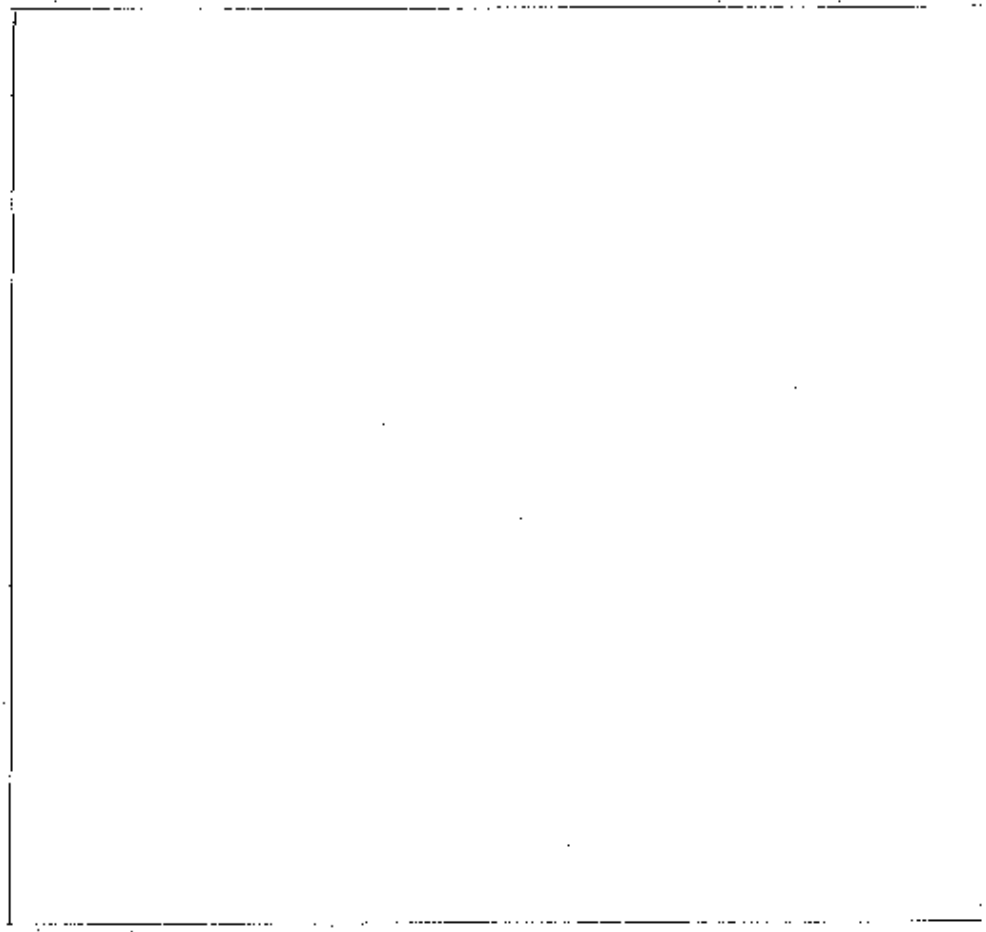
GENDER, ENVIRONMENTAL DEGRADATION & DEVELOPMENT: THE EXTENT OF THE PROBLEM

Gregor Büchner
Joanne C Burgess
Victoria C Drake
Tom Gameson
David Hanrahan

Discussion Paper Series

DP 91-04

June 1991



Acknowledgement

This paper is the product of the "Environment and Development Seminar" which was conducted as part of the MSc. in Environmental and Resource Economics taught at the Department of Economics at University College London in 1990-1. The authors gratefully acknowledge comments and suggestions received from David Pearce and would like to thank Ed Barbier for inviting the authors to publish this paper through the London Environmental Economics Centre. All errors, as usual, are ours alone.

Table of Contents

		page
1.	Introduction	i
2.	The Gender Bias Issue in Environment and Development: Fact or Fiction *Victoria C. Drake*	4
3.	Women in Devleopment and Environment: Indicators of the Extent of Bias *David Hanrahan*	10
4.	Gender, Environmental Degredation, and Development: Modifying the New Household Economic Model *Gregor Büchner*	18
5.	The Gender Issue in the Third World and Constraints on Economic Theory *Tom Gameson*	24
6.	Land Management and Soil Conservation in Malawi: A Case Study *Joanne C. Burgess*	29
7.	Conclusion	37

Introduction

This paper attempts to establish a framework within which to examine the extent of gender bias in environment and development. The first chapter traces the emergence of gender bias as an issue in the debate about environmental and economic development and examines the reasons why this relationship is vital to understanding the link between environment and development. Subsequently, the extent to which macro-economic statistics reflect these factors and their complex interactions is exposed. Attention is then devoted to the role of gender bias on a micro-level in the form of constraints on the household model and economic theory in general. These two chapters reflect the adequacy or inadequacy of current economic analysis to grapple with the gender-bias issue. In the light of a case study of land management in Malawi, specific ways will be suggested in which household production functions must be extended to account for the linkages between gender, environment and development.

In the first chapter, the historical view of gender bias is explained in terms of the distinction between sexual and social bias. This is followed by an examination of the importance of women in global and especially developing country economic activity. Esther Boserup's work on the sexual division of labour is identified as a breaking point in the analysis of gender bias. The 1975 declaration of the UN Decade for Women is evaluated as a failure in retrospect. Attention is then devoted to the distinction between household and reproductive labour as a determinant of women's work, and the role of the sexes within the household. In particular, the significance of "z-goods" is discussed. The problem of intra-household decision-making within household is then addressed. Next, the topic of access vs. control of resources is discussed in the contest of property rights and their effects on environmental management and poverty.

Turning to methodological issues, the continued failure to adequately represent intrahousehold inequalities in access and distribution, especially in the context of household models is criticised. Based on the 1980 World Conservation Strategy, strategies for improveming the legal and economic status of women are identified. Finally a critique of the traditional measurement and benefits of economic development is conducted.

The second chapter turns to the problem of aggregate measurement. The existence of a gender bias in development has been widely recognised in the literature but there is little in the way of aggregate statistics to quantify the extent of the effect. The "Human Development Index" (HDI) recently developed by the UNDP was taken as the basis for calculating a measure of gender bias. The HDI combines data on life expectancy, education and income to produce a single overall index. Using data fron the UNDP report it has been possible to construct seperate male and female indicies, although the income data is not differentiated by gender.

The results (as detailed in the body of this report) show firstly that there is a strong relationship between overall HDI and national wealth, although there are many exceptions. There is also clear evidence of gender bias, particularly at the low end of the development scale. At the bottom of the ranking this closes quite rapidly as overall levels increase.

Estimates were also made of the change in HDI and of the gender bias over the past decade. These results show both a general improvement in development and a narrowing of the gender gap over this period.

The HDI measure is not ideal but it does provide a yardstick for efforts to reduce the gender bias which is clearly demonstrated to exist.

The third chapter analyses the extent to which gender bias is a significant factor in linking economic development and environmental management in the agricultural household. Anecdotal evidence suggests that gender bias in favour of policy directed at male led households at project level is widespread. Furthermore, the underestimation and undervaluation of the female role in environmental management in the household suggests a substantial degree of gender bias.

Particular attention is paid to how gender bias fits into existing assumptions of the internal dynamics of the agricultural household model. Present theory is based on the homogenous aggregates of main household economic indicators and absence of any environmental constraints. However, anthropological research suggests a considerable

variation in economic gender roles while ecological studies identify important resource use constraints, especially with respect to sustainable development.

It would therefore appear that even in more advanced models of the rural household such as the New Household Economic Model (NEHM - e.g. Singh, Squire and Strauss, 1987) gender bias occurs through the assumption of household utility maximisation on the basis of an aggregate welfare function, the assumption of an aggregated household labour supply, the absence of both natural and man-made resource use constraints. The role of gender and environmental management in agricultural household interaction therefore requires further examination.

The fourth chapter starts by considering general issues of gender and social status. An in-depth analysis of the gender division of labour follows, covering task division, the distinction between women's roles in productive, reproductive and leisure activities and the differing income and valuation of labour between men and women. Next the intra-household subordination of female labour and female disadvantages in time allocation are addressed, with the conclusion that male and female labour cannot be treated as substitutes.

The second part analyses the problem of the inappropriateness of aggregate utility maximisation when considering households. A disaggregation of the household is suggested along time allocation. It is concluded that the rigidities of time allocation, and unequal command over other resources can result in the household being inflexible in its response to market forces.

The fifth chapter considers a sub-Saharan case study. In Malawi, the persistence of low income levels and increasing population pressure coupled with increasing land scarcity and land degradation requires significant attention to ensure that the economic development can take place whilst the natural resource base is not degraded further. Women's role in environment and development is important not just through the poverty-land degradation link, but also because of the level of their interaction with the land and the particular constraints they face to undertake sound land management. Therefore there is a need to take special consideration of women's integration in agricultural development in Malawi.

Development projects and policies need to be sensitive to the role of gender in environment and development, otherwise women are unlikely to benefit, and at the worst face detrimental impacts, from such strategies. Targeting policies to deal with the gender issue requires detailed information at a micro level - such as cropping patterns, methods of cultivation, input of labour, credit constraints and so on. However, it is important not to make broad generalizations with site specific data which will vary considerably throughout Malawi. Policies to promote economic development whilst maintaining the productivity of the land requires substantial efforts to ensure that sufficient data is collected to ensure the role of gender is given due and accurate consideration in decision making.

It is concluded that we need to expand evaluation of policy measures to improve natural resource management which improves efficiency in an equitable manner (ie, not increase the work burden on women, relevant technology, info and extension, pricing strategies taking explicit account of women's responses, investment policies). We often do not understand the motivations of the people at whom policy is directed or upon whom policy response is dependant. More discussion is needed about the ways in which women might enhance resource stocks through project help and policy changes.

The recognition of the role of women as producers and managers of natural resources has placed gender on the analysis, research and policy making agenda. Although gender has been recognised as an issue worthy of consideration, little appropriate action has been forthcoming, for example:

* economic approaches still need to be more inter-disciplinary in nature, taking note of other, especially anthropological, wisdom on the subject;

* marco-economic indicators fail to adequately reflect womens role in development - such as through income, education, nutrition, fertility, family size and so on - and provide even less indication of womens role in managing natural resources. However, focussing on large scale macro-indicators, whilst useful for attracting political attention, is not sufficient for policy making;

* the vast majority of micro-level data, for example on rural activity in developing countries, is derived from census which tend to take male household heads as the primary data source, and thus greatly underestimate the role of women in farmwork, food

processing, fuel collection and the specific constraints that they face. This bias in data needs to be addressed; and,

* the rural household is generally considered as one unit, and its internal working of little concern to theories assuming a single set of decisions across all household members. Economic analysis needs to be more sensitive to the internal workings within the household, especially the separate gender production functions.

The neglect of women in economic policy exacerbates the subordination of women and diminishes the impact of policies designed to increase development and environmental management. We argue that the most effective, although undoubtedly the most difficult way, to deal with the gender issue in environment and development is through improved understanding of household level systems, and incorporation of this information into our policies and decision making. For example, our case study has shown that it is necessary to open this 'closed box' household approach, and consider the influence of gender on the division of labour, access to land, capital, labour and credit, food/cash crop objectives, risk aversion and so on.

The Gender Bias Issue in Environment and Development: Fact or Fiction

Victoria C. Drake

What is meant by gender-bias? Sex is a physical distinction; gender is social and cultural. Masculine or feminine gender may be associated with male or female sex but this is not an absolute correlation. A dialogue on the division of labor between men and women is almost exclusively focused on gender roles rather than sex roles, determined by culture not biology. The delineation between male and female roles varies of course within a wide range of cultures. But, for the most part and for the purpose of the ensuing discussion, it is assumed that there is tremendous complexity embodied in the gender inequality issue in developing countries.

It is often said that women comprise the majority of the world's population. Sen (1990) contends that this may not actually be true. This common misconception is based upon a generaliztion from the contemporary situation in Europe and North America where the ratio of women to men is typically around 1:05 or 1:06 or higher. In South Asia, West Asia and China, the ratio of women to men can be as low as 0.94 or even lower and it varies widely in Asia, Africa and Latin America. What historical benchmarks can account for the varying perceptions of how men and women are aggregated?

Engels, in The Origin of Family, Private Property and the State (1884), was perhaps the first to describe women's position in society as varying according to prevailing economic and social relationships. He presented a historical view from communal, egalitarian societies through the rise of private property and the family to exploitative class societies. Here, women were initially dominant but became subordinant with the appearence of means of production which could be privately owned such as domesticated animals. When men held private property in productive assets and exchangeable surplus, women worked for their husbands and families instead of for society: thus the division of labor became exploitative. With accelerating capitalism, production and reproduction are spatially separated. Consequently, women were subordinated by their alienation from direct production (Momsen and Townsend 1987).

Esther Boserup's pioneering study of the sexual division of labor Women's Role in Economic Development (1970) elucidated for the first time the significant contribution of women to agricultural production and the differential impact of economic change on women and men. She made two outstanding assertions. First, is her scenario of technological change in agriculture under which change profits men not women- since men's labor productivity tended to increase while women's remained relatively static. Second is her identification of male and female farming systems. These are defined by gender roles, as to which gender contributes most agricultural labor. Boserup contends that in extensive, shifting, non-plough agriculture, as in most traditional societies of Africa and tribal societies of South and South East Asia, most field work is done by women: farming systems are female. Where plough cultivation is the rule, low female participation is standard, as in Latin America and Arab cultures: farming systems are male. In regions of intensive, irrigated agriculture, as in much of South and South East Asia, both men and women must contribute.

By underlining the basic differences in the industrial skills and educational backgrounds of men and women, Boserup graphically illustrated why women occupy a secondary position in urban labor markets. She also highlighted the vital role of women in production and alerted donor agencies to the misallocation of resources that reflected an abiding ignorance of women's role in production. Boserup claimed the "process of polarization and hierarchization of men and women's roles" can be observed in the "modern, urban economy," whereas it is not usually observed "either in family production for subsistence or market production in home industries at a village level." But, since she did not specify the type of modernization responsible, the polarization and hierarchization she discussed is viewed, not as a result of modernization, but because of a capitalist development model.

It was this study that inspired the United Nations in 1972 to proclaim the first Decade for Women (1975-1985). The World Plan of Action for the Implementation of the Objectives of the International Women's Year were accepted in 1975, which was officially christened International Women's Year at the UN conference in Mexico City, Mexico. The UN General Assembly also endorsed the themes of Equality, Development and Peace for the Decade for Women. The subject of women in the context of Development has traditionally been viewed as a welfare issue, meriting a low priority status in governmental national planning strategies. During the earlier part of the Decade for Women, the belief that economic growth must unquestionably benefit women was prevalent, but subsequent research proved this simplication to be a major fallacy.

In 1980, there was a follow-up UN conference in Copenhagen to formulate an Action Programme for five years and to introduce the three additional sub-themes of Employment, Health and Education as approved by the UN in 1979.

The Decade for Women closed in 1985 at the United Nation's Nairobi meeting (25-26 July) where the Forward-Looking Strategies for the Advancement of Women (during the Period from 1986-2000) were adopted by a consensus of 157 countries. Emphasis was placed on the "unremunerated contributions of women to agriculture, food production, reproduction and household activities." In particular, the Conference recommended that "efforts be made to measure and reflect these contributions in national accounts and economic statistics." The United Nations document also claims that if current trends continue, the prospects for the developing world, particularly the low-income and least developed countries, will be somber. Overall growth in developing countries is projected to be lower in the period 1980-2000 than 1960-1980. If this is so, there will inevitably be negative implications for women due to diminishing non-renewable resources and lessening access to them, high illiteracy rates, low education standards, high job discrimination and lack of recognition for their contribution to the economy.

Essentially, the Decade for Women came and went without so much as a whimper, leaving the majority of women in poorer sectors none the better off. However the link between women and development had finally been recognized in many aid agencies with the establishment of "Women in Development" (WID) strategies and the concept of 'primary environmental care'- a basic concept of repair and preventative action which can underpin sustainable development. But, events surrounding the UN Decade for Women dramatized women's invisibility in development planning. A mounting international economic crisis rocked the developing country sphere. Enormous debts, inadequate readjustment policies in response to these negative effects linked to protectionism against the exporting efforts of developing countries as well as the failure to establish democratically - based economic relationships constitute the main reasons why the Decade for Women failed.

Under close scrutiny, Boserup's study was criticized for its undue reliance on the modern perspective and a utopian view of pre-capitalist sexual equality. However, Boserup did pave the way for more detailed analyses on how the sexual division of labor was maintained or restructured under capitalist or socialist pressures. Traditional analysis on the "women question" had formally focused on women in the labor market and other issues falling outside the domestic economy. Therefore, the solution to women's oppression was perceived as being lodged in the realm of paid production, i.e. outside the household and independent of it. These new studies emphasized the social rather than "natural" basis of the sexual division of labor and stressed the extent to which women must be considered not only as breeders and nuturers, but as economic agents in their own right. Goody (1976) linked his work to Boserup by a quantitative analysis of pre-industrial societies: female farming was strongly associated with hoe agriculture and simple polity while male farming was associated with ploughing and irrigation with more complex polities and inheritance systems of diverging devolution. Without exception, once societies develop complex economies and stratification systems extending beyond the community level, these are dominated by men (Blumberg, 1984).

One of the most pervasive themes of the emerging women's studies discipline was an emphasis on the role of reproduction, women's reproductive activities as a determinant of women's work, and the role of the sexes within the household. Thus, in order to grasp women's position in the labor market, an analysis of the significance of women's role in the household/reproduction as well as the interaction between reproduction and production must exist. In order to distinguish which part of domestic activities is economic (i.e. should be considered production) and which is not, one must determine whether the performance of an activity can be delegated to a paid outsider or not. This

criterion, often referred to as the "third person criterion" was introduced by Reid (1934):

"Household production consists of those unpaid activities which are carried on, by and for members, which activities might be replaced by market goods or paid services, if circumstances such as income, market conditions, and personal inclinations permit the service being delegated to someone outside the household...if an activity can be delegated to a paid worker, then that activity shall be deemed productive."

The third person criterion was restated by Hawrylyshyn (1977):

"An economic service (or z activity) is one which may be done by someone other than the person benefitting therefrom. You must ask: Can one hire labour to achieve the same results? If yes, then the activity is one which produces z-goods; if not, the activity is a direct utility one [producing welfare or satisfaction] and cannot be measured in any meaningful way."

The next historical stage in the emergence of gender bias as an issue was marked by the compounded negative effects of foisting a western gender ideology perspective by colonial states and by post-colonial development agencies onto women in developing countries during the late 1960s-early 1970s. Galbraith depicted the Western concept of a household in non-classical models of economic society as an "extremely sophisticated disguise for the role of women." Even though a household may comprise several individuals with a range of preferences, risk-aversion, risk neutral or risk-loving choices, he suggests all neo-classical theory considers it to be one individual. Thus, if individual and household choices are interchangeable, the identity of the real decision-maker is hopelessly obscured. The household in established economies is actually a cover for the deployment of male authority. If authority is a function of income, then the person who earns the money is by default the head of the family, Rogers (1980).

There is an inherent confusion in the literature over access to vs. control of resources. Merely having access to resources is insufficient to generate control over one's environment. In advanced agricultural systems, it is typical for women to trade control of resources for access to them. Thus, if the social system deprives women of resource control while still allowing them resource access, then their overall status will be low, i.e. men will be better off and have more power then women.

A standard consequence of this arrangment is the alienation of women from traditional land rights as they are forced into non-mechanized, low-productivity activities. This shift superficially appeared to show an increase in women's labor-intensive committment while unilaterally decreasing their control over their product. Women's lack of access to credit and education further marginalized their status. The underlying contradiction of this transformation in rural production systems soon asserted itself. More wages for men meant less and less real income for women. Thus the aggregate increases in productivity resulted in such severe demands for women's labor that their well-being and that of their families was completely undermined. A steady overall decline in women's control over resources led to a growing "feminization" of poverty. It was no surprise when the past clarion call to integrate women into Development was attacked in the late 1970's. Recent research has attempted to correct this negative shift in the perception/reality of women by accounting for the vital family labor work women perform which has never been properly measured on an empirical level let alone the inadequacies of statistical methodologies in representing women's waged and non-waged labor.

Barke's (1990) study of women in Latin America dramatically shows how women in a relatively small area of the Yucatan and again in Mexico are affected by the process of development as well as how the extreme duality of social and economic structures leads to a marked negative stratification of women in society. This notion of a duality is peculiar to Latin America where one finds entirely different social and economic spheres within the same region. One extreme is modernization where most of the features of the 'western' developed society exist. At the other extreme lies a 'traditional' society which is socially and economically separate and which appears to be immune from modernization effects. To escape a 'circle of dependency' whereby women are disadvantaged in both extremes, there is an enormous rate of migration among women to urban areas for employment and educational advancement in an effort to gain their independence.
However, as Barke enunciates, "Migration to the city does not offer a panacea for all women and for many the struggle to maintain a decent life in the rural area is simply exchanged for a different kind of struggle in the urban environment."

While there has been much empirical investigation into the linkages between economic development, dependence and income inequality, the issue of gender inequality has received less systematic attention. Although some macroeconomic indicators emerge as significant predictors of gender inequality in several regression equations, the most important explanatory variable is cultural region. These specific findings fail to support the "modernization" or dependency/world system, theoretical perspective for the existence of gender inequality (Marshall, 1985).

It is still impossible to use one single econometric methodology to reveal the hidden underside of women's work. Micro-economics has failed in giving sufficient weight to intrahousehold inequalities in access and distribution. The available household models do not account for women's work within and across their associations. There is a persistant tension between the reality of society's dependence on women to perform certain tasks, particularly in the agricultural sector which may or may not benefit them and the enduring constraints on their control of the resources. One observation from an ILO mission to Zambia (1970):

"Women are over-worked in rural areas; women's labour is one of the factors which determine how much land can be cultivated and how well and the pressure on women's time is an important constraint on raising agricultural production and rural living standards." (Rogers 1980)

In 1990, the International Union for the Conservation of Nature and Natural Resources (IUCN) published its second draft of Caring for the World: A Strategy for Sustainability, commonly known as "The World Conservation Strategy II", in conjunction with UNEP and WWF. IUCN's highly publicized precursor, The World Conservation Strategy (1980), had taken no notice of the economic and social let alone ecological requirements of sustainability. Action 6.5. of the new document yet to be published:

Improve the legal and economic status of women by:

Ratifying and upholding the Convention on the Elimination of all Forms of Discrimmination Against Women.

Ratifying and upholding gender-specific labour legislation - as formalized by the International Labour Organization - to ensure equal pay for equal work, equal representation of women in on-the-job training programmes, etc.

Increasing economic opportunities for women...

Reviewing laws that impact family size...
(end)

Since the final draft will not be launched until 1992, it is still unclear how the concatenation of yet another blueprint for "sustainability", albeit with unprecedented economic verbiage, will actually ameliorate women's global economic status.

The gender-bias issue is clearly a necessary and critical variable in the "development equation" as evidenced by women's contributions to the economic and human resource "wealth" of nations. It is estimated that women comprise 41% of the measured labor force in developed countries and 32% in developing countries. However, this is not an accurate reflection of the true contribution women make overall. Many of their most productive activities are simply not quantified, such as low resource farming/marketing and unpaid family/household labor. Current research shows that income under female supervision is a primary determinant of women's total status. Moreover, this income is usually spent on child nutrition/family needs and reinforces women's decision-making efficacy in the household. As Rogers (1980) enunciated, "Since so few development programs or projects offer adequate incentives to women, their potential for increased production remains undiscovered."

To account for the unaccounted role of women, two simplistic explanantions have been suggested or assumed. One view emphasizes the cultural contrasts between the East and the West (the Occident and the Orient), claiming that Western civilization is less sexist than Eastern hence the high ratio of women to men in paid work. The other view examines stages of economic development, seeing the unequal nutrition and health care provided for women as a feature of underdevelopment, a characteristic of poor economies awaiting economic advancement. A unified cultural and economic explanantion is most certainly closer to the truth. Economic development is actually quite often accompanied by a relative worsening in the survival rate of women (even as life expectancy improves in absolute terms for men and women). A significant proportional decline of women occurred in China after the social and economic reforms of 1979. The numbers began to

rise in 1986 but the 1989 figures were still below those of 1979. Economic causes for women's deprivation must be integrated with social and cultural factors to lay a foundation for the real solutions.

To conclude, the process of economic change in the developing world and the generalization of a dominant agro-technological model utilizes the gender-bias issue in different contexts. Its impact on individual livelihood is also gender-specific, more often than not negative for women. If this is a universally accepted notion of how development must operate, then the hidden "injuries" of gender-bias, as yet unquantified, demand a reassessment of what we call Development. Previously, development has been quantified as an activity. Increasingly, development is now viewed as achieved well-being. This reflects a shift from development defined simply to economic to socioeconomic and finally to include some vector of combined human choice, both male and female. The global response to women's current roles and future aspirations will determine the real, as opposed to marginalor expected, commitment to "sustainable development".

Appendix

Economically, women's unpaid household labor would increase the world's measured annual economic product by US $4 trillion.

These findings have critical implications for the food crisis in Africa where women raise 80% of the food crops. Which leads us to ask: Are we discussing "women" in the ever-undulating context of Environment & Development or is it more the deeper, less tangible implications of "gender" in Environment & Development?

1. This issue involves more than one dimension in which the sexes are inequal and more than one social situation where inquality is exercised.
2. There is an inherently weak grasp of gender stratification which leads to a confounding of class & gender stratification in addition to a confusion between the notions of "access to" resources and "control of" resources.

Although the status of women is conceptually divisible into separate dimensions, it is empirically one dimension. In other words, correlations between different dimensions of gender inequality may be so strong that it is essential to focus on "the" status of women. The same idea can be expressed in terms of the differential control of resources. There are many different kinds of resources that men & women can control resulting in many different male-female power differences. In socio-historical terms, control of certain productive resources, like land and animals, gave the control and power over other resources. Thus, despite the theoretical possibility that there is more than one area of resource control on which the sexes differ, the reality may be that there is only one dimension. The most extensive study on the "status of women" by Whyte (1978) concluded that there is no such thing because gender inequality is empirically and conceptually a "multi-dimensional phenomenon.". Be that as it may, since we have established that this phenomenon does indeed exist, we are still left with the problem of how to account for all its possible pertubations in the context of Environment & Development.

To abstract women as a separate category from the socially established relations between men & women is to impose a misleading universalism (Absolute vs. Relative Perceptions). Our intention is not simply to delineate the individual experience of one sex, but to grasp the historically specific nature of gender differentiation and its relationship to social & economic processes. Previous empirical studies of women's roles and status led to an evaluation of gender in the context of varying food/market production channels. The confluence of gender with ethnic and class issues & the different historical experience of black & white women resulted in a shifting focus from specific, isolated gender cases to an overall picture of gender relations which now entails a revised perception/definition of Development itself.

Another area of interest is how technology advancements tend to exclude women from traditional sources of income in the agricultural sector. Correlations between Third World women and the experience of women in recession-bound British industry or the textile sweat-shops of Los Angeles stress the inter-connectedness of processes in which advanced industrial countries play a

crucial role.

The ILO estimates that more than a billion women, 1/3 of the world population, will be economically active in the year 2000. Over 700 million of these women will be in developing countries and their ranks will represent less than 50% of the Third World female population aged 16-64 (The corresponding population in Industrialized countries will be 60%). The ILO studies show high unemployment for women in both developed and developing countries as well as underestimated economic contributions of women in North Africa, Asia, and the Caribbean. The challenge is clear. Vigorous national and international efforts are needed to ensure equal opportunities for women in access to training and employment since the 1 billion women who will be in the labor market in less than a decade are already born.

BIBLIOGRAPHY

Beneria, L. (ed.), (1982), Women and Development: The Sexual Division of Labor in Rural Societies, New York, Praeger.

Blumberg, R.L., (1984), "A General Theory of Gender Stratification", in Collins, R.(ed.), Sociological Theory, London, Jossey-Bass.

Blumberg, R.L., (1989) Making the Case for the Gender Variable: Women and the Wealth and Well-Being of Nations, Washington, DC, Agency for International Development.

Boserup, E., (1970), Women's Role in Economic Development, London, George Allen and Unwin.

Goldschmidt-Clermont, L., (1987), Economic evaluations of unpaid household work: Africa, Asia, Latin America and Oceania, Geneva, International Labor Office.

Goody, J., (1976), Production and Reproduction, Cambridge, Cambridge University Press.

Hawrylyshyn, O., (1977)., "Towards a Definintion of Non-Market Activities", in Review of Income and Wealth, Vol. 23, No. 1, pp. 79-96.

IUCN, UNEP and WWF, (June 1990), Caring for the World: A Strategy for Sustainability, second draft, the first draft with the provisional title "World Conservation Strategy for the 1990s" was distributed in September 1989.

Marshall, S.E., (1985), "Development, Dependence and Gender Inequality in the Third World", International Studies Quarterly, Vol. 29, No. 2, pp. 217-40.

Mason, K.O., (1985), The Status of Women, New York, The Rockefeller Foundation.

Momsen, J. and J.T. (eds.), (1987), Geography of Gender in the Third World, London, Hutchinson Ltd.

Otero, M., (1985), "Fording the Stream", World Education Reports, Vol. 24.

Reid, M., (1934), Economics of Household Production, New York, Wiley and Sons.

Rogers, B., (1980), The Domestication of Women - Discrimmination in Developing Societies, London, Tavistock Publications Ltd.

United Nations, (1986), The Nairobi Forward-Looking Strategies for the Advancement of Women, as adopted by the "World Conference to Review and Appraise the Achievements of the United Nations Decade for Women, Equality, Development and Peace", Nairobi, Kenya, 15-26 July 1985, New York.

Women in Environment and Development: Indicators of the Extent of Bias

David Hanrahan

Gender bias has been recognised as a real issue in development and in treatment of the environment, mainly as result of a wide range of project or village level studies. It is difficult, however, to find information on the extent of the bias and the impact that it is having on overall development and on environmental degredation. This paper addresses the extent of available aggregate data (i.e. at country or regional level) in order to determine what useful indicators can be found to quantify the severity and distribution of gender bias.

In this context a broad interpretation of gender bias is adopted: the term is taken to reflect unequal status or treatment of women resulting in their physical or economic deprivation relative to counterpart males. To a significant extent the issue is one of degree since there are a range of social differences in the treatment of men and women in any society, based historically at least on the fundamentally different biological roles. Value judgements are required to determine what would be "acceptable" social differentiation as opposed to outright and unacceptable bias. It is necessary therefore to seek indicators which are as little dependant as possible on any social interpretation.

1. Where are the biases likely to be evident?

There are a number of areas where the anecdotal and project evidence suggest that it should be possible to identify a bias and where the data should be sought to quantify (or deny) the effects. The most obvious of these are in the basic measures of the human condition:

* malnutrition
* child mortality
* life expectancy
* and also in the direct measures of personal development such as literacy and education

In practice, data are available and do demonstrate clear gender effects in all of these areas.

The more recent development literature has a consistent strand which is that there has been an undervaluing of womens' contribution to economic production and to growth. However, since the relevant data are virtually all based on household, regional or sector units the available country data on production and growth are not disaggregated by gender. There are data at project level which addresses the issue but this is generally very localised and specific. An indication of the significance of the effect can be seen from a statement in a recent UNDP Report on Human Development 1 (p.32) that "it is estimated that unpaid household work by women, if properly evaluated, would add a third to global production". This is supports the argument that GDP measures, intended originally to motitor production in developed countries are inadequate as global measures of progress or development, particularly in the less developed economies.

The most complex of the relationships that we would like to explore is that of women/poverty/environment. There are two sides to this relationship: the impact of women in poorer countries on the environment (through fuel collection, agricultural decisions, hygiene and sanitiation and so on) and the impact of the environment on women - soil degredation and increasing workload, exposure to waterborne diseases, time and effort in collecting fuelwood etc.

Clearly these relationships are very complex with poverty a "disabling factor" affecting the severity of the various impacts and the opportunities (or lack of them) for breaking out of the cycle. The very issue of defining and identifying a critical poverty level is itself a major task: the most recent World Development Report 2 defines poverty as the inability to attain a minimal standard of living (p.26) and then addresses the consequent questions of a metric for poverty, what is meant by "minimal" and whether it is possible to develop an index of the severity of the problem of poverty in an area.

The UNDP Human Development Report I tackles very similar issues, although from an different perspective (as will be discussed shortly). The Report also does attempt a very concise summary of "Who The Poor Are", which focuses on the crucial factors and is far beyond any definitional uncertainties. This summary (Box 1) does quite clearly identify linkages between poverty, environment and gender bias although the Report is not able to quantify these links.

BOX 1 "WHO THE POOR ARE" (UNDP)

* The chronic poor are at the margin of society and constantly suffer from extreme deprivation.
* Over one billion are in absolute poverty in the Third World. Of these, 64% are in Asia and 24% are in Africa.
* Three quarters of the poor are in rural areas although the numbers of urban poor are increasing.
* There is a "close link" between poverty and the environment, with three quarters of the developing country poor in ecologically fragile areas.
* Poverty has "a decided gender bias; a large proportion of poor households are headed by women, especially in rural Africa and in the urban slums of Latin America. In Africa women produce 75% of the food yet suffer greater deprivation than men.

Source: UNDP Human Development Report, 1990

Given the complexity of the issues it is not surprising that although gender bias has been recognised and its relationship with poverty and with the environment has been identified there is very little useful aggregate data to quantify the effects. A number of mechanisms have been examined in project or sector reports but global data has not been compiled. It has therefore been necessary to manipulate available aggregate data to produce some first order results.

2. Sources of Aggregate Data

The basic sources of aggregate or country level data that have been surveyed or used fall into three catagories:

* International Agency Reports, particularly the World Bank and the various arms of the United Nations;
* U.S. Bureau of Census - which publishes a Women in Development series compiling various country census data in a roughly comparable format;
* Private sector publications such as World Resources or the feminist "Women in the World Atlas".

For a number of practical reasons (including the extent of coverage) most of the data used in this paper come from the first category and the actual sources are referenced in the text.

3. An Overall Metric - the Human Development Index

Some overall measure of the status of women is required if broad comparisons are to be made. Ideally it would take into account a wide range of measurable factors such as life expectancy, standard of living, health, education and so on. Clearly it is a very difficult task to come up with a practical and meaningful metric but the UNDP has attempted such an exercise in its Human Development Report 1.

The UNDP defines human development as "a process of enlarging peoples' choices" and identifies three key factors: health, education and resources for a reasonable standard of living. (It is interesting to compare this approach with that of the World Development Report, as quoted above. That report focuses on some definition of consumption as the basic measure of living standards, but does also refer to the need to incorporate other parameters in order to reflect a true "standard of living". The other measures suggested include nutrition, life expectancy, infant mortality and school enrollment rates. The two approaches, although with different emphases, are obviously broadly compatible.)

In constructing the Human Development Index (HDI) the three parameters used by the UNDP to represent the key factors were life expectancy, literacy rates and the (log of) GDP per capita. (The log value was used to reduce the impact of this parameter on the overall index.) The three parameters were each calculated as a fraction of the full range possible (from the world minimum to the world maximum) in order to make them comparable and to avoid scaling problems. (In practice the approach calculates "deprivation values" as shortfalls from the world maximum which are then subtracted from unity - for each parameter - and averaged to give an overall HDI.

The approach is summarised in Box 2.)

BOX 2 HUMAN DEVELOPMENT INDEX

The UNDP approach uses three variables:

* life expectancy
* literacy
* (log of) real GDP per capita.

A deprivation measure is calculated for each variable as the shortfall from the world maximum, on a scale where the world maximum is taken as 1 and the world minimum as 0. (This standardises the measures on a single scale so the resulting values can be added or averaged without problems of differing units of measurement). For each parameter therefore, if the individual country value is VAL, the deprivation measure is:

$$DM = 1 - \{(MAX - VAL)/(MAX - MIN)\}.$$

The overall Human Development Index for the country is:

$$HDI = AVERAGE\ OF\ (DM1 + DM2 + DM3).$$

This index can be criticised on a number of grounds and the UNDP acknowledges shortcomings but it is an extremely useful first cut at some holistic parameter of progress which allows simple comparisons and enables trends to be measured.

One primary and very interesting finding of the Human Development Report is that the HDI produces a very different profile of distribution to that of GNP, showing that the gross material wealth of a country is not necessarily the best indicator of "progress". The UNDP comments on this ranking noting that Sri Lanka, Chile, Costa Rica, Jamacia, Tanzania and Thailand all do far better on the HDI index than on GNP values - while the contrary is true for Oman, Gabon, Saudi Arabia, Algeria, Mauritania and Senegal.

4. HDI and Gender

Having obtained an overall measure of human development then - for present purposes - the need is for separate indices by gender. The Human Development Report does not present its formal HDI results by gender but many of the individual data tables in the report are differentiated and there is data in the appendices giving the gender results by country. It is possible to construct separate gender indices, although because the GDP data is not differentiated by gender (one of the data problems noted above) the figures almost certainly underestimate any gender bias. The results are shown in Figure 1, where the approximately 130 countries for which data are available are plotted - by gender - against per capita GNP (taken from [2]). This presentation is used to summarise the data although there will clearly be a correlation between the HDI value (which includes log of GDP) and the GNP. Tabulated values are given in Appendix A to this paper.

The very low HDI values in the poorest countries are evident and there are significant gender gaps. In order to see the effects more clearly, the same data is plotted in Figure 2 for the lowest GNP countries only. There is a very wide scatter in the data but a straight line fit for the two genders show a distinct gap, reducing slightly with increasing income. At the bottom end the gap represents an 18% bias while at the upper end of this income range the gap has reduced both in absolute terms and as a percentage (to about 5%). This decreasing bias is shown in a different perspective in Figure 3 which plots the gap against increasing HDI (for the full data set). In this case there is an obvious reduction in the bias as the base level increases. The one outlier showing a large female bias is the case of Lesotho - this comes from a much higher reported literacy rate for females. The female bias at the high end of the scale comes from the higher life expectancy for female in developed countries.

5. Changes Over Time

The Human Development Report is based on data for the late 1980s and is effectively the present situation. It is the first time that the calculation of the index has been carried out. It would be very interesting to see how the index changes over time and therefore an estimate was made of the value of the index for the late 1970s in order to examine the change over the last decade.

This index was developed using data on literacy and life expectancy from the World Development Report [2]. The main difficulty was that the formal HDI figures were based on purchasing power adjusted GDP figures which were not available for the earlier period. Instead, the 1988 figures were hindcast using listed GNP growth rates. This will have introduced some errors but since the GDP value is common to both genders these will not effect the estimates of the gender bias.

The 1970s index was calculated for the forty four "low development" countries as listed by UNDP and, in order to ensure compatability, the 1980s index was recalculated using figures from the same sources. This means that the time comparisons are as valid as can be expected, although there are some inconsistencies in the two sets of 1980s figures. (On average the recalculated figures are around 15% lower than the UNDP figures, with many of the countries in quite close agreement and a small number significantly lower. A qualitative comparison of the data sets indicates that the recalculated figures underestimate in particular the male HDI for some of the lowest countries but a detailed analysis of the causes of the differences has not been carried out.)

The results of the calculations are shown in Figure 4, which present the male and female values for each of the two periods. The graphs show an increase over the time period in both male and female values and also a decrease in the gender gap from 1970s to 1980s. The gap, in terms of a simple average over the values calculated, narrowed from about 25% to 7%, while the male HDI increased by 22% over the period. This 1980s gap of about 7% (which is probably a low figure, given the uncertainties in some of the individual country male HDI values) is broadly consistent with the range seen in the UNDP data. The data certainly does demonstrate both an upward shift in general HDI values and a closing of the gender gap over the decade.

6. Human Development Index and Environment

The analysis above indicates a clear (if not necessarily) causal relationship between gender bias and poverty but it is much more difficult to make a connection with environmental degredation. There are not sufficient quantitative measures of environmental quality to allow practical correlations to be made between gender based parameters and natural or physical resources data.

One broad connection that can be identified is between carrying capacity in Africa and HDI. Figure 6 shows the countries of Africa and their HDI rank, together with those countries which were identified by FAO as having carrying capacities of 5 or less. (In other words, where the estimated capacity of the land to feed the existing population - in 1975 - was 5 or less). It can be seen that 32 of the 44 countries listed by UNDP as "low" in HDI value are in Africa and all of the low carrying capacity countries except two (Botswana and Zimbabwe) are in this category. Once again, the connection is not causal but does suggest that there may be some connection between a stressed environment and low levels of development, although social factors will also be significant.

7. Conclusions

There are some aggregate data that can be used to examine the issue of gender bias but results would need to be interpreted and expanded by project level results.

The Human Development Index is a reasonable measure of overall welfare but it must be remembered that it is based on three specific parameters and is not (yet) an accepted comprehensive measure.

The data presented here do show that there is a correlation between low GNP and low overall development, as measured by the Human Development Index. There is clear evidence of a gender bias in development, although this has reduced over the past decade and becomes very much less (at least as measured by the HDI) as per capita incomes increase.

It is not possible at the present to construct a statistical link between women, development and the environment. This is principally because of the lack of quantitative data on environmental quality, particularly as it impacts agricultural and economic development. However, there is much project specific and anectdotal evidence that there is a strong gender component in human relationships with the environment, with an implied message that a stronger focus on womens' roles would help to aleviate some of the ongoing environmental degredation. Similarly, a recent international opinion poll [3], in fifteen countries ranging from Japan to Senegal, found that women were more aware and concerned about environmental problems than men. If the statistics are weak the conclusion is nevertheless clear: in development projects more attention (and resources) needs to be given to womens' requirements - the environment will almost certainly benefit also.

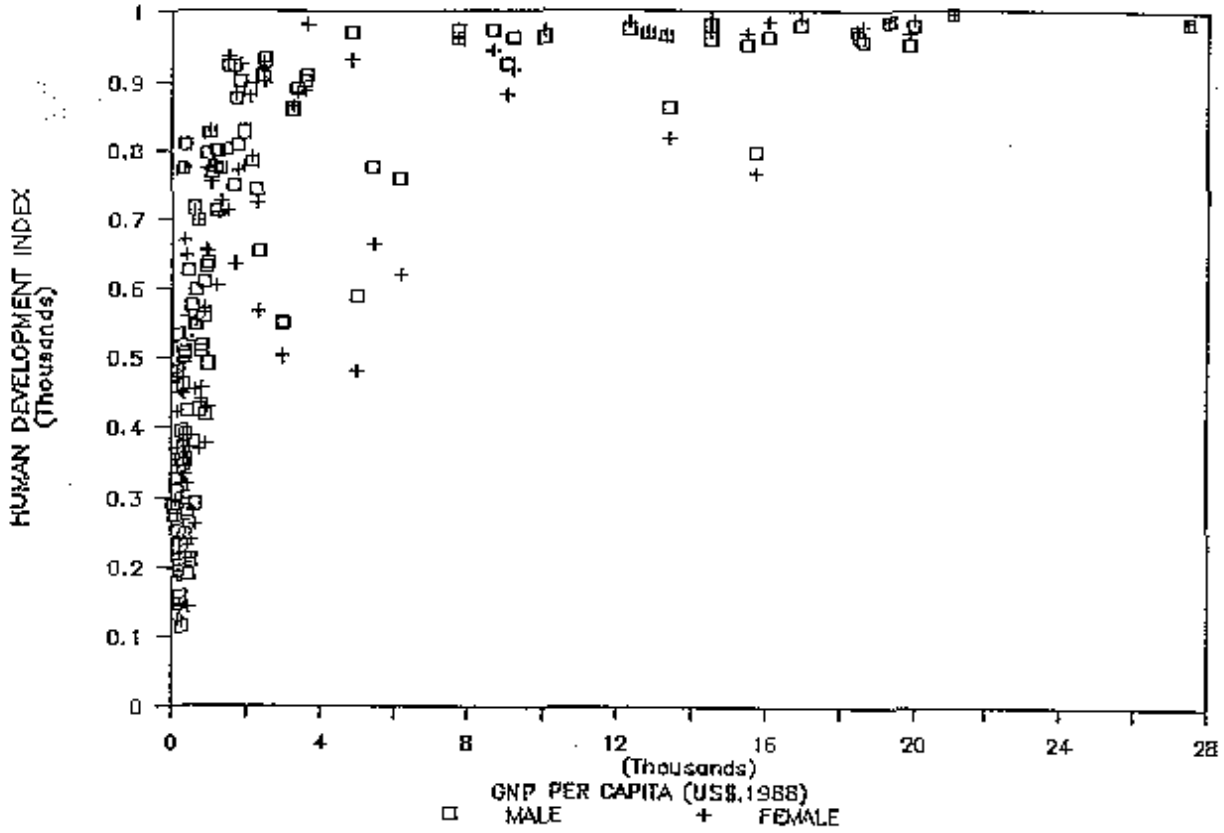
Bibliography

Louis Harris and Associates, (1988,1989), Public and Leadership Attitudes to the Environment in Four Continents, referenced p.10 in "World Resources 1990-91" by World Resources Institute, Oxford University Press, 1990.

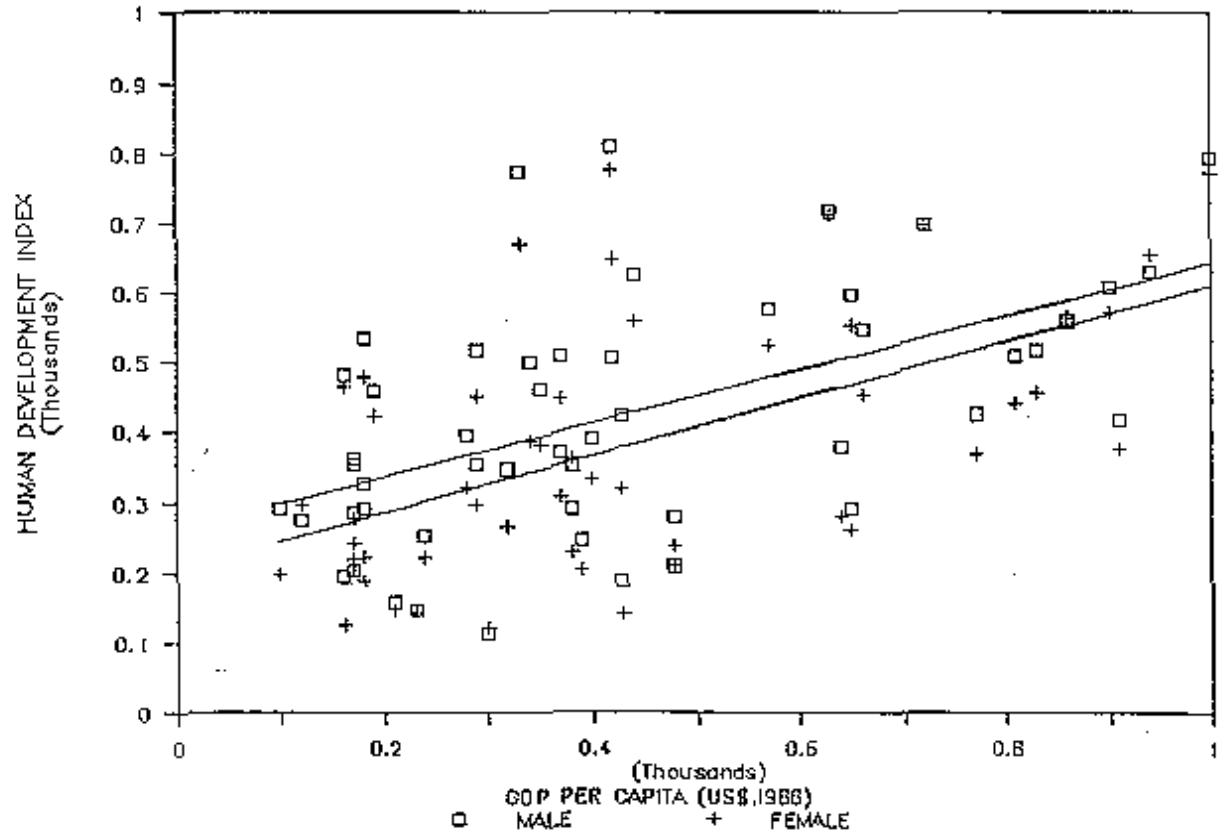
UNDP, (1990), Human Development Report 1990, Oxford University Press, 1990.

World Bank, (1990), World Development Report 1990, Oxford University Press, 1990.

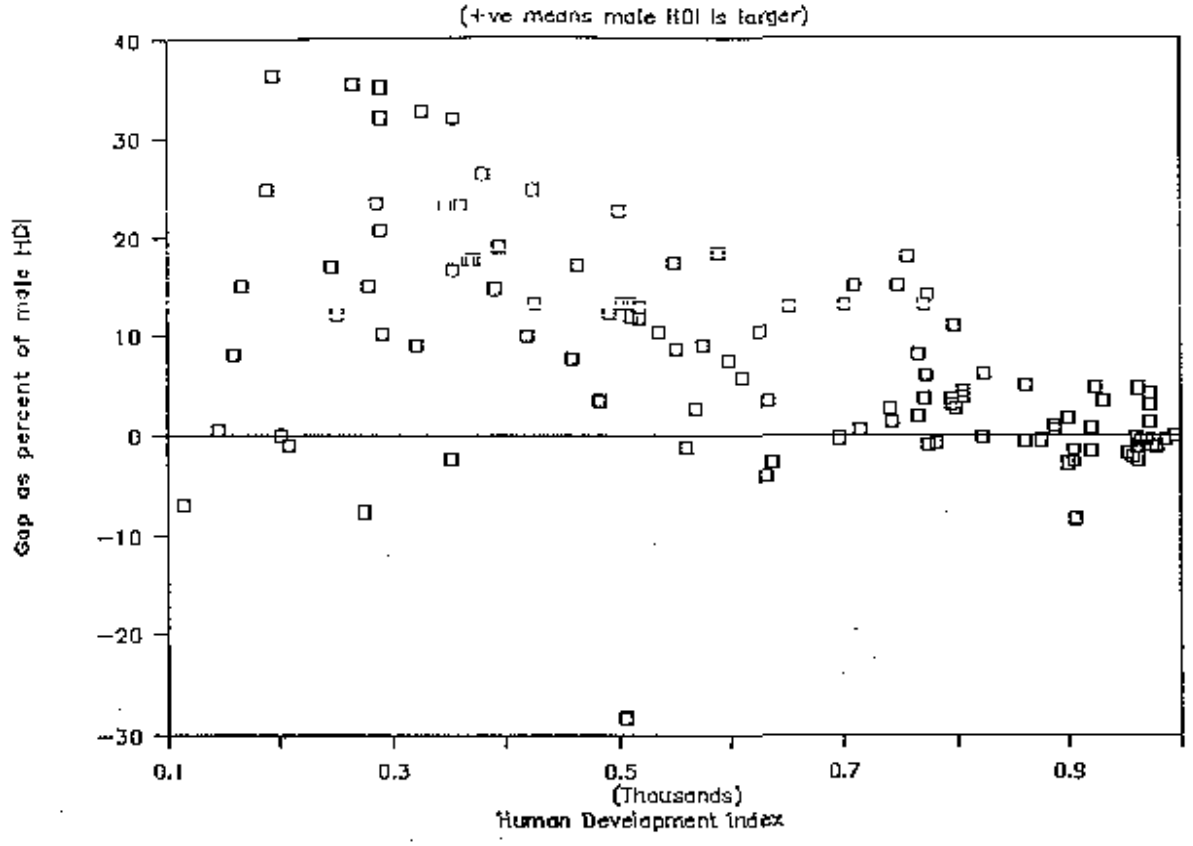
HUMAN DEVELOPMENT INDEX BY GENDER



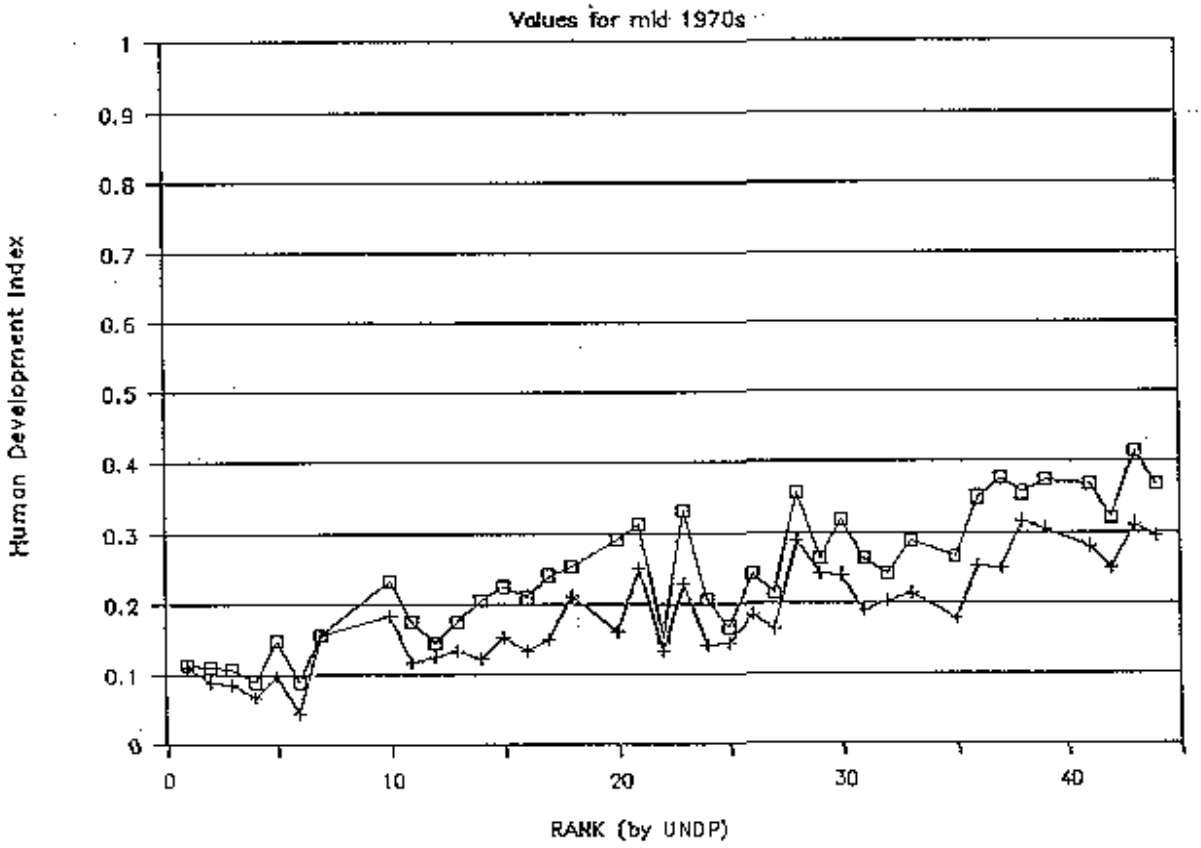
HUMAN DEVELOPMENT INDEX BY GENDER

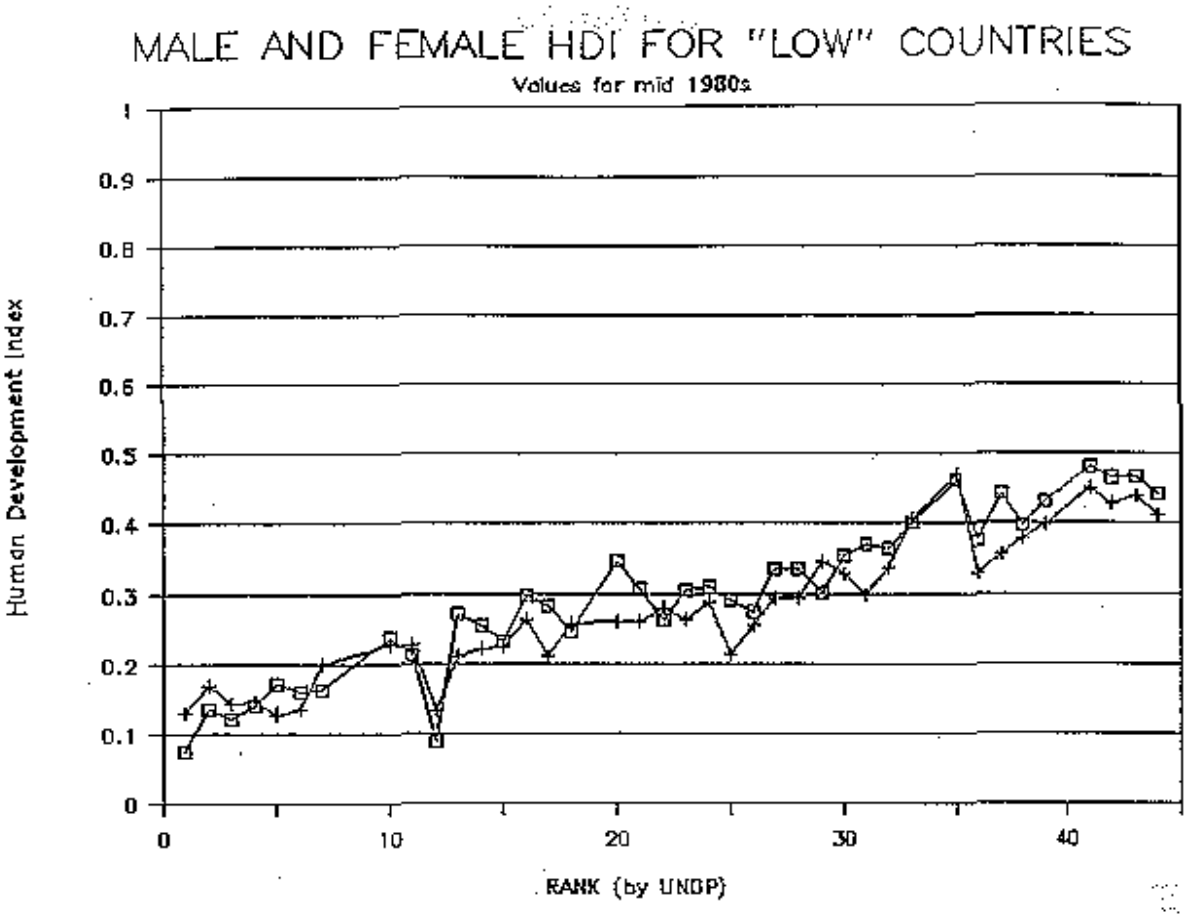


DIFFERENCE BETWEEN MALE AND FEMALE HDI



MALE AND FEMALE HDI FOR "LOW" COUNTRIES




MALE AND FEMALE HDI FOR "LOW" COUNTRIES
Values for mid 1980s
Human Development Index
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
40
RANK (by UNDP)

Gender, Environmental Degradation, and Development: Modifying the New Household Economic Model

Gregor Büchner

1. Introduction

In the previous chapter we examined the magnitude of gender bias at an aggregate level. The goal in this chapter is to analyze the extent to which gender bias is a significant factor in linking economic development and environmental management in the agricultural household. Anecdotal evidence suggests that gender bias in favour of policy directed at male led households at project level is widespread. Furthermore, the underestimation and undervaluation of the female role in environmental management in the household suggests a substantial degree of gender bias.

In particular we examine how gender bias fits into existing assumptions of the internal dynamics of the agricultural household model. Present theory is based on the homogenous aggregates of main household economic indicators and absence of any environmental constraints. However, anthropological research suggests a considerable variation in economic gender roles while ecological studies identify important resource use constraints, especially with respect to sustainable development.

It would therefore appear that even in more advanced models of the rural household such as the New Household Economic Model (NEHM - e.g. Singh, Squire and Strauss, 1987) gender bias occurs through the assumption of household utility maximisation on the basis of an aggregate welfare function, the assumption of an aggregated household labour supply, the absence of both natural and man-made resource use constraints. The role of gender and environmental management in agricultural household interaction therefore requires further examination (Pearce, 1986).

2. The New Household Economic Model (NHEM)

The NHEM has been chosen in place of other units of analysis (such as the individual, the village, the region, the nation) because it offers several distinct analytical advantages. First, despite great structural variety, households display a higher degree of behavioral consistency than individual preferences facilitating inter-regional comparisons. Second, the agricultural household in particular combines the functions of production and consumption and its concomitant externalities in one decision-making unit. Third, the rural household represents a large proportion of the developing country populations. Fourth, environmental problems such as land degradation and fuelwood and water depletion are most directly linked in the rural household. A production function approach can be taken instead of attempting the complicated process of monetary valuation. However, it should not be forgotten that the agricultural household represents only one response level. Analysis of informal village associations for instance represents another level for analysis.

The NHEM was developed in the late 1970's (Barnum, 1979 and Singh, Squire and Strauss, 1986) to improve existing neo-classical models of agricultural household behaviour. In order to pick up the close relationship between consumption and production in subsistence agriculture the model is designed to examine the implications and responses of households to projects or agricultural policy integrating both the production and consumption function in overall utility maximisation. Assumptions are that the neo-classical model of economic behaviour applies to the household as an aggregate actor and well-functioning labour and factor markets which permit independence of farm profit maximisation and family welfare maximisation.

Some alterations to reflect the complicated intra-household decision-making process have already been suggested. Ellis (1988) for example introduces the notion of z-goods, ie goods whose

utility is derived only after a preparation process (esp. food). This approach recognises the labour involved in the consumption of z-goods. The z-good approach can be expanded to various environmental resources (water, fuelwood) which may often be unpriced at source but involve substantial amounts of labour in order to be consumed. Singh, Squire, and Strauss (1986) introduce the notion of a household time constraint, given that labour can either be devoted to household production or the market. However, their approach takes a limited view of the application of labour and can be expanded to include other non-production (non-staple crop) but still productive activities. A disaggregation according to household members would shed some light on the ability of the household to react to particular policy changes.

2.1. Constraining the agricultural household model

Constraining the agricultural household model is an attempt to improve our understanding of the internal dynamics of the agricultural household and its environmental constraints. The model should meet the following requirements: incorporate gender and environmental management constraints to make bias explicit; permit the testing of envisaged policy and projects for potential gender bias; point to incentives which would reduce gender bias; show areas where further data collection is needed; generate aggregate data to quantify extent of gender bias in linking economic development and environmental management.

2.2. Disaggregating the agricultural household model

Although the NHEM represents an advance on earlier modelling approaches, further disaggregation is necessary as intra-household decision-making is not limited to male head of household. For instance, households are often female-headed either de jure (death or divorce) or de facto (absentee husband). However, it would not be useful to dispense with the NHEM completely because a focus solely on the individual misses out production, consumption and environmental management functions. Furthermore, the household constitutes a more appropriate and convenient policy target than the individual.

2.3. The production function

The production function side of the NHEM (Singh, Squire and Strauss, 1986) considers the "business" or "farming" side of household activities: "for any production cycle, a household will maximise profit whereby profit is a function of the price and level of output of the agricultural staple, total labour input, variable inputs, land inputs and fixed stock".

$$\max \{\pi\} \quad \pi = \pi (p_s, Q_s, p_l, L, p_v, V, A, K)$$

where:

- p_s is the market price of the agricultural staple,
- Q_s is the quantity of agricultural staple output,
- p_l is the market price of labour,
- L is the total labour input,
- p_v is the market price of a variable input,
- V is a variable input (eg. fertiliser),
- A is the household's fixed quantity of land,
- K is the household's fixed stock of capital;

Given that the agricultural staple derives its value directly from consumption which cannot be exchanged in the market or substituted by another activity while the cash crop derives its value indirectly through the market and profits which can be reused in the market or substituted by another activity, the agricultural staple should be disaggregated. We can construct a separate production for the cash crop (Q_{cc}) and food crop (Q_{fc}), given that the maximisation objective for the former, namely food security, is different from the maximisation objective for the latter, namely profit.

"for any production cycle, a household will maximise the security of a minimum supply of food crop independently of cash available to buy food, whereby food security is a function of the certainty of the level of food crop output, total labour input, variable inputs, land inputs and fixed stock" (Singh, Squire and Strauss, 1986)

$$\max \text{ security of minimum } (Q_{fc}) \text{ msm } Q_{fc} = \text{msm } Q_{fc} (P [Q_{fc}], p_l, L, p_v, V, A, K)$$

where:

- Q_{fc} is the quantity of food crop output,
- msm Q_{fc} is the maximum security of a minimum level of quantity of food crop,
- $P (Q_{fc})$ is the probability of the quantity of food crop output,

p_l is the market price of labour,
L is the total labour input,
p_v is the market price of a variable input,
V is a variable input (eg. fertiliser),
A is the household's fixed quantity of land,
K is the household's fixed capital of stock;

and:

"for any production cycle, a household will maximise profit depending on the price of the cash crop, the quantity of cash crop output, the market price of labour, the total labour input, the market price of variable inputs, variable inputs, the household's fixed quantity of land and fixed stock of capital".

$$\max \{\pi\} \quad \pi = \pi (p_{cc}, Q_{cc}, p_l, L, p_v, V, A, K)$$

where:

p_{cc} is the market price of the food crop,
Q_{cc} is the quantity of cash crop output,
p_l is the market price of labour,
L is the total labour input,
p_v is the market price of a variable input,
V is a variable input (eg. fertiliser),
A is the household's fixed quantity of land,
K is the household's fixed stock of capital;

2.4. The consumption function

The consumption function considers the "family" side of household activities. Singh, Squire and Strauss provide a very simple model.

"for any production cycle, a household will maximise utility whereby utility depends on the consumption of an agricultural staple, a market purchased good, and leisure" (Singh, Squire and Strauss, 1986)

$$\max \{U\} \quad U = U (X_a, X_m, X_l)$$

where:

X_a is an agricultural staple,
X_m is a market purchased good,
X_l is leisure;

As mentioned above, this can be expanded into a utility matrix by desegregating household utility into individual utilities, expanding utility maximisation to other "goods" and material improvements, and disaggregating the agricultural staple. Utility disaggregation should reflect a differing valuation of goods or material improvements by individual household members. We should therefore be able to utility changes which offer a potential Pareto improvement for inter-household utility but might not do the same for intra-household utility. Alternatively, we should be able to test for a potential maximin improvement (Rawls, 1971) for individual groups of people (women, children). Sources of utility can be expanded to include agricultural staple, fuelwood and water (though in some cases this might be covered by market purchased goods) as well as education and nutrition.

3. Constraints

We must now consider in detail a number of constraints observed from household behaviour. I first mention the production and consumption constraints developed by Singh, Squire and Strauss. I then consider additional gender, resource use and dynamic constraints.

3.1. Consumption constraints

Two consumption constraints can be identified. First, a cash income constraint where:

"total cash expenditure on market goods cannot exceed income from excess agricultural staple minus income (expenditure) on farm labour input minus cost of variable inputs plus any remittances" (Singh, Squire, Strauss, 1986)

$$p_m X_m = p_a (Q_a - X_a) - p_l (L - F) - p_v V + E$$

where:

p_m is the price of the market purchased good,
X_m is a market purchased good,
p_a is the market price of the agricultural staple,
Q_a is the quantity of agricultural staple output,
X_a is an agricultural staple,
p_l is the market price of labour,
L is the total labour input,
F is the family labour input,
p_v is the market price of a variable input,
V is a variable input (eg. fertiliser),
E is non-labour, non-farm income (eg. remittances, credit);

Second, it is worth considering a minimum income constraint, given that in a mixed market subsistence economy survival without any income at all is impossible.

3.2. Production constraints

Singh, Squire and Strauss also identify an input and time constraint on the production function. The input constraint assumes that:

"the quantity of agricultural output is limited by the availability of total amount of labour, variable inputs, a fixed quantity of land, and a fixed stock of capital".

$$Q_a = Q(L, V, A, K)$$

where:

- Q_a is the quantity of agricultural staple output,
- L is the total amount of labour,
- V is a variable input (eg. fertiliser),
- A is the household's fixed quantity of land,
- K is the household's fixed stock of capital;

The time constraint stipulates that:

"a household cannot allocate more time to leisure, on-farm production, or off-farm production than the total available".

$$T = X_l + F$$

where:

- T is the total stock of household time,
- X_l is leisure,
- F is the family labour input;

3.3. Gender constraints

Gender constraints appear mainly in the labour market. First, women are subjected to a different cash income constraint than men, due to gender discrimination in off-farm labour markets where the female wage rate is lower and reduced access to credit. Both result in an inefficient allocation of resources, ie. labour and capital.

Second, women also face an additional cash expenditure constraint due to a limited authority to dispense their own money. A similar constraint might be imposed by the need to purchase certain types of goods, eg. food. Willingness to pay therefore does not necessarily reflect personal preferences.

Third, the total stock of household labour time depends on the number of household members.

$$L = L_n = L_1 + L_2 + \ldots + L_i \quad \text{for } n = (1, 2, 3, \ldots i)$$

where:

- L_n is the total stock of household labour time,
- L_1 is the stock of the first family member's labour time,
- L_i is the stock of the last family member's labour time;

The goal is to construct a labour time use matrix for the household as a whole.

Fourth, each individual is subject to constraints of time use as well. On a daily basis these constraints limit the total stock of individual time available as follows:

$$T_1 = 24 \text{ hours} - S_1 \text{ (sleep)} - L_1 \text{ (labour)} - LS_1 \text{ (leisure)}.$$

Variation on a short-term basis is possible but there exists a minimum number of hours of sleep required on a long-term basis.

Fifth, more important for gender differentiation though, are seasonal variations of labour time use (mainly due to harvest).

$$L_1 = L_{c1} \text{ (time spent on crop one)} + T_{c2} \text{ (time spent on crop two)} + OT \text{ (all other labour tasks)},$$

whereby there is a seasonal minimum of time that has to be spent on a particular crop.

Sixth, women are constrained by physical or social non-substitutability of labour (ie. gender specificity of labour). This can be represented in the following way.

$$L = FC + CC + OF + AH + CR + FP + FW + WC + EC$$

where:

- FC is a food crop,
- CC is a cash crop,

OF is off-farm labour,
AH is animal husbandry,
CR is child rearing,
FP is food preparation,
FW is fuelwood gathering,
WC is water collection,
ED is education.

In turn, each member of the household is limited to a certain number of tasks (not in any specific order) given a limited amount of time, eg:

L_1 = CC + AH + OF (male adult),
L_2 = FC + OF + CR + FP + FW + WC (female adult),
L_3 = ED + FP + CR + FW + WC (female child),
L_4 = AH + ED + FW + WC (male child)

Compared with an unrestrained model, these constraints create a less efficient allocation of individual time in terms of activity.

Seventh, we can now identify total and individual job specific labour time constraints, whereby each activity can only draw total labour time from a limited amount of individuals, eg:

CC = CC (L_1)
AH = AH (L_1, L_4)
etc.

but assuming individual labour time available remains constant in the long term, any increase in demand of one form of labour necessarily implies a reduction in another type of labour time;

3.4. Resource use constraints

Environmental management activities have an effect on utility both through the consumption and the production function. Disaggregation is necessary given gender specific use of resources to varying degrees and for differing purposes. Individuals also differ in their resource benefits valuation.

First, land use is constrained by land degradation in the form of soil erosion and pastureland depletion. Constraints are the result of inappropriate crop type use, frequency of use and type of land used. For the production function degraded land either reduces long-term output or requires substitution with higher levels of labour and variable inputs. For the consumption function, degraded land may require a diversion of time allocation to farming labour creating an opportunity cost of foregone benefit elsewhere.

Second, fuelwood gathering is constrained by deforestation. Constraints are posed by the quality of fuelwood gathered, the quantity available, the accessability, and the substitutability with other fuels. Depletion usually requires higher household time allocation implying an opportunity cost of household time. Opportunity cost may take the form of reduced agricultural output or increased off-farm labour costs.

Third, water collection is constrained by droughts and pollution. The utility of any particular well is a function of the quality, quantity and accessability. As quality decreases, previous drinking water can only be used for irrigation. Outtake quantity must be sustainable and not induce over-rapid lowering of water levels. If a well dries up and a further one is used more time must be devoted to the collection of a fixed amount of water.

Fourth, natural inputs are constrained by variable use. Inputs such as dung can be used both as fuel and fertiliser while woody biomass can also be used either as fodder or fuel.

Fifth, utility is affected by optimal gender specific and total knowledge of efficient and sustainable resource use. The level of information constraints is determined by education and extension service.

Sixth, poverty constraints affect the ability of the individual to maximise direct income. Below a certain level of cash and food income utility is reduced through forced non-optimal use of resources and labour. A Rawlsian maximin criterion might therefore be more appropriate than the traditional Pareto improvement.

3.5. Dynamic constraints

So far, the modifications of the NHEM have remained in the static realm. However, it has become clear, especially in the resource constraint section, that the concept of sustainable development and sustainable use of natural resources is imperative both to correctly formulating constraints and devising policy. In particular, the non-substitutability of certain forms of natural capital must be stressed through the constant natural capital rule.

Given the frequency of uncertain property rights, especially for women, differences in risk-taking behaviour can be expected. Furthermore, female

responsibility for food security might also affect risk taking behaviour. This is likely to be represented in higher discount rate for women.

4. Policy testing

The goal of revising the NHEM is not so much to prescribe policy but to permit improved understanding of existing mechanisms. On the one hand the intention is to minimise the disturbance to the local social value structure. On the other hand, it is imperative to make social and economic trade-offs explicit in terms of: the costs of economic inefficiency, the costs of poverty, the costs of non-sustainability, and the costs of inequity.

In any specific project or policy scenario, the model should provide and indication of the efficiency of various policy incentives and mechanisms to achieve predetermined policy target.

5. Conclusion

While anecdotal project evidence suggests a considerable linkage between gender, resource management and use and development at the agricultural household level, this is not reflected in any of the existing economic household models. Even more advanced models such as the NHEM, do not fully accommodate the constraints imposed by gender and natural resource use. Particular areas of concern are assumptions of aggregate household utility maximisation, aggregate agricultural production functions, assumptions of well-functioning labour and input markets, intra-household time-use constraints, and non-valuation of environmental services.

Bibliography

Barnum, H. and Squire, L., (1979), "An Econometric Application of the Theory of the Farm Household", Journal of Development Economics, Vol.6, pp. 79-102.

Ellis, F. (1988), Peasant Economics; Farm Households and Agrarian Development, CUP.

Pearce, D.W., et al., (1988) ,"Role of Women in Managing Environmental Resources: Gender, Natural Resources And Economic Development", Research Proposal from University College London to The World Bank, January 1988.

Rawls, (1971), A Theory of Justice.

Singh, I., Squire, L. and Strauss, J., (1986) ,"A Survey of Agricultural Household Models: Recent Findings and Policy Implications", The World Bank Economic Review, September 1986, Vol. 1, No. 1, pp. 149-179.

Stone, A. and Molnar, A., "Issues: Women and Natural Resource Management", mimeo, 1986.

The Gender Issue in the Third World and the Constraints of Economic Theory

Tom Gameson

1. Gender and Status

Gender may be seen as a symbolic construction or as a socio-economic relationship. Feminist literature which views women's subordination as universal tends to symbolise the distinctions between man and woman purely in cultural terms. Thus woman is associated with nature and domesticity, man with culture and public life. However, analytical debate appears to have failed to discover a consensus of these issues.

Those who maintain that woman's subordination is not universal tend to approach the problem of gender relations through a consideration of what women and men do. Men and women play different roles in society, their gender differences being shaped by ideological, historical, religious, ethnic, cultural and economic factors. The economic concepts most commonly referred to are the gender division of labour, more specifically, the gender divisions of tasks and the allocation of time and income, and the overall control men have over women.

1.1. The Gender Division of Labour

The feminist reference to a 'sexual division of labour' implies causation by biological differences. However, as Dankelman and Davidson (1989) amongst many point out, women tend not only to work longer hours than men, they often do the most onerous physical tasks, reflecting norms and beliefs and social customs which govern and circumscribe individual behaviour. They must therefore be susceptible to change.

Indeed, it is widely accepted that the impact of colonisation and international capitalism have had a profound effect on women's economic activities, in many cases undermining their economic autonomy (Boserup, 1970). Ivan Illich (1982) has argued that the inevitable consequence of economic growth has been the conversion of gendered but complementary societies into genderless and sexist ones. Genderless as revealed in economic theory by the 'entrepreneur' and the 'labourer'. Sexist because it polarises the human labour force. His contention is that the movement towards greater equality in the developed world is a myth and that to reduce sexism requires economic shrinkage. Whatever the rights and wrongs of such an argument it is unacceptable to suggest that in all pre-colonial societies women have a significant degree of independence.

1.2. The Division of Tasks

Illich's concepts are echoed in Marxian philosophy. Engels' vision of the origin of women's oppression arose from a 'naturally' determined sexual division of labour which in turn shaped the form of the family. One result of this idea that is often seen in the gender literature, is that while the relations of production and reproduction are often seen as co-existing systems which influence and affect one another, a somewhat artificial separation is none the less maintained between 'the economy' and 'the family'.

McSweeney (1979) categorised the various activities of women in rural areas:

A. Reproductive activities

a. Generational reproduction: childbearing and infant care, care and upbringing of children;

b. Daily reproduction: cooking, cleaning, washing, mending clothes, firewood collection, water carrying, house building and repair;

B. Productive activities

a. Production for household use: cultivation of food crops, animal husbandry, food processing, tailoring, craft work;

b. Production for the market: cultivation of cash crops, food marketing, wage work, craft work for

sale;

C. Leisure activities

meals, personal hygiene, social obligations, many others.

The list emphasizes the direct link between the work of women and their local environment. Of course not all activities can be unambiguously assigned to each label. For example, some work can be for the home as well as for the market.

In most Third World societies activities in the home are mainly the responsibility of women and their older children. The absence of men from such activities is, for the most part, a social rather than a biological phenomenon.

Women also participate in productive activities, frequently in informal sector enterprises located either in the home or at the neighbourhood level. For de jure and de facto reasons it is estimated that about one-third of the world's households are headed by women. In these situations women may have primary if not total responsibility for the financial and organisational aspect of the household.

Moser (1989) adds a third role to women, that of community management work (in both urban and rural contexts) based on the provision of items of collective consumption. Moser argues that men's community work is quite different, normally approximating to the community leadership role in which they organise at the formal political level.

Thus women, unlike men, are considered to be severely constrained by the problem of simultaneously balancing all of these different roles.

1.3. Income

Productive work is recognised as such by virtue of its exchange value. Thus the majority of men's work is valued either directly through paid remuneration, or indirectly through status and political power, while the majority of women's work (for use) is made invisible. Moreover the product of women's non-wage labour is available to meet the needs of the family as a whole. The same is not necessarily true however of cash income generated mainly by men. The degree of sharing of income has a direct impact on material consumption.

1.4. The Subordination of Women

This is essentially the degree of control which men have over the way women conduct their lives, as well as over the intra-household allocation of tasks. Patriarchy, for example, describes the state when socially men control the property, resources and income of the household, also commonly the labour time of women their freedom of movement and their levels of consumption. Thus when economic development has genuinely benefitted poor men, it has not always benefitted poor women and indeed has often harmed them. "Although women represent half the world's population and one third of the official labour force, they receive only one per cent of the world's income and own less than one percent of the world's property." (UN conference, Copenhagen, 1980) Apart from income, already mentioned, women have only very limited access to and control over credit, land, education, training and information (Dankelman and Davidson, 1989).

1.5. Time Allocation

The Study of time allocation opens up differences between men and women in hours of work, productivity and returns to labour. It is also a first step towards identifying areas of cooperation, conflict, independence and obligation.

Typically national statistics do not collect any information on work within the household, and in rural areas they understate the contribution of women to the farm because they are assigned to the category of housewives (Beneria, 1981). Thus data of this kind comes mainly from field studies of sample households.

Form such studies Ellis (1988) has established three general results. First, in many peasant societies women work longer hours than men. Secondly, in all peasant societies, as elsewhere, there are rigidities in the division of tasks. Finally the role of women in actual farm work varies considerably but some patterns emerge, for example:

> In Africa women often work in food crops for domestic subsistence and men in cash crops for market sale.
>
> Throughout the Third World the poorer the household the higher the farm work hours of women.

> Women in poor farm households often work as casual wage labour on other farms.

Form this Ellis summarised that economic theories which treat men and women as perfect substitutes can be crucially inaccurate. Substitution is typically lower with respect to household chores, but it is sometimes higher in market activity. Thus the amount of time women can work in 'production' depends on the rigidity of their commitment to household work. He also observed the unequal distribution of time with respect to cash income earning activities, with all that that implies about the share of the household total product.

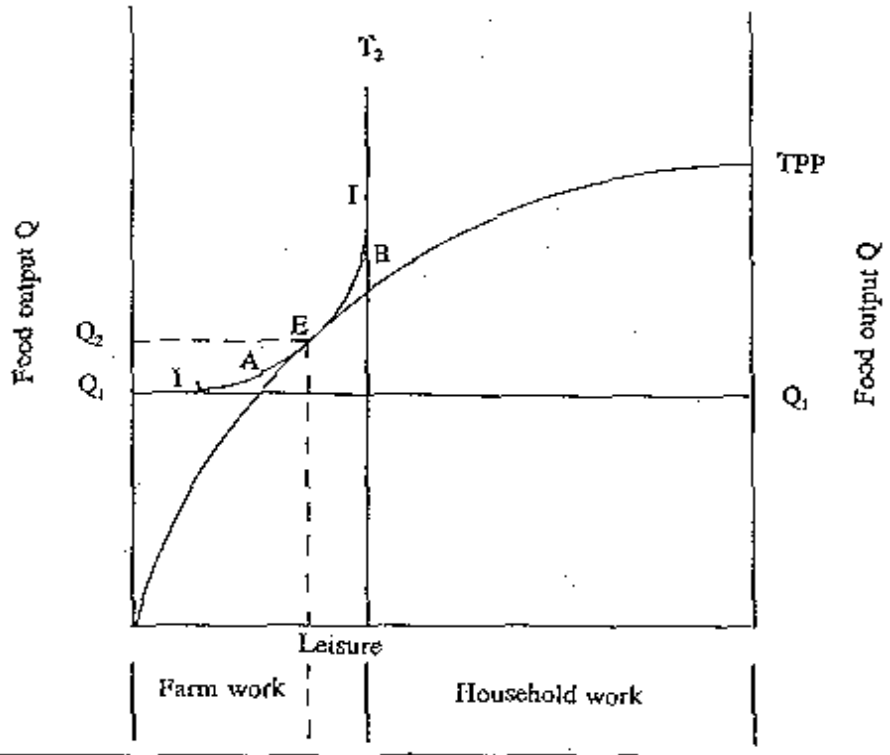
2. Utility, Comparative Advantage and Market Prices

Since the economic relationships between people within a household are not mediated by market prices, neoclassical economics treat the household as maximising a single utility function. This is not derived by summing the utility function of individual members. Instead the assumption is that household members subordinate their individual wants to the pursuit of common goals, in other words, altruism. It is easier to justify the single family welfare function by reference to an altruistic household head - a benevolent dictator who sets the goals in the interests of the family - than by pretending it could be derived from the preferences of all the family members.

Altruistic motives are familiar to economists and can by and large be subsumed into the traditional model of rational economic behaviour (Pearce and Turner, 1990). However, there is an inherent danger in this analysis. In neoclassical economics conflict and exploitation cannot exist in the market because transactions do not occur unless both parties benefit from them. The altruism assumption ensures that they do not occur in the home either (Folbre, 1986). How gender blind might economic theory be?

The division of labour is explained in household economic theory by static comparative advantage - the opportunity cost of labour in the market. For example, if men and women were equally efficient at household chores but men received higher wages in the market than women, then men would go to work and women would stay in the home. The obvious problem with this is that, as suggested earlier, it rules out all non-market reasons for the division of labour and resources in the home, but relies purely on market prices. It also rules out unequal power and separate areas of decision making in the home.

Figure 1 Time allocation of a farm woman



2.1. Disaggregation of the Household

Clearly the social subordination of women cannot be investigated if economic analysis stops at the front door of the home. One way forwards is to build on the distinction between market and non-market areas of inter-household decisions. If, as suggested earlier, women's 'productive' time may be constrained by 'reproduction' activities, then it is possible to build an illustrative model to suggest analytical possibilities by disaggregating the household rather than treating it as an aggregate unit. Ellis (1988) proposes an illustrative model.

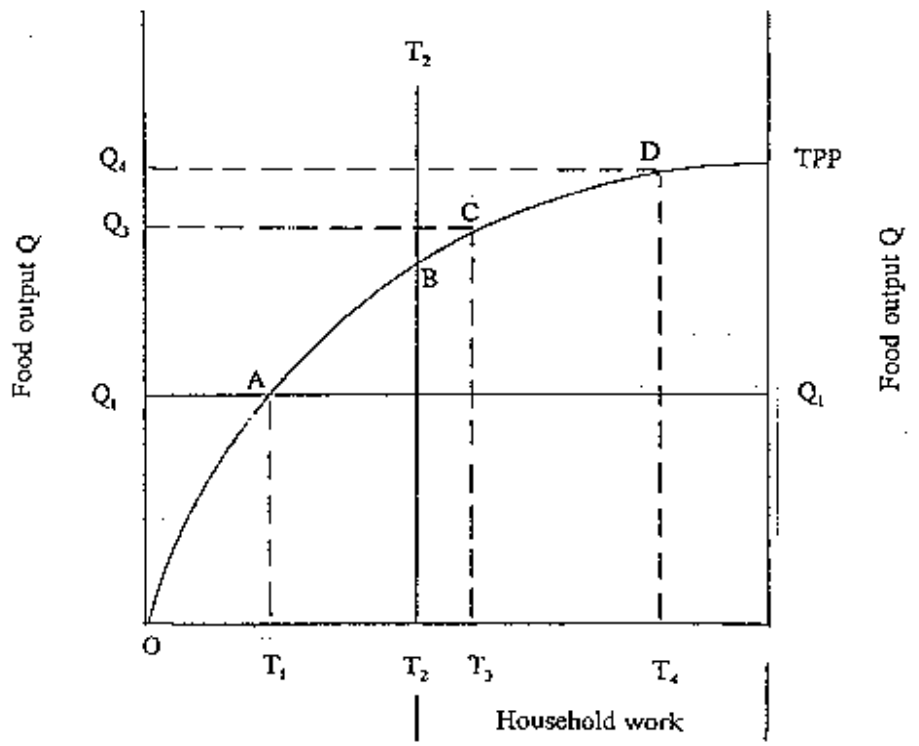
Assume the woman is wholly responsible for household chores and for producing the staple crop which feeds the entire household, but receives none of the cash income from the sale of the surplus.

The horizontal axis on figure 1 measures total hours available with household work time increasing from right to left and farm work time increasing form left to right. There are two constraints: minimum housework T2 and minimum food consumption Q1. The only variation thus open lies between A and B. What determines the women's labour input in this area? It might occur at some point E where her indifference curve trade off between income and leisure time equals her marginal value product in farm work.

This model dispenses with a family utility function for a personal one. If the surplus cash is lost to her husband, the personal utility for extra income is zero and her farm work stops at A rather than E. However altruism could theoretically push labour input to T2 (point B). Of course rarely in Third World societies can individual women possess such neoclassical economic freedom, and decisions do not correspond to marginal utility criteria. The main point is that the gender division of labour limits the scope for variation of personal labour time. Now assume a market for labour and a single wage - the opportunity cost of time for both men and women. This permits the economic optimum level of labour use in food production to be identified. One such optimum is shown at point C in Figure 2 giving a total output of Q3 and a labour input of T3.

Here A and B represent sub-optimal levels of labour use and output. Thus if the man does not engage in food production, lower output and incomes occur. The optimum is reached by the man taking on 'reproductive' work or food production.

Figure 2 Impact of a market wage



Now assume a rise in the price of the staple food which gives a new efficiency position at point D. Whether this causes increased output depends on the rigidity of the division of labour. If the man will do neither more household work or more food production, the woman may keep her labour input at point A, perceiving no gains to be achieved by raising output above minimum subsistence.

In summary the rigidities of time allocation, and unequal command over other resources can result in the household being inflexible in its response to market forces. Non-market determinants may thus be seen as a constraint on the material conditions of survival of the household quite apart form its meaning for the subordination of women.

Bibliography

Beneria L., (1981), "Conceptualising the Labour Force: The Underestimation of Women's Economic Activities", Journal of Development Studies, Vol.17, No.3.

Boserup E., (1979), Women's Role in Economic Development, Earthscan.

Dankelmann I. and Davidson J., (1988), Women in Environment in the Third World, Earthscan.

Ellis F., (1988), Peasant Economics, Cambridge University Press.

Folbre N., (1986), "Hearts and Spades: Paradigms of Household Economics", World Development, Vol.6, pp. 87-103.

Illich I., (1982), Gender, Pantheon.

McSweeney B.G., (1979), "Collection and Analysis of Data of Rural Women's Time Use", Studies in Family Planning, Vol.10, No.11/12.

Moser C., (1989), "Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs", World Development, Vol.17, No.11, pp. 1799-1825.

Pearce D.W. and Turner K., (1990), Economics of Natural Resources and the Environment, Harvester Wheatsheaf.

Land Management and Soil Conservation in Malawi: A Case Study

Joanne C. Burgess

Malawi has an agriculturally based economy, with agriculture accounting for 37% of GDP, 90% of exports and 85% of total labour force utilization (Barbier and Burgess, 1990). Although 4.3 million hectares (ha) of land, from a total of 9.4 million ha, in Malawi is classified as arable, only around 2.4 million ha is probably suitable for agriculture, most of which is already under cultivation. Given that land density in Malawi is among the highest in Africa and that its population is over 6 million and growing rapidly, the already high pressure on the land will continue to intensify (World Bank, 1989a). Land degradation (i.e. the process of accelerated soil erosion whereby land use practices result in net loss of soil from arable land and deteriorating soil structure and fertility) is a serious problem in Malawi (Lele, 1989). It is of crucial importance that soils are conserved to sustain land productivity and support the demands of the increasing population (World Bank, 1989b).

1. Women-Poverty-Land Degradation

The most apparent relationship between women and the environment arises through the link between women, poverty and land degradation. The poverty profile of Malawi shows that across all households, female-headed households make up a large percentage of the poor and core poor households (see Table 1; World Bank, 1989). It is typically the relatively less well off households that tend to shoulder a disproportionate burden of the impacts of poverty and land degradation. It is mostly the poorer households that are marginalized onto the smaller plots (<0.5 ha), steeper slopes (>12%) and less fertile soils when the pressure on the land increases or the existing quality of land declines.

The poorer households are often unable to finance agricultural inputs such as fertilizer and new maize varieties, unable to rotate annual crops, make insufficient use of leguminous crops in intercropping and relay cropping or undertake soil conservation. As a direct consequence they face declining soil fertility and lower crop yields (see Table 1). This further exacerbates their poverty, increases their dependance upon the land and vulnerability to its degradation. They become locked into a 'viscous circle of poverty-land degradation' from which it is extremely difficult to break free (Conway and Barbier, 1990).

2. Women, Land Management and Soil Conservation

Women's relationship with the environment is not just confined to the poverty link. Even in those households that are not classified as poor women are active participants in agricultural and household production. Thus, gender becomes important when womens use, perception, knowledge and management of the land is considered and contrasted to that of men across all households.

A detailed study of the effects of agricultural commercialization among smallholders in the Zomba district of the southern region of Malawi emphasizes the importance of considering gender when examining household economies (this case study is based on Peters et al, 1989). All smallholders grow large amounts of maize, most of which is intercropped with legumes, groundnuts and other crops. Although some of this may be sold, the majority is retained for household consumption. In addition, some smallholders cultivate the cash crop tobacco.

The household economy is highly commercialized in that, on average, just over 30% of the total income is from marketed agricultural production, a further 39% comes from off-farm sources. The latter includes transfers, mostly from relatives working elsewhere, which make up 15% of total average income. Some of these transfers are used to buy fertilizers or to pay for hired agricultural labour. However, in the poorer households, the transfers are mainly used to support the low income derived from the land.

There is an inequitable distribution of land in this region. The smaller the land holdings the higher is the percentage of female-headed households. However, it is important to distinguish three different types of female-headed households (see Table 2A):

* Teba households - where husbands are employed in South Africa, are significantly wealthier in income, land and total harvest than other households. Larger household size tends to reduce the difference in per capita income measures;

* de jura households - where the adult woman is without a husband; and,

* male absentee households - where the husband's employment within Malawi, often locally, takes him out of the household for at least half the time. These tend to be the poorest households responding to small land holdings and/or the perception that an adequate cannot be made on the family landholding. Farming in this case is almost completely the responsibility of the wives.

The distribution of income is equally shared between men and women across all households. However, in the male-headed households, the female share of income is relatively less, and declines with increasing income and with increasing cash crop production. The type of crops cultivated (cash/food crops) differ between men and women - with female-headed households cultivating an average of 90% of their land under the food crop maize, whilst men cultivate maize on 81% of their farms, with the remaining land mostly under the cash crop tobacco.

The land is cultivated overwhelmingly by family labour, and especially women on the smallest plots (see Table 2B). As landholding size increases so does men's agricultural labour. In contrast, women's agricultural labour first increases, the decreases with increasing plot size. Although agricultural work tends to increase with farm size, farmers on the smaller plots tend to have longer total work days because they undertake higher levels of off-farm labour. The use and rates of use of agricultural inputs, notably fertilizer, tends to be low across all households, although those with smaller plots and sufficient cash are able apply fertilizer more intensively.

The size of maize harvests correlates positively with income. The Teba households have similar per capita landholdings to male-headed households but larger per capita maize harvests. Their higher income levels, mainly derived from remittances sent from husbands working in South Africa, enables them to purchase labour and fertilizer inputs for their farms and thus increase land productivity.

The dominant objective across all households appears to be achieving food security - and the more food supplies that the household is able to produce on his/her own farm, the lower the risk the household faces during times of food shortages. However, the dynamics between income strategies, sales of cash crops (including food crops) and the retention of food crops is complex and differs across households depending upon a wide range of factors. For example, as income rises the retention of own produced maize for household use increases both relatively and in absolute terms. This is influenced by the trade-off between meeting household needs for cash immediately after the maize harvest, their expected need to purchase food in the pre-harvest food shortage period and their level of income to support these requirements. There is no data available to suggest that women may be more risk averse than men, and have a higher discount rate, but this may have an important role in differentiating male/female household coping strategies.

Although the new maize varieties give higher yields on average compared to local maize varieties, they require greater efforts for pounding, have poorer storage capacity and are considered to have inferior taste to the traditional varieties (Kydd, 1989). As women are responsible for maize storage, processing, and cooking their perception of the benefits of the hybrid maize is likely to significantly differ from those of the men. In addition, the traditional maize varieties are more drought resistent than the new varieties and perform relatively well on poor soils and without fertilizer. As it is the women who often cultivate the poorer soils and are usually responsible for caring for the crops after planting and up until harvesting they are likely to be more highly aware of the costs and benefits of the performance of alternative crop varieties than men, and less prepared to trade-off the risks associated with growing the new hybrid versions.

3. Constraints on Women for Soil Conservation

Women confront a multitude of constraints that are non-existent or less binding for men which limit

economic opportunities and improved land management. For example, both men and women may be constrained in uptaking new maize varieties as it requires relatively intensive fertilizer inputs as compared to local maize. However, female-headed households are often low-income and are unlikely to be able to raise sufficient own finance to purchase maize. Women may, in addition, be unable to purchase fertilizer on credit due to its high cost and low availability, their high risk of non-repayment which bars them from joining 'credit clubs', their limited ability to use land ownership as a basis for loan security and/or sexual discrimination (see Table 3A). Although women as a percentage of total credit recipients has been rising steadily in Malawi they still accounted for only 30% in 1989/90 (Table 3B).

Large labour demands on women within the household - such as child bearing and rearing, fuel and water collection, cooking, land preparation, planting and weeding, and the limited availability of affordable labour saving technologies, further constrains their ability to undertake sound land management. Female headed-households with no male help available may be physically unable to undertake the heavy agricultural work, or have insufficient finance to hire labour, that is required for soil conservation - including constructing ridging along contours, building bunds, maintaining waterways and so on. Off-farm employment opportunities for women to supplement farm income may also be constrained by gender discriminations in the labour market, such as for cash labour on tobacco estates.

Understanding the process of soil erosion and awareness of its impact on cultivation is critical to farmer's willingness to undertake soil conservation. A farmer is more likely to adopt a conservation measure if he or she can directly relate to the problem and link it to economic losses. Smallholders in Malawi appear aware of the problems posed by persistent soil erosion. This is particularly noticeable among farmers cultivating steep slopes who frequently cite problems of run-off and declining yields (Barbier and Burgess, 1990). It is often the poor female-headed households who cultivate the marginalized land and women in general who undertake the majority of farming and thus have significant interaction with, and understanding of, the problems of soil erosion.

Extension advise on how to deal with the problems posed by soil erosion is generally only reaching larger farmers (>1 ha) who are credit club members. This typically excludes the majority of female-headed households. What is more, of those households that are reached by extension agents, it is usually the males in the household who are visited or uptake the recommended land husbandry advice (see Table 4). The achievement of targets for adoption of soil conservation is much lower by women in comparison to men. Extension messages tend to be very general, and often related to tasks undertaken by men - such as building ridges, bunds, applying fertilizer. The messages are not customized to the needs and requirements of women, such as how to deal with problems of labour constraints and so on (Barbier and Burgess, 1990).

4. Substistence Farm Household Production Decisions

A recent study by Becker (1990) examines the labour input decisions of subsistence farm households in Southern Malawi with risky agricultural technologies and constrained off-farm employment opportunities. The study attempts to explain why induced innovations leading to soil-saving and labour-using technologies are not generally adopted by smallholders. The use of such technologies is a potential solution to ameliorate the effects of increasing rural population which exasperates the existing land pressure causing declining soil fertility, yield reductions and reduced self-sufficiency in substistence production.

The study analyzes the factor input and subsistence production decisions of rural households in a modified neoclassical framework. The model distinguishes by gender which household members will be engaged in on-farm activities to produce the required subsistence goods directly (i.e. survival goods) and which members will be engaged in off-farm employment to generate funds indirectly for subsistence products and surplus. The model distinguishes between the genders because it is assumed that:

- o male labour has three major job opportunities - permanent off-farm employment, temporary off-farm employment and production of subsistence goods - whilst female labour is discriminated from off-farm employment and can only be utilized for the production of substistence goods on-farm;

- o although women can participate in 'modern' farming techniques, it is necessary for certain

male activities to be carried out to enable the use of yield-increasing inputs; and,

o in order to receive 'modern' inputs, the male of the household is required to participate in organisational activities outside the household.

The yield increasing and land-saving technologies will be implemented by the farm families only if sufficient specific labour remains on-farm to participate in learing and organisational activities required for the adoption of these modern technologies, and if families risk aversion towards new technology if not too high. This analysis highlights the need for special attention to be paid to those households that are currently constrained in fulfilling these requirements, such as female headed households. In addition, it is recommended that extension advice needs to focus on the the houshold members with low opportunity costs of off-farm employment (typically women) and improve credit and input disbursement facilities is required to reach the currently excluded sectors of the population.

5. Conclusion

The persistence of pervasive low levels of income and increasing population pressure coupled with increasing land scarcity and land degradation requires significant attention to ensure that the economic development can take place and that natural resource base of Malawi is not degraded further. Women's role in environment and development is important not just through the poverty-land degradation link, but also because of the level of their interaction with the land and the particular constraints they face to undertake sound land management. Thus, there is a need to take special consideration of women's integration in agricultural development in Malawi.

Development projects and policies need to be sensitive to the role of gender in environment and development, otherwise women are unlikely to benefit, and at the worst face detrimental impacts, from such strategies. Targeting policies to deal with the gender issue requires detailed understanding at a micro level. For example, the case study above showed that in the Zomba district of Malawi men are primarily responsibe for the tobacco cash crop whilst women cultivate mainly substitence crops. Such information may be important when considering the impact of crop pricing policies at the farm household level. However, it is important not to make broad generalizations with such site specific data as the cropping patterns and methods of cultivation vary considerably throughout Malawi. Therefore, policies to promote development whilst maintaining the productivity of the land requires substantial efforts to ensure that the role of gender is given due and accurate consideration.

Bibliography

Barbier, E.B. and Burgess, J.C., (1990), 'Malawi - Land Degradation in Agriculture', Report for the World Bank Economic Mission on Environmental Policy, Malawi, July-August 1990.

Becker, H., (1990), 'Labour Input Decisions of Subsidtence Farm Housholds in Southern Nalawi', Journal of Agricultural Economics, Vol.41, No.2, pp.162-172.

Conway, G.R. and Barbier, E.B., (1990), After the Green Revolution: Sustainable Agriculture for Development, Earthscan Publications Ltd, London.

Kydd, J., (1989), 'Maize Research: Lessons from Failure', Journal of International Development, Vol.1, No.1, pp.112-144.

Lele, U., (1989), Structural Adjustment, Agricultural Development, and the Poor: Some Lessons from the Malawian Experience, MADIA Working Paper, World Bank, Washington DC.

Peters, P.E., Herrera, M.G., and Randolph, T.F., (1989), Cash Cropping, Food Security and Nutrition: The Effects of Agricultural Commercialization Among Smallholders in Malawi, final report to the U.S. Agency for International Development, Harvard Institute for International Development, One, Eliot Street, Cambridge, MA.

World Bank, (1989a), Malawi - Agricultural Sector Adjustment Credit, World Bank, Washington DC.

World Bank, (1989b), Malawi - Country Economic Memorandum: Growth Through Poverty Reduction, Vols. I and II, Washington DC.

Table 1

Malawi - Smallholder Poverty Profile

	Core Poor	Other Poor	Non Poor
Sex of head of household (% female)	42	34	16
Number of labour days/year			
- per household	532	606	762
- per capita	133	138	143
Average land holding (ha)			
- per household	0.39	0.73	1.76
- per capita	0.10	0.17	0.33
Agricultural services			
- % using fertilizer	9	16	35
- maize yield (1000 tn/ha)	1.2	1.3	1.4

Source: World Bank [1989]. 'Malawi - Country Economic Memorandum: Growth Through Poverty Reduction', Washington DC, Table III.B.1.

Table 2

A. Characteristics of Smallholders in Zomba, Malawi

	Male	F Teba	F de Jura	F Male absent
De facto household size	6.3	6.2	5.1	5.9
Male equiv. labour units	2.5	1.8	1.7	1.9
Ratio women to men	1.3	1.7	1.9	1.2
Per capita ha cultivated	0.25	0.24	0.22	0.19
Per capita Kg of maize harvested	160.2	214.8	157.5	108.4
No of tobacco growers	55	2	3	2
Per capita (DJ) income in Kwatcha	84.15	117.02	57.11	50.39
Household income in Kwatcha	510.15	802.53	282.98	331.98

B. Male and Female Labour Hours by Activity and Land Group

	<0.5		0.5-1		1-1.5		1.5-2		2-3		3-5	
	M	F	M	F	M	F	M	F	M	F	M	F
Agr Prod	0.7	1.8	2.0	1.8	2.4	2.2	2.8	2.1	2.4	2.2	3.3	1.9
Self-Emp	1.3	0.6	0.5	0.3	0.4	0.3	0.7	0.1	0.6	0.1	0.3	0.3
Wage-Emp	3.9	0.1	2.2	0.2	0.8	0.1	0.4	0.1	0.3	0.1	0.1	0.0
Domestic	0.4	4.2	0.4	4.1	0.4	3.8	0.4	3.7	0.4	2.9	0.6	3.2
Others	4.9	5.1	5.0	4.8	4.6	4.9	4.8	5.2	5.1	4.8	6.9	4.3

Source:P.E. Peters, M.G. Herrera and T.F. Randolph, [1989]. 'Cash Cropping, Food Security and Nutrition: The Effects of Agricultural Commercialization Among Smallholders in Malawi', final report to U.S. AID.

Table 3

A. Fertilizer Use by Household Type (Blantyre ADD)

Total Households			883	
Type of Household	Male		Female	
	No.	%	No.	%
	556	63.0	327	37.0
Fertilizer Farmers	208	37.4	90	27.5
Non-Fertilizer Farmers	348	62.6	237	72.5

B. Malawi - Credit Disbursement and Input Use to Smallholders

	83/84	84/85	85/86	86/87	87/88	88/89	89/90
Seasonal Loans ('000 MK)	11460	15555	19065	18283	26871	42211	57075
No. of Credit Clubs	7191	8148	8259	8045	9129	10570	10722
No. of Beneficiaries ('000)	180	212	208	206	243	301	315
% of Total Farm Families	12.9	14.9	14.4	13.9	16.1	19.6	20.1
Women as % of Beneficiaries	15.0	16.2	19.4	25.4	29.8	24.8	29.9
Average Loan per Farmer (MK)	63.6	73.4	91.7	88.6	110.4	140.1	181.1

Source: E.B. Barbier and J.C. Burgess [1990]. 'Malawi - Land Degradation in Agriculture', draft report to the World Bank Economic Mission on Environmental Policy, Malawi, July-August 1990.

Table 4

Adoption of Soil Conservation, Ntcheu Rural Development Project, Malawi

ACTIVITY	TARGET (1)	ACHIEVEMENT (2)	(1/2) %
Farm Plans	M: 8	M: 3	37.5
	W: 2	W: 0	0.0
Contour Marker Ridges	M: 600	M: 232	38.7
	W: 300	W: 42	14.0
Composting	M:1500	M:1051	70.1
	W:1000	W: 156	15.6
Manuring	M:4500	M:3347	74.4
	W:2500	W:1002	40.1
Alley Cropping	M: 170	M: 30	17.6
	W: 80	W: 14	17.5
Buffer Strips	M: 8	M: 3	37.5
	W: 2	W: 0	0.0
Raised Boundaries/Paths	M: 200	M: 321	160.5
	W: 100	W: 199	199.0
Gully Reclamation	M: 80	M: 104	130.0
	W: 20	W: 20	100.0
Farmer Training	M: 500	M: 157	31.4
	W: 220	W: 245	111.4

Notes: M: Men W: Women.

Source: Table A from World Bank, Malawi - Country Economic Memorandium: Growth Through Poverty Reduction, Washington DC, 1989, Table III.B.1; Tables B,C and D from E.B. Barbier and J.C. Burgess, Malawi - Land Degradation in Agriculture, Report to the World Bank Economic Mission on Environmental Policy, Malawi, London, July-August 1990.

Conclusions

The above sections highlight the various reasons why economists need to pay special attention to the role of gender in sustainable development. We have drawn together what we consider to be the major problems for economists attempting to persue this objective and suggests some positive steps that need to be taken:

o failure to recognise the relationship between women, environment and development

It is important that the linkages between women-environment-development continue to be explored by further research at the field and macro-level and that greater efforts are devoted to such research. It is also necessary the findings of the reseacrch are widely dispersed through a mix of academic publications, the 'grey literature' and the popular press.

o greater integration of the social sciences with economic analysis

For economic anaysis of the relationship between women-environment-development to provide useful insights it is necessary that much more inter-disciplinery research is undertaken. Practical experience and theoretical ideas developed by other disciplines needs to be integrated into economic understanding. Current methods of economic analysis may have to be modified in the light of these ideas.

o greater information is required at both a macro and a micro level

In order to have any significant impact on policy making, data reflecting the costs of the policy decisions failing to account for women and the environment is of great importance. This is necessary both to influence governments and aid agencies, although it is likely that such data is expensive to obtain. Macro-level data may be necessary, but is insufficient for understanding the problems posed by women-environment-development linkages. A key priority is to establish greater understanding of the relationships at the micro-level, and in order to achieve this a substantial amount of effort has to be put into obtaining field-level information.

o appropriate policy response and action

Probably the most difficult area for the future is soliciting the appropriate response from government and aid agencies. Policy makers may need to pay specific attention to womens projects and target women and womens groups through specific policies.

DISCUSSION PAPERS

Discussion Papers examine a wide range of issues in environmental economics, including theoretical questions as well as applications, case studies and policy analysis. They are directed mainly at academics and researchers. Discussion Papers may be purchased for £3.50 each unless otherwise stated.

DP 88-01 September 1988	David W Pearce, Edward B Barbier and Anil Markandya **Environmental Economics and Decision Making in Sub-Saharan Africa**
DP 88-02 October 1988	Edward B Barbier **Sustainable Agriculture and the Resource Poor: Policy Issues and Options**
DP 88-03 November 1988	David W Pearce, Edward B Barbier and Anil Markandya **Sustainable Development and Cost Benefit Analysis**
DP 89-01 January 1989	Edward B Barbier and Anil Markandya **The Conditions for Achieving Environmentally Sustainable Development**
DP 89-02 February 1989	Nicholas Michael and David W Pearce **Cost Benefit Analysis and Land Reclamation: A Case Study**
DP 89-03 March 1989	Douglas Southgate **Efficient Management of Biologically Diverse Tropical Forests**
DP 89-04 May 1989	Timothy Swanson **International Regulation of the Ivory Trade (£4.00)**
DP 89-05 June 1989	Edward B Barbier and Joanne C Burgess **Analysis of the Demand For Raw Ivory: Case Studies of Japan and Hong Kong**
DP 89-06 June 1989	Scott Barrett **Deforestation, Biological Conservation, and the Optimal Provision of Wildlife Reserves**
DP 89-07 July 1989	Scott Barrett **On The Overgrazing Problem**
DP 89-08 July 1989	Scott Barrett **Optimal Soil Conservation and the Reform of Agricultural Pricing Policies**
DP 89-09 October 1989	Douglas Southgate, Rodrigo Sierra and Lawrence Brown **The Causes of Tropical Deforestation in Ecuador: A Statistical Analysis**
DP 89-11 November 1989	Charles Perrings, Alison Gilbert, David W Pearce and Anne Harrison **Natural Resource Accounts for Botswana: Environmental Accounting for a Natural Resource-Based Economy**
DP 89-12 November 1989	Gardner Brown Jr. and Wes Henry **The Economic Value of Elephants**
DP 89-13 December 1989	Charles Perrings **Industrial Growth, Rural Income and the Sustainability of Agriculture in the Dual Economy**

DP 90-01
March 1990
R Kerry Turner and David W Pearce
The Ethical Foundations of Sustainable Economic Development

DP 90-02
May 1990
Anil Markandya
Environmental Costs and Power Systems Planning

DP 90-03
June 1990
Edward B Barbier
The Economics of Controlling Degradation: Rehabilitating Gum Arabic Systems in Sudan

DP 90-04
October 1990
Charles Perrings
Stress, Shock and the Sustainability of Optimal Resource Utilization in a Stochastic Environment

DP 90-05
October 1990
Edward B Barbier, Joanne C Burgess and David W Pearce
Slowing Global Warming: Options for Greenhouse Gas Substitution

DP 90-06
November 1990
David W. Pearce
An Economic Approach to Saving the Tropical Forests

DP 91-01
January 1991
Douglas Southgate
Tropical Deforestation and Agricultural Development in Latin America

DP 91-02
April 1991
Edward B Barbier, William M Adams and Kevin Kimmage
Economic Valuation of Wetland Benefits: The Hadejia-Jama'are Floodplain, Nigeria

DP 91-03
May 1991
Timothy Swanson
Wildlife Utilisation as an Instrument for Natural Habitat Conservation: A Survey of the Literature and of the Issues

DP 91-04
June 1991
Gregor Büchner, Joanne C Burgess, Victoria C Drake, Tom Gameson and David Hanrahan
Gender, Environmental Degradation and Development: The Extent of the Problem

DP 91-05
July 1991
Edward B Barbier
The Role of Smallholder Producer Prices in Land Degradation: The Case of Malawi

DP 91-06
November 1991
Anil Markandya and Charles Perrings
Resource Accounting for Sustainable Development: A Review of Basic Concepts, Recent Debate and Future Needs

DP 91-07
November 1991
Edward B Barbier
Environmental Management and Development in the South: Prerequisites for Sustainable Development

DP 92-01
June 1992
Edward B Barbier, Joanne C Burgess, Bruce A Aylward and Joshua Bishop
Timber Trade, Trade Policies and Environmental Degradation

DP 92-02
June 1992
Joanne C Burgess
Impact of Wildlife Trade on Endangered Species

DP 92-03
June 1992
Joanne C Burgess
Economic Analysis of the Causes of Tropical Deforestation

DP 92-04
October 1992
Edward B Barbier
Valuing Environmental Functions: Tropical Wetlands

DP 92-05 November 1992	Bruce A Aylward and Edward B Barbier **What is Biodiversity Worth to a Developing Country? Capturing the Pharmaceutical Value of Species Information**
DP 93-01 April 1993	Edward B Barbier, Joanne C Burgess, Nancy Bockstael and Ivar Strand **The Timber Trade and Tropical Deforestation in Indonesia**
DP 93-02 June 1993	Edward B Barbier **Policy Issues and Options Concerning Linkages Between the Tropical Timber Trade and Sustainable Forest Management**
DP 93-03 June 1993	John M Perez-Garcia and Bruce Lippke **The Timber Trade and Tropical Forests: Modeling the Impacts of Supply Constraints, Trade Constraints and Trade Liberalization**
DP 93-04 June 1993	David Brooks **Market Conditions for Tropical Timber**
DP 93-05 December 1993	Bruce A Aylward **The Economic Value of Pharmaceutical Prospecting and its Role in Biodiversity Conservation**
DP 93-06 December 1993	Bruce A Aylward, Jaime Echeverría, Liza Fendt and Edward B Barbier **The Economic Value of Species Information and its Role in Biodiversity Conservation: Costa Rica's National Biodiversity Institute**
DP 94-01 August 1994	Carlos E F Young and Ronaldo Seroa da Motta **Measuring Sustainable Income from Mineral Extraction in Brazil**
DP 95-01 February 1995	Ritu Karmar and Yasser Sherif **Economic Incentives for Pollution Prevention: A Case Study of Coal Processing Industries, Dhanbad, Bihar, India**

GATEKEEPER SERIES

The Gatekeeper Series highlights key topics in the field of environmental and resource economics. Each paper reviews a selected issue of contemporary importance and draws preliminary conclusions of relevance to development activities. References are provided to important sources and background materials. The Swedish International Development Authority (SIDA) funds the series, which is aimed especially at the field staff, researchers and decision-makers of SIDA and other development agencies. All Gatekeepers are priced £2.50 unless otherwise stated.

GK 89-01 June 1989	David W Pearce **Sustainable Development: an Economic Perspective**
GK 89-02 August 1989	Edward B Barbier **The Economic Value of Ecosystems: 1 - Tropical Wetlands**
GK 89-03 October 1989	David W Pearce **The Polluter Pays Principle**
GK 89-04 November 1989	Joanne C Burgess **Economics of Controlling the Trade in Endangered Species: The African Elephant**
GK 90-01 March 1990	Edward B Barbier **Natural Resource Degradation Policy, Economics and Management**
GK 91-01 January 1991	Edward B Barbier **The Economic Value of Ecosystems: 2 - Tropical Forests**
GK 91-02 May 1991	Joshua Bishop, Bruce A Aylward and Edward B Barbier, **Guidelines for Applying Environmental Economics in Developing Countries**
GK 91-03 June 1991	Bruce A Aylward **The Economic Value of Ecosystems: 3 - Biological Diversity**
GK 91-04 May 1991	David W Pearce **Afforestation and the Greenhouse Effect: The Economics of Fixing Carbon by Growing Trees**
GK 92-01 March 1992	Joshua Bishop **Economic Analysis of Soil Degradation**
GK 92-02 September 1992	Edward B Barbier **The Nature of Economic Instruments: A Brief Overview**
GK 92-03 October 1992	James P G Spurgeon and Bruce A Aylward **The Economic Value of Ecosystems: 4 - Coral Reefs**
GK 92-04 December 1992	Douglas Southgate **The Rationality of Land Degradation in Latin America: Some Lessons from the Ecuadorian Andes**
GK 93-01 June 1993	Bruce A Aylward, Joshua Bishop and Edward B Barbier **Economic Efficiency, Rent Capture and Market Failure in Tropical Forest Management**

BOOKS

Edward B. Barbier
Economics, Natural-Resource Scarcity and Development: Conventional and Alternative Views, Earthscan, London, 1989 (paperback £17.50)

The history of environmental and resource economics is reviewed; then using insights from environmentalism, ecology and thermodynamics, Barbier begins the construction of a new economic approach to the use of natural resources, particularly to the problem of environmental degradation. With examples from the global greenhouse effect, Amazonian deforestation and upland degradation on Java, Barbier develops a major theoretical advance and shows how it can be applied. This book breaks new ground in the search for an economics of sustainable development.

David W. Pearce, Anil Markandya and Edward B. Barbier
Blueprint for a Green Economy, Earthscan, London, 1989 (paperback £8.95)

This book was initially prepared as a report to the Department of Environment, as part of the response by the government of the United Kingdom to the Brundtland Report, *Our Common Future*. The government stated that: '...the UK fully intends to continue building on this approach (environmental improvement) and further to develop policies consistent with the concept of sustainable development.' The book attempts to assist that process.

Edward B. Barbier, Joanne C. Burgess, Timothy M. Swanson and David W. Pearce
Elephants, Economics and Ivory, Earthscan, London, 1990 (paperback £10.95)

The dramatic decline in elephant numbers in most of Africa has been largely attributed to the illegal harvesting of ivory. The recent decision to ban all trade in ivory is intended to save the elephant. This book examines the ivory trade, its regulation and its implications for elephant management from an economic perspective. The authors' preferred option is for a very limited trade in ivory, designed to maintain the incentive for sustainable management in the southern African countries and to encourage other countries to follow suit.

Gordon R. Conway and Edward B. Barbier
After the Green Revolution: Sustainable Agriculture for Development, Earthscan Pub. Ltd., London, 1990 (paperback £10.95)

The Green Revolution has successfully improved agricultural productivity in many parts of the developing world. But these successes may be limited to specific favourable agro-ecological and economic conditions. This book discusses how more sustainable and equitable forms of agricultural development need to be promoted. The key is developing appropriate techniques and participatory approaches at the local level, advocating complementary policy reforms at the national level and working within the constraints imposed by the international economic system.

David W. Pearce, Edward B. Barbier and Anil Markandya
Sustainable Development: Economics and Environment in the Third World, London and Earthscan Pub. Ltd., London, 1990 (paperback £11.95)

The authors elaborate on the concept of sustainable development and illustrate how environmental economics can be applied to the developing world. Beginning with an overview of the concept of sustainable development, the authors indicate its implications for discounting and economic appraisal. Case studies on natural resource economics and management issues are drawn from Indonesia, Sudan, Botswana, Nepal and the Amazon.

David W. Pearce, Edward B. Barbier, Anil Markandya, Scott Barrett, R. Kerry Turner and Timothy M. Swanson
Blueprint 2: Greening the World Economy, Earthscan Pub. Ltd., London, 1991 (paperback £8.95)

Following the success of *Blueprint for a Green Economy*, LEEC has turned its attention to global environmental threats. The book reviews the role of economics in analyzing global resources such as climate, ozone and biodiversity, and considers economic policy options to address such problems as global climate change, ozone depletion and tropical deforestation.

E.B. Barbier and T.M Swanson (eds.)
Economics for the Wilds: Wildlife Wildlands, Diversity and Development, Earthscan Pub. Ltd., London, 1992 (paperback £12.95).

This collection of essays addresses the key issues of the economic role of natural habitat and wildlife utilization in development. The book argues that this role is significant, and composes such benefits as wildlife and wildland products, ecotourism, community-based wildlife development, environmental services and the conservation of biodiversity.

Copies of publications listed above may be obtained from the bookshop at IIED. Please use the order form below, and send to:

Marilyn John
Publications Department
IIED
3 Endsleigh Street
London WC1H 0DD, UK
Tel: 071-388 2117
Fax: 071-388 2826
Telex: 261681 EASCAN G

Please add £1.00 post and packing per publication. Orders over £20.00 in value will be sent post free (UK only).

Overseas customers: please do not send payment with your order; you will receive a *pro forma* invoice once the cost of dispatching your order has been calculated.

Publications Department
IIED, 3 Endsleigh Street
London WC1H 0DD

PUBLICATIONS ORDER FORM

Name: _____

Address: _____

_____

_____

Reference/Title	Price	Quantity

Payment enclosed: £ _____

The London Environmental Economics Centre (LEEC) is now known as the Environmental Economics Programme, at the International Institute for Environment and Development. The former name dates from 1987 when the Centre was established by IIED and the Economics Department of University College, London.

Today, all environmental economics staff and research projects are based at IIED where the Programme has become a core area of Institute activity.

The Environmental Economic Programme conducts economic research and policy analysis for improved management of natural resources and sustainable economic growth in the developing world.

iied

International Institute of Environment and Development
3 Endsleigh Street, London WC1H 0DD
Tel: 0171-388 2117 Fax: 0171-388 2826