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Syracuse University
1975

DAVID JEREMIAH VAIL is an Assistant Professor of Economics at Bowdoin College in Brunswick, Maine. During 1972-73 he was Agricultural Economic Advisor to the Common Market and Economic Affairs Secretariat of the East African Community in Arusha, Tanzania.

This paper stems from concurrent work as an Economic Consultant to the "Intermediate Technology Project" at the Tanzania Agricultural Machinery Testing Unit -- TAMTU -- in Arusha. The project is directed by the Crop Production Division of the Tanzania Ministry of Agriculture, with assistance from the United Nations International Labor Organization. The views expressed in this paper are those of the author and should not be attributed either to the Tanzania Government or to the International Labor Organization.

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TECHNOLOGY FOR THE FIRST STAGE OF UJAMAA (SOCIALISM) IN RURAL TANZANIA

> "The true proletarian in Tanzania is not the docker or the urban worker with a fixed salary, but rather the peasant farmer, with a much lower average income. For although he owns his means of production, these --his hand tools-- often remain laughable."
>
> Rene Dumont, "Tanzanian Agriculture After the Arusha Declaration," p. 58.

Tanzania differs from most African nations by giving top priority in its economic strategy to a type of rural development that will create opportunities for the entire agricultural populace to participate directly in raising their own productivity and material standards of living. The contrast is sharpened by the socialist philosophical underpinnings and the co-operative institutional focus of Tanzania's rural development strategy. The communally organized village, operating on principles of "familyhood" (ujamaa), is the core social, political and microeconomic unit in the Tanzanian strategy for building a co-operative society. For the past seven years Tanzania's political leadership has encouraged voluntary formation of ujamaa villages, to bring a larger proportion of the agrarian population actively into the process of economic modernization and to reverse an incipient tendency toward a stratified rural socio-economic class structure (a tendency reflected in the increasing control by a minority of the population over land and capital resources and, in the end, over the labor of the poorer peasants).

In the simplest economic terms, ujamaa is intended to be a gradual, incremental progression toward communal ownership and deployment of productive resources. Decisions on village resource allocation are to be taken through democratic procedures (with guidance from market signals as well as public

sector agencies). Ultimately, access to goods, services and cash income will either be equal (for collective services such as health care) or according to work performed (in the case of money income and private consumer goods such as foodstuffs).

It is widely acknowledged, even by Government officials, that ujamaa village formation has encountered difficulties since inception of the strategy in 1967. These stem in part from the limited organizational and implementational capacities of the Government and the ruling TANU Party. Such shortcomings would seem to be inevitable in a nation so poor, so short of personnel with experience in the processes of modernization, and with such a geographically dispersed population. But the difficulties also stem from the failure of the ujamaa village concept to attract the majority of rural Tanzanians. Official registration in ujamaa villages reached 1.6 million by the end of 1971, yet it appears in early 1974 that there are actually fewer than one million Tanzanians (less than 10% of the rural population) actively participating in them.[1] Numerous sources report a drift of disillusioned wajamaa (village members) back to their private shambas (farm plots).

In these circumstances, the emphasis on a collective mode of rural economic development might be questioned. It could be argued that policies relying upon more individualistic incentives, but vigilant to prevent unacceptable disparities in income and wealth, stand a greater chance of stimulating rapid and equitable economic development than does a commitment to

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[1] "Tanzania: Collectivizing the Villagers," Africa Confidential, 15, No. 1 (January 4, 1974), p. 6.

the relatively unappealing policy of communization.

But despite, or possibly because of the inauspicious evidence from the past several years, the Government in late 1973 declared the intention of achieving universal "ujamaaization" by 1976.[1] Communization of twelve million rural Tanzanians in the coming two years would rival the Chinese "Great Leap Forward" of the 1950's in relative magnitude, and even sympathizers must reckon the odds to be against making the deadline. The political leadership has apparently abandoned its previous assurances that joining ujamaa villages would be voluntary; yet there are grounds for doubting whether the Government and TANU can muster either the moral suasion or the tools of coercion to carry out compulsory communization in short order. It is also contrary to the spirit in which Tanzania has been governed in twelve years of independence to suggest that President Nyerere would countenance the creation of police state apparatus to oversee rural collectivization. Nyerere undoubtedly perceives the contradiction between such means and the espoused end of a socialist democracy built upon grass roots participation of the wananchi (citizens, common people) in economic and political decision-making. Conceivably the 1976 target is considered less a firm, realizable objective than an inspirational device to motivate and challenge the young Government and TANU cadres who are being sent to rural areas in large numbers to spearhead the ujamaa village drive.

Whether ujamaa villages contain 10% or 100% of the rural people by 1976, they will have to be organized around facilities and activities which participants recognize to be in their individual (or nuclear family) interest as well

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[1] Ibid., p. 6.

as the interest of the larger collectivity or the nation. In much of the country the prevailing rural way of life centers on the nuclear family and its smallholding of land. It provides a degree of current well-being and security as well as hopeful future prospects. It is a premise of this essay that to induce people to form ujamaa villages and, crucially, to cement their ties to the ujamaa way of life after a village is organized, it is necessary to establish a basis for the village economy in cooperative commodity production which holds the promise of a level of material well-being that members could not attain individually.

President Nyerere has expressed the truism that "it is impossible to build socialism without socialists." This essay will not address the issue of whether Nyerere is correct in claiming that "traditional culture" was organized according to the proto-socialist principles that he labels ujamaa -- equality, mutual responsibility, cooperative activity and universal obligation to work. But it is clear in Tanzania today that national leaders cannot expect the rural smallholders to re-organize themselves spontaneously for economic modernization along such lines -- in short, the Tanzanian peasantry does not possess socialist consciousness. Such consciousness arises only through practice, and a first step in fostering commitment to collective practice is to appeal to the individual through his existing material motivations. This is the classic problem of creating grass roots cooperative institutions and consciousness with a minimum of coercion and a maximum of voluntarism.

The State* can, and in fact it must, provide certain critical services

*Since the TANU Party and the Governmental apparatus overlap, and since both participate in rural development planning, the term "State" is used in this paper to connote Party or Government, operating separately or in concert.

to fledgling ujamaa villages (some examples are community health facilities, agricultural extension advice and guidance in formulating the village development plan.) But the State lacks the capability to engineer rural development from above. Thus the popular slogans "ujamaa na kazi" (socialism and work) and "ujamaa na kujitegemea" (socialism and self-reliance) describe objective necessities as well as ideological principles for the Tanzanian variant of rural socialism. This essay takes Tanzania's stated national objectives as its starting point and deals primarily with the promotional functions of the State in bringing wajamaa together in co-operative production activities. Although this essay is critical of some aspects of past and current Tanzanian policy, and although it reflects a degree of skepticism about the likely effectiveness of future policy implementation, the author is fundamentally in sympathy with Tanzania's effort to achieve economic development without the highly unequal distribution of income, wealth, employment opportunities, social status and political power that characterize most of Africa and poor nations in general. The author is persuaded by signs within Tanzania and by the evidence from neighboring countries such as Kenya, Zaire and Ethiopia that if systematic and vigorous action is not taken to mold institutions that reinforce co-operative rather than individual production activity and collective rather than private ownership of the basic productive resources, then the objective of bringing the whole people into the development process as both contributors and beneficiaries will be subverted and class stratification will harden along "have" vs. "have not" lines that are the antithesis of President Nyerere's vision of the good society.

The central purpose of this paper is to develop the proposition that co-operative village carpentry and blacksmithing workshops (a small scale, rural capital goods sector), producing tools and equipment for farm and non-farm activities, can make a substantial contribution in the formative stage of ujamaa. It seeks to demonstrate that there is considerable economic potential in what has come to be called "intermediate technology": a technology that relies heavily upon locally available skills and materials, combined with relatively simple tools and concepts borrowed from other times and places. The idea of intermediate technology is perhaps best conveyed by illustration. In Tanzanian agriculture it implies a middle ground between traditional techniques such as hoe cultivation and head porterage and fully mechanized and motorized techniques such as tractor cultivation and lorry haulage. Between the two extremes of unaided manual labor and engine power, the stock of world knowledge provides a broad range of potentially valuable techniques from which to choose.

It will be argued that a broad diffusion of such technology is within the financial and manpower capabilities of the State, in a way that tractor mechanization, for example, is not. It will also be argued that the apparent lack of motivational impetus for ujamaa village consolidation in much of Tanzania can be partly overcome by the employment opportunities created for fundis (craftsmen), plus the increase in labor productivity and the decrease in arduous toil that result from the adoption of a well selected intermediate tools technology. In addition to enhancing the well-being of wajamaa themselves, increased agricultural productivity will contribute to several important

objectives: adequate food supplies for the non-farm population, expanding crop export earnings and an enlarged tax base.

The case for an intermediate tools technology proceeds from the general to the specific. Section I. summarizes Tanzania's rural development strategy and stresses the relevance for ujamaa of proposals on agricultural mechanization in the Second Five Year Development Plan (SFYP). Section II. investigates some of the characteristics and deficiencies of ujamaa implementation to date. Section III. indicates the actual and potential roles of TAMTU (Tanzania Agricultural Machinery Testing Unit) in creating and spreading an intermediate tools technology. Section IV. raises a warning that intermediate technology, if diffused indiscriminately, can have powerful negative effects on Tanzania's development pattern.

I. Ujamaa as a Social Philosophy and Economic Development Strategy

Recent Tanzanian efforts to create a socialist society have been well documented in both scholarly literature and popular journalism. Since most readers will have some familiarity with Tanzania's circumstances and the developmental philosophy of its leaders, this resume is brief. It is also selective, stressing the implications of President Nyerere's writings, TANU policies and, in particular, the strategy of the Second Five Year Development Plan for the main themes of this essay: (1) the mechanization of rural activities through new implements and power sources and (2) the establishment of cooperatively run rural industries to produce such tools and maintain them in working order.

We should first take note of some "facts of life" confronting Tanzanian policy makers. An unavoidable demographic-economic nexus underlies efforts at economic development. The population in 1974 remains over 90% rural and almost all of the economically active are engaged in smallholder farming. The population and the labor force are growing at nearly three per cent per annum. Non-agricultural wage employment has increased significantly, at an annual rate of 6.1% in the past three years. However, the actual number of non-farm wage earners (officially 292,220 in 1971 and unofficially 350,000 in 1974) is still less than ten per cent of the economically active population, and the number of people engaged primarily in farming will continue to grow in absolute numbers for decades to come.[1] Even if non-farm wage employment continues to grow at the high rate of 6% per year, the agricultural population will still increase by over 2% per year through the 1970's and by over 1% per year through the rest of this century. In consequence, apart from any socialist bent, a development strategy that emphasizes the creation of opportunities for broad participation in economic growth must be heavily oriented toward rural, and especially agricultural, development.

Beyond the problem of fostering satisfying livelihoods for a growing rural population, the Tanzanian non-farm economy is dependent upon the performance of the agricultural sector. The capacity to import critical development goods, such as fuel and machinery, depends heavily upon foreign exchange earned by exports of agricultural commodities (the majority of Tanzanian households produce at least one cash crop). The Government depends for a large

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[1] The Economic Survey, 1971-72, Tables 29 and 30, (Dar es Salaam: The Government Printer, 1972).

proportion of its tax revenues upon incomes generated in rural areas, incomes that stem ultimately from cash crop production. Farmers supply cotton, copra, oil seeds and other raw materials to the growing industrial sector. And finally, the market for many urban-produced manufactures such as textiles and household utensils is primarily among the rural populace. Thus, an assessment of key linkages between agriculture and other sectors reinforces the normative values that underlie Tanzania's heavy stress on rural development.

Tendencies Toward Exploitation and the Emergence of Antagonistic Classes

Before and since Independence, Julius Nyerere -- called mwalimu, the teacher -- has shaped and articulated Tanzania's unique national creed. His social analysis and his aspirations are not universally accepted, yet his interpretation of Tanzania's current situation, and his outline of a path to a modern, humane and egalitarian society, have substantially molded Tanzania's strategy of socio-economic development. It is therefore worthwhile to summarize his views on several important issues: the dangers inchoate in the emerging pattern of rural economy, inherited from the Colonial era; the core of communalistic relationships -- ujamaa -- that characterized traditional, pre-Colonial, culture and that should be encouraged in the developing society; and the possibility of a gradual transition to a new form of rural socialism built on a modernized production base.

Nyerere's essay "Socialism and Rural Development" (September 1967) immediately preceded TANU's adoption of a policy of ujamaa vijijini (socialism in the villages). In it he describes an ominous trend in rural social and economic relations:

> There has been a general acceptance of the social attitudes and ideas of our colonial masters. We have got rid of the foreign government, but we have not yet rid ourselves of the individualistic social attitudes which they represented and taught. For it was from these overseas contacts that we developed the idea that the way to the comfort and prosperity which everyone wants is through selfishness and individual advancement.[1]

The predominant means by which economic class stratification has begun to emerge in the countryside is the spread of cash crop cultivation. The most prominent forms it has taken are large estate farming (coffee, sisal, wheat, livestock) and petty capitalist farming. In the former, expatriate ownership has been characteristic and the solution to the socio-political problems it poses are relatively easily dealt with, principally by forcing the owners to sell out to the State. (In many cases the economic problem of maintaining production levels and production efficiency when such farms revert to the State and lose their experienced managers have not been solved.) In the past year, a new series of expropriations (with compensation) has occurred among the wheat, coffee and dairy estates of West Kilimanjaro and in sisal growing areas of Morogoro Region (sisal, in particular, has become attractive to the public sector with the sharp increase in world prices for hard fibers in the past two years.) The expropriated owners are a mix of expatriates and citizens, virtually all of whom are Asians.[2]

In Nyerere's view a more serious threat to egalitarian principles is posed by the petty capitalist variant of private commercial farming. Enter-

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[1] J. N. Nyerere, "Socialism and Rural Development," in Freedom and Socialism, (Nairobi: Oxford University Press, 1968), p. 340.

[2] For a review of the plight of Tanzania's citizen Asians, including the expropriated estate owners, see "Tanzania: Asian Anxieties," Africa Confidential, 15, No. 11 (May 31, 1974).

prising Africans use the surplus from cash crop sales to acquire land in addition to their patrimony and begin to use wage labor for cultivation tasks. Nyerere views such an enterprise as inherently exploitative, regardless of the means by which the capitalist farmer initially gained control over productive resources. The crux is that the returns to land, capital, and entrepreneurship accrue to the owner, while his employees are reduced to selling their labor power, *with no share in the surplus value they generate.*[1]

Although there is no indication in Nyerere's essay that he drew this conceptual analysis from a reading of European history, it bears a close resemblance to Marx's characterization of "primitive accumulation" and the proletarianization of the yeomanry during the British land enclosure movement (Capital, Volume I, Part VIII). As cash crop production expands and as population density increases, making arable land relatively scarcer, the economic power of the land-owner class increases and that of the landless or land-poor laborers declines. The danger is that this cumulative tendency might ultimately develop to the point where the predominance of independent smallholders gives way to a polarized rural society of landlords and the landless. Although this sequence has not yet proceeded very far in Tanzania, studies have documented its existence in many cash crop growing areas.[2] The studies suggest that rural stratification, initially based on differential cash crop production, is likely to extend evenutally to the dominance of

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[1] Nyerere, "Socialism and Rural Development," op. cit., pp. 342-3.

[2] L. Cliffe, "The Policy of Ujamaa Vijijini and Class Struggle," Socialism in Tanzania, L. Cliffe and J. Saul, eds., Vol. II (Dar es Salaam: East Africa Publishing House, 1973), pp. 203-208.

both rural commerce and local politics by a numerically small stratum of local society.[1] In Nyerere's perhaps overly optimistic words:

> The small scale capitalist agriculture we now have is not really a danger; but our feet are on the wrong path, and if we continue to encourage or even to help the development of agricultural capitalism, we shall never become a socialist state.[2]

Two further elements of Nyerere's critique of existing social relationships are of special relevance to the proposals made later in this essay. First, a prominent feature of rural Tanzania in this century is the bureaucratic nature of governmental and parastatal bodies that impinge upon peasant life (e.g., colonial chief, district commissioners, marketing co-operative officers). The bureaucracy has often been inertia-bound and unresponsive to peasant needs -- for example in supplying farm inputs and farming advice. The salaries and other perquisites which raise the real incomes of this social stratum far above the typical peasant are ultimately paid for by the peasants through taxes. Thus it is valid to claim that if bureaucracy stifles rather than enhances development opportunities it is parasitic, another form of exploitation of the peasantry. Two requirements of rural development strategy to counteract this tendency, are that many former State functions be debureaucratized, returned to popular control, and that bureaucrats, insofar as they remain necessary, earn their privileges through constructive service to the people.

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[1] H. Thoden Ban Velzen, "Staff, Kulaks and Peasants," in ibid., pp. 153-179. In economic usage, oligopoly exists when there are a few sellers who control a market.

[2] Nyerere, "Socialism and Rural Development," op. cit., p. 344.

The subordinate status of women is a third exploitative feature of Tanzanian rural culture, one which antedates the colonial era. Specifically:

> It is impossible to deny that the women did, and still do, more than their fair share of work in the fields and in the homes. By virtue of their sex they suffered from inequalities which had nothing to do with their contribution to family welfare. Although it is wrong to suggest that they have always been an oppressed group, it is true that in traditional society ill-treatment and enforced subservience could be their lot.[1]

The contradiction between the subordination of women and ujamaa socialism is echoed in the recommendations of Rene Dumont, a renowned French agriculturalist who has advised socialist regimes from Mali to Cuba. In response to Nyerere's request for guidance in formulating rural development policy, Dumont contended that reducing women's inordinate burden of arduous toil, in such tasks as hauling water, pounding grain and gathering firewood, must be a central concern, not merely a peripheral issue, in the construction of rural socialism.[2]

Traditional Ujamaa

In Nyerere's conception, the good society in contemporary Africa will possess a set of characteristics which he postulates to have been part of traditional African cultures. Traditional ujamaa (familyhood) rested upon a customary adherence to several principles in social relationships. The most important among them were mutual respect and mutual responsibility among extended family members, a high degree of equality in access to the

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[1] Ibid., p. 339. See also M. Mbylyini, "The Participation of Women in African Economies," University of Dar es Salaam, Economics Research Bureau Papers, 71.12 (1971).

[2] R. Dumont, Tanzanian Agriculture After the Arusha Declaration, Tanzania Government, DEVPLAN, 1969; see especially "Summary" and "Recommendations," pp. 3-5.

basic material needs of subsistence (no one feasted while others were starving), and a universal obligation to participate in physical labor (no one lived from the labor of others).[1]

Even sympathetic scholars have questioned the validity of this somewhat simplistic image of pre-colonial life.[2] Our present knowledge of those East African ethnic groups with a tradition of chiefdom or kingdom suggests a degree of social and economic stratification that contradicts Nyerere's view. And Nyerere himself points out shortcomings of most pre-colonial cultures in the subordination of women, the sometimes arbitrary exercise of power by elders, and the existence of inequalities in wealth and status (as reflected, for example, in number of wives or size of herds).

As Saul has put it, Nyerere's vision is largely intuitive and selective, clearly not in the tradition of rigorous "scientific socialism." But if ujamaa is not a "living tradition" with "powerful historical legitimacy," it does, nonetheless, serve as "an instructive analogy," supporting the "moral imperative of equality."[3] One wants to keep in mind that Nyerere does not indulge in

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[1]Nyerere, "Socialism and Rural Development," op. cit., pp. 337-340.

[2]See for example, L. Cliffe "Planning Rural Development," in Towards Socialist Planning, Uchumi Editorial Board, (Dar es Salaam: Tanzania Publishing House, 1972), p. 93; Migot-Adholla, "Traditional Society and Cooperatives," in Cooperatives and Rural Development in East Africa, C. Widestrand, ed., (New York: Africana Publishing Corp., 1970); and B.B. Bakula, "The Effect of Traditionalism on Rural Development," in Building Ujamaa Villages in Tanzania, J. H. Proctor, ed., (Tanzania Publishing House, 1971).

[3]John S. Saul, "Nyerere on Socialism," in Cliffe and Saul, eds., op. cit., Volume I, pp. 180-182.

the romantic notion that an egalitarian, non-exploitative, communalistic "human nature" lies just below the surface in the Tanzanian psyche. To the extent that these attitudes did once exist, they have been seriously undermined by the colonial experience. Still, the core of Nyerere's optimism is a faith that human attitudes and behavior can be influenced for the better and that ujamaa relationships can be established -- and on a scale larger than the traditional family, clan or age-set. With perseverance in institution building and with judicious application of modern production techniques, ujamaa can be the institutional basis for rapid economic development.[1] But social transformation and economic transformation do not occur in separate spheres; rather, both forms of development occur through the medium of activities and relationships among people. Ujamaa social relationships contradict, and cannot be built upon, a base of individualistic or exploitative economic production and distribution.

Two elements of Nyerere's view of the change-over from emergent rural capitalism to ujamaa are of special importance for this essay: its gradualism and its dependence on local initiative and self-reliance. Individualistic and cooperative production activities are bound to co-exist for some time, but the objective must be to progress steadily toward expansion of cooperation and contraction of individual initiative. " . . . in living, in working and in distribution." And Nyerere recognizes that the diversity of cultural, economic and environmental circumstances in different parts of the country means that building ujamaa will take different forms and will proceed at a different pace from village to village and from region to region.[16]

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[1] Nyerere, "Socialism and Rural Development," op. cit., p. 340.

[2] Ibid., pp. 348-9, 355-8.

The gradualist approach stems from both a recognition of the peasants' wariness about an immediate full commitment to communal life and the state's limited capability to provide wajamaa with physical infrastructures (road links, water supplies), services (agricultural extension, veterinary care, formal education) and directly productive capital (tractors, lorries). Through improvement of planning and administration, expansion of cadre training programs and growth in government revenues, the state's ability to give tangible assistance to the wajamaa will increase over time. (As taxpayers, the agricultural population will foot most of the bill for this assistance.) But, fundamentally, ujamaa villages cannot rely upon the state to give many things to them or do many things for them.

In planning, and especially in the mobilization of productive resources, there is no short term alternative to self-reliance. Inputs supplied by the state are complementary to, but cannot substitute for, local work and initiative. The emphasis on self-reliance also results partly from leaders' disillusionment with the heavily capitalized settlement schemes and block cotton farming projects that predominated in rural development strategy of the 1960's. When projects were organized on the basis of command, with orders to the wananchi coming from above, and when motorized equipment was supplied and run by the state, the typical result was peasant apathy. Scheme members had little sense of responsibility to do a fair share of the work or to repay production loans, much less to develop a self-sustaining, self-reinforcing cooperative outlook.[1]

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[1] See L. Cliffe and G. Cunningham, "Ideology, Organization and the Settlement Schemes in Tanzania," in Cliffe and Saul, eds., op. cit., pp. 131-140; also H. Ruthenberg, ed., Smallholder Farming and Smallholder Agriculture in Tanzania, (Munich: Weltforum Verlag, 1968).

The majority of such projects have been financial as well as social failures.

Review of Past Agriculture Development Policies

As the illustration of the preceding paragraph suggests, an effort to learn from past failings underlies Tanzania's rural development strategy in the 1970's. A brief synopsis of agricultural policy, going back to the early colonial period, will help to place the discussion of ujamaa policies in an historical perspective. (Readers interested in a more detailed overview of agricultural policy should see L. Cliffe, "Planning Rural Development," from which the following paragraphs are condensed.)[1]

Modifying the concept of economic dualism as it is applied to less-developed countries one could say that the pattern of agricultural development in colonial Tanganyika was "polyistic." Fully commercialized settler estate farming predominated in some areas, a mixture of cash crop and subsistence production was characteristic of other areas, and a substantial proportion of the African population remained without significant attachment to the market economy. By Independence, the majority of Tanganyika households were probably engaged in production of at least one crop or livestock product primarily for sale in the national market network.

The German Colonial administration and later the British Protectorate government played critical roles in stimulating the partial-commercialization of private smallholder farming among the indigenous population. A set of positive roles helped to promote cash crop production: the supply of seeds or planting materials, the provision of agronomic and other advice to cultivators,

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[1] L. Cliffe, "Planning Rural Development," op. cit.

the articulation of a marketing and transportation network for export crops, and in a rather passive way, the fostering of rural commerce that supplied smallholders with both farm inputs (such as metal hoes and, in some areas, ox plows) and with consumer goods that promoted an interest in money-earning activities (examples: kerosene lamps, cotton textiles, bicycles, corrugated metal roofing).

It would be wrong, however, to conclude that the government, after providing certain infrastructural investments, left peasant farming to the invisible hand of the market mechanism. The colonial era was most certainly a time of "commandism." Cash crop cultivators, in such areas as Sukumuland, Bukoba and Kilimanjaro were hemmed in by a set of regulations (called by-laws) requiring certain minimum crop acreages, planting dates and cultivation practices. Failure to pay taxes (financed out of cash crop sales) or to obey by-laws was punishable by fine, imprisonment or forced labor. This modus operandi of rural development reflects the regimes lack of confidence in the attitudes and abilities of the wananchi and it was one of the prime sources of peasant discontent that fueled the independence movement in rural Tanganyika. Yet, as we will see, the tendency of a bureaucratic administration to give orders, rather than to educate and persuade farmers, has persisted into the post-Independence period and even into the attempts to create ujamaa villages.

Along with efforts in the post-World War II period to stimulate smallholder cash crop production, the administration undertook a few larger more capital intensive projects to create mechanized commercial agriculture in areas of new settlement. The famous Tanganyika Groundnut Scheme was the

largest of these projects. Within a few years of its inception it proved a financial disaster, and yet it also proved to be a model for rural development strategy in the 1960's. The bias of public policy toward large "transformation" projects, rather than a gradual improvement in the agriculture of existing farming systems, was reinforced by the recommendations of the 1960 World Bank Mission to Tanganyika. The Mission's emphasis on resettlement and mechanization projects, relying upon "expert management and control" of the African settlers, became a cornerstone of the First Five Year Development Plan (1965-69).[1]

The First Plan's objectives were couched primarily in terms of quantitative production targets for the major export crops and in terms of the establishment of new export crops, such as tea and tobacco, in areas where cash crop production had not previously taken root. In effect, plan implementation was split between the Village Settlement Agency (VSA), which oversaw "transformation" projects, and the Ministry of Agriculture, which was charged with carrying out programs following the "improvement approach." Nyerere and others were drawn to the idea of new village settlements as a focus for economic modernization. However, his conception of partly spontaneous and largely cooperative and self-reliant villages was contradicted by actual practices in most of the eight block farming settlements that got off the ground in the mid-1960's. The schemes proved to be a heavy drain on the capital and the skilled manpower available for rural development. They were characteristically run by a command mechanism that left little initiative to the settlers. The ratio of economic benefits to costs was very low (for reasons discussed below), and the schemes had an extremely high opportunity cost, in the sense that they brought only a few thousand households into the development process while leaving out

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[1] Ibid., p. 97.

hundreds of thousands who might have been mobilized by a different strategy of public sector promotion and resource allocation.

Output of cash crops did grow very substantially during the 1960's but Settlement Schemes accounted for only a negligible fraction of the growth, while production of every smallholder cash crop (excepting groundnuts) at least doubled.[1] Peasant agriculturalists, from many ethnic groups and many parts of the country, demonstrated an eagerness to adopt farming innovations that raised the productivity of their labor and increased their money incomes. Yet Nyerere and others of the TANU left-wing were disturbed at the entrenchment of an individualistic orientation and at the signs of growing stratification in Tanzanian society, both within ethnic groups and between regions of the country.

In sum, the failure of the commandist and highly capitalized "transformation approach" and the very success of private smallholder farming in the 1960's combined to provide a basis for the sharp redirection of rural development strategy that Tanzanians call ujamaa vijijini.

The Connection Between Ujamaa and Technology in the Second Five Year Plan

As mentioned, the First Five Year Plan stressed the goal of quantitative production targets and the policy instrument of agricultural "transformation" projects. The shift in the late 1960's to a more complex goal-set and a new choice of policy tools was mandated by the TANU Executive Council, then ratified by the Party's National Conference in October 1967, and finally incorporated

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[1] Ibid., p. 100.

into the Second Five Year Development Plan in 1969.[1] Subsequent discrepancies between the Plan document and plan implementation indicate that it is not to be read as a definitive blueprint for development. However, the approach to ujamaa and its links to the approach to agricultural mechanization, as set forth in the Plan have an important bearing on this essay.

Most importantly, the Plan espouses a "frontal," as opposed to "selective," approach to building ujamaa. That is, the Plan rejects the 1960's strategy of "concentrating attention on limited areas which are capable of making movement to complete Ujamaa over a short period of time." To follow such a course would mean that while, " . . . a few thousand families in Tanzania are living, or learning to live Ujamaa, the rest of the population continues to live on single-family peasant shambas."[2] The strategy adopted,

> " . . . is to move towards Ujamaa on all possible fronts, mobilizing the full range of Governmental and political institutions behind the principles of Ujamaa. Under this approach we would seek to ensure that large segments of the society will make some movement towards socialism."[3]

It is acknowledged that, although "fledgling Ujamaa Villages and production cooperatives need help in getting on their feet," the State must spread its limited resources rather thin to pursue a frontal approach. As a result, most

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[1] An indication of the divergence of views on development strategy in the late 1960's, between the political leadership and the professional planners, is that the Economic Committee of the Cabinet rejected an early draft of the Five Year Plan as insufficiently oriented toward ujamaa. As noted in the body of this essay, the Plan as finally adopted still conveyed an impression of ujamaa philosophy and programs hastily superimposed upon, rather than integral with, the "planners' plan."

[2] United Republic of Tanzania, Second Five Year Plan, for July 1969 - June 1974, Volume I: General Analysis (Dar es Salaam: 1969), p. 27.

[3] Ibid.

villages cannot expect a great deal of material or professional manpower assistance in the short run. Moreover, the settlement scheme experience, "has shown that where (material assistance) is given too lavishly, it can have adverse effects, diverting the community from its true objective."[1] Again, the emphasis is on grass roots initiative, self-reliance and self-mobilization of the villagers, with Government and TANU concentrating on investment in infrastructures and providing assistance to education, village organization, agricultural extension and leadership training.

The Plan reveals an awareness that some kind of project for village economic improvement is required immediately to stimulate cooperative activity and solidarity, to avoid disillusionment and backsliding. In particular, there is a recognition that the State must fertilize the village concept by providing an input of ideas and opportunities; and, "Among the inputs required to make a success of an Ujamaa Village [are] agricultural and other techniques by which production can be increased."[2] More concretely, the Plan reflects a belief that significant economies of large scale production and a fruitful division of labor can be major sources of attraction to cooperative, as opposed to individualistic, production.[3]

The paragraphs of the Plan that deal with agricultural mechanization are not linked very closely to the discussion of the frontal strategy for ujamaa vijijini. This seems to reflect,

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[1] Ibid., pp. 27-28.

[2] Ibid., p. 26.

[3] Ibid., p. 29.

> "A compartmentalized pattern of thinking [that has] developed . . . in the planner's view that there is an ujamaa program, on the one hand, and that there is an agricultural development program on the other; missing, therefore, is a more meaningful and integrated alternative approach which sees ujamaa, socialist production relations, as a principle which underlies all rural planning."[1]

This, as argued below, is one of the most serious deficiencies in Tanzanian planning.

Yet there are strong implicit connections between the espousal of ujamaa and the planned development of a tools technology for rural economic modernization. The reference to "advantages of large scale production" in ujamaa villages, for example, implies innovation in tools technology, to increase the productivity of human labor and to substitute other power sources for human bone and sinew. However, the section on mechanization reveals a lesson learned from experience by warning against the facile assumption that mechanization implies or requires tractorization. Experience had taught that tractor technology is an intrinsically high cost mode of production and one that is subject to numerous manmade failures in implementation. By citing the successful trials of simple and low cost capital equipment already designed and tested at the prototype stage, the Plan conveys a growing commitment to "less spectacular forms of mechanization," forms consistent with local resource endowments of skills, materials and finance.[2] The implication is not that any specific implement, or set of implements is suited to the needs and problems of all Tanzanians. Rather, there is a confirmation that, at the level of economic

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[1] L. Cliffe, "Planning Rural Development," op. cit., p. 99.

[2] Second Five Year Plan, op. cit., pp. 37-38.

development prevailing in much of the country, cheap and simple new tools can make a contribution as one element of a concerted drive to raise productivity.

The Plan proper indicates that implements based on successful designs are to be produced both by specialized, relatively large scale farm equipment factories and also by local craftsmen.[1] In his speech of May 28th, 1969, presenting the Plan to the TANU Conference, Nyerere stressed the latter potentiality. In his call for a program of integrated rural development, going beyond complete specialization in agriculture, he made the following statement:

> "Although mass production is the best and cheapest way of meeting the needs of our people for certain types of goods, there are many others where the needs can best be met by labor intensive small scale industries and craft workshops."[2]

There is some evidence "on the ground" that this contention is being successfully borne out. But the available documentation, corroborated by first hand experience in 1972 and 1973, indicates that to date rural craft workshops and "intermediate technology" have been little utilized in the strategy for implementing ujamaa. This essay seeks to demonstrate, conceptually and empirically, that a systematic application of ideas set out in the Second Plan can help to overcome obstacles which so far have stymied ujamaa in much of Tanzania. It is hard to avoid the conclusion that the more urgent the frontal effort to "ujamaaize" the population in a short period of time, the more awesome these obstacles will be.

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[1] Ibid.

[2] Ibid., pp. ix and xiii.

II. Tendencies in the Implementation of Ujamaa

By 1972, the official statistics showed over 4,900 ujamaa villages with nearly 1.8 million members.[1] In terms of sheer numbers, the "frontal strategy" adopted in the Second Five Year Plan was being implemented with moderate success. However, over 80% of the villages were at "Stage I," the "formative stage," and not yet engaged in communal production (Stage III).[2] Further, the official statistics apparently include villages that existed only on paper, where prospective wajamaa had drawn up and signed a charter, but had taken no tangible steps toward cooperative living and working. (Readers should be aware that for a group of people to form an ujamaa village does not imply that they have constructed or even plan to construct a physical village settlement. Actual homestead locations have not changed in the majority of cases.)

The numbers also belie some fundamental weaknesses in the methods of implementation. Of particular importance for the arguments of this essay is a tendency toward polarization between a small proportion of villages that receive governmental grants and loans for investment in buildings and equipment (especially tractors) and the majority of villages that have no such privileged access to financial capital or capital goods. It appears, further, that most villages in the latter category have had little technical assistance in developing production programs. In effect, they have been left to map out their own course of development, relying upon the use of traditional hand tools -- panga (machete), jembe (digging hoe) and shoka (axe).

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[1] P.B. Ngeze, "Some Aspects of Agricultural Development in Ujamaa Villages," (Dar es Salaam: East African Agricultural Economics Society Conference, 1973), Appendix.

[2] Republic of Tanzania, Economic Survey, 1971-72, op. cit., pp. 61-62.

Far from being a frontal strategy to eliminate rural poverty and to re-organize rural society along socialist lines, the concentration of public support in a relatively small proportion of ujamaa villages looks suspiciously like the discredited settlement scheme, or "transformation approach" which was a strategic failure in the 1960's. As perceptive critics of the settlement schemes have stressed, projects that are highly capitalized and that use much skilled manpower cannot be appraised in isolation. Their opportunity costs -- the foregone alternative uses of capital and trained manpower -- are of central importance. If mobilization of the entire rural population into a socialist economic development process is the priority objective, then funneling public resources into a relatively small proportion of the new villages has a high opportunity cost indeed and contradicts stated policy objectives. It is not possible to document this contention exhaustively, since there is no comprehensive published statistical material on public investment and manpower allocation, village by village. But there is sufficient anecdotal evidence, supported by first-hand observations in Arusha and Tanga Regions, to argue that Tanzania must reject the "privileged village" bias if the national leadership wants: 1. to use the State's resources to induce the majority (much less 100%) of peasants to join the ujamaa movement; and 2. to avoid a high dropout rate of frustrated wajamaa returning to private family farming or drifting to the larger towns when they find "nothing happening" in the village.[1]

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[1] Interestingly, the national English language newspaper, the Daily News, provides the best source of anecdotal documentation of the "privileged village" syndrome. Very often, probably at least once a week, the paper hails a new ujamaa village that has, for example, brought in its first bumper crop utilizing tractors, lorries and storage facilities provided by the State. The polarization tendency implied by the State's lack of capability to provide all 5,000 villages

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The almost daily success stories reported in the Tanzania Daily News indicate that a sizable number of villages are developing an economic base for cooperative living. Unfortunately, neither the newspapers nor the State agencies report on ujamaa in a way that lends itself to systematic economic analysis of performance. However, the reports do leave the impression that where villages have been most successful in establishing a cooperative production base, it is usually due to one or a combination of the following factors:[1]

1. The location of villages along a new transport artery, such as the blacktop road that runs from Lushoto toward Dar es Salaam; or, even more prominently, the new Tanzania-Zambia railroad, which is opening up vast areas of the Southwest.

2. The promise of land and physical infrastructures to landless peasants or people whose dwellings were widely dispersed across the countryside with poor access to clinics, water supplies or schools.

3. Grants of or soft loans for capital goods, particularly tractors, but also lorries, building supplies, planting materials and fertilizers.

4. The Organization of Villages around new cash crops, most prominently tea and tobacco (in the South and West), but also cotton, maize, cashews and dairy products in various parts of the country.

But the majority of Tanzanian households already produce a cash crop and have sufficient land for their current needs. By itself, a borehole or a clinic is not enough to hold a village together for long. Limitations on the public

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so generously is acknowledged informally by Kilimo (Ministry of Agriculture) officials and was a recurrent theme of informal discussions at the 1973 conference of the East African Agricultural Economics Society, held at the University of Dar es Salaam.

[1]Along the Mozambique border the formation of ujamaa villages has also been prompted by defense needs -- the fear of armed Portuguese incursion.

purse render the extension of major transportation arteries and heavy capital investment in village production unfeasible as the galvanizing force for nationwide village formation in the near future. So it appears that in all likelihood there is no mechanism, no mixture of compulsion and inducement, to bring the entire rural populace into communal living and production arrangements by 1976. And certainly the principle sources of "success" up to now cannot be duplicated nationwide.

A further assessment of the use of capital improvements to induce village formation is in order. Grants for investment have covered land clearing, local roads, water supplies and building materials for housing, clinics, crop storage and schools. But in previously unmechanized farming systems, investment in tractors is characteristically viewed as the prime mover of agricultural development. Put simply, the economic case for tractorization rests on two interrelated advantages: economies of large scale in farming and elimination of seasonal labor bottlenecks that arise under the pre-existing technology. Examples of labor bottlenecks in annual crop zones are the onset of the main rains, when fields must be hoed or plowed and then planted over a short span to avoid sharp drops in yield that result from late planting; a subsequent peak labor demand arises a few weeks after planting,when all plots need weeding simultaneously. Tractors substitute for scarce manual labor or for mechanically inefficient animal power in these peak season tasks, for example, by mechanizing interrow weeding or by permitting tilling before the rains when soil is too hard for ox plowing. Used with skill, tractors also raise yields by improving the quality of some operations, for example in preparing a fine seedbed tilth. In sum, tractors can lead to increased acreage

and to more timely, more thorough and more precise performance of cultivation tasks. Both of these factors raise production levels, but the capital, operating and maintenance costs of tractors are so much higher than with a human and draft animal technology that substantial increases in both acreage per worker and yield per acre are almost always necessary if tractor cultivation is to pay financially.[1] This in turn requires that tractors be kept in good running condition and supplied with fuel, that they not be used in ways that destroy the fragile fertility of Tanzanian soils (e.g. through inappropriate deep plowing), that the amount of wasted running time be minimized by consolidating farm plots, and that the entire sequence of cultivation operations on each crop be performed to high quality standards.

A report by P.B. Ngeze, a District Planning Officer in Iringa Region (where ujamaa has been pushed hard) and the author's observations at Mikuuni village in Arusha Region suggest a common, if not universal, pattern in the tractorization of ujamaa villages. Ngeze reports that when tractors are used to plow and plant annual crops on communal shambas, villagers frequently fail to appear for cultivation work until harvest time. Instead, they allocate their labor to their private shambas. Since weeding and thinning are critical farm tasks in East Africa, their neglect of communal shambas results in substantially depressed yields. As a result of the wajamaa's neglect, several villages in Iringa have been unable to cover the operating costs of tractors, much less to repay capital loans (or to set aside a depreciation fund for replacement of

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[1] A good summary of the problems inherent in tractorizing African agriculture can be found in J.C. deWilde, et al, Agricultural Development in Tropical Africa, (Baltimore: Johns Hopkins University Press, 1967), Chapter 6, "Implements and Machinery." The frequency of financial failure in African tractorization is documented in C. Eicher, et al, "Subsidized Tractor Mechanization," East African Community Specialist Committee Meeting in Agricultural Engineering, 1971.

equipment after five or six years).[1] In terms of building a foundation of cooperative work relations, the financial loss from poorly implemented tractorization may be less important than its perverse attitudinal effects. "Give-away" mechanization seems to foster attitudes against communal work: "the tractor does the work for us;" "the tractor gives us time to work on our own shambas."[2] Instead of self-reliance it prompts "a dependent attitude and commandism:" the tendency of wajamaa to perceive the State as provider, coupled with the tendency of public officials to see orders and coercion as the only means of inducing wajamaa to work together.[3]

To be sure, tractors have been a vital and economically efficient complement to human labor and collective organization in some villages. But in the last analysis, a nationwide strategy using tractors as a lure to the formation of ujamaa villages is simply unfeasible, even if it could be effectively implemented. An elementary arithmetic exercise will illustrate the problem. To provide each of the 4920 ujamaa villages in 1972 with one tractor and related equipment (much less with the two or three tractors actually provided to some villages)[4] would require an initial investment (almost entirely in foreign exchange) or roughly $25-30 million. This equals 28-33% of the entire Ministry of Agriculture development budget for the 1969-1974 Plan period. This figure would not cover the cost of crash training for drivers and mechanics. Considering that the 4920 villages include less than one-sixth of the rural

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[1] P. B. Ngeze, "Some Aspects of Agricultural Development," op. cit., p. 16.

[2] D. Vail, recorded from comments of wajamaa at Mikuuni ujamaa village (Arusha), 1973.

[3] L. Cliffe, "Planning Rural Development," op. cit., p. 104.

[4] M. Mugoya, "Ujamaa in Practice: Mwalimu Visits Makundusi," African Development, December 1972, p. T.21.

population, while the goal is to enlist the whole rural population in ujamaa villages by 1976; considering that Tanzania imports all of its fuel and that fuel costs have tripled in the last year; and considering that other budgeted expenditures -- such as biochemical research, input supply, produce marketing, and agricultural extension -- are also key ingredients of agricultural development, it is apparent that the promise of a tractor to take away the drudgery of farm labor cannot be used as a general inducement to form ujamaa villages.

This leaves the problem that tangible incentives to bring people together in cooperative work are lacking in many of the non-tractorized villages. Pronouncements on ujamaa often emphasize economies of increased farm scale as efficiency grounds for organizing agriculture collectively. Efficiency is certainly increased by a central water supply, by centralized crop storage and by group instead of individual extension demonstrations. But in cultivation per se, no automatic rise in labor productivity or crop yield follows simply from planting a communal block plot -- as long as it is worked by hoe or as long as oxen are not used for anything but plowing. In Iringa, Ngeze reports that wajamaa typically find farming their private plots more rewarding than collective work. (This is also a problem for communes and collective farms in other socialist countries, including the Soviet Union, China and Cuba.) The tendency is strongest where wajamaa are not truly villagers, but continue to have homesteads dispersed across the countryside. Getting together for communal work involves considerable lost time in walking several miles each way to the village shamba. The unattractiveness of cooperative farming is further reinforced if wajamaa are permitted to grow cash crops on their private plots. The observed result is that in the season of peak labor demand, members allocate

only eight to sixteen hours per week to the communal plot.[1] Late planting and poor weeding result, and the subsequent low yields and low returns to communal work reinforce the mjamaa's impression that he is making a personal sacrifice by participating in communal enterprise. An administrative deficiency contributing to this problem, as Cliffe notes, is that,

> "The (village) planning teams tend to formulate proposals for crops, (physical) layout, and (public) services once a village has been formed; there is perhaps too little emphasis on the actual cooperative organization of production, and also some avoidance of how one promotes cooperative activities among those who have not spontaneously expressed their interest in ujamaa."[2]

It is also apparent in Iringa that the Government and TANU are either unwilling or unable to counteract the discouragement syndrome by using force.

Ngeze concludes that "the only remedy lies in giving the wajamaa more political education."[3] The change in consciousness which he prescribes is certainly important, but it is naive to think the change can be built upon abstractions or exhortations that are not backed up by tangible incentives. New consciousness is part of, not a precondition of, the process of transforming of social and economic relationships. And transformation must begin with the existing motives of Tanzania's smallholders. A survey of wajamaa in Bukoba (one of Tanzania's more highly developed cash crop growing areas) indicates the nature of those motives. Asked why they had joined an ujamaa village, 62% replied that it was for higher income, 20% that it was for "higher income and an improved life," 8% had "no other job" and 10% were ordered to join by

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[1] Ngeze, op. cit., pp. 10-11.

[2] L. Cliffe, "Planning Rural Development," op. cit., p. 99.

[3] Ngeze, op. cit., p. 15.

local politicians.[1] None said anything to indicate a pre-existing socialist consciousness.

Here, in light of the preceding evidence, is the logic that should guide policy making for ujamaa: the State lacks the resources to provide much capital to the greater majority of new ujamaa villages; and people join villages primarily seeking tangible personal benefit. So the need is for programs to enhance self-reliance instead of financial dependence upon the State and to encourage collective effort by making it more attractive than individualistic effort. Effective programs will take many forms and will have numerous ingredients. In some regions elimination of tsetse fly will be a critical component; in arid regions, central water supply will play a central role; in most farming zones, biochemical innovations in the form of improved seeds and fertilizers will be important. But, in addition, innovation in the tools people use -- to wrest livelihoods from the soil, to transport produce, fuel and water, and to carry out household tasks -- can also be a powerful stimulus. And the consolidating impact of mevel mechanical implements can be redoubled if wajamaa learn to make them in a cooperative village workshop.

III. The Creation, Adapation and Diffusion of Intermediate Technology by T.A.M.T.U.

Craft skills are displayed in every trading center in rural Tanzania by carpenters, blacksmiths, bicycle repairmen and the like. There is potentially

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[1] B. Bakula, "The Effect of Traditionalism on Rural Development," in Building Ujamaa Villages in Tanzania (Tanzania Publishing House, 1971), p.25.

no shortage of skilled artisans to reproduce simple, yet mechanically and economically efficient implement designs. Two things, primarily, are lacking: better tools for making implements and knowledge of superior designs for implements. Another bottleneck, which might arise if the tool-making sector expanded and became more sophisticated, is the supply of factory-made intermediate inputs (materials and parts). The Intermediate Technology Project at TAMTU (Tanzania Agricultural Machinery Testing Unit) in Arusha has pursued solutions to these problems for the past four years. The Project is supported by the UN International Labor Organization (ILO) and located in the Crop Production Division of the Tanzania Ministry of Agriculture. The professional staff, until recently, consisted of an expatriate advisor (an agriculturalist with almost ten years of grass roots experience in African peasant farming) and two Tanzanian trainee counterparts. In December, 1973, expatriate staffing was phased out according to plan.

The Project operates on four principles:

"1. Machinery for village people must be of such design and construction that the people can easily understand how it works and can feel confident about using and maintaining it.

2. Materials used must be such that an ordinary villager can obtain them without too much difficulty.

3. The construction of such machinery must be possible by using only tools and techniques that can be found or easily learned in villages by ordinary people.

4. Machinery must fit in easily with village life and require no great change of routine for its adoption. At first machinery will be very simple, and then they (sic) will become more complex as people become more technically minded."[1]

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[1] G. Macpherson, "Appropriate Technology for Tanzania Villages," Annual Agricultural Engineering Meeting, Moshi, 1972.

The last point suggests a dynamic conception of development in stages. It deserves elaboration. The sponsors of the Intermediate Technology Project recognize that some implements of great value for rural development cannot be made efficiently by simple workshop techniques, e.g., a two furrow moldboard plow (currently made with more sophisticated equipment in the metal shop at TAMTU). And technological innovation is recognized as sequential, not a one-time change. The simple tools and production methods discussed in this paper are appropriate to needs and abilities of several million rural Tanzanians at their present level of technical and economic development. As intermediate technology is assimilated into village life, "it is hoped that an enterprising village could develop from goat-skin bellows and stone anvils to a portable engine-driven welding plant in a period of five years or less."[1] As the demand for more sophisticated equipment increases over time, spurred by increased purchasing power and new technical constraints on production, some village workshops will probably evolve into more specialized and larger scale factories. The Project personnel were only vaguely familiar with the central role that production of simple capital goods has played in employment generation and self-reliant development of China's rural communes. But the similarities in conception are striking.[2]

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[1] G. Macpherson, "Intermediate Technology and Village Development," (Mimeo), September, 1972.

[2] Two major differences between rural China and rural Tanzania are the more highly developed traditional tools and implements of the Chinese and the size difference between an average Chinese Commune (4,000-5,000 families) and a typical ujamaa village (200-300 families). These disparities suggest that a Chinese commune is probably better able than an ujamaa village to generate

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Although the various aspects of work on the Project are closely linked, it is convenient to discuss them as separate component tasks: the design and testing of implements; the construction of an inexpensive workshop and a tool kit; and the extension of results in the field.

Designing and Testing Prototypes

In the search for implement designs, the Project staff have been guided by their understanding of four prominent Tanzanian production problems: seasonal labor shortage, human inefficiency as a power source, the "underemployment" of beasts of burden, and the sheer arduousness of many tasks. But there has been relatively little empirical economic analysis of the benefits deriving from specific tools; few attempts, for example, to estimate the shadow price (productivity in alternative uses) of the peak season labor that is saved by mechanizing weeding under various Tanzanian farming conditions.

Most designs are initially imported and then adapted to local conditions and available materials. As the ILO advisor put it, "there is no need for our own program to design implements from scratch. There are so many good, cheap implements throughout the world that it is a matter of buying them, trying them and copying the best for local production."[1] The statement does not do justice to the complexity of technology adaptation, but it does point up the advantage to poor countries of accelerated international diffusion of the

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its own ideas for tool innovations with less outside "extension" advice; and also that the larger scope for use of its products permits greater economies of scale in production.

[1] G. Macpherson, personal communication.

stock of technical knowledge over the past decade. Inappropriate imported technology can be counterproductive, witness Tanzania's tractorization schemes of the 1960's. But the opportunity -- to test inter-row weeders from India, hand planters from the Netherlands and groundnut (peanut) lifters from Senegal -- does offer a shortcut to better implement designs, with savings in expert manpower and shortening of time lags in research and development (R&D). Perhaps most importantly, the ability to tap into the world supply of knowledge gives access to novel ideas that simply would not be thought of by researchers working in isolation.

An outsider's sense of what peasants need and an a priori economic calculation of the payoff to a mechanical device cannot substitute for field trials by local farmers under everyday conditions. Part of TAMTU's inductive approach to design was to demonstrate prototypes in villages and then loan them to farmers. When possible, farmers' comments on performance were supplemented by rough time-motion studies (e.g., the number of work hours needed to weed an acre of maize by hoe contrasted with a donkey-drawn weeding harrow). After testing in "real world" conditions, some design models were scrapped and others went back to the drawing board: if they were too complicated or expensive to produce or maintain, if they did not hold up under constant use, or if farmers found that the existing technology was superior to the putative improvement. Such was the case with a technically ingenious $10.00 maize sheller. It was rejected "for the wrong reason" in one ujamaa village in Arusha Region because the villagers already had a $550.00 motorized sheller, given by the State. It was rejected "for the right reason" in a village in Mwanza because the local women found that they could separate kernels from cobs faster

by the customary method of beating a sackful of cobs on the ground.

This kind of "learning from the masses" about problems with which they are intimately familiar is one of the most encouraging aspects of the I.T. project. Notably absent is the arrogance observable in much East African agricultural research, where the technical expert assumes that something which works at the research station must be right for smallholder farmers. The TAMTU sensitivity to peasants' preferences extends even to esthetics. To offset a bias in favor of factory-made implements, a bias that remains after TAMTU tools are shown to be equally effective yet cheaper, the Intermediate Technology group has advocated painting its implements in eye-catching colors, to give a store-bought look.

By mid-1973 there was a backlog of proven designs, complete with production cost estimates based on labor inputs, local materials costs, purchased inputs and a capital amortization charge. It included the following:

Intermediate Technology: Designs and Costs

		Approximate Production Cost
A.	For hauling and transportation:	
1.	several variants of wheelbarrow	$ 7 - 15
2.	several variants of hand cart	20 - 40
3.	several variants of ox or donkey cart	80 - 120
4.	Wheel chair for invalids.	N.A.
5.	improved ox or donkey harness	3 - 5
B.	For cultivation tasks:	
6.	clod crusher for seedbed preparation.	N.A.
7.	adjustable width animal-drawn weeding harrow.	$15.00
8.	hand planter for maize or beans	6.00
9.	fertilizer applicator	6.00
10.	wooden-tooth harrow	18.00

C. For food processing:

11.	solar vegetable drier (175 degree interior temperature)	$50 - 65
12.	mechanical maize sheller	8 - 12

D. Miscellaneous:

13.	hollow cement block mold	N.A.
14.	bee hive	N.A.

"The materials used include branches of trees (trimmed to shape) planks, bolts, nails, old rubber tires, bits from scrap vehicles (especially spring steel), water pipe, petrol . . paint," plastic sheeting, burlap and creosote.[1]

Cost estimation for implement production is relatively simple and straightforward, despite conceptual problems of imputing an appropriate wage rate for self-employed craftsmen and a discount rate for capital (i.e., the work shop and tools). For several reasons, it is more difficult to estimate the economic returns to new implements: 1. the working lifetimes of tools under normal conditions are uncertain; 2. adoption of new technology may lead to entirely novel or unforseen activities, on which little data are available (for example the availability of ox carts to haul large volumes of water might stimulate irrigated vegetable production in the dry season); 3. many TAMTU tools speed up or replace unpaid family labor, but there is no ready estimate of the extra production from using "saved" labor in alternative employment; 4. some of the tools contribute to welfare in a qualitiative way by reducing the drudgery of tasks as well as by speeding them (for example, a stand-up maize planter that replaces the bent-over method of chop-and-plant with a short handled hoe).

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[1] G. Macpherson, "Intermediate Technology as Interpreted at TAMTU," (mimeo), October, 1971.

Several economists have attempted to quantify the impact of innovations in East African agriculture by linear programming and other techniques,[1] but these methods require abundant farm-level data for estimating production functions and framing a model of the farm unit as an input/output system. For example, a "package" of technical innovations including ox-drawn plowing, seeding and weeding implements is likely to affect peasant farm production both through expansion of planted acreage and increase in yields. The yield effect stems from better seedbeds, enhanced timeliness of planting, and improved timeliness and thoroughness of weeding. To measure these components of the payoff to innovation requires detailed information on farm resource endowments (especially land and labor per farm unit), and also on the quantitative effect on yields of such variables as planting date, seed rate, and thoroughness of weeding. Such data are not available for most East African farming systems, especially not for communally-organized farming.

Of course, the agricultural economist and the agricultural engineer can use deductive reasoning combined with their feel for local conditions to weed out some inappropriate ideas for specific farming conditions. The labor-saving effect of mechanized weeding, for example, is far less important where the available land/labor ratio is two acres per worker rather than ten acres per worker, since peak season labor bottlenecks are less severe when there are fewer acres of crops per worker. In general it is more difficult to determine which new implements should be included in the innovation package for a partic-

[1] See, for example, D. Vail, The Public Sector as Stimulus of Innovation in African Smallholder Agriculture, University Microfilms, 1971; and "Induced Farm Innovation and Derived Scientific Research Strategy," East African Journal of Rural Development, 6, No. 1 (1973).

ular locale than to know which ones should obviously be excluded. TAMTU's tactic may be the optimum under present circumstances. They have worked on a wide range of implement designs (including several different models of some tools, like brick molds, vegetable dryers and wheelbarrows). From this inventory of designs, village craftsmen can produce prototypes and rely on feedback from the villagers to guide decisions on the set of implements to produce in volume. Such a creative interaction between the public sector (TAMTU) and socialist village units, providing a stimulus but leaving much initiative to the village, would seem to be precisely the kind of modernizing self-reliance that President Nyerere has urged for Tanzania.

Two thumbnail sketches may help to communicate the effect that intermediate technology can have in much of Tanzania. Most of the data come from a four-parish study in Eastern Uganda -- Teso and Bukedi Districts, but it represents a situation similar to much of Tanzania, in terms of natural environment, culture, and farming systems.[1] The first example demonstrates how innovation in transport can raise the labor productivity and ease the toil of women, who must gather firewood and fetch water at a considerable distance from the homestead in most of Tanzania. The second example illustrates the possibility of greater utilization of Tanzania's sizable livestock resources as draft animals in the relatively land-abundant savannah areas that encompass most of Mainland Tanzania.

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[1] D. Vail, History of Agricultural Innovation and Development in Teso District, Uganda, Maxwell School of Citizenship and Public Affairs, Syracuse University, 1971.

A. Wooden Wheelbarrow

The nearest water source, whether it is a borehole, dug well or stream, is typically a mile or more from most homesteads. A daily trip to the water source to fetch a debbe of water (four imperial gallons) for family use takes roughly an hour of walking time.[1] The return trip, carrying forty pounds of water on the head, is taxing even on flat terrain. If six trips were made in a typical week, the labor time input would be six hours per week or about 312 hours per year.

A wheelbarrow is conceptually very simple: a wheel and axle, a lever and a load-bearing platform, but it can raise work efficiency dramatically when compared with head porterage, particularly on the first leg of the circuit -- but a $10 TAMTU barrow could carry four debbes easily. Assuming no change in the total volume of water used, the weekly labor input would be reduced to about two hours -- a saving of four hours per week or 208 hours annually. Many of the saved hours fall during periods of peak labor demand in the agriculture calendar. If we assume, for the sake of simplicity, that all of the saved time is transferred to farm tasks, then a household in South Mwanza with 4.5 arable acres per adult worker, growing cotton as a cash crop, could increase the net value of its crop production by over $25 per year. The barrow would thus repay its cost 2.5-fold in the first year. Under continuous use, a TAMTU barrow might last only one year -- low cost implements are often not very durable. But this is unimportant if the short term benefit/cost ratio is high enough, as it is in this case. The farmer could easily buy a new barrow

[1] It should be noted that meeting at the water source is a significant part of women's socializing. One can assume, however, that ujamaa village women will have ample opportunity to meet and talk without daily excursions to the borehole.

each year out of the returns from the old one.

The benefit/cost estimate understates the economic returns since it does not include the potential payoff from additional uses of a barrow: gathering firewood, carting manure from cattle kraal to fields, transporting crops, or hauling larger quantities of water for more frequent washing and for dry-season vegetable irrigation. It also understates the welfare effect by not taking account of the fact that work is lightened as well as shortened.

The example is based on private farming. But the seasonal pattern of supply and demand for labor that determines the economic returns to this labor-saving device will hold for communal production in similar environments.

B. Inter-Row Weeder

Exhortation to weed plots thoroughly is leitmotif of agricultural extension advice in Tanzania. Agricultural extension officers are wont to express frustration that farmers attain such low yields because of late or scanty weeding. This is particularly true in the more land-abundant annual crop zones. However, the officials' notions of optimum yield usually stem from research station trials, where mechanization or the use of hired labor permits timely and thorough weeding. This commonly produces yields 25% to 50% higher than those observed in peasant farming.[1] Although this difference is sometimes attributed to peasants' ignorance, backwardness or laziness, in fact it stems less from values and attitudes of farmers than from constraints on the supply of family labor during seasons of peak demand.[2]

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[1] D. Vail, "Induced Farm Innovation," op. cit., pp. 11-12.

[2] For a discussion of factors limiting the supply of labor for cultivation tasks, see ibid., pp. 9-14.

Outside the fertile and well-watered highland zones, most of Tanzania is characterized by a distinctly seasonal rainfall pattern (bimodal in most areas) which sets the tempo of agricultural work. Land clearing, seedbed preparation, planting and weeding tend to be highly concentrated in the two months following the onset of the main rains. The majority of households in these zones have between four and ten arable acres per adult worker. This is not a high land/labor ratio by American standards. However, many households perform all farm tasks by hand and even where oxen are in use, they are infrequently employed for anything but plowing. Given the seasonality of tasks and the highly labor-using technology, it is valid to call these parts of Tanzania relatively land-abundant and relatively labor-scarce. If labor at particular times of year, rather than land, is the binding constraint on production, then the productivity of peak season labor (measured, for example, as output per man-day) rather than of land (yield per acre) should be the maximand incorporated in extension advice. If seasonal labor bottlenecks are severe, this would suggest a search for technological innovations to augment (raise the marginal productivity of) the scarce factor -- labor. If oxen are already used for plowing, this search would naturally lean toward fuller utilization of animal traction and mechanization.

TAMTU's oxen or donkey-drawn inter-row weeder, with adjustable width for different row spacings, is an outstanding example of such a technology. The production cost ranges from $7 to $15, depending upon how much of the material is locally available and how much has to be purchased (e.g. leaf spring steel from abandoned automobiles vs. from an urban rolling mill). Unlike the more

elaborate weeding harrows widely used in West Africa, the TAMTU version weeds only one row at a time, but it also requires only one bullock or donkey (donkeys are not common in most of East Africa, but they have long been kept by the Masai in Northern Tanzania and are coming into greater use by agriculturalists in surrounding areas). For weeding, the animal must have somewhat better training than for plowing, since it is important to keep a straight line and not to trample the planted crop. It also is necessary to use a simple wire or rope muzzle to prevent the animal from eating the tender leaves of growing corn, sorghum or other plants.

The frame is made from local hardwood poles, two to four inches in diameter, with two rows of "L" shaped steel tines fashioned from discarded spring steel. The lower part of each "L" is set at right angles to the direction of movement, thus acting like a small hoe when pulled through the soil. The two rows of overlapping "L" tines provide a clean, shallow weeding, but only if the task is carried out before weed stems and roots become too thick and only if the field is covered twice, once in each direction along the rows. On average, this process requires six hours per acre. It is still necessary to thin the crop by hand and to do a bit of hand weeding close-by the planted rows: this adds about 17 more hours per acre for the first weeding. The following data give some indication of the time saving that results from mechanized weeding.[1]

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[1] nb. The main reason for higher hand weeding time on cotton vis-a-vis sorghum or millet is that cotton is usually planted on land fresh from fallow. On this fertile soil, weed growth is more prolific than on sorghum and millet fields planted later in the rotation cycle. On the other hand, thinning an acre of millet takes two hours more than an acre of cotton, because the millet is planted continuously along rows, while cotton is spaced at six to twelve inches.

Man-Hours for Weeding One Acre[1]

	one weeding (includes thinning)	two weedings	three weedings
1. Cotton			
mechanical weeder	23	29	35
hand hoeing	70	115	155
2. Finger millet or sorghum			
mechanical weeder	25	31	37
hand hoeing	60	100	130

When we imagine households with several acres of crops for every worker, both food and cash crops that need weeding at the same time following the onset of the rains, it is possible to grasp intuitively that the hundreds of total man-hours of hoeing saved by use of the ox weeder can permit both more timely and more thorough weeding of plots.

The actual payoff to this innovation varies with the severity of labor shortages, which is a function of land/labor endowments and the degree of seasonal rainfall concentration. This proposition can be demonstrated heuristically by looking at the results of a study of farm innovations in the savannah zone of eastern Uganda, a farming system analogous to large parts of Tanzania.[2] Farmers use oxen for plowing, but they use digging hoes for weeding. They cultivate cotton as a cash crop and finger millet, sorghum, corn, peanuts, cassava and minor food crops.

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[1] D. Vail, The Public Sector as Stimulus of Innovation, op. cit., Appendices V and VI. These figures agree with the orders of magnitude estimated in many other farm survey investigations in East Africa.

[2] Teso, with 30-40 inches of annual rainfall, bimodally distributed, with many cattle, with cotton and grain as the major crops, resembles much of Kigoma, Southern Mwanza, Shinyanga and Morogoro Regions of Tanzania.

In the communities studied, two-thirds of households had 4.5 or more acres per adult (or equivalent) worker. Each year, with the approach of the main rains, a household must make numerous decisions on the crop mix and on the allocation of its labor time. Staple food crops take precedence -- a family will not jeopardize its subsistence. But, given that households act to secure adequate supplies of staples (e.g. millet) and variety foods (e.g. peanuts), they appear to use the remaining available resources grosso modo to maximize cash crop income. By analyzing farm records of labor and land use (collected daily for a year from 48 households), and by using linear programming optimization techniques, it was possible to conclude that mechanized weeding would give a pronounced boost to peak season labor productivity and to net farm income (after deduction of the added costs) for the majority of households. In the survey parishes, there has been no innovation of comparable impact since the introduction of cotton and oxen plowing, 40 to 50 years ago. The following table indicates the orders of magnitude.

Percentage Increase in NET Farm Income by Mechanizing Seeding and Weeding[1]

Household Resources	
3.0 acres/worker or less	negative
4.5 acres/worker	22%
6.0 acres/worker	36%
8.0 acres/worker	40%

[1] D. Vail, The Public Sector as Stimulus of Innovation, op. cit., Table 5.9, p. 128. Net farm income was derived from gross income by deducting annual capital charges for the weeder and harness, using a 12% discount rate and an assumed working lifetime of six years.

For the sake of simplicity, the weeder has been discussed as a single innovation. The above results, however, required the simultaneous adoption of a cheap mechanical seeder as well as the weeder. The seeder cuts planting labor to only 20% to 40% of the level required for hand planting in rows. In eastern Uganda this enables farmers to get a larger proportion of their crops planted at the optimum time. And it is an inducement to give up broadcast planting, which is incompatible with mechanized weeding. The study led to the conclusion that there is a strong synergistic, or mutually reinforcing, effect in using the seeder and weeder together. It also pointed to the conclusion that adoption of these innovations would give rise to a new set of labor constraints at the harvest season, because mechanized seeding and weeding raise the total harvest size enormously.

The seeder-weeder package is precisely the kind of powerful innovation that ujamaa village farmers should be able to discover for themselves, once they have village craftsmen to turn out prototypes for local experimentation.

Designing a Workshop and a Toolkit for Carpentry and Blacksmithing

The TAMTU Intermediate Technology group designed their own workshop as a model for shops "which could be reproduced comparatively easily throughout Tanzania." Nonetheless, their shop cost $570 and tools another $430. The total cost of roughly $1000 provided six workplaces, or $167 per workplace (i.e., per craftsman). When this figure is compared to more than $1100 per workplace for the TAMTU production factory, it is evident that the Intermediate Technology shop can provide employment opportunities at an extremely low initial capital cost. However, even $167 per workplace is more than many

ujamaa villages are likely to afford. So an effort has been made to design a "minimal" open air workshop. It consists essentially of two rugged handhewn workbenches rooted firmly in the ground or against a tree, two ingenious wooden vices for working large pieces of wood and utilizing the workman's own weight to generate compression, and a small blacksmith's forge with a bellows adapted from eastern African metallurgical technology going back at least six hundred years (to the Zimbabwe culture in what is now Rhodesia). Rural Tanzanians don't need lessons in the use of local materials to put up a low cost shelter around the work area.

The basic store-bought toolkit costs $11 and includes a hammer, pliers, saw, wood rasp, file and pencil. With it, the I.T. group has devised methods for fabricating several other hand tools such as a cold chisel, axe, adze, compass, screw driver, metal punch, tongs, knives, mallet, and sledge hammer. Adding up materials and tools costs, the minimal shop can be established at a cash outlay of less than $20 per workplace. Adding implicit labor costs to the cash outlay, the total would still not exceed $50 per workplace.[1] In an ujamaa village the labor would presumably be part of the communal work obligation. In two villages on the slopes of Mt. Meru where the I.T. group set up prototype workshops, many wajamaa, not just the chosen trainee-craftsmen, turned out

[1] The inventory and cost estimates derived from personal interviews with the TAMTU staff and from the author's participation in constructing two ujamaa village workshops. Also, G. Macpherson, "Intermediate Technology in the Rural Sector of Tanzania," November 1972, (TAMTU mimeo).

to help cut and shape poles, dig foundations, build a rear wall and prepare thatch for the shop roof.

The I.T. group has worked out a series of store-bought toolkits, ranging from the $11 "starter set" to a relatively elaborate $115 set. In practice, every village touched by the project wants to start out with one of the more expensive sets of tools. It is probably valid to say that neophyte fundis have a strong preference for store-bought tools rather than the cruder-looking homemade ones, apart from any differences in technical efficiency and durability. Likewise, many villages prefer the more wa kisasa (modern) image of a cement block workshop with a corrugated metal roof. The I.T. group has not encouraged these leanings in its extension work, and one might wish that peasants were not as they are -- that they would show a stronger natural bent toward "socialist austerity." But, if a village pays for such economically unnecessary refinements out of its own funds, then they are a relatively inexpensive indulgence, considering the increase in village pride and cohesiveness that may result and considering the greater confidence that wajamaa may place in the implements produced by the workshop. The moral of this short story is that in village-level planning, where enthusiasm for new ideas and programs is a key ingredient of success, the medium is often the message: a more modern looking shop, a more sophisticated set of tools, and a farm implement painted to look more like the commercial variety may all contribute to the spread of a new technology.

Extension Work: Spreading New Technologies

The strategy for getting cooperative rural workshops and novel implements off the drawing board and into use in ujamaa villages is still in the formative

stages. As conceived by the ILO advisor the main task is to train trainers and not to get heavily involved in training village fundis directly. The reasoning behind this tactic is sound and runs roughly as follows: there already exist about 5,000 ujamaa villages and universal ujamaaization would imply at least 10,000 villages, if they averaged 250 households each. If a typical cooperative workshop had six fundis, this would imply a need for 60,000 trained artisans nationwide. Even assuming that the process of establishing village workshops is spread over several years, that many of the existing private enterprise craftsmen shift to cooperative shops, and that one or two trained craftsmen can train others in their villages as apprentices, there is still a need to train several thousand craftsmen in the immediate future. Given the small size of the TAMTU staff and the necessity of a fairly personalized training in craft skills, it is clearly impossible for the I.T. group to meet the quantitative need for fundis by training them directly. If this course were pursued, the diffusion of intermediate technology would be very narrow, duplicating the undesirable "privileged village" syndrome that has prevailed up to now. So the prime need is for Instructors from the Rural Training Centers (RTC's) to be given short courses on how to build a workshop and how to make implements. They, in turn, can provide training to craftsmen chosen by ujamaa villages and sent to the RTC's. To facilitate this training, TAMTU has prepared the first in a series of swahili language pamphlets, called "How to Make Yourself a Wheelbarrow." An English language textbook, written by the ILO advisor, is currently in press at the Tanzania Publishing House. The text will provide RTC instructors and others with a fully illustrated set of designs and instructions

for construction fo workshops, toolkits, and implements. It indicates the likely costs of production and demonstrates how to make costings. It also gives numerous suggestions as to the types of tools and implements that can help most to solve particular problems in the villages.[1]

Since January, 1972, several two-week and three-week training courses have been held at RTC's in Northern Tanzania. The typical course attendance is 15 to 20, composed primarily of RTC instructors and Rural Construction Team members (these cadres, who come under the direction of the Prime Minister's Office, are in charge of ujamaa village development). Some courses have included village craftsmen as well as government staff. Young educated Tanzanians are required to do two years of National Service, which more and more consists of helping to set-up ujamaa villages. It is a logical step to begin training some of these cadres as well.

The emphasis in training courses is to get participants to use their hands and apply their minds to making tools. They are encouraged to derive technical and economic principles from practice and to interpret their new knowledge in terms of particular problems of the farmers they serve. Feedback from participants in the courses has helped the I.T. staff, especially in pointing out things (like the maize sheller) that need modification or are likely to encounter resistance in the village. The response to courses has generally been enthusiastic, although some participants show a reluctance to do manual work

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[1]The costs of putting out the pamphlet were underwritten by UNESCO. The text, Steps in Village Mechanization, is being financed in part by the Ford Foundation.

and others cling to an image of modernity symbolized by the lorry and the tractor. The greatest deficiency in this approach is that a two-week course is insufficient to make either "believers" or qualified craftsmen-teachers out of State functionaries who have little training and practical experience in mechanical technology.

A more thorough training for a smaller number of craftsmen-teachers is preferable: they must know thoroughly and believe firmly "what they're talking about" when the time comes to persuade wajamaa and train village fundis. This method is pursued at the Handeni Rural Training Center (Tanga Region), where instructors originally schooled by the TAMTU staff are now holding three month courses for young men sent by ujamaa villages. A different approach has been tried at the LIDEP Project (also in Tanga Region) where instructors trained by TAMTU in 1972 run shorter courses to teach villagers to make only wheelbarrows and handcarts, implements that seem especially important for that area.[1] The hope is that from this modest base, a broader range of toolmaking will develop in time.

Paralleling its training activities, the Intermediate Technology staff have gone into several ujamaa villages. One purpose, as mentioned, has been to subject its prototype implements and the prototype workshop to daily use and to the critical scrutiny of the villagers -- but the aim is also to get village tool making under way. This has been a valuable learning process for the TAMTU staff, stimulating numerous modifications in shop and tool design, while vindicating the basic approach.

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[1] LIDEP is the German aided Lushoto Integrated Development Project, in Lushoto District.

In most cases, the village shops have been their own advertisements, drawing many curious farmers from neighboring areas. An indication of the demonstration effect this has had is that several workshops have reported over 100 orders from private farmers for their wheelbarrows and ox carts. The dilemma, of course, is that selling new and effective implements to private farmers increases the rewards of individualistic enterprise and as a result may discourage ujamaa organization.

There appears to be pressure from within the Ministry of Agriculture for the I.T. group to create showcase villages to impress visiting higher-ups. Of course, this may serve the constructive purpose of persuading skeptical policy makers and administrators to commit themselves to the concept of co-operative workshops as a core ingredient of ujamaa construction. There can be no question that vigorous advocacy at the highest levels is crucial to the effective implementation of this or any element of the nationwide plan for cooperative rural development. On the other hand, showcases run the danger of becoming Tanzania's Potemkin Volleges: a bit of highly visible proof that progress is being made, to which every visiting dignitary is steered, while little else is done.[1] This kind of superficiality and complacency is a real danger and not just cynicism.

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[1]Anecdotally, this is what happened in July, 1973, at Mikuuni ujamaa village in Arusha District. A great deal of effort on the part of Ministry officials, TANU leaders and the TAMTU group went into preparation for a brief visit by Mwalimu Nyerere and Liberian President Tolbert. Ironically, it is difficult to imagine Tolbert taking much interest in efforts to build socialism in the villages.

Since Independence, Tanzania has had to struggle continually with the tendency of State functionaries to view their jobs as bureaucratic sinecures, rather than commitments to sustained hard work for the common good. The temptations of bureaucrats to slack off in their work and to stress form rather than substance are reinforced by the weak lines of communication and feedback from the bottom of the administrative apparatus to the top. It is typically impossible for central or even regional officials to keep close surveillance on the performance of staff in the field.[1] Indeed, the recognition of these tendencies has been one of the prime motivations of the major effort to decentralize governmental decision-making and operations in the past two years. The decentralization effort, the 1971 guidelines for the behavior of TANU cadres, the infusion of young secondary and higher education graduates into the rural development programs, and the inclusion of elected village representatives in the District and local planning processes are all signs that President Nyerere and the top political leadership are extremely concerned about bureaucratization and unresponsiveness in the State apparatus.[2]

To spread its ideas, the Intermediate Technology group has initiated collaboration with other public agencies and utilized the mass media. The Faculty of Agriculture of the University of Dar es Salaam (at Morogoro) has begun to incorporate intermediate technology into its teaching curriculum and

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[1] Monthly and annual reports by junior staff -- i.e., their own version of their efforts and progress -- are a main source of information further up the administrative ladder.

[2] See J. Nyerere, "Decentralization," (Dar es Salaam: Tanzania Government Printer, 1972); and TANU, "Mwongozo: TANU Guidelines," (Dar es Salaam: TANU, 1971).

into its agricultural engineering research. The TAMTU farm implement factory is now producing more sophisticated versions of the I.T. Project ox cart and metal-tooth harrow. The Ubungu Farm Implements (UFI) factory in Dar es Salaam is mass producing metal parts such as plowshares and hoe blades for TAMTU-designed implements. And the Tanganyika Farmers Association (TFA), a farm input marketing co-op, is being encouraged to order carpentry and metal-work tools plus materials like nails, glue, plastic sheeting and paint to stock the ujamaa village workshops. Judging by past experience with innovations in agricultural technology, once village workshops become numerous, the rising demand for tools and materials will outstrip the supply, making inputs the critical bottleneck in the diffusion process.

TAMTU's progress with intermediate technology has been written up in the Tanzania Daily News and also in the Ministry of Agriculture's Swahili monthly Ukulima wa Kisasa (Modern Farming). What may eventually have greater direct impact on rural dwellers is a vernacular newsheet, Jitengenezee (Do-it-yourself). One thousand copies of a trial run were printed in December, 1972.[1] The trial issue was designed to appeal to a broad range of villagers' interests. It contains simple instructions and illustrations for making a workbench, a cement block mold, wall shelves for the home, children's clothing, a stool, and wheaten flat bread (chapatis). This may, in time, become the principal way of passing new ideas to Rural Training Center instructors, to Village-level government cadres, and to the wajamaa themselves.

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[1] Jitengenezee is a joint venture of TAMTU and LIDEP, the West German aided "Lushoto Integrated Development Project" in Tanga Region. LIDEP is another agency that has become deeply involved in the diffusion of intermediate technology.

In summary, the TAMTU Intermediate Technology group has acted on several fronts to translate its ideas into village realities. It has seized the initiative to design a technically and economically sound program, to show that intermediate technology can be attractive to the wananchi, and to demonstrate how to make it work in ujamaa villages. As of this writing, the Government agencies directing the ujamaa village program have not yet made village workshops a central part of their activity. But the groundwork has been well laid. The concluding section will examine some of the problems that will be encountered in continuing the work begun at TAMTU.

IV. Warnings and Conclusions

The central proposition of this paper is that, in economic terms, intermediate technology "works." Evidence both from a priori economic calculations and from field trials under Tanzanian conditions gives a clear indication that the availability of new kinds of capital equipment, produced at the village level, will bring about substantial increases in labor productivity and in levels of production in agriculture and in non-farm activities. But however persuasive the case for intermediate technology on paper, there is no assurance either that it will be adopted as a prominent part of rural development strategy or, if it is so adopted, that it will contribute to a collective as opposed to individualistic brand of economic growth. This concluding section raises issues that fall under two broad questions about the implementation of an intermediate technology policy: will it be carried out vigorously and effectively?; will it contribute to or detract from ujamaa?

One potential obstacle resides in the superstructure of planning and implementing agencies. It has been mentioned several times that there persists a mystique equating modernization with electrification and motorization. This is not only incompatible with the limited public resources available at present to stimulate ujamaa nationwide; but it is also much too narrow a conception to fit the fundamental meaning of economic modernization, which is raising the volume of production while reducing the costs of production. At the outset, even the Tanzania counterparts of the ILO Advisor at TAMTU showed some resistance to the idea of an intermediate technology and to getting their hands dirty in the process of making, testing, and teaching villagers about simple implements. This resistance is bound to be encountered in much of the country. Getting newcomers past their initial skepticism and reluctance requires teachers and administrators who are committed, confident and persuasive spokesmen for intermediate technology, and this means teachers who can demonstrate vividly the contribution of I.T. to universally accepted development goals. At present, people with the required expertise and persuasive power are few and they tend to be expatriates. Until leaders at the top levels of the political and administrative hierarchy become advocates, many of the junior staff charged with implementing programs are likely to perceive intermediate technology as a form of patronization by the aid agencies of rich Western nations, interested in keeping Tanzania technologically backward.[1]

Another forseeable implementation problem is the bottleneck in the supply of shop tools and factory-made inputs to the widespread villages. A necessary

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[1]This viewpoint was communicated to the author by several TANU functionaries in Arusha.

ingredient of the solution is co-ordination between the requirements of village plans, aggregated to District and Regional levels, and expansion of urban factories that mass produce such tools and inputs. But it is not simply a question of the logistics of matching supply and demand. If I.T. is to serve socially desirable ends, the supply mechanism must discriminate in favor of ujamaa village workshops and discourage or prohibit investment in private workshops. Short of outright prohibition of private shops, discrimination in favor of wajamma might take several forms: privileged access to short term credit, discount pricing, and transport assistance. The point is that, especially in the relatively wealthy export crop producing zones, there are plenty of enterprising Tanzanians with a bit of capital who could easily subvert the cooperative objective if tools and materials are supplied indiscriminately by the Tanganyika Farmers Association and the State Trading Corporation.

The preceding point raises the very basic question of how intermediate technology will be diffused. It should be obvious that the technology itself -- both in the production and in the use of implements -- is not inherently "socialistic." A carpentry shop that can be built and stocked at a cost of $50 per workplace might just as easily be a petty capitalist establishment as a cooperative one. The new implements, such as wheelbarrows and beehives, can as easily be used to modernize private farming as collective farming. The prime reason for this is that there are no significant indivisibilities and economies of scale in producing and using the implements that might deter small scale, private use.

Thus the answer to the question, whether intermediate technology will contribute to further socio-economic stratification and the entrenchment of an

individualistic ethos, or to the evolution of an egalitarian society built upon a cooperative ethos, depends critically upon the way in which State agencies make use of the technology and create access to the technology as part of their action programs for ujamaa. In all likelihood, the State will have to impose strong sanctions against private appropriation of intermediate technology. An enumeration of setbacks already encountered by the TAMTU I.T. group illustrates the difficult choice that confronts political leaders who want to foster rapid economic growth, but who face a population that is by and large more inclined to individual than to collective effort and reward.

One danger is that cooperative workshops will gear their production to profit-making in the private market. It is encouraging that large numbers of private farmers have put in orders for maize planters, wheelbarrows, ox carts and beehives at workshops already established with TAMTU assistance.[1] This reaffirms that field demonstrations have been persuasive, that the low prices of new tools are within the financial means of many Tanzanians and that a supply of appropriate implements to meet local needs will generate its own demand. But the orientation to a market outside the ujamaa village has two deficiencies: first, it contradicts the idea that village workshops should concentrate on making implements to stimulate communal production activities within the village, and second, sales to individuals outside the village make private agriculture all the more productive and remunerative, which acts as an obstacle to voluntary formation of new ujamaa villages.

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[1] Through mid-1973, these shops were at Malya (Mwanza Region), Soni, Babati and Handeni (Tanga Region), and Tabora (Tabora Region).

Where these shops are currently operating, local officials are enthusiastic about the indications of a large prospective demand for farm implements. Considering the stress on increased farm production that emanates from higher in the bureaucracy, one can sympathize with their reluctance to confront the contradiction between maximum short term growth of private farm production and the establishment of viable ujamaa villages. But higher up the lines of authority, there must soon be a resolution of the question: will intermediate technology be used to stimulate or to stifle socialist construction? It is naive to think that its effect will be neutral regardless of the mode of implementation.

Another potential danger follows from Nyerere's observation that Tanzanian rural society, at both household and more aggregative levels, tends to be dominated by males. From the precedents of customary role patterns and colonial history, it is not surprising that the Party and Government functionaries working in the villages are virtually all male, and that the craftsmen-trainees thus recruited for TAMTU's training programs have also been male. This raises questions at two levels: first, will women have equal opportunity to participate in ujamaa village decisions and activities, and second, will village workshop committees give priority to the production of implements that ameliorate some of women's more burdensome tasks such as portcrage and pounding grain? (Whether the customary sex division of labor that has made these "women's work" will be eliminated by ujamaa living is yet another question.) The answers that Tanzania gives to these questions in practice will have a profound effect on the quality of its socialism. The habit of male dominance runs deep. Notwithstanding statutory provisions for equality and the existence of the "Umoja

wa Wanawake wa Tanzania" women's movement, it would be wrong to assume that sex discrimination is no longer a significant social phenomenon or that socialis institutional structures will automatically eliminate it.[1]

A third danger, which has already surfaced in two villages, is that craftsmen may attempt to secure privileged status within the village, disdaining farm labor, rejecting villagers' suggestions about which implements to make, claiming the right to higher income than the farmers, and making private sales on the side for personal gain. The report of a field trip by the TAMTU group in November 1972 records that at Soni (Lushoto District, Tanga Region), "craftsmen say that their time is more valuable than that of someone digging, so they want special conditions."[2]

This problem is common to all societies trying to build socialism on a base of peasant agriculture and rural poverty. The "New Man" of socialist society does not emerge full blown from a mere institutional reorganization. Reports from Chinese rural communes and Cuban state farms indicate that they too have found elitism, based on economic specialization, to be a problem in transforming peasants into socialists.[3] Clearly, Village Development Committees in Tanzania must emphasize proper attitudes toward the collectivity when selecting candidates for craft training. As collective owners of the workshops

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[1] See M. Mbilynini, "The Participation of Women," op. cit.

[2] G. Macpherson, "Safari Report," 5 November, 1972 (mimeo).

[3] See, for example, William Hinton, FANSHEN, (New York: Vintage Books, 1965), Part IV, "Who Will Educate the Educators," and R. Dumont, Cuba: Socialism and Development, (New York: Grove Press, 1970), pp. 229-232.

and tools, the villagers must also assert their authority over workshops activity and craftsmen's remuneration. But these things are more easily said than done. The problem of motivating the craftsmen to work diligently and to shun self-aggrandisement is not easily resolved. The experience of Suwa Village (Handeni District, Tange) suggests one reason why this is true: a year after the wajamaa had supported a carpenter through training, he left for a higher paying job in a nearby town. He had acquired a marketable skill in a country with serious skill shortages, and the commitment to the ujamaa village was weaker than his material self-interest.[1] Difficulties in dealing with village craftsmen are but one manifestation of the broader problem of establishing collective decision-making on the division of labor and the distribution of the product among members. The benefits to be derived from a cooperative workshop that is efficiently run and effectively controlled by the wajamaa should give them a large tangible stake in making it work.

Socialist regimes in economically underdeveloped nations such as China, Cuba and North Vietnam have encountered pitfalls and obstacles in transforming peasant societies, with capitalist or feudalist institutional traditions, into modernizing communal societies, but they at least could rely upon the galvanizing influence of a revolution against an oppressor class to provide momentum for rural socialist construction. In contrast, the colonial regime in Tanganyika was not so obviously oppressive and it was terminated peacefully. Furthermore, life for most rural Tanzanians, before and since Independence, has not been characterized by the kind or the degree of insecurity, exploitation and indignity that usually galvanize socialist movements. Thus, the

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[1] Macpherson, "Safari Report," op. cit.

difficulty of creating rural socialism is compounded in Tanzania by the fact that most of the wananchi will not easily be persuaded to give up their current way of life and its future prospects for an unproven collective existence.

Tanzania lacks the police state apparatus to achieve its goal of complete ujamaaization by 1976 through coercive means. More important, such a strategy sharply contradicts the consistently democratic and humanistic social philosophy of its highest political leaders. One can conclude, therefore, that the movement from private enterprise in farming and commerce toward communal organization of the rural economy must be predominantly voluntary. It must rely primarily, though not exclusively, upon tasty carrots rather than threatening sticks. This paper has presented a case for village workshops, producing inexpensive yet productive implements, as an appetizing carrot -- one that can be widely planted across the Tanzanian countryside despite the State's limited resources; one that can help prepare the soil for ujamaa by fostering local experimentation and self-reliance.

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