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**THE DETERMINANTS OF LABOR'S OFF-FARM SUPPLY PRICE:
A MICRO-THEORETIC APPROACH**

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First Draft

Introduction

The high and apparently rising rates of urban unemployment observed in most low income areas, including a majority of African countries, has become a central theme of much of the recent development literature. Analyses examining the causes of this widespread labor misallocation have followed often divergent paths to identify a complex of contributing factors, both economic and institutional in nature [Eicher et al, 1970], [Frank, 1971], [Harbison, 1967]. Nevertheless, with few exceptions, these studies share a common focus: they have concentrated almost exclusively on factors distorting and restricting the demand for labor services. Prescriptions for corrective action have reflected the orientation by similarly concentrating attention on the development and evaluation of alternative policy tools geared to the generation of additional employment opportunities. Recent writers pointing at the African experience of the last decade, however, have convincingly demonstrated the pitfalls of following unbalanced policies of job creation without a better understanding of the impacts of such policies on the labor supply [Todaro, 1969], [Frank, 1971], [] .

Supply factors, when discussed at all, have most often been framed either in a demographic or migration context. The demographic arguments clearly have relevance to long-run solutions to the unemployment problem.^{1/} But by ignoring changes in labor force participation rates and factors contributing to the amount of labor offered among active members of the work force, the

^{1/} See especially Appendix A in [Eicher et al, 1970].

demographic approach provides little guidance to planners responsible for the formulation of policies with more immediate impact. The migration analyses have to a greater extent attempted to identify those economic as well as social and institutional factors contributing to short and medium-term spatial labor transfers of various types. Models of increasing rigor have been developed to help explain observed patterns of rural-urban migration using intersectoral income differentials as the primary independent variable [Todaro, 1969], [Johnson, 1971], [Fields, 1972]. These models, however, have foundered on the inability to identify the relevant rural income or reservation price among potential migrants [Byerlee, 1972].

The components of the rural labor supply function and its dynamics over time remain problematical. Factors contributing to adjustments in the size of the rural labor force by age, sex, and educational classes, by season and as a function of level of wages and of structural changes in the rural economy have yet to be satisfactorily identified. And, only superficial and speculative treatment has been given to the determination of the individual's labor supply function once in the labor force.

This lack of a general theory of labor supply in the African context has created knowledge gaps in a number of related areas with important policy implications. In addition to the problem of identifying the rural labor reservation price to better understand migration flows, the following problem areas have also drawn analysts' attention to questions of labor supply, price and opportunity cost: (a) There has been revival of interest in the capability of rural public works to provide seasonal or full-time employment to residual members of the rural work force. Questions remain as to the optimal timing of such labor intensive projects, the setting of appropriate wage incentives,

and the net impact in attracting rural underemployed away from urban alternatives without reducing productive on-farm employment [Lewis, 1971], [Norbye, 1967].

(b) Strategies to develop and expand employment in rural non-farm industries are hampered by an insufficient understanding of the factors which influence labor allocation to on-farm activities, both agricultural and non-agricultural, and thus which determine the implicit opportunity cost of work in off-farm rural employment [Liedholm, 1973]. (c) It has been argued that within institutional systems believed to be representative of much of rural Africa, the most appropriate shadow wage for use in project evaluation is labor's reservation price or voluntary supply price [Harberger, 1971], [Ward, 1973]. To be operational, however, this shadow pricing approach requires an estimation of the regional labor supply function in the area of the proposed project, an exercise which has yet to be satisfactorily accomplished.

The purpose of this paper is to explore the theoretical and empirical problems facing research in the general area of labor supply. An attempt is made to critically review the existing literature and to suggest a framework within which further research might be usefully oriented for attaining a more comprehensive understanding of the nature and dynamics of the rural labor supply.

Labor Supply in African Development Theory

The largest single body of literature concerned with the supply of African labor is that describing patterns of labor migration. The reasons for this are both theoretical and historical.

Helleiner [1966] has critically pointed out that implicit in the emergence of the sub-discipline of development economics was the assumption that the essential characteristics of most low income countries were sufficiently

similar as to warrant similar theoretical treatments. The earliest important set of development models (as opposed to growth models) to gain fairly wide currency was the Lewis-type dual sector framework [Lewis, 1954]. Although Lewis specifically excluded most areas of Africa from his surplus-labor version of the dualistic framework, there can be little doubt that the perspective which these models gave to both policy planners and researchers in Africa helped to focus their attention on the central dynamic element of the dualistic model--the transfer of labor between traditional and capitalist sectors. These models not only drew the attention of researchers to interspatial labor movements, but they also provided theorists with a first approximation of an aggregate labor supply function.

The conditions defining the familiar labor supply presented in the classical dual models are dependent upon a substantial pool of disguisedly unemployed laborers in the traditional, predominantly agricultural, sector. In the Lewis version, labor is in perfectly elastic supply to the urban sector at any wage above an institutionally determined subsistence wage by an amount reflecting psychic and transfer costs and differences in the cost of living. The source of this unlimited labor supply is an unfavorable labor to land ratio and is augmented over time by the natural rate of population increase and by increased labor force participation of previously excluded groups.

The Ranis-Fel model [1961] expanded on the Lewis framework by exploring not only the transfer of labor between sectors but also the transfer of capital and wage goods. They demonstrated that with the withdrawal of labor whose marginal product is less than the institutional wage, the latter would remain constant, that is the labor supply curve would remain infinitely elastic, only through the intervention of a landlord class or government to remove the average agricultural surplus which emerges with the transfer of labor. In the absence

of such intervention, the labor supply curve would turn upward. Although Ranis and Fei addressed their analysis to the aggregate agricultural sector, it is shown below that the value of this average agricultural surplus may be a critical determinant also in the micro or household decision to offer labor for off-farm employment.

Important difficulties are encountered in applying development models based on the classical interpretation of surplus labor to Sub-Saharan Africa. Byerlee and Eicher [1972] have warned against the direct adoption of such models due to assumptions contained therein defining factor proportions and institutional systems which fit poorly the African environment. A substantial literature, some of which is cited in the Byerlee-Eicher survey, concurs in their warning.^{2/} It has been suggested that "vent for surplus" models may better represent African conditions during the earliest stages of development [Myint, 1965]. However, as Byerlee and Eicher have pointed out, this merely replaces the classical Ricardian explanation of surplus labor with a more Keynesian explanation based on inadequate aggregate demand. No difference is made with respect to the nature of the implied labor supply function.

The presence or not of surplus labor and its attendant implications with respect to the elasticity of the rural labor supply would seem to be questions subject to empirical verification. Substantial conceptual and measurement problems, however, preclude definitive conclusions even within limited geographical areas [Kao, 1964], [Matlon, 1972]. The wide diversity of population densities and institutional conditions among and even within individual African countries would in any case prohibit any generalized application of the surplus labor construct.

^{2/}A consensus on the inapplicability of the surplus labor assumption to Africa however, hasn't been reached. For example, Godfrey [1969] and Berry [1970] have

But finally, even disregarding the labor surplus problem, it should be clear that the supply conditions depicted in the classical dual sector models are, at best, superficial and, at worst, unrealistic in the African context. For example: (a) Homogeneity is implicitly assumed between various classes of labor and among farms with respect to productivity and levels of consumption. (b) Labor markets are assumed to be perfectly competitive and subject to instantaneous adjustment to equilibrium. (c) Measures by which the average agricultural surplus is to be siphoned off are ill-defined and assumed to have complete coverage throughout the rural sector. (d) Economic individualism is assumed to determine the migrant's decision to seek capitalist sector employment. And (e) income transfers between the household and migrant are implicitly disallowed. And finally, in point of fact, at the earliest stages of development substantial labor recruitment problems were experienced in much of Africa. Rather than being infinitely elastic, the labor supply curve is reported to have been extremely inelastic and, very possibly, backward bending for many types of employment [Berg, 1961, 1965], [Miracle, 1970].

Interspatial Labor Movements--Some Evidence

Whether or not development theory during the last two decades would have justified an examination of inter- and intra-sectoral labor movements, the flows which actually occurred during that period most certainly did. The migration streams of rural to urban labor which contributed heavily to the explosive growth of African cities during the period are well known and documented in research which cuts across social science disciplines. Even in pre-colonial times, predominantly

(cont'd) pointed to the relatively recent high rates of natural increase and accompanying rises in levels of overt unemployment characteristic of most African nations to conclude that there may well be important elements of these models which pertain directly to important policy issues.

[Gugler, 1968]. With the establishment of small urban industrial and trading centers and the gradual spread of new economic aspirations during the last century, the transfer of labor to exploit emerging employment opportunities was initiated and has increased in pace. Currently observed patterns of migration include not only rural-urban labor flows, but also rural-rural, urban-rural and urban-urban. It is not within the scope of this paper to review the extensive literature on African labor migration. Surveys by Byerlee [1972], Miracle and Berry [1970] and others already provide excellent critical reviews of this work from economic, anthropological and historical perspectives. But also the usefulness of migration studies to determine the nature and relative importance of factors contributing to ^{the} regional and individual labor supply function, at best, is indirect. This is true for two reasons. First, the macro or regional perspective taken in much of the migration literature is at too high a level of aggregation to identify those factors affecting the decision to migrate within a given household. Too often one is left with the implicit assumption of homogeneity within regions which obfuscates the most interesting, and, likely, critical relationships contributing to the migration decision.

Second, the linkage between the willingness of an individual or household to offer labor services and the willingness of an individual or household to undergo geographic and cultural dislocation entailed in the migration process is not necessarily close. The psychic and transfer costs incurred in migration employment are significantly greater than that incurred in local rural employment [Berg, 1965]. The weighing of such costs undoubtedly differ by age and sex groups thus introducing a bias or selectivity into the migration function not present in the labor supply function for local employment [Byerlee, 1972]. Selectivity is also introduced by the limited types of employment offered in

particular urban areas, employment which places a premium on the educational or skill characteristics of the potential migrant. Additional selectivity may exert itself through the responsibilities of persons occupying particular roles in the household, roles which can be adequately exercised in local employment but possibly not during employment away from the home village.

With these caveats in mind, however, the migration literature does serve to identify the general types of factors which appear to be significant determinants in off-farm labor transfers. These factors may also be significant in explaining differences between households and individuals with respect to rural labor allocation. ^P In his survey of research into African rural-urban migration Byerlee [1972] observed that "migrants generally have demographic, educational and economic characteristics which distinguish them from their population of origin." Most of the literature represents the typical migrant as being young, male, better educated than non-migrants and with either family or tribe-based friends in town who are able to provide temporary support to the migrant while he is engaged in job search. Lack of sufficient data and conflicting evidence have left open the economic characterization of migrants [Elkan, 1960], [Caldwell, 1969].

Nearly all studies concede the dominant role played by economic determinants yet the data, for the most part, are conflicting and subject to ambiguous interpretation. Macro analyses which have attempted to determine the impact of economic factors by regressing inter-regional labor movements on a number of variables including regional income differentials have resulted in positive [Beals, Levy and Moses; 1967], negative [Mabogunje, 1970], and occasionally insignificant [Sabot, 1971] coefficients. Other macro studies, using population densities as a proxy for average regional household incomes, have shown both the

expected positive relationship [Elkan, 1960] but also a less easily explained negative relationship [].

Byerlee [1972] attributes a large part of the inconclusiveness of such studies to theoretical problems in measuring and comparing the relevant incomes. Average rural incomes, for example, are typically used as the reservation price for rural labor, but this is of questionable validity. The mean income would clearly have less explanatory power if substantially skewed income patterns characterize rural areas and if there are significantly different propensities to migrate from households of varying income levels. Both conditions seem to be born out by recent evidence [Essang, 1970], [RERU, 1972], [Green, 1972], and [Caldwell, 1969]. In addition, a rapidly growing literature has argued rather convincingly the importance of on and off-farm non-agricultural activities in supplementing rural incomes [Hymer and Resnick, 1969], [Byerlee and Eicher, 1972], [Thirsk, 1973], [Gerken, 1972], [Norman, 1972]. Yet most studies which have attempted to measure the incomes and productivity of rural labor have largely ignored non-agricultural activities often by lumping such work into an ill-defined "leisure" category [Jones, 1968], [Cleave, 1970]. This avoidance of a more inclusive determinant of income very possibly reflects the substantial difficulties posed in the measurement and valuation of such activities. And finally, Knight [1972] has shown that the relevant reservation price for labor may be importantly affected by the income sharing system practiced within the household and by the tenure system.

Until a better understanding is reached as to what constitutes the reservation price of rural labor, the macro or regional flows methodologies described above will contribute little useful information. More disaggregated analyses are clearly called for to better identify both the characteristics

and motivations of the transferred laborers, and in turn, of their rural households. Byerlee [1972] has concluded that "...a theory of migration should center on the decision making process of the migrant and the environment in which that decision is made. Because rural-urban migration decisions are made in rural areas it is logical to emphasize the alternatives faced by individuals in rural areas." The same conclusion is just as valid for a theory of labor supply.

Since the household is the relevant decision-making unit and constitutes the production and consumption set for the rural laborer before off-farm movement, it follows that the household is the most proper focus of further research. Very few studies of migration, however, have actually collected data on the household from which the migrants originate. A major exception to this is Caldwell's 1969 study of Ghanaian rural-urban migration. This study attempts to identify both household and migrant characteristics as well as the motivations underlying the off-farm movements as voiced by both migrants and other members of the household.

The results of this research tentatively suggest outlines of the objectives and the decision making process pursued by households in offering their labor services. Although Caldwell unfortunately did not solicit information which would explicitly indicate how the decision to migrate was actually made, the responses to a number of questions imply strongly that a communal decision process is involved which weighs the welfare changes experienced by the entire rural household subsequent to off-farm labor transfer. For example, very few migrants reported that they moved to urban employment over the objections of other persons in the household. Among the small minority of households which had urged that their migrants not leave, two-thirds cited fear of a fall in

village or household welfare as their primary argument. And, among those potential migrants who did not leave for urban employment, a sizeable majority cited family responsibilities as the major reason for staying in the rural household.

The pressure placed on migrants to fulfill household responsibilities was also reflected in the selectivity of those who did and did not migrate with respect to their position in the family and size of household. The propensity to migrate was found to be positively related both to the total number of siblings and to the potential migrant's order of birth. As the number of male off-spring in the family increases, there is less pressure placed on the young adult to remain in the household to be in a position that he can assist the family if an emergency should arise. Similarly, since family leadership is typically passed to the eldest son, there was found a stronger tendency for older siblings either not to migrate at all or to return permanently following long-term or seasonal absences.

The impact of migration on family welfare was reflected not only in the potential costs of his absence, but also in the remittance of income earned in urban employment back to the rural household. Nearly half of the households interviewed from which migrants had left reported receiving money through remittance payments. And of these, nearly one-third expressed a heavy dependence on this source of income.

Moreover, it was found that the regular remittance of urban income was the normal behavior expected of a migrant and was not reserved only for periods of need or when explicitly requested. Remittances were extended typically at least once a month and no reduction in their value over time was observed.

Differences in remittance patterns among regions varying in relative

prosperity are consistent with the view that such income transfers constitute an important supplement to the standard of rural living. In the North, the poorest region of Ghana, two-thirds of households with migrants absent received remittance payments as compared to two-fifths in the South and Volta, and to only one-third in Ashanti, the most wealthy rural area in Ghana. And Caldwell reported that "the greatest pressure on reluctant young men to migrate" was among the Ewes "where a tradition has grown up...of partially supporting the rural population by remittances from the town."

Although Caldwell's findings are in accord with the presumption common in most of the migration literature that economic factors dominate the decision for off-farm movement, he was unable to establish, unambiguously, the economic characteristics of the migrants or of their households of origin. The great majority of respondents cited hopes for a better income and improved employment opportunities as the primary motivating factors for movement to the cities. Least often mentioned were the generalized rural "push" factors including household and village problems or land shortage thus giving the impression that migrants weren't escaping village poverty, but attempting to improve already reasonably satisfactory levels of income. On the other hand, the most frequently voiced factor contributing to the decision not to migrate and to remain in the rural areas was the adequacy of rural employment. This apparent contradiction may be explained by differences in the perception of employment opportunities and adequacy among males with various educational characteristics.

A slightly greater propensity to migrate was found among individuals from households judged by the enumerators to be "above average" as compared to those classified as "below average". This is consistent with the findings of a strong positive relationship between the propensity to migrate and

educational attainment since above average families would presumably be in a better position to afford additional years of schooling. The multiple correlation problem prevents an assessment of the ceteris paribus impact of the income variable due to the manner in which Caldwell presents his results. But also, as Caldwell points out, the direction of causation is uncertain. The remittance received by the rural households may raise their observed living standard above what it would be in the absence of the migration. Given the above evidence, we can make the following observations:

1. A function representing the determinants of the supply of rural labor to urban employment must at least distinguish between classes of labor based on age, sex, educational and family position criteria.
2. The size of family work force is positively related to the propensity to transfer to off-farm urban employment.
3. The decision to migrate is determined primarily by economic factors although economic characteristics alone are insufficient to identify the source of off-farm labor among households.
4. The relevant objective function determining the decision to migrate is the maximization of aggregate family welfare over time. Thus a theory of labor supply based solely on assumptions of individualistic economic rationality would appear to misrepresent the observed migration behavior.
5. Remittance payments are a common and important means by which off-farm earnings contribute to the common welfare of the rural household.

Village and Farm Management Studies--Additional Evidence

It is clear that an adequate theory of labor supply requires an even more disaggregated research approach which is capable of distinguishing between the alternatives faced by the individual among various households and between

regions. These kinds of information are an important by-product of farm management and village studies which have become increasingly popular during the last decade. The allocation of labor time and the factors responsible for differences in labor's allocation to off-farm employment have been documented in a number of such studies in Africa, most notably [Pudsey, 1966, 1967], [Norman, 1972], [Goddard, 1971] and an extensive survey of rural labor studies compiled by Cleave [1970].

The following major patterns emerge from these studies:

1. There is substantial evidence of a complex supplementary relationship between farm and off-farm employment. A study of three villages in the Sokoto close-settled zone of Nigeria [Goddard, 1971] revealed the importance of off-farm activities among farm households. Just over half of the farm unit heads surveyed regarded farming as their primary occupation, with only twelve percent reporting farming as their only occupation. Among the Nigerian villages studied by Upton [1967], a range of between 30 and 64 percent of the farmers interviewed reported secondary occupations. Norman [1972] observed that in some areas as much as one-third of adult labor time was employed in off-farm activities even during peak labor periods. This was interpreted as reflecting a seasonal shortage of food and cash reserves forcing laborers to turn to off-farm work yielding immediate cash returns to supplement farm sources of income.
2. The allocation of labor to on or off-farm activities generally follow a seasonal pattern determined by the precipitation cycle. Most farm management studies which have analyzed resource allocation with the aid of linear programming techniques have found wide swings in the

shadow price of labor between peak and bottleneck periods.

[Norman, 1972], [Ogunfowora, 1972], [Heyer, 1971]. The seasonal variation in returns to on-farm labor is reflected in roughly corresponding allocation patterns to on and off-farm employment. Norman [1972] found in his study of three villages in Northern Nigeria that although off-farm employment doesn't completely compensate for slack periods in farming, that it was sufficient to produce a significant negative correlation between male adult labor time devoted to on and off-farm employment. Pudsey [1966] found the same pattern significant in only one of the two Ugandan villages he studied, with greater substitution between leisure and on-farm activities observed in the other village.

3. Consistent with research conducted elsewhere, Nigerian farm management studies show that the size of land holding relative to the household labor force is an important determinant in the decision to offer family labor for off-farm employment. As the land to labor ratio increases, the proportion of agricultural work done by hired labor increases and the importance of off-farm work to supplement agricultural incomes decreases. Upton found that much of the labor offered from high labor density farms was employed as hired workers on low labor density farms, reflecting differences in labor productivity associated with different land complements.
4. Location with respect to marketing channels and access to off-farm employment is another contributing factor in the allocation of labor to various types of off-farm work. Proximity or easy access to urban areas and thus to urban consumer goods and services may disrupt employment in traditional village marketed services and crafts production while encouraging

production of a new set of goods for the urban market. On the other hand, proximity to urban centers enables year-round urban employment or near costless job search. Norman observed that in more distant locations and in areas lacking adequate marketing and transport systems, traditional crafts and services employment assumes greater importance with less labor allocated to urban employment and cash cropping. Both the lack of a market for the cash crops and the absence of competition for village produced consumer goods would explain this pattern.

Examining labor circulation in the Sokoto and Kano areas of Nigeria, Goddard found access to major roads and proximity to urban markets the single most important factor in determining the relative profitability of growing cash crops, engaging in traditional forms of off-farm employment based in the village, or seeking off-farm employment in an urban center. Those areas with the least access to a marketing system and thus with the least opportunity to earn income through cash cropping or craft production for the urban market experienced the largest amount of seasonal and permanent off-farm mobility. Goddard concluded that in the areas studied location was a more dominant factor in explaining off-farm mobility than labor density, and as important as land type in explaining the presence of absence of cash cropping.

Quality of the land base also appears to be an important determinant of the relative attractiveness of on or off-farm employment. Norman concluded that the high proportion of good quality lowland in the village of Doka was a major factor explaining the relative unimportance of off-farm employment among males. The land base was influential

in two respects. First, year-round cultivation was possible due to a high water table, thereby reducing the necessity of seasonal migration. Second, higher valued and more labor intensive crops and cropping combinations were well suited to the lowland thereby pushing outward the value of the marginal product of labor curve in agricultural work.

Towards a Theory of Labor Supply

On the basis of the admittedly sketchy evidence reviewed above, we can outline the following characteristics of an improved theory of African labor supply:

1. Since for the most part a landless laborer class has not yet developed in most African countries, a theory explaining household behavior, with respect to labor allocation will be our point of departure.

2. Allocative decisions within the household framework must reflect a communal objective function. The theory must also be able to explain the impact of at least the following factors on the decision of the family to offer labor to off-farm employment:

3. Income status of the family.

4. The degree to which directly productive non-agricultural activities are performed within the household and contribute to family welfare.

5. The absolute size of family.

6. The size of the family work force relative to its arable land base.

7. The quality of the land base.

8. Seasonality.

9. Location of the household with respect to product and factor markets.

10. The characteristics of the off-farm worker: i.e., position in family, age, sex, and educational attainment.

11. The degree to which economic ties with the family are maintained through income transfers.

To clarify the focus of our discussion, we must distinguish between the household labor supply function and the aggregate or regional supply function. Our concern here is primarily with the former. The regional supply curve may be viewed as the horizontal summation of the individual household curves. Thus it is a function of the distribution of relevant household characteristics among the population. The impact of the distribution of household characteristics on the regional supply elasticity will be discussed in the last section.

The discussion in this section will proceed in the following manner. First, a very simple model of household labor allocation will be presented. Only two activities will be distinguished, on-farm subsistence agricultural work and off-farm wage employment, to determine the conditions defining maximization. Second, the model will be expanded to include labor time devoted to agricultural production for the market and to productive on-farm non-agricultural activities. Third, factors contributing to differences between households and over time as to the nature of the indifference and production schedules will be identified as shift variables. Fourth, seasonal shift factors will be introduced. And fifth, secondary impacts on family welfare caused by off-farm labor transfers will be discussed. Conditions defining optimal levels of income transfer between the household and the off-farm worker will be identified as will the impact of such transfers on the supply price.

A Simple Household Model

Following Sen [1966] and Wellisz [1968] we assume that the objective function guiding the allocation of the household's resources is the maximization of household welfare which is a function of leisure (S) and consumption (C).

$$(1) \quad W_h = W_h(S, C)$$

The total time available for both labor and leisure is equal to T, such that

$$(2) \quad T = S + L$$

where

L = total time expended to productive activities.

If labor is the only variable input then

$$(3) \quad C = Q(L) \quad \text{and} \quad \frac{dq}{dL} \text{ is } \overset{\text{assumed to be}}{\text{positive and decreasing.}}$$

Also following Wellisz we assume "altruistic" conditions such that the utility of each individual is dependent upon the consumption and labor of every other member in the family,

$$(4) \quad u_i = u_i(c_1, \dots, c_n, l_1, \dots, l_n)$$

such that at the optimal point no individual can increase his own welfare by decreasing the amount of work he performs or the amount of income accruing to other members of the family:

$$(5) \quad \frac{\partial u_i}{\partial c_i} = \frac{\partial u_i}{\partial c_j} = \dots = - \frac{\partial u_i}{\partial l_i} = - \frac{\partial u_i}{\partial l_j}$$

We also assume that $\frac{\partial u}{\partial c}$ is positive and decreasing and $\frac{\partial u}{\partial l}$ is negative and increasing.

In the special case described by both Wellisz and Sen, if the utility and disutility schedules of all individuals are identical, then all members

perform the same amount of work,

$$(6) \quad l_1 = l_2 = \dots = l_u = \frac{L}{n}$$

where

n = number of family members. And each member consumes the same portion of the total product,

$$(7) \quad c_1 = c_2 = \dots c_n = \frac{C}{n} = \frac{Q(L)}{n}$$

If all members of the household are identically efficient workers, then the optimal point of labor allocation for each individual in agricultural work is defined by

$$(8) \quad \frac{\frac{\partial u}{\partial l_{as}}}{\frac{\partial u}{\partial c_{as}}} = \frac{dc_{as}}{dl_{as}}$$

where the subscript "as" refers to agricultural output produced and consumed within the household. (Sen described the left hand term of equation (8) as the "real cost of labor.")

We can depict a similar point of optimization for off-farm wage employment at which the marginal rate of indifferent substitution is just equal to the wage rate:

$$(9) \quad \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial c_w}} = \bar{w}$$

where the subscript "w" refers to labor expended in off-farm employment and to the consumption of goods purchased in the market by means of money income. Faced with the decision of allocating labor between on and off-farm employment, welfare is maximized

where the ratio of marginal disutilities of both types of work are just equal to the ratio of the marginal utilities of the goods consumed made possible by the last unit of labor input:

$$(10) \quad \frac{\frac{\partial u}{\partial l_{as}}}{\frac{\partial u}{\partial l_w}} = \frac{\frac{\partial u}{\partial c_{as}}}{\frac{\partial u}{\partial c_w}} \cdot \frac{\frac{dq_{as}}{dl_{as}}}{\bar{w}}$$

If the types of consumer goods obtainable from either type of work are equivalent, this reduces to:

$$(11) \quad \frac{\frac{\partial u}{\partial l_{as}}}{\frac{\partial u}{\partial l_w}} = \frac{\frac{dq_{as}}{dl_{as}}}{\bar{w}}$$

This condition defines a stable partial equilibrium under the normal assumptions of decreasing marginal utility of income (consumption) and increasing marginal disutility of labor. Thus we would expect that in equilibrium the ^{minimum} wage paid to labor in off-farm employment would be greater (or less) than the marginal product of labor in on-farm agricultural work by the proportion that the disutility of off-farm employment is greater (or less) than the disutility of on-farm work. That is,

$$(12) \quad \bar{w} = \frac{\frac{dq_{as}}{dl_{as}}}{\frac{\partial u}{\partial l_w}} \cdot \frac{\frac{\partial u}{\partial l_{as}}}{\frac{\partial u}{\partial l_{as}}}$$

This formulation can be easily modified to represent the case of agricultural production for sale in the market if we introduce a price term (P_{am}) reflecting either a weighted price index for those agricultural commodities produced, or in the simpler case of a single commodity, the price per unit of that agricultural good in terms of the purchased consumer goods it will buy.

Now, in equilibrium the supply price of labor to off-farm employment (P_L) would be equal to the marginal value product of labor, again adjusted by the difference in disutility of work between on and off-farm employment:

(13)

$$\bar{w} = P_L = P_{am} \cdot \frac{dq_{am}}{dl_{am}} \cdot \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{am}}}$$

where the subscript "am" refers to that labor expended solely on the production of marketed cash crops.

Hymer and Resnick [1969] have focused attention on the choices faced by the household with respect to the decision to produce food (both for home consumption and for the market) or to produce a class of commodities vaguely titled Z goods (on-farm non-agricultural activities including "processing, manufacturing, construction, transportation, and service activities to satisfy the needs for food, clothing, shelter, entertainment, and ceremony."). The additional conditions defining allocative efficiency can easily be derived by incorporating such activities into the simple model already described.

Faced with the choice of allocating labor to either subsistence agricultural production or on-farm non-agricultural employment (Z activities), welfare would be optimized where the marginal rate of transformation between the two classes of goods is just equal to the ratio of the marginal disutilities incurred in either effort times the inverse of their implicit price ratio:

$$(14) \quad \frac{\frac{dq_z}{dl_z}}{\frac{dq_{as}}{dl_{as}}} = \frac{\frac{\partial u_z}{\partial l_z}}{\frac{\partial u_{as}}{\partial l_{as}}} \cdot \frac{\frac{\partial u_{as}}{\partial c_{as}}}{\frac{\partial u_z}{\partial c_z}}$$

Alternatively this relationship can be viewed as:

$$(15) \quad \frac{\frac{dq_z}{dl_z}}{\frac{dq_{as}}{dl_{as}}} \cdot \frac{\frac{\partial u_z}{\partial c_z}}{\frac{\partial u_{as}}{\partial c_{as}}} = \frac{\frac{\partial u_z}{\partial l_z}}{\frac{\partial u_{as}}{\partial l_{as}}}$$

This formulation has greater intuitive meaning. The left hand side of the equation simply represents the ratio of the marginal value products of labor in "z" or "as" type activities; that is, the ratio of the demands for labor in either activity. The right side represents the ratio of the real costs (per the terminology used by Sen) of either activity expressed as the disutility of work effort or loss of utility derived from leisure.

Hymer and Resnick have further explored the welfare and structural impacts introduced by changes in technology and terms of trade on the allocation of labor to "am" or "z" type activities. Their analysis usefully points out the sensitivity of these changes to ^{the} nature of the household indifference schedules, in particular, relative to the income inferiority or superiority of "z" goods. Their model, however, does not explicitly consider the decrease in utility caused by loss of leisure (strictly defined) or conversely, the disutility of work effort. Nor does it consider the alternative of off-farm employment.

We are now in a position to combine these partial allocative efficiency conditions into a more general household model. The following equation is central to the remainder of our discussion: (next page)

$$P_L = \bar{w} = \frac{dq_{as}}{dl_{as}} \cdot \frac{\frac{\partial u}{\partial c_{as}}}{\frac{\partial u}{\partial c_w}} \cdot \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{as}}} = \frac{dq_z}{dl_z} \cdot \frac{\frac{\partial u}{\partial c_z}}{\frac{\partial u}{\partial c_w}} \cdot \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_z}}$$

$$P_{am} \frac{dq_{am}}{dl_{am}} \cdot \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{am}}} = \theta \frac{\frac{\partial u}{\partial s}}{\frac{\partial u}{\partial c}}$$

where the last term states that the reservation price of labor is a function of the marginal rate of indifference substitution between leisure, strictly defined, and consumption.

Household characteristics as determinants of labor's supply price

Through the use of this simple model it is possible to identify the impact of various household characteristics on labor's reservation price. Inter-household differences will be grouped as follows: (a) technology (including factor proportions); (b) location; (c) income status; (d) degree of commercialization; (e) nutrition; and (f) education.

In the past, analyses which have attempted to identify the relationships between these characteristics and the propensity to supply labor for off-farm employment have been conducted at too general a level without a sufficient specification of the proposed theoretical linkages. Since the effects of these characteristics on the household decision to offer off-farm labor may well be both multiple and countervailing, it is not surprising that the results of these studies have been inconclusive and often contradictory. It is hoped that the framework presented in this paper will enable a modestly more rigorous specification of these linkages and point towards areas of additional research, both theoretical and empirical. In the remainder of this section we will summarize briefly some of the more obvious linkages. The discussion is not intended to be all-inclusive but rather suggestive of an improved approach.

1. Technological differences between households.

The nature of a farm unit's technology will act on the supply price of labor through two factors: (a) by affecting the marginal product of labor engaged in on-farm activities relative to off-farm employment, and (b) through the marginal disutility of labor engaged in on-farm activities relative to off-farm employment. With reference to equation (16), the dependent variables are, respectively,

$$(a) \quad \frac{dq_{am}}{dl_{am}}, \quad \frac{dq_z}{dl_z}, \quad \text{and} \quad \frac{dq_{as}}{dl_{as}} .$$

$$(b) \quad \frac{\partial u}{\partial l_w}, \quad \frac{\partial u}{\partial l_z}, \quad \text{and} \quad \frac{\partial u}{\partial l_{am}} .$$

It is clear from equation (16) that, all else constant, labor's supply price is positively related to its marginal product in on-farm activities, and inversely related to the disutility of work effort in on-farm work.

The influence of technology on the marginal product of labor is perhaps the most obvious, but its effect is not necessarily unambiguous. We must distinguish between the short-run impact of the introduction of new production techniques and the long-run static conditions defining labor efficiency after movement to a new equilibrium has taken place. If the new technology is labor augmenting, it will ultimately raise the productivity of the marginal worker. But the size of the work force defining the marginal worker will include fewer members, thereby lowering the marginal product of those workers who have become redundant. Thus, until the new equilibrium is reached through the off-farm movement of the redundant workers, the supply price of labor may actually be lower than previously. Once these adjustments have taken place, however, the more efficient labor on farms with the more advanced technology will be associated with a higher off-farm supply price.

It should be pointed out that this will hold for the relative efficiency of labor in all on-farm activities, production of food or non-food items for household consumption as well as production for the market.

As defined earlier, we include factor proportions, and therefore the land to labor ratio, as a component of technology. Given diminishing returns to labor, theory suggests and the literature empirically confirms that the ceteris paribus marginal product per worker is lower on farms with a larger work force per unit of cultivated land [Mazumdar, 1959], [Mabro, 1971], [Mathur, 1964]. Depending upon the value of the marginal rate of substitution between land and labor we would therefore expect the reservation price of labor to be lower on higher labor density farms. Norman's [1972] results reflect this expected behavior.

Alternative techniques of production can affect the relative disutilities of on or off-farm labor through differences in the physical and psychic costs incurred per unit of work time. To the extent that these costs per unit of time are lower in off-farm employment due to differences in technology, the labor supply price would be lower than that suggested by the on-farm marginal product of labor alone.^{5/} It follows that farms employing production techniques which reduce the disutility of on-farm work will be associated with a relatively higher supply price for off-farm employment.

In summary, it is clear that once long-run allocative efficiency has been reached, the level of labor augmenting technology is positively related to the off-farm labor supply price through both factors. For reasons discussed, the impact of technology on the supply price through the marginal

^{5/} However, since wage employment is likely to demand a longer working day than that of on-farm self-employment [Cleave, 1970], [Norman, 1972], the marginal disutility of the last hour worked in the former is likely to be greater than in the latter. Sen [1966] cites this as a major contributing factor to the existence of a wage gap in dual agriculture.

product of household labor is ambiguous in the short-run.

2. Differences in household location.

The location of a farming unit may be defined in two dimensions: first, in a micro sense, with respect to the quality of its land base; and second, in a regional sense with respect to its proximity to product and factor markets. The micro dimension will be discussed first.

The quality of a household's land base can influence the reservation price of labor through two factors: (a) by affecting the value of the marginal product of labor engaged in on-farm agricultural activities, and (b) by influencing the weighted price index of the agricultural commodities produced for the market. With reference to equation (16), these factors are, respectively,

$$(a) \quad \frac{dq_{am}}{dl_{am}} \quad \text{and} \quad \frac{dq_{as}}{dl_{as}} .$$

$$(b) \quad P_{am} .$$

From equation (16) it is obvious that both factors are positively related to labor's supply price.

The impact of land quality on the marginal product of labor is readily apparent. The better suited is the land type to the crop and technology combination of a given household, the higher will be its labor efficiency.

The effect of land type on the prices received for the bundle of marketed goods produced is also clear. Since cash and specialty crops are often sensitive to the soil and topographic characteristics of particular land types, the quality of its land base may importantly determine the crop

combination alternatives of a farm unit. Thus, Norman [1972] observed that the proportion of a farm's land base that was lowland fadama critically restricted the household's ability to produce specialty crops thereby limiting its cash income potential. If the prices received for different cash crops vary widely, the weighted price index (P_{am}) would be a function of the proportional distribution of the crops grown.

The existence of regional price gradients, which are a function of transport costs, emanating from market centers is familiar to students of marketing economics. Proximity to major markets has the dual effect of raising the farm gate price of agricultural products while lowering the cost of consumer goods originating from the market center. By raising the value of marketed agricultural production in terms of purchased consumer goods, that is by improving the agricultural terms of trade (a rise in P_{am}), the closeness to urban markets would also raise the supply price of labor. A corresponding shift internal to the household would also take place as labor reallocates out of subsistence and Z type activities and into the production of marketable products.

Market proximity, however, may also exert an off-setting negative influence on labor's supply price if the primary source of off-farm employment is in the market center. Closeness to the area in which wage labor is offered reduces the corresponding spatial and cultural dislocation thereby reducing the transfer and psychic costs of off-farm employment. In terms of equation (16), the term $\frac{\partial u}{\partial l_w}$, representing the disutility of off-farm employment, is inversely related to market proximity. This impact would be expected to partially or completely off-set the improved price ratio exerting an opposite effect on the price of labor.

In summary, the impacts of farm location on the labor supply price are multiple and countervailing. The ultimate effect is a function of a number of factors including the extent to which cash cropping is possible in a given area, the utility of consumer goods relative to household produced commodities (that is, $\frac{\partial u}{\partial c_{as}}$ and $\frac{\partial u}{\partial c_z}$), the efficiency of the transport

$$\frac{\frac{\partial u}{\partial c_{as}}}{\frac{\partial u}{\partial c_w}} \quad \frac{\frac{\partial u}{\partial c_z}}{\frac{\partial u}{\partial c_w}}$$

system, and the relative disutility of off-farm employment requiring spatial dislocation. In a given situation, several of these factors should be subject to empirical analysis. The complexity of these relationships and their ultimate resolution is well reflected in the studies referenced earlier by Goddard and Norman.

3. The level of commercialization or market orientation of the household.

The extent to which a household is market oriented^{6/} can influence the supply price of labor through several possible linkages: (a) by affecting the allocation of labor to either subsistence production or to production of agricultural commodities for the market; (b) through the relative marginal disutilities of on and off-farm employment; and (c) through the relative utility of consumer goods purchasable in the market. In terms of equation (16), the dependent variables are, respectively,

(a) P_{am}

(b) $\frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{as}}}$, $\frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_z}}$ and $\frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{am}}}$

^{6/}Market orientation or degree of commercialization are terms used here to represent a range of not unrelated factors including balance of production between subsistence or for the market, the extent to which "industrial" work habits and ethic have been developed, and the consumption aspirations of the household members.

$$(c) \quad \frac{\frac{\partial u}{\partial c_{AS}}}{\frac{\partial u}{\partial c_w}} \quad \text{and} \quad \frac{\frac{\partial u}{\partial c_z}}{\frac{\partial u}{\partial c_w}}$$

From equation (16) it is clear that the reservation price of labor is positively related both to the market value of agricultural production and to the disutility of off-farm employment relative to on-farm employment, and inversely related to the utility derived from the consumption of goods produced off the farm relative to those domestically produced.

The first relationship is self-evident. The second relationship operates through the additional psychic costs associated with wage employment; for example, the disutility of being supervised, of being disciplined to an ascribed work routine and schedule, and the loss of independence and satisfaction derived out of self-employment. At the earliest stages of commercialization when industrial habits and attitudes toward work are not fully developed one would expect a high value for $\frac{\partial u}{\partial l_w}$, thereby giving an upward bias to the supply price [Berg, 1965]. With increased exposure to commercialized activities (over time or due to proximity to markets or urban centers) this component of $\frac{\partial u}{\partial l_w}$ would decrease in value. As off-farm employment, particularly that involving rural-urban migration, develops an aura of status and prestige, a reversal of this influence is also possible. Thus, all else constant, one would expect households which have had greater exposure to the market, and particularly those with laborers who have experienced off-farm employment, to have a lower reservation price for subsequent employment. Caldwell's [1969] findings that the propensity to migrate out of households from which previous off-farm mobility has

already taken place, offers partial evidence in support of this reasoning.

The utility derived from non-traditional consumer goods purchased in the market is probably also directly related to household market orientation. Berg [1965] has explained the reluctance of African laborers to enter into wage employment during the early stages of colonial exploitation as reflecting in part the very limited utility attached to the available goods which could be purchased with the resulting money wages. That is, the value of $\frac{\partial u}{\partial c_w}$ was initially so low as to raise the labor supply price to prohibitively high levels. Gradually, however, with increased exposure to Western tastes and value systems and with the increased availability of purchased commodities which were attractive within the African cultural and economic context, the marginal utility of such goods rose [Berg, 1961, 1965], [Miracle, 1970].^{7/} This, in turn, lowered the reservation price and subsequently increased the participation of rural workers in the employed labor force, a trend which is, of course, continuing even now.

In summary, the net ceteris paribus effect of ^{the household's degree of} commercialization is to unambiguously lower the supply price of labor to off-farm employment.

4. Educational differences between households.

The level of education of potential off-farm laborers may affect their reservation price through three relationships: (a) the impact of education on the marginal product of labor in household activities; (c) changes in

^{7/} Until these developments took place, however, colonial administrations used a variety of devices to increase labor force participation rates (that is, to lower the supply price of labor to wage employment). Forced recruitment, which bypassed the household allocative system, and the imposition of mandatory head taxes, which artificially raised the utility of money income (or more accurately, raised the disutility attached to not having the necessary cash resources) were two such devices by which the reservation price was sufficiently lowered to extract the desired amounts of labor. For an interesting discussion of the full range of approaches taken by the colonialists to increase African labor force participation see [Berg, 1965].

the utility of purchased consumer goods relative to household products;
and (b) changes in the relative disutility of on and off-farm employment.

Again referring to equation (16) the relevant dependent variables are

$$(a) \quad \frac{dq_{as}}{dl_{as}}, \quad \frac{dq_z}{dl_z} \quad \text{and} \quad \frac{dq_{am}}{dl_{am}} .$$

$$(b) \quad \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{as}}}, \quad \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_z}}, \quad \text{and} \quad \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{am}}} .$$

$$(c) \quad \frac{\frac{\partial u}{\partial c_{as}}}{\frac{\partial u}{\partial c_w}} \quad \text{and} \quad \frac{\frac{\partial u}{\partial c_z}}{\frac{\partial u}{\partial c_w}} .$$

The impact of education on the productivity of labor engaged in on-farm activities is not clear. Through the mid-1960's it was fashionable in the manpower and human resources literature to argue the position that expanded education, particularly at the primary school level, was a necessary component of programs to raise productivity in the agricultural sector. Functional literacy and basic mathematical skills were viewed as essential to the successful adoption of new production techniques [], [], []. This line of argument, however, has more recently been called into question [], []. Clearly doubtful is a significant impact of education on $\frac{dq_z}{dl_z}$ or $\frac{dq_{as}}{dl_{as}}$ where traditional implements, commodities, and techniques of production have remained relatively unchanged. Schultz [1972] has observed that "Since there are no new techniques... [in traditional agriculture]... farm people know from long experience the quality of the factors they employ... [and]... the productivity of the crops they grow..., " and thus would not be made any

more productive through exposure to formal training. It is only with the introduction of new crops, factor inputs, and techniques of production that "allocative ability", which Schultz defines as the ability to exploit opportunities that changing conditions present, become important. Although many of the new skills required in a modernizing agriculture, he argues, can be learned from experience, "allocative abilities", in particular, skills in reading and writing, can be acquired only through formal education.

Thus the impact of education on $\frac{dq_{am}}{dl_{am}}$ would depend on the level, rate of change, and complexity of cash crop technologies and on the extent to which new crops or cropping combinations are available and being introduced. We might qualify this even further by placing conditions on the relevance of the materials being taught through formal education with respect to the economic environment of the farmer, and on the number of years of formal training required to successfully absorb a critical level of these allocative abilities. And finally it is clear that the methods through which the extension service operates may significantly determine ^{the net impact of} the educational premium for successful adoption of new techniques.

On balance all that can be said is that the ultimate impact of education on the efficiency of labor, and thus on the supply price of labor through this linkage, is an empirical question which remains to be satisfactorily answered.

The impact of education on the relative disutilities of on and off-farm employment is also problematical. Caldwell [1969], Lewis [1967] and Harbison [1967], among others, have put forth the view that formal education is an important factor in causing African youths to turn away from household agricultural activities by increasing the psychic disutility associated with

agricultural employment relative to off-farm, non-agricultural employment. They have based their argument on the widely observed high correlation between education and the propensity for off-farm migration. Although the large proportion of migrants who are school leavers would seem to support the view of an extremely low reservation price for off-farm employment, the high proportion of unemployed school leavers in the urban areas and their apparent reluctance to take what might be considered menial jobs [Callaway, 1963^{and 1967}] would appear to indicate instead a rather high reservation price. The answer to this paradox probably lies in the selective impact of education on the disutility perception of various types of off-farm occupations. Thus education probably increases the disutility of both on-farm and some low-status off-farm occupations, while decreasing the disutility of higher status jobs.^{8/} We might view education therefore as a shift factor which selectively raises the personal reservation price of an educated laborer above both the returns to his labor within the household and above the wages he would receive for low status jobs off the farm.

The impact of education on the relative utility of various forms of consumption is less problematical. Education, however broadly defined, can be viewed as an important means by which new consumption as well as employment aspirations are introduced to the rural population. Harbison, Lewis and Callaway have indicated the impact of the educational system in

^{8/} Byerlee's [1972] reference to studies by Hutton [1970], Forster [1968], and McQueen [1969] to the effect that education doesn't increase the psychic disutility of on-farm work "when sufficient economic incentives are provided" fails to distinguish between the influence of the factors P_{am} and $\frac{dq_{am}}{dl_{am}}$

the educational impact on $\frac{\partial u}{\partial l_{as}}$, $\frac{\partial u}{\partial l_z}$ and $\frac{\partial u}{\partial l_{am}}$.

changing the tastes and consumption aspirations of African youth. With the attainment of higher levels of education, the goods and services produced in the household and village become ^{increasingly} inferior to the package of consumption possibilities obtainable through monetary exchange in the market. That is, the ratios $\frac{\partial u}{\partial c_{as}}$ and $\frac{\partial u}{\partial c_z}$ would

$$\frac{\frac{\partial u}{\partial c_{as}}}{\frac{\partial u}{\partial c_w}} \quad \text{and} \quad \frac{\frac{\partial u}{\partial c_z}}{\frac{\partial u}{\partial c_w}}$$

be expected to fall significantly, in turn reducing the reservation price of labor.

Because of the complex and often counter-acting psychological factors which link education to the labor supply price, it is extremely difficult to summarize the most probable result with respect to inter-household differences. The following general, and perhaps obvious, statements must suffice. A positive relationship between education and supply price would be more likely in a dynamic agricultural sector than in one experiencing little growth and structural change. Also, it is likely that ^a supply price above the returns to farm labor would be associated with labor from households where the educational attainment has been greater due primarily to (a) greater dissatisfaction with on-farm employment and (b) a shift in consumption aspirations from household or village produced commodities towards those purchased in the market. The level of the supply price, however, is most likely highly job specific and a direct function of the level of formal schooling received.

5. Variations in nutritional status among households.

The relative adequacy of a household's diet can affect its reservation price operating through two factors: (a) through its influence on the

marginal product of labor in household work; and (b) through the relative disutility evaluation of on and off-farm employment. Respectively, the dependent variables are:

$$(a) \quad \frac{dq_{as}}{dl_{as}} \quad , \quad \frac{dq_z}{dl_z} \quad , \quad \text{and} \quad \frac{dq_{am}}{dl_{am}} \quad .$$

$$(b) \quad \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{as}}} \quad , \quad \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_z}} \quad , \quad \text{and} \quad \frac{\frac{\partial u}{\partial l_w}}{\frac{\partial u}{\partial l_{am}}} \quad .$$

A substantial literature has forwarded the argument that the productivity of labor is a positive function of the labor's nutritional status.^{9/} Berg [1966], for example, has suggested that an improved diet may improve labor efficiency through (a) raising the laborer's resistance to debilitating diseases not directly caused by malnutrition; (b) reducing the extent of chronic malnutrition which can retard the mental and physical development of the individual; and (c) through increased caloric ingestion permitting a greater expenditure of physical and psychic energy in daily tasks. Labor in households with relatively higher nutritional status would therefore be expected to have a higher on-farm marginal product, and consequently, a higher supply price to off-farm employment.

Although the argument is intuitively sound, studies to date which have focused on the nutrition-productivity relationship in African rural households, have not been able to identify a nutritional constraint to work output.^{10/} Again, this is an area calling for more rigorous empirical

^{9/} See, for example, [Leibenstein, 1952], [Wonnacott, 1962], [Mazumdar, 1959], [Edwards, 1971], [Bottomley and Moes,], and [Harris, 1969].

^{10/} See [Davey, n.d.], [FAO, 1962], [Lowenstein, 1968], [Nicol, 1959], [Ryan, 1952], [Berg, 1966], and [Areskog, 1969].

research.

The influence of the nutritional factor on the relative disutilities of on and off-farm employment is dependent upon a number of conditions. If there is no difference in the aggregate physical exertion required in these types of employment, no nutritional impact on the value of labor's reservation price would be expected. If, on the other hand, the nature of the work required under wage employment calls for greater (less) energy expenditure, households in which the labor force is less well fed would experience relatively greater (less) work related disutility and thus would be associated with a higher (lower) labor supply price than labor from households which don't suffer a nutritional deficiency. Further conditioning these relationships, of course, are the techniques of production and length of work day under either type of employment.

The net impact of nutrition on labor's supply price is therefore ambiguous and a function of the relative physical components of on-farm and wage employment. These would have to be empirically determined on a case-specific basis if valid conclusions on this linkage are to be drawn.

6. Income status differences between households.

It is clear that differences in the income level enjoyed by a household may be intimately correlated with several of the household characteristics already discussed. In particular these include the educational and nutritional status of the household, the level of technology it applies in on-farm operations, and its market orientation or degree of commercialization in its perception of the economic environment. As mentioned earlier the failure to disaggregate these multiple effects has undoubtedly contributed to the inconsistent and often contradictory results from studies which

have attempted to explain off-farm labor movements as a function of income differentials alone.

In this subsection we identify two likely linkages through which the income level acts ceteris paribus on the labor supply price. These are (a) the relative marginal utilities experienced from leisure and consumption (generally considered) at various income levels, and (b) the income elasticities of demand for different types of consumer goods acting through the marginal consumption utilities of available consumption items. With reference to equation (16) these dependent variables are:

$$(a) \quad \theta \frac{\frac{\partial u}{\partial s}}{\frac{\partial u}{\partial c}}$$

$$(b) \quad \frac{\frac{\partial u}{\partial c_{as}}}{\frac{\partial u}{\partial c_w}} \quad \text{and} \quad \frac{\frac{\partial u}{\partial c_z}}{\frac{\partial u}{\partial c_w}}$$

An assumption which is adhered to in much of the literature on labor allocation is that the marginal utility of goods and services is a decreasing function of income [Sen, 1966], [Stiglitz, 1969], [Berry and Soligo, 1968]. It will be remembered that this assumption was included in the current framework as presented earlier. Some authors have attempted to introduce an additional condition defining a critical turning point in these relationships around an either biologically or culturally defined subsistence income level [Mellor, 1963], [Wharton, 1968]. According to this approach the marginal utility of goods and services is extremely high until the subsistence level is attained, after which it falls substantially. Either formulation can be applied to the model defined in equation (16).

The implications of changes in income level on the supply price through this linkage in our model are obvious. Differences in ^{the} level of income [^] ^{the} affect [^] the value of $\frac{\partial u}{\partial c}$ thereby ^{affecting} [^] the labor supply price. ^{inversely} [^]

Offsetting this impact, however, is the likely behavior of the household with respect to the types of goods and services consumed. Hymer and Resnick [1969] assumed in their analysis income inferiority for most Z type goods. As incomes rise, the composition of the household consumption package is expected to shift away from village and household produced items (local pottery, hand woven fabrics, local construction materials, etc.) towards goods available in the market (metal cooking pots and implements, machine made cloth and clothing, tin roofing, etc.). Although very few household budget surveys have yet been conducted in the rural areas of most African countries to confirm this pattern of change, the logic is compelling.

African household consumption surveys, however, do show a definite movement away from home produced and processed food items towards processed or semi-processed commodities purchased in the market [Poleman,]. Although these surveys have been limited primarily to urban areas, it is likely that similar patterns would be found in rural areas where development of the marketing and transport infrastructure permit the outward flow of processed foods.

The net ceteris paribus impact of income level differences between households on labor's reservation price then depends upon the relative rise

in $\frac{\frac{\partial u}{\partial s}}{\frac{\partial u}{\partial c}}$ at higher levels of income relative to the fall in $\frac{\frac{\partial u}{\partial c_{as}}}{\frac{\partial u}{\partial c_w}}$ and

$\frac{\frac{\partial u}{\partial c_z}}{\frac{\partial u}{\partial c_{..}}}$ at these improved income levels. Again, these are empirical questions

which can be addressed in rural household budget surveys.

Seasonality in the Labor Supply Function

Throughout the above discussion we have used the suggested framework to explain inter-household differences in the labor supply price at a given point in time. The same general framework, however, is also useful in determining the probable directions of change of a given household's reservation price over time, particularly between seasons. If we assume two seasons (wet and dry) and a single harvest cropping cycle, we can characterize the following four factors in the household's environment which are subject to seasonal variation: (a) cash balances derived from on-farm production--high during the post-harvest period and declining continuously until the next year's harvest; (b) food stocks--these follow the same pattern as (a); (c) the productivity of labor--peaks during land preparation, planting, weeding, and harvesting with a trough during much of the dry season; and (d) climatological conditions with respect to work disutility--hotter and less comfortable during the dry season relative to the cooler wet season.

In combination, these factors may be at least partially counterbalancing resulting in a more constant supply price than one would expect simply by an examination of seasonal variations in the production opportunity cost of on-farm agricultural labor alone. It is clear that $\frac{dq_{as}}{dl_{as}}$ and $\frac{dq_{am}}{dl_{am}}$ exert a strong positive influence on P_L during the wet season. On the other hand, during this period and particularly during the immediate pre-harvest period, low cash and food reserves reduce the level of daily consumption thereby increasing the value of $\frac{\partial u}{\partial c}$ [], [].

The high marginal utility of consumption during this period thus applies downward pressure on the level of P_L .

The opposite adjustments would occur during the labor trough period of the dry season. Downward pressure is placed on P_L due to the extremely low values of $\frac{dq_{am}}{dl_{am}}$ and $\frac{dq_{as}}{dl_{as}}$. Offsetting this is a positive, possibly strongly positive, value for $\frac{dq_z}{dl_z}$. Also exerting upward pressure on P_L is a low value for $\frac{\partial u}{\partial c}$, due to the high level of cash and food stocks on hand, and a high value for $\frac{\partial u}{\partial s}$, caused by weather which is not generally conducive to work of any type. The climatological influence would also be reflected in increased marginal disutility of off-farm work, $\frac{\partial u}{\partial l_w}$, again exerting upward pressure on P_L . This could be reinforced by low values for $\frac{\partial u}{\partial l_{as}}$ and $\frac{\partial u}{\partial l_{am}}$ due to the negligible amount of labor time spent in on-farm agricultural work during the dry season.

The outcome of this chain of interacting factors, that is, a relatively constant labor supply price, is of course entirely speculative and dependent upon the proportional seasonal changes of each dependent factor. These in turn would be expected to vary greatly between regions differing with respect to climate, cropping pattern, technology, level of income, efficiency of food storage systems, importance of Z goods and thus market orientation, etc. The decidedly seasonal patterns of labor migration reported in parts of Africa might offer some intuitive proof against the outcome suggested here; for example, the seasonal stream of workers out of Northern Ghana into the Ashanti cocoa belt to perform harvesting and other operations. However, extremely low income levels experienced year-round in the north, a change in

climate and perhaps improved working conditions in the south, in addition to strong demand ^{for labor} and thus acceptable wages, would explain this phenomenon consistent with the suggested approach. This framework also provides a useful context within which the phenomenon of peak season off-farm labor allocation, as described by Norman [1972], can be somewhat better understood. It is also entirely consistent with the unexpectedly invariant seasonal wage behavior also observed by Norman [1972, pp. 33-39] in Northern Nigeria.

Personal characteristics within the household

(6) and (7)

Conditions _A set out earlier assuming interpersonal identity with respect to labor efficiency, utility and disutility schedules, and consequently labor performed and total product consumed, abstract considerably from reality. The same can be said of the perfectly altruistic individual utility function assumed in conditions (4) and (5) requiring that each individual's total utility be a function of his own consumption and work behavior and that of all other members in the household. These conditions can easily be relaxed adding somewhat greater realism to our results by permitting interpersonal differences in the allocation of various types of labor to various tasks within the household and in their respective off-farm reservation price.

The most general characteristics we might use to distinguish among individuals within the household are age, sex, and educational attainment. Important differences would be expected regarding labor productivity in on-farm tasks on the basis of age and sex in particular.

That is,

$$(17) \quad \frac{dq_{as}}{dl_{as_i}}, \quad \frac{dq_z}{dl_{z_i}}, \quad \frac{dq_{am}}{dl_{am_i}} = f(\text{age}_i, \text{sex}_i)$$

Likewise, the utility derived from various types of consumption would be expected to vary by age, sex, and educational characteristics.

$$(18) \quad \frac{\partial u}{\partial c_{as_1}}, \frac{\partial u}{\partial c_{z_1}}, \frac{\partial u}{\partial c_{w_1}} = f(\text{age}_1, \text{sex}_1, \text{education}_1)$$

The disutility incurred in various on and off-farm activities would also vary between individuals on the basis of these three personal characteristics.

$$(19) \quad \frac{\partial u}{\partial l_{as_1}}, \frac{\partial u}{\partial l_{z_1}}, \frac{\partial u}{\partial l_{w_1}}, \frac{\partial u}{\partial l_{am_1}} = f(\text{age}_1, \text{sex}_1, \text{education}_1)$$

We can maintain a central element of the communal sharing system by defining a household utility consumption function which is a weighted average of the individual utility functions, such as

$$(20) \quad \frac{\partial u^*}{\partial c_z} = c_{z_1} \cdot \frac{\partial u_{z_1}}{\partial c_{z_1}} + c_{z_2} \cdot \frac{\partial u_{z_2}}{\partial c_{z_2}} + \dots + c_{z_n} \cdot \frac{\partial u_{z_n}}{\partial c_{z_n}}$$

c_{z_h}

Against this consumption utility derived by the entire household, it is assumed that the individual weighs the personal disutility he experiences in his work effort (19). It is assumed, finally, that each individual has a unique function defining his marginal indifference rate of substitution between leisure and consumption at various levels of household income.

$$(21) \quad \theta_1 \neq \theta_2 \neq \dots \neq \theta_n$$

The reservation price for each person in the household, then, is individually defined as follows:

$$(22) \quad P_{L_i} = \frac{dq_{as}}{dl_{as_i}} \cdot \frac{\frac{\partial u^*}{\partial c_{as}}}{\frac{\partial u^*}{\partial c_w}} \cdot \frac{\frac{\partial u_i}{\partial l_{w_i}}}{\frac{\partial u_i}{\partial l_{as_i}}} = \frac{dq_z}{dl_{z_i}} \cdot \frac{\frac{\partial u}{\partial c_z}}{\frac{\partial u^*}{\partial c_w}}$$

$$\frac{\frac{\partial u}{\partial l_{w_i}}}{\frac{\partial u_i}{\partial l_{z_i}}} = P_{am} \cdot \frac{dq_{am}}{dl_{am_i}} \cdot \frac{\frac{\partial u_i}{\partial l_{w_i}}}{\frac{\partial u_i}{\partial l_{am_i}}} = \theta_i \frac{\frac{\partial u}{\partial s}}{\frac{\partial u}{\partial c}}$$

The result, it is clear, is a bastardized version of equation (16) incorporating elements of both individualistic and communal behavior. It is suggested, however, that this framework is considerably more useful in defining supply price outcomes which have greater consistency with the off-farm patterns and motivations observed by Caldwell and others.

It seems unnecessary here to trace through the intuitive linkages through which age, sex, and education affect the individual's reservation price. The exercise is both tedious and highly speculative. Nevertheless, as in the previous section in which we traced the linkages relating household characteristics to differences in the off-farm reservation price, the exercise can prove helpful in identifying relationships which may not be intuitively obvious at the outset, and in identifying areas requiring further empirical research.

The role of income transfers

It should be noted that the value of the average product within the household has played a minor and indirect part in the determination of labor's reservation price. Its importance was manifest only in determining the relative values of the marginal utility of consumption for various

commodity groups and in determining the marginal rate of substitution of consumption for leisure.

This is in direct contrast to the approach taken in the classical dualistic models where it is the average rural product, adjusted by transfer, psychic, and living cost differences, which constitutes the supply price to capitalist sector employment [Lewis, 1954]. Our approach also stands in contrast to the Todaro-type models which similarly use an adjusted average rural income as the relevant reservation price. In comparison, we have concluded that the reservation price is a function of the aggregate marginal product of labor adjusted for differences in the marginal disutilities of on and off-farm work and the marginal utilities of the consumption of the goods obtainable from both types of employment.

The cause of these varying results are due to differences in the ethical systems we have assumed to guide the allocation of labor. The Lewis and Ranis-Fei models implicitly assumed individualistic systems whereby the individual laborer allocated his work where he could maximize his own utility with no regard to welfare changes within the household. Thus he would not move to off-farm employment unless he received an income at least equal to his consumption share within the household, generally assumed to be the average product. The approaches taken herein, of course, have incorporated respectively a perfectly altruistic ethical system in which each individual's utility is dependent upon all others within the household, and a modified communal ethical system weighting household welfare derived out of consumption according to personal preferences. Since the central objective function has been to maximize aggregate household welfare, including that of the individual worker as well as of the members remaining

in the household, the contribution of the individual to that objective, that is his adjusted marginal product, has been the appropriate reservation price.

Implicit in our approach has been the pooling or sharing of household income derived from both on and off-farm sources. From (7) we saw that if all individuals are identical, aggregate household welfare can be maximized only if all individuals consume identical shares; that is, the average product. Within the more realistic framework allowing for interpersonal differences, aggregate household consumption welfare is maximized where the marginal utilities of consumption for each individual are identical.

$$(23) \quad \frac{\partial u_1}{\partial c_1} = \frac{\partial u_2}{\partial c_2} = \dots = \frac{\partial u_n}{\partial c_n}$$

Again, it should be emphasized that the income being allocated includes both on-farm output and off-farm wages.

If the off-farm worker takes employment near his household and is therefore able to remain under the same roof consuming his normal share of family income, the income transfer is, in a sense, internal. If his off-farm earnings are exactly equal to his reservation price, aggregate household welfare remains unchanged.

When the worker relocates off the farm, the external income transfers are slightly more complex. Wellisz [1968] has shown that if the worker while in the household consumed more than his marginal product, income for those remaining in the household would increase by the difference between the worker's contribution to on-farm output and his share in consumption. The per capita increase in available on-farm consumption, in the absence of an income transfer, is therefore equal to

$$C_i - \left(\frac{dq_{as}}{dl_{as_i}} + \frac{dq_z}{dl_{z_i}} + \frac{dq_{am}}{dl_{am_i}} \cdot P_{am} \right)$$

where n is equal to the number of members remaining in the household. Aggregate household welfare (including the welfare of the off-farm worker) would remain unchanged if the off-farm worker receives a wage equal to his reservation price and, in addition, receives a subsidy from the farm household equal in value to the amount

$$C_i - \left(\frac{dq_{as}}{dl_{as_i}} + \frac{dq_z}{dl_{am_i}} \cdot P_{am} \right)$$

To the extent that the off-farm earnings exceed the reservation price, the subsidy can be reduced by an amount equal to the difference between the off-farm earnings and the reservation price times the proportion of the household members remaining on the farm. In the case of a single off-farm worker, the subsidy could be reduced by $\frac{(E-P_L)n}{n+1}$ where E is equal to the off-farm earnings.

There is a critical value of E below which a subsidy will be extended to the off-farm worker, and above which the off-farm laborer will extend a remittance back to the rural household. We can define the zero-subsidy turning point as that level of off-farm earnings where the reduction in subsidy implied by the value of the off-farm earnings are just equal to the maximum subsidy; that is, where

$$(24) \quad \frac{(E-P_L)n}{n+1} = C_i - \left(\frac{dq_{as}}{dl_{as_i}} + \frac{dq_z}{dl_{z_i}} + \frac{dq_{am}}{dl_{am_i}} \cdot P_{am} \right)$$

Solving for E , and inserting the utility equivalents to reduce the various factors to a common unit we get, (next page)

$$(25) \quad E^* = c_1 \left(\frac{\partial u^*}{\partial c} \right) + P_L - \left[\left(\frac{dq_{as_i}}{dl_{as_i}} \right) \left(\frac{\partial u^*}{\partial c_{as}} \right) + \left(\frac{dq_{z_i}}{dl_{z_i}} \right) \left(\frac{\partial u^*}{\partial c_z} \right) \right. \\ \left. + \left(\frac{dq_{am_i}}{dl_{am_i}} \right) \cdot P_{am} \right] +$$

$$\frac{\partial c_{w_i}}{\partial u_i}$$

$$+ c_1 \left(\frac{\partial u^*}{\partial c} \right) - \left[\left(\frac{dq_{as_i}}{dl_{as_i}} \right) \left(\frac{\partial u^*}{\partial c_{as}} \right) + \left(\frac{dq_{z_i}}{dl_{z_i}} \right) \left(\frac{\partial u^*}{\partial c_z} \right) + \right. \\ \left. \left(\frac{dq_{am_i}}{dl_{am_i}} \right) \cdot P_{am} \right]$$

$$n \left(\frac{\partial c_{w_i}}{\partial u_i} \right)$$

The intuitive meaning of equation (25) can be roughly stated as follows. The level of off-farm earnings at which the off-farm worker would neither receive nor extend income transfers is where his earnings are equal to his former level of consumption, c_1 , adjusted for changes in the net disutility he experiences due to his wage employment, $P_L - \left(\frac{dq_{as}}{dl_{as}} + \frac{dq_z}{dl_{z_i}} + \frac{dq_{am}}{dl_{am_i}} \cdot P_{am} \right)$, plus the amount by which the per capita income of the remaining members in the household has increased due to his off-farm move,

$$c_1 = \left(\frac{dq_{as}}{dl_{as_1}} + \frac{dq_z}{dl_{z_1}} + \frac{dq_{am}}{dl_{am_1}} \cdot P_{am} \right). \quad \text{It is obvious}$$

that as earnings increase beyond E^* , the amount of the increment to E remitted to the household through external transfers would be equal to $\frac{(E^*-E)n}{n+1}$.

Implicit in the above discussion have been two assumptions. First, we have assumed that the external income transfer is being sent in a form which either reflects the rural household's commodity preferences, or in a form, such as cash, which can easily be transformed into commodities which the household desires. Second, the external transfers have been assumed to be costless. We will now introduce factors which reflect both of these assumptions into equation (22) in order to determine how relaxing them affects the value of labor's reservation price.

Both Lux [1972] and Caldwell [1969] have reported the economic and social importance of the wide range of consumer goods brought or sent back by urban off-farm wage earners to their rural households. Non-durables including such items as cloth, clothing, food, soap and seed, and durables such as radios, bicycles and farm implements constitute a substantial part of the flow of wealth remitted from the urban to rural areas [Caldwell, 1969]. Many of these items are not available for purchase in the rural areas, due to inadequate marketing systems, and thus may have a high utility valuation attached to them in the rural area. Of course, the contrary is also possible. Some of these goods may be shipped by lorry from the urban center while others are brought as gifts during visits of ^{the} off-farm laborer to the household. In either case, some of the off-farm earnings are absorbed in these travel or shipment costs.

Considerations of consumption utility differences and transfer costs can

be introduced through the term $\frac{\partial u}{\partial c_w}$ in equation (22). We can disaggregate the marginal utility of consuming goods purchased from wage earnings into that component consumed by the off-farm worker, c_{w_1} , and that remitted portion consumed in the household, c_{r_h} . If we assume that the transfer costs are absorbed by the rural household, then the value of c_{r_h} actually consumed must be reduced by the portion lost in shipment costs, t , or $c_{r_h} (1-t)$ where $0 < t < 1$.

We can further distinguish between the marginal utility of wage goods consumed by the off-farm worker, $\frac{\partial u_{w_1}}{\partial c_{w_1}}$, and the marginal utility of remittance goods consumption experienced by the rural household, $\frac{\partial u_{r_h}}{\partial c_{r_h}}$.

The components can now be combined into a single weighted household consumption utility term,

$$(26) \quad \frac{\partial u^{**}}{\partial c_w} = \frac{c_{w_1} \cdot \frac{\partial u_{w_1}}{\partial c_{w_1}} + c_{r_h} (1-t) \frac{\partial u_{r_h}}{\partial c_{r_h}}}{C_w}$$

where

$$(27) \quad c_w = c_{w_1} + c_{r_h}$$

Replacing $\frac{\partial u^*}{\partial c_w}$ with $\frac{\partial u^{**}}{\partial c_w}$ in equation (22) and expanding, we get,

$$(28) \quad P_{L_i} = \frac{dq_{as}}{dl_{as_i}} \cdot \frac{\frac{\partial u^*}{\partial c_{as}}}{\left(\frac{c_{w_i}}{c_w} \cdot \frac{\partial u_{w_i}}{\partial c_{w_i}} + \frac{c_{r_n}}{c_w} (1-t) \frac{\partial u_{r_h}}{\partial c_{r_h}} \right)}$$

$$\frac{\frac{\partial u_i}{\partial l_{w_i}}}{\frac{\partial u_i}{\partial l_{as_i}}} = \frac{dq_z}{dl_{z_i}} \cdot \frac{\frac{\partial u^*}{\partial c_z^*}}{\left(\frac{c_{w_i}}{c_w} \cdot \frac{\partial u_{w_i}}{\partial c_{w_i}} + \frac{c_{r_n}}{c_w} (1-t) \frac{\partial u_{r_h}}{\partial c_{r_h}} \right)}$$

$$\frac{\frac{\partial u_i}{\partial l_{w_i}}}{\frac{\partial u_i}{\partial l_{am_i}}} = P_{am} \cdot \frac{dq_{am}}{dl_{am_i}} \cdot \frac{\frac{\partial u_i}{\partial l_{w_i}}}{\frac{\partial u_i}{\partial l_{am_i}}} = \theta_i \frac{\frac{\partial u}{\partial s}}{\frac{\partial u}{\partial c}}$$

The intuitive meaning of these expansions is clear. We can see that the reservation price for labor is now positively related to the costs incurred in remitting income payments from the off-farm worker to the rural household. Also, the reservation price is now inversely related to the utility derived by the rural household through either the consumption of those commodities sent by the off-farm worker or through the consumption made possible by cash remittances and resulting purchases in the rural market.

Approximating the Regional Labor Supply Curve

Based on our discussion of the determinants of the household and individual reservation prices, we can make some tentative suggestions as to the factors contributing to the shape of the regional labor supply curve. To simplify the discussion, let us assume that only a single individual from each household is in a position to take on or off-farm employment. Let us

further assume that each potential off-farm worker spends all of his time in either on-farm labor or in off-farm wage employment and can't participate in both on a part-time basis. These assumptions allow us to ignore the shape of the household off-farm labor supply curve and focus instead on the reservation price at which that one unit of labor will transfer to full time off-farm employment.

Graphically we can visualize a point which identifies a given household located immediately above the single labor unit mark on the horizontal axis and to the right of that wage value identifying its reservation price on the vertical axis. Having identified the reservation price for each farm in the region associated with a given type of off-farm employment offered in a given location, the regional labor supply curve is simply the horizontal summation of these points.

It is obvious that the slope of the regional labor supply curve depends upon the degree of homogeneity or heterogeneity between farms; that is, it is a function of the distribution of those characteristics identified in an earlier section as determinants of the household or individual reservation price. The greater the degree of homogeneity among farms, the greater the elasticity of labor supply. Conversely the wider the spread of differences among farms and the lower the concentration of farms around a normal or typical farm, the less elastic will be the aggregate supply curve.

We can take as an example the dispersion of land to labor ratios that might be observed within an area. Let's assume that all farms are identical with respect to technique of production, degree of commercialization, distance from product and labor markets, land type, etc., but differ with regard to the size of land base per working member of the household. From our earlier

discussion we know that the land to labor ratio is positively related to the labor reservation price, ceteris paribus. If there are a large number of farms with a small land to labor ratio and comparatively few large farms relative to their available labor force, we would expect the regional labor supply curve to be highly elastic at that wage which approximates the reservation price of the smaller farms, and becoming highly inelastic at the wage levels associated with the reservation price of the farms with the larger land base. Thus we can view the supply curve as being composed of unfavorably endowed farms at the lower tail, that is farms where the labor to land ratio is high, and the factor proportions improving as we move to the upper part of the curve.

The problem is greatly complicated when we consider the full range of determinants which contribute to the household's reservation price. Empirically, however, it should be possible to identify the most important characteristics, those which seem to be highly correlated with the others, such as farm income, and which are most powerful in explaining differences in the labor supply price. Using one or two such characteristics as a proxy for the rest, it is at least conceptually possible to formulate a regional labor supply function based on the distribution of these characteristics among the population.

Summary and implications for further research

The absence of a general theory of labor supply in the African context has left knowledge gaps in several areas central to the formulation of more effective policies to deal with growing levels of unemployment. Largely superficial and speculative treatment has been given thus far to an identification of those factors which contribute to adjustments in the size and

composition of the rural labor force over time, and as a function of the level of wages and of structural change in the rural economy. The largest body of research concerned with the supply of African labor has concentrated on the description and analysis of labor migration patterns. These studies however, have proceeded without satisfactorily specifying the theoretical linkages through which social and economic variables are hypothesized to affect off-farm labor allocative decisions. The effect of both household and personal characteristics may well impact in a multiple and countervailing manner on this decision, ^{Thus,} it is not surprising that these studies, which have been carried on at a high level of aggregation, have emerged with inconclusive and often contradictory results.

Since the household is the relevant decision making unit and constitutes the set of rural production and consumption alternatives for the potential off-farm laborer, it is argued that the household is the proper focus of further research. Such research must attempt to identify the characteristic motivations, and alternatives of the individual within the context of his household, and their relationships to off-farm movement.

To provide a framework within which such research might be oriented, we presented a simple household model reflecting conditions of optimal allocative efficiency with respect to labor use. The model distinguished between four labor activities: (a) agricultural subsistence production, (b) agricultural production for the market, (c) on-farm non-agricultural activities, and (d) off-farm wage employment. Using this indifference framework, we discussed a series of intuitive linkages relating a range of household and personal characteristics to the level of labor's reservation price. The linkages were traced and found to be complex, often off-

setting, and in need of greater empirical specification.

Areas in which useful research might be directed to further specify the impact of these determinants on the supply price of labor at the micro level include the following:

1. There is a need to evaluate the consumption aspirations of individuals and households distinguished by a number of social and economic characteristics. Rural household budget surveys which identify income and price elasticities of demand for various types of on and off-farm produced consumer items should be complemented with subjective approaches which abstract from existing market and budget constraints to identify consumption desires.
2. The elasticity of substitution between "as", "z", "am", and "w" activities as a function of relative prices and levels of income should be identified.
3. The impact of education on the labor supply price remains one of the most problematical areas discussed. More information is needed relating education to differences in on-farm productivity and its affect on consumption and employment aspirations. Research linking personal educational characteristics to specific off-farm jobs (distinguished by status and wage) as contrasted with the production and consumption alternatives offered within the rural household could usefully highlight some of these relationships.
4. Both migration and farm management studies should try to identify with improved accuracy seasonal cash and food stocks profiles and relate these variables to differences in the propensity to take temporary off-farm employment.

5. Greater information is also needed linking income transfers to households with varying economic characteristics. In particular, information on (a) the form of remittance payments, (b) their timing, both seasonally and over the duration of extended off-farm employment, and (c) their value relative to off-farm earnings and on-farm income and liquidity, should provide a much improved understanding of the importance of these flows as a determinant of the labor supply price.

6. Finally, more understanding is needed of the nature of the decision making process regarding off-farm labor transfers. A set of subjective relationships which could be probed include (a) the effective scope of the household's objective function regarding questions of labor transfer, (b) the time horizon implied in such decisions, (c) how and by whom the decision is made, (d) how these factors differ between household types, and (e) changes in the decision making process over time.

It is acknowledged that substantial methodological problems of data collection, quantification, and analysis lie in each of these areas. Many of the critical factors are intangible and not subject to direct observation and measurement. Thus, if these relationships are to be meaningfully analyzed, proxy variables and units of measurement will have to be identified. Nevertheless, these problems are not insurmountable. The general analytical framework, it is believed, has direct relevance to an important problem-- it simply places a high premium on the imagination and resourcefulness of the analyst to use it in an equally relevant manner.

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