analysis of the Role of Ox-Plowing and Cattle-Feeding in the Stratification of West African Livestock Production," M.S. thesis, University of Maryland, May 19, 1978.

As a student at the University of Maryland and as a research assistant to Dr. Ferguson on the C.R.E.D. baseline study, my job has been to conduct a literature search on bovine traction and small unit feeding in Central West Africa. My "field work" has therefore been limited to the National Agricultural Library in Beltsville.

I set my task to determine whether or not bovine traction and "embouche paysanne" as currently practiced in West Africa could perform three specific functions in the regional stratification approach:

- 1) increase net cash farm incomes.
- 2) increase the demand for immature cattle and thus draw off large numbers of immatures from northern rangelands.
- 3) increase the rural supplies of red meat.

In my Master's thesis, I examined the various physical, economic and institutional factors which have been present where these two activities have developed, as well as the constraints which continue to prevent their general expansion outside of selected pockets in Central West Africa. However, I would like to limit myself to a brief consideration of the three possible functions which bovine traction and cattle-feeding may perform in the regional stratification approach. I would like to consider bovine traction and small unit feeding separately under points one and two, and together under point three.

First of all, to consider Oxine traction. Despite its considerable benefits as demonstrated on the research stations, it is a technology enjoyed by only a minority of West African farmers--probably less than five per cent. There are about a half million working oxen in West Africa, comprising less than two per cent of the region's thirty million cattle. Older oxen might represent only some four per cent of all cattle slaughtered in the region. Nonetheless, the magnitude of investment in oxen and equipment, possibly 100 million dollars, is comparable to current investment in operating tractors, which might be on the order of 135 million dollars. Furthermore, the evidence indicates that the absolute number of working oxen may be growing at seven to eight per cent per year.

In an attempt to ascertain the profitability of the package as it is currently practiced by farmers in West Africa, a very simple pro forma farm budget in an undiscounted cash-flow format was utilized. This permits the examination of increases in cash farm revenues and cash costs after the adoption of ox-cultivation and over the working life of a team of oxen on the farm. Assumptions regarding increases in production from ox-cultivation and income generated from the sale of the oxen and custom services were based upon what the literature indicated to be more or less typical of farmers

adopting bovine traction.

The following assumptions were made: a 500 dollar investment package for both oxen and equipment at conventional medium-term credit, twenty to thirty per cent yield increases from the cultivation effects of plowing, a five per cent annual increase in area cultivated, and an annual appreciation in value of the team of fifteen per cent over four years on the farm. The results corresponded well with generalizations made elsewhere in the literature about the profitability of bovine traction in West Africa. This is that the adoption of ox-cultivation does not substantially increase cash farm revenues until the third or fourth year of adoption. The increase in cash farm revenues from the adoption of ox-plowing was defined as "substantial" at that point in time when the ratio of incremental cash revenues to incremental cash outlay was two to one. Under manual cultivation, it was estimated to be about six to one.

This suggests that the adoption of ox-cultivation would not substantially increase cash farm incomes for the majority of farmers in the Sudanian eco-climatic zone. In fact, among others, there are four very important constraints to the profitability of ox-cultivation and thus to its wider expansion beyond selected pockets within the Sudanian zone. These are:

- 1) the high capital requirements for oxen and equip-

ment--400 to 500 dollars--in a region of the world where per capita G.N.P. is 200 to 250 dollars.

2) the requirement for the presence of strong governmental support services--extension, veterinary, institutional credit, and research and design services, as well as marketing programs for inputs, and in some cases, output.

3) the high cost of feeding oxen, particularly over the dry season.

4) the inability of the farmer to perform ox-drawn weeding.

The literature very strongly suggests that these four factors--among others--have limited the adoption of ox-cultivation to the top ten to fifteen per cent of farmers who may be classed as "wealthy." By wealth, I refer to the possession of productive resources, i.e., land, labor and capital. Capital, of course, would include cattle.

For example, to briefly consider what is probably the most important of the above four constraints, the dry season feeding problem. Because of the lack of on-farm resources (crop residues, on-farm fallow or local village grazing, and water), it appears that farmers with holdings of under five to eight hectares of land must depend upon a considerable amount of off-farm extensive grazing to maintain their animals over the seven to nine month dry season. The animals are either managed by Fulani herders or left to graze in the village

perimeters with little or no supervision. At the end of the dry season after grazing upon the natural grasses of the Sudanian zone, the animals return to the villages having lost anywhere from ten to thirty-three per cent of their weight. At this time they are in poor physical condition to perform the heaviest work required of them, that of breaking the soil for the first rains. At the end of the dry season, they require a feeding-up period on a high-energy ration (grain or cereal bran), but this falls at a time when the average farmer's cash resources and family granaries are at their lowest. There is also evidence to suggest that by the end of the dry season, the animals have lost a degree of domestication, or training. It appears that this is related to the farmer's unwillingness to perform inter-row cultivation. Obviously, manure which is dropped over the dry season is unavailable to the farmer, as are the animals themselves for utilization in custom-carting, which would maintain a degree of training over the dry season.

Among other alternatives, it appears that the most logical means of completely breaking the dry season feeding constraint is the adoption of forage cultivation in crop rotations and/or a controlled system of grazing in the village environs.

It was also concluded that bovine traction activities would not draw off a substantial number of immatures from the northern rangelands. This was determined by making assumptions about the rate of growth of numbers of working oxen, annual

mortality and the amount of time the animals are retained on the farm. Bovine traction activities may have drawn off only some eight per cent of the 1.5 million male three year olds in 1974, or less than a half per cent of the region's thirty million cattle. If bovine traction activities continued to expand at eight per cent per year and the national herds by three per cent, then in 1990 only about sixteen per cent of the male three year olds would be drawn off at that time.

Furthermore, since over half of the regional herd is comprised of trypano-susceptible animals, future areas of potential expansion of bovine traction, which are below the tse-tse belt, would not substantially increase the demand for animals from the northern ranges.

As a footnote, it is paradoxical that although bovine traction activities appear to impact very little on the regional population of male cattle, at the same time there may also be a shortage of young animals suitable for draft. This is primarily because of the special requirements for draft work (size, conformation and health) and the generally high morbidity and slow rates of maturity characteristic of most conventionally managed animals.

To consider small unit feeding: there is very little data as to the numbers of animals fed out by small cattle-feeders. However, the evidence does suggest that this acti-

tivity is more geographically widespread than previously believed. It is practiced by butchers, entrepreneurs and farmers at points anywhere between: 1) cattle production zones; and 2) transportation terminals, large cattle markets or urban areas. It occurs where there are available supplies of dry season grazing. It also occurs on farms which have adopted ox-cultivation.

Among other factors, the profitability of small unit cattle-feeding depends upon the feeding margin as it does in the United States. The feeding margin is the differential between purchase price per kilogram and selling price per kilogram liveweight. Farmers with access to strong urban markets can obtain a twenty to thirty per cent differential for forty to fifty kilogram net liveweight gains. Indicative budgets for small unit feeding were constructed with only fifteen per cent differentials, and it was concluded that feeding was only marginally profitable in production zones. But if a farmer has direct access to a strong urban market, then the budgets indicate that he could net anywhere from twenty to one hundred dollars a head above concentrate and interest costs.

It was therefore concluded that this activity would expand with: 1) increased availability of agro-industrial feedstuffs and/or the adoption of forage cultivation; 2) increased availability of institutional credit; and 3) increased rail or road access to the urban markets.

I was not able to determine numbers of animals drawn off from the north by small unit feeding activities due to the data constraints.

Finally, to consider both bovine traction and small unit feeding under point three: to increase the rural supply of red meat. In some areas, donor and national agencies actively promote bovine traction and cattle-feeding together as beef production activities. Ideally, the farmer would buy a pair of immatures, work them for two to three years, then market them after a few months of stall-feeding. For added income, the farmer would also feed immatures as a side activity.

However, the literature search indicated that because of high replacement costs, a possible supply constraint, and/or a marketing constraint for older oxen, most ox-powered farmers in West Africa retain working oxen on the farm for several years. The question then arises whether or not the diversion of young animals into draft work may decrease the available supply of beef in any particular region because of delayed marketing.

A very simple exercise was utilized to explore this question, as well as to compare the amount of meat produced in a combined system of bovine traction and small unit feeding to the available amount of carcass meat from young animals which would otherwise be immediately marketed for slaughter.

Based upon what are hoped to be conservative assumptions about mortality, daily weight gains and killing-out percentages, results indicate that ox-cultivation does not decrease the supply of available carcass meat because of delayed marketing. In fact, combined with cattle-feeding in a region, it can increase the supply of meat by as much as forty per cent. It must be pointed out, however, that in the particular example utilized, bovine traction would in fact decrease the meat supply at annual mortality rates above four per cent. It would increase it at rates below four per cent.

In conclusion, I would like to reconcile the evidence that the number of working oxen is increasing by seven to eight per cent per year, and the statement that the adoption of ox-cultivation would not be profitable for the majority of West African farmers. If in fact only the top ten to fifteen per cent of farmers adopt bovine traction in areas where it is feasible, then one would expect the rate of adoption to eventually decline. The limited evidence from northern Nigeria, where one of the earliest and most important developments of ox-cultivation has taken place, in fact indicates that this may very well be the case.

However, there is every reason to believe that the current rate of expansion may continue for some time with: 1) the currently increasing cattle ownership among settled agri-

culturalists; 2) increased support services to train farmers in ox-drawn weeding and animal care; 3) increased availability of lower cost equipment packages designed for farmers with low cash resources; and 4) breeding activities to increase the supply of trypano-tolerant and intermediate cattle for use in more humid areas where dry season feeding is less of a problem.

The conclusion is nonetheless that although ox-cultivation will remain an extremely important means of more closely integrating crop and livestock production on settled farms, it will not become a truly viable farming system for most West African farmers until such time that they adopt forage cultivation or some kind of village grazing arrangement. The policy implication of the literature search is simply that bovine traction is not the universal answer to increased food and cash crop production in Central West Africa. Rather, the appropriate approach in integrated rural development projects would be to promote other yield-increasing technologies which may be more rapidly adopted by the mass of West African farmers, yet retain a bovine traction component for the minority of farmers for whom this technology appears to be better adapted. This in fact appears to be the approach in some of the I.B.R.D.-funded rural development projects currently under way in West Africa.