

## **Annexes**

Annex A: Contributors

Annex B: Determinants of agricultural productivity, economic development, and human welfare from a gender perspective: An Annotated Bibliography by Siwa Msangi and Mandy Ewing

Annex C: Agenda of the meeting

Annex D: Participants of the meeting

Annex E: Notes on regional definitions used in the conceptual overview

Annex F: Notes on the methodology of the Tanzania time use study

Annex G: Notes on the methodology of the DREM for the Dominican Republic

## **Annex A: Contributors (in alphabetical order)**

**Michelle Adato**, a development sociologist, is a Senior Research Fellow in the Poverty, Health, and Nutrition Division at IFPRI. She co-leads IFPRI's Global and Regional Program on Large Scale Human Capital Interventions, and is the theme leader on AIDS, Community Resilience and Social Protection for IFPRI's Regional Network on AIDS, Livelihoods and Food Security (RENEWAL) in southern and East Africa. Her main area of research focuses on social protection and other interventions that aim to reduce poverty and improve health, nutrition, and education. She has also worked on employment and livelihoods support programs, governance and policy processes, and community-driven development. She has conducted impact evaluations and served as a policy advisor on these topics for governments in Latin America, Asia, and Africa for over thirteen years. Michelle received a Ph.D. in Development Sociology from Cornell University, a Master of Public Administration from Harvard University's John F. Kennedy School of Government, and a B.A. from Colorado College.

**Mandy Ewing** is a Research Analyst within the Environment and Production Technology Division at IFPRI. Prior to coming to IFPRI, she worked in Bolivia assisting rural communities develop community tourism projects and related small enterprises. She also held the position of policy analyst for the Wisconsin Department of Transportation where she developed alternative fuel policies. She received a M.S. in Agricultural and Applied Economics from the University of Wisconsin-Madison and a B.S. in Environmental Engineering from the University of Florida.

**Mateusz Filipski** is a graduate student in the Department of Agriculture and Resource Economics at the University of California, Berkeley. He also has received a UC Mexus fellowship to conduct research on Mexico.

**Marzia Fontana** is a development economist at the Institute of Development Studies at the University of Sussex, in Brighton, U.K. She is also the programme convenor for MA Gender and Development. Her research interests include the interactions between trade, labour, and income distribution; gender inequalities and intra-household resource allocation. Her recent research focuses on the gender impact of trade liberalisation in Bangladesh. With Adrian Wood, she authored the now-classic article from

2000 “Modelling the Effects of Trade on Women, at Work and at Home,” *World Development* 28.7:1173-90. She has previously worked at the International Food Policy Research Institute in Washington D.C., at the Institute of Development Studies at Sussex, and at the Reserve Bank of Fiji.

**Karen Hardee** is a social demographer with who is currently the Vice President for Research at Population Action International (PAI). She provides technical direction on PAI’s research portfolio, including population, development, and climate change; gender; integration of HIV/AIDS and sexual and reproductive health interventions; and reproductive health financing. Prior to joining PAI, Dr. Hardee was a Senior Advisor at John Snow, Inc. where she managed a project on harmonization of data quality tools for multiple donors, including the Global Fund to Fight AIDS, TB, and Malaria (Global Fund), the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR) and other donors. She was previously director of Constella Futures’ Center for Research and Evaluation, and director of research on the POLICY Project. Dr. Hardee has studied the interaction between society and family planning, HIV/AIDS and safe motherhood policies and programs through assessing the role that gender plays in women’s, men’s and adolescents’ experiences with the programs. She has been principal investigator and co-principal investigator on a number of key studies, including research on the service delivery practices of private providers, quality of care in government and NGO health facilities, a longitudinal assessment of the knowledge, attitudes, and behavior of young adolescents at risk of pregnancy, and national surveys of HIV and AIDS. Dr. Hardee holds a Ph.D. from Cornell University’s Population and Development Program.

**Leiwen Jiang** is a Senior Demographer for Population Action International. He is currently working on improving demographic components of integrated climate/environment assessment models and exploring the environmental implications of demographic dynamics. He joined PAI in 2008 from Brown University, where he was a Co-Principal Investigator of Population-Environment Program. Prior to that, he had worked at the Max Planck Institute for Demographic Research, Indiana University, Peking University, and Vienna Institute for Demographic Analysis conducting research on population and climate/environment interaction. He was also a consultant to UNICEF and the World Bank, and a collaborator of the Asian MetaCentre for Population and Sustainable Development Analysis. He remains an adjunct professor at Brown University and Peking University, as well as a

guest researcher at International Institute for Applied System Analysis (IIASA) and China Academy of Sciences. He has a PhD degree in environmental sciences from the University of Amsterdam.

**Zhenya Karelina** is a student at Wellsley College in Wellsley, Massachusetts, majoring in sociology and Spanish. She expects to graduate in 2010.

**Luisa Natali** is a researcher with IDS working at IDS with Marzia Fontana on patterns of time use in Tanzania and is currently working as a Researcher for ODI on a project commissioned by OECD on the developmental effectiveness of untied aid. Her research interests also centre around the social and economic impact of HIV/AIDS pandemic, economics of poverty and inequality. She worked as a Research Assistant on short-term projects at Sussex (Department of Economics), before moving to Zambia to work in the Strategy and Policy Unit of UNDP. She completed her MA in Development Economics at Sussex University.

**Siwa Msangi** is a Senior Research Fellow in the Environment and Production Technology Division, and co-leads a research theme on the major socio-economic and bio-physical drivers affecting agricultural production and trade, and their impacts on nutrition, poverty and the environment. While a great deal of his current research activity focuses on the economic and environmental impacts of biofuels, Msangi has a broader research background in natural resource management -- especially that of surface and groundwater management policy. Msangi also has interests in quantitative dynamic economics and the application of dynamic game theory to the study of user behavior in natural resource settings. A Tanzanian national, Msangi joined IFPRI in August 2004 as a post-doctoral fellow, after obtaining his degree in Agricultural and Resource Economics at the University of California at Davis. He earned a Masters degree in International Development Policy at the Food Policy Research Institute at Stanford University, where he also received an undergraduate degree in Chemical Engineering.

**J. Edward Taylor** is a Professor in the Department of Agricultural and Resource Economics, University of California, Davis, where he also received his M.A. and Ph.D. degrees. His research interests include: Economic Development, Human Resources, and the Environment; Village and Rural

Economy-wide Modeling; Applied Micro-Econometrics. He has published extensively on the economics of farm households in Mexico and the Caribbean.

## **Annex B: Determinants of agricultural productivity, economic development and human welfare from a gender perspective: A literature review and annotated bibliography by Siwa Msangi and Mandy Ewing**

### **1. Introduction**

This literature review and annotated bibliography covers studies that are key to understanding the socio-economic linkages underlying gendered dynamics and well-being outcomes. The review synthesizes critical lessons from studies that best illustrate the linkages between agriculture growth, economic development and the improvement of well-being from a gendered perspective. Most of the literature that explores the linkages between the development of agricultural economies and the improvement of human welfare does so without paying adequate attention to where gender really matters, and it either tends to over-simplify the problem (and its solution) or ignores the real constraints that prevent policy interventions from having their intended effect. The purpose of the study is to highlight opportunities where paying closer attention to gender can really pay off in better targeting policy interventions and investments, which can lead to improved outcomes and enhanced levels of welfare and human well-being.

The thematic areas of the review and bibliography parallel the project components that form the previous sections of this report, including:

- (1) Macro-economic modeling that disaggregates the supply and labor response of households by sex to illuminate the impact of policy on women and men;
- (2) Population modeling that illustrates the impacts of education and fertility policy on future demographic and socio-economic growth;
- (3) A benefit cost analysis of increasing the provision of clean water to rural and urban populations, examining its associated benefits (from avoided sickness and the implied loss in economic productivity, to the reduction in women's time burden for women); and,
- (4) The implied benefit of girls' schooling on economic productivity, as well as household nutrition outcomes.

### **2. Thematic overview of the literature**

The sources in this literature review have been divided into seven broad categories. Each of these categories covers a different area in which gender inequality influences productivity and growth. The first section gives an overview of the literature discussing how gender inequalities overall impact macroeconomic growth. Following this, each section focuses more explicitly on areas where women have differential access and control, including time use, technology adoption, education, and land tenure:

- The section on time use includes papers describing and assessing women's and men's time use, in both productive and reproductive areas. Time use research is interested in assessing whether or not women are differentially burdened by non-market activities, and if so, which investments or policies could reduce women's time burden.
- The technology adoption section contains papers that discuss how women and men gain access and control of technology that can impact productivity and overall well-being. For

example, women have been shown to have differential access to productive inputs that would potentially raise their earnings.

- The section on women and girls' education discusses articles on how gender gaps in educational attainment and enrollment affect various aspects of welfare, including infant nutrition, fertility, HIV infection rates, timing of first births and marriage, and overall macro economic growth.
- The section on gender and land tenure presents a few key pieces of the literature that demonstrate how women's lack of access to land affects earnings and well-being.
- The section on gender-targeted social programs reviews the effectiveness of policy designed specifically to address women's differential access to health care and education.
- Finally, the section on the Sustainable Livelihoods Approach reviews the conceptual framework of women and assets, which is used in this project.

**Note:** *In each section, text in italics indicates that it is the original abstracts printed with the published work.* Standard text indicates that the review comments were added by the authors of this compilation.

### **2.1. Gender inequality and macroeconomic growth**

Blackden, C.M. 2003. "Gender and trade expansion in Africa: A "win-win" scenario?" Paper prepared for the Panel on Gender and Globalization, Global Development Network Fourth Annual Conference, Cairo, Egypt, January 31, 2003.

Excellent for introduction of all overarching links between gender and growth.

Blackden, C. M., S. Canagarajah, S. Klasen, and D. Lawson. 2006. *Gender and growth in Sub-Saharan Africa: Issues and evidence*. United Nations University World Institute for Development Economics Research (UNU-WIDER) Research Report No. 2006/37. Helsinki: UNU-WIDER.

The authors argue that among other macroeconomic influences like weak institutions and trade issues, gender inequality can also be implicated in explaining the poor growth performance in Africa. The inequalities mentioned include gender gaps in education, formal sector employment, access, and control over important economic assets and productive inputs, gender gaps in (productive) time use, differences in household bargaining power, and political empowerment. The authors review the theoretical and empirical literature that link these inequalities with growth (or lack of it), and arrive at policy interventions and further research areas.

Blackden, C.M., and C. Bhanu. 1999. *Gender, growth, and poverty reduction*. Special Program of Assistance for Africa, 1998 Status Report on Poverty, World Bank Technical Paper No. 428. World Bank: Washington, D.C.

Grown, C., G. Rao Gupta, and A. Kes. 2005. *Taking action: Achieving gender equality and empowering women*. United Nations Millennium Project Task Force on Education and Gender Equality. London: Earthscan. <<http://www.unmillenniumproject.org/documents/Gender-complete.pdf>>

*This report, prepared by the United Nations' Millennium Project Task Force on Education and Gender Equality, identifies strategic priorities and practical actions for achieving women's empowerment by 2015. Those relating particularly to women's economic empowerment include: investing in infrastructure to reduce women's and girls' time burdens; guaranteeing women's and girls' property and inheritance rights; and eliminating gender inequality in employment by decreasing women's reliance on informal employment, closing gender gaps in earnings, and reducing occupational segregation. The report argues that the problem is not a lack of practical ways to empower women but rather a lack of change on a large and deep enough scale to bring about transformation in the way societies conceive of and organize men and women's roles, responsibilities, and control over resources. Essential for this kind of transformation is the mobilization of a large group people committed to the vision of a gender-equitable society; the technical capacity to implement change of institutional structures and processes to support the transformation; and adequate financial resources.*

Grown, C., D. Elson, and N. Çagatay, eds. 2000. Growth, trade, finance and gender inequality. *World Development* 28 (7). Special issue.

*This special issue of World Development is part of a larger project aiming to explore new ways of engendering macroeconomic and international trade models both theoretically and empirically. For example, Seguino's article uses empirical analysis to show that Gross Domestic Product (GDP) growth is positively related to gender wage inequality in contrast to recent work which suggests that income inequality slows growth. Elson and Çagatay's article explores ways of ensuring that macro-economic policies have social and gender justice as their central goal. Although some of the papers are very technical, others are for a more general audience. The articles are divided into four categories: 1. growth and trade liberalization; 2. financial liberalization; 3. supply response and household well-being in gender segregated low-income economies; and 4. bringing gender analysis into economic policy institutions.*

International Bank for Reconstruction and Development/The World Bank. 2007 *Confronting the challenges of gender equality and fragile states*. Global monitoring report: Millennium Development Goals. The World Bank: Washington D.C.

Chapter 3, "Promoting Gender Equality and Women's Empowerment" deals with strides to meet MDG 3. It offers many indicators and some theoretical foundations toward perusing gender parity.

Klasen, S. 2004. *Gender-Related indicators of well-being*. WIDER Discussion Paper No. 5. <<http://www.wider.unu.edu/publications/dps/dps2004/dp2004-005.pdf>

*This paper discusses the rationale as well as the challenges involved when constructing gender-related indicators of well-being. It argues that such indicators are critically important but that their construction involves a number of conceptual and*



*measurement problems. Among the conceptual issues considered are the space in which gender inequality in well-being is to be measured, whether the indicators should track well-being of males and females separately or adjust overall measures of well-being by the gender inequality in well-being, whether gender equality in every indicator is necessarily the goal, how to assess gender inequality that is apparently desired by males and females, and what role indicators of agency or empowerment should play in gender related indicators of well-being. Among the most important measurement issues addressed are: the role of the household in allocating resources, the question of stocks versus flows, as well as significant data gaps when it comes to gender inequalities. Where appropriate, remedies to the conceptual and measurement issues are proposed. The paper also briefly reviews UNDP's gender-related indices to illustrate some of the challenges involved.*

Seguino, S. 2006 *Gender inequality in a globalizing world*. 06-14 Working paper series, International Working Group on Gender, Macroeconomics and International Economics (GEMIWG) <<http://www.econ.utah.edu/genmac/WP/06-14.pdf>>

*How far have development strategies aimed at enabling poor countries to compete in global trade markets boosted well-being and gender equality? With a focus on rapidly developing East Asian countries, this paper argues that while Asian growth has been rapid, it has not produced greater gender equality. The paper notes that initial rapid growth in Taiwan and South Korea was largely sustained because of low wages paid to the women who constituted the majority of export industry workers. Since the 1990s increased competition from other low-wage producers has driven women's wages even lower and led to the growth of informal, unregulated work arrangements. As a consequence, their bargaining power in the workplace is reduced, particularly with regard to demanding equal wages with men and negotiating better conditions of work such as shorter hours and paid maternity leave. The paper argues that gender-equitable macroeconomic and development policies are therefore required, with an emphasis on gender-sensitive public sector spending. For example, public expenditure on infrastructure, such as clean water and roads, can reduce women's unpaid care burden.*

## **2.2. Gender and time use**

Enete, A., F. Nweke, and E. Tollens. 2002. Determinants of cassava cash income in female headed households in Africa. *Quarterly Journal of International Agriculture* 41(3): 241-254.

The lion's share of weeding work is done by women, and often entails back-breaking work, and spending hundreds of hours per hectare, in a stooped position – which has long-term health consequences. In cassava fields across Africa, women spend up to 126 hours per hectare weeding.

Esplen, E., and A. Brody. 2007. *Putting Gender Back in the Picture: Rethinking Women's Economic Empowerment*. BRIDGE Bibliography No. 19. University of Sussex: Brighton: Institute of Development Studies..

Relevant annotated bibliography on double burden, unpaid work, remittances, and unequal pay.

Fafchamps, M. 1993. Sequential labor decisions under uncertainty: An estimable household model of West-African farmers. *Econometrica* 61(5): 1173-97.

This paper by Fafchamps demonstrated the severe constraint that is placed on the productivity of households by the time needed for weeding. Time spent on weeding<sup>1</sup> restricts flexibility in timing for carrying out other types of tasks. It also reduces use of inputs, since farmers also want to avoid using inputs (e.g., fertilizer or water) that would be absorbed by the weeds rather than the crops, and weeds often have a agronomic advantage in absorbing nutrients, hindering crop growth.

Razavi, S. 2007. *The political and social economy of care in a development context conceptual issues, research questions, and policy options*. Gender and Development Programme Paper Number 3. Geneva: United Nations Research Institute for Social Development (UNRISD).

*This paper traces the evolution of ideas in the area of gender and care, and analyses some of the main strands of thinking that have contributed to this ongoing debate. The effort to review the literature is far from exhaustive, and it is also biased toward connecting gender analyses of care in developing countries to some of the conceptual and theoretical work on care that, for the most part, takes the developed capitalist economies as its point of reference.*

Ukeje, E.U. 2004. *Modernizing small holder agriculture to ensure food security and gender empowerment: Issues and policy*. Research Paper of the Intergovernmental Group of Twenty-Four on International Monetary Affairs and Development. Accessed on 25 June, 2009. Available at <<http://www.g24.org/ukeje.pdf>>

Field studies from Nigeria indicate that out of all farm labor, including field preparation, planting, weeding, harvesting, and storing crops, women allocate between 90 and 100 percent of their time to weeding, while men tend to the remainder of productive activities.

### **2.2.1. Time use approach to poverty reduction**

Bardasi, E., and Q. Wodon. 2006. Poverty Reduction from Full Employment: A Time Use Approach. In *Gender, Time Use, and Poverty in Sub-Saharan Africa*. Ed. C. M. Blackden, and Q. Wodon. World Bank Working Paper #73, Washington, D.C.: The World Bank.

*Despite long working hours, for many household members, and especially women, underemployment is nevertheless affecting a large share of the population in many developing countries. Using data on time use, wages, and consumption levels from a recent household survey for Guinea, this paper provides a simple framework for assessing the potential impact*

*on poverty and inequality of an increase in the working hours of the population up to what is referred to as a full employment workload. The framework provides for a decomposition of the contribution to higher household consumption of an increase in working hours for both men and women. The key message is that job creation and full employment would lead to a significant reduction in poverty, even at the relatively low current levels of wages and earnings enjoyed by the population. However, even at full employment levels, poverty would remain massive, and the higher workload that the full employment scenario would entail would be significant.*

Blackden, C.M. 2002. "All Work and No Time: Time Poverty as a Development Issue in Africa." Poverty Reduction and Economic Management, Africa Region. The World Bank, Washington, D.C. Processed.

Gill, K., R. Pande, and A. Malhortra. 2007. Women Deliver for Development, Background paper prepared for the Women Deliver Conference, 18-20 October 2007. Washington, D.C.: USAID.

Quantitative estimates on the global costs of sick women and infant mortality from USAID.

Horrell, S., H. Johnson, and P. Mosley. 2008. *Work, female empowerment and economic development*. Oxon: Routledge.

Kes, A., and H. Swaminathan. 2006. Gender and time poverty in Sub-Saharan Africa. In *Gender, time use, and poverty in Sub-Saharan Africa*. Working Paper No. 73, ed. C. M. Blackden, and Q. Wodon. Washington, DC: The World Bank.

The authors develop a conceptual model for analyzing time use and time poverty for rural women in SSA. In addition, they review available time use surveys, present relevant descriptive statistics, and review the state of the literature.

This essay will be useful in presenting time use statistics for firewood and water collecting for these countries, including trends over time.

Kes, A., and H. Swaminathan. 2005. *Gender and Time Poverty in Sub-Saharan Africa*. PowerPoint presentation at the Conference on Unpaid Work and the Economy, October 2: Bard College.

Presents descriptive statistics from the results of five SSA national time use surveys: Benin (1998), South Africa (2001), Ghana (2000), Mauritius (2003), and Madagascar (2001) (see time use survey list below). Presents charts and tables on time spent in reproductive activities, including fetching water and fuel, differentiated by men, women, boys and girls. For example, in Benin, women spend 337 (highest of five surveys) hours a year fetching water. The authors advocate improving infrastructure in order to "alleviate women's time poverty."

Mosley, P. and S. Horrell. 2008. Policies and poverty alleviation. In *Work, female empowerment and economic development*, eds. S. Horrell, H. Johnson, and P. Mosley. Oxon: Routledge.

Ritchie, A.; C. Lloyd; M. Grant. 2004. Gender Differences in Time Use Among Adolescents in Developing Countries: Implications of Rising School Enrollment Rates. Population Council. <<http://www.popcouncil.org/pdfs/wp/193.pdf>>

*Three research questions are addressed in this paper: (1) How does time use change during the transition to adulthood? (2) Does gender role differentiation intensify during the transition? (3) Does school attendance attenuate gender differences? Researchers at the Population Council have been involved in the collection of 24-hour recall data on time use from adolescents in India, Kenya, Pakistan, and South Africa. Sufficient data have now been collected to permit comparative analysis. These data are supplemented by comparable data from Guatemala and Nicaragua from the World Bank Living Standard Measurement surveys. Our research addresses significant gaps in the literature, in particular the lack of attention to how time use is affected by school attendance. The data document differences in time use patterns between students and non-students. Although female adolescent students still work longer hours than male adolescent students, the gender division of labor that typically develops during adolescence is greatly attenuated among students when time spent at work is measured by combining labor market work with non-economic household work.*

### **2.2.2. Gender disaggregated time use surveys, CGE models and the political economy of care**

Arndt, C., and F. Tarp. 2000. Agricultural Technology, Risk, and Gender: A CGE Analysis of Mozambique. *World Development* 28 (7): 1307-1326.

*Interactions between agricultural technology improvements, risk-reducing behavior, and gender roles in agricultural production in Mozambique are examined. The analysis employs a computable general equilibrium (CGE) model that explicitly incorporates key features of the economy. These include: detailed accounting of marketing margins, home consumption, risk, and gender roles in agricultural production. Our results show that agricultural technology improvements benefit both male and female occupants of rural households. Due to economic interactions, agricultural technology improvements are particularly compelling when combined with marketing system improvements. Moreover, technological change in cassava appears to be a particularly strong lever for increasing female and overall household welfare, especially when risk is considered.*

Budlender, D. 2007a. *A critical review of selected time use surveys*. Gender and Development Programme Paper Number 2. Geneva: United Nations Research Institute for Social Development (UNRISD).

*The paper presents the results of a desk-based study, as well as limited interaction with people knowledgeable about the surveys undertaken in countries included in the study: Argentina, Brazil, Mexico and Nicaragua (in Latin America); Bangladesh, India and the Republic of Korea (in Asia); and Chad, Mali, Tanzania and South Africa (in sub-Saharan Africa). The paper focuses on the following seven issues in reviewing the country experiences: • assessing the design of the survey; • delineating the scope of the survey and the information it contains; • assessing the quality of the data obtained, with particular attention to data available on unpaid care work; • identifying weaknesses in the data and survey design, especially with respect to*

*unpaid care work; • identifying countries most suitable for inclusion in the second phase of the project; • identifying issues for exploration through qualitative research in the second phase of the project; and • providing some recommendations, in terms of design/methodology, scope and training for fieldworkers, for future time use surveys.*

Budlender, D. 2007b. *The statistical evidence on care and non-care work across six countries*. Gender and Development Programme Paper Number 4. Geneva: United Nations Research Institute for Social Development (UNRISD).

*The paper confirms some constant basic gender patterns in engagement in System of National Accounts (SNA) work, and unpaid care work, across the six countries. For all countries, the mean time spent on unpaid care work by women is more than twice that for men. The gender gap is most marked in India, where women spend nearly 10 times as much time on unpaid care work than men. Conversely, men tend to spend more time than women on SNA work across all countries. Again, India has the largest gender difference, with men spending nearly two and a half times as much time on SNA work as women.*

*When SNA and unpaid care work are combined, women are found to do noticeably more work than men in all countries. The volume of the total work done by men ranges from 74 per cent of the total amount done by women in South Africa to 94 per cent of the amount done by women in India. When the distribution of men and women in terms of time spent on unpaid care work is examined, there are far more men than women who do not do this type of work at all. Among those who do, there is strong clustering at points representing short times spent on this work. In contrast, there is high variability among women in the amount of unpaid care work done and, as a consequence, a notable level of inequality, with some women spending considerable time on it.*

Budlender, D. 2004 *Why should we care about unpaid care work?* United Nations Development Fund for Women (UNIFEM), New York <<http://www.sarpn.org.za/documents/d0000919/index.php>

*The failure of macroeconomic policies to acknowledge unpaid care work – such as housework, cooking, and caring for children, the elderly and sick people – has a significant impact on women's lives. This guidebook, written for non-economists and non-statisticians, focuses on the issue of unpaid care work in Southern Africa and the Indian Ocean States, where the problem has been exacerbated by HIV/AIDS and cuts in the health sector. It discusses the links between unpaid care work and poverty, and provides information on how to influence macroeconomic and trade policy-making, how to collect and analyse statistics on unpaid care work, and how and why to include unpaid care work in economic policy-making. The final section outlines possibilities for advocacy work and provides examples. One example is an initiative by the Korean Ministry for Women's Affairs which is pushing for insurance for full-time housewives, calculated on the basis of the value of their household labour. The initiative also advocates for family friendly policies in the areas of family support and child care, and for the sharing of marital assets in cases of divorce.*

Charmes, J. 2006. A review of empirical evidence on time use in Africa from UN-sponsored surveys. In *Gender, time use, and poverty in Sub-Saharan Africa*. Working Paper No. 73, ed. C. M. Blackden, and Q. Wodon. Washington, DC: The World Bank.

Charmes reviews four time use surveys from SSA: Benin (1998), South Africa (2000), Madagascar (2001), Ghana (1999). Reports time use results along productive and reproductive categories and compares their coding to SNA classifications. Presents gender-differentiated results for time spent in collecting water and firewood, and estimates total hours spent nationally by women and men on these activities. Also presents trends over time for these activities, where panel data available. In conclusion, the author calls for the need to develop gender-targeted infrastructure improvements in order to free labor, and also for the quantifiable evaluation of project impacts. This essay will be useful in presenting time use statistics for firewood and water collecting for these countries, including trends over time.

Fontana, M. 2007. A Review of Selected Social Accounting Matrices for Use in Gender-Aware Evaluations of Employment Guarantee Policies (*draft*). Background Paper No.2, revision September, the Levy Economics Institute: Bard College.

Fontana, M., and Y. van der Meulen Rodgers. 2005. Gender Dimensions in the Analysis of Macro-Poverty Linkages. *Development Policy Review*. 23 (3):333-349.

*Women and men experience poverty differently. Taking gender inequalities into consideration in the design of CGE models can significantly improve our understanding of the mechanisms through which macroeconomic policies affect poverty. This article reviews current approaches to gender modeling and suggests ways in which CGE models can be further developed to include gender features. The ideal combination of such features in a CGE model will vary, depending on the issues analyzed, the country context and data availability. At a minimum, a gender-aware model should incorporate segmentation in labor markets and some representation of the unpaid household economy. <<http://www.blackwell-synergy.com/links/doi/10.1111/j.1467-7679.2005.00290.x/abs/>*

Fontana, M. 2003. *Modeling the Effects of Trade on Women, at Work and at Home: A Comparative Perspective*. Discussion Paper no. 110, Trade and Macroeconomics Division, Washington, D.C.: International Food Policy Research Institute.

Fontana, M. and P. Wobst. 2001. A Gendered 1993-94 Social Accounting Matrix for Bangladesh. Discussion Paper no. 74, Trade and Macroeconomics Division. Washington, D.C.: International Food Policy Research Institute.

Fontana, M., and A. Wood. 2000. Modeling the effect of trade on women, at work and at home. *World Development* 28(7): 1173-1190.

The authors expand the SAM from Bangladesh to treat men and women as separate factors of production and to add domestic work and leisure activities as economic sectors. Other sectors used include manufacturing, services and agriculture. By changing elasticity values and the allocation between reproduction and leisure, the authors examine the economy-wide effects of a female-intensive manufactured exports policy. The results under these scenarios differ, which

highlights the necessity of gendered CGE models in determining the trade-offs in well-being between time spent in labor, leisure and reproduction.

Fontana, M., S. Joekes, and R. Masika. 1998. *Global trade expansion and liberalization: gender issues and impacts*. A study prepared for Department for International Development (DfID). BRIDGE (Development-Gender). Report no. 42. Brighton, UK: Institute for Development Studies.

Horrell, S., and P. Mosley. 2008. Time use and labour supply in rural households. In *Work, female empowerment and economic development*, eds. S. Horrell, H. Johnson, and P. Mosley. Oxon: Routledge.

The paper has time use survey results for a number of African countries and runs regressions concerning intra-household bargaining.

Latigo, A.A.R., and M. Neijwa. 2005. A New Round of Time-use Studies for Africa: Measuring Unpaid Work for Pro-poor Development Policies. Global Conference on the Unpaid Work and the Economy: Gender, Poverty and the Millennium Development Goals, October 1-3, 2005, Bard College: New York.

Advocates for wide-spread time use surveys in order to augment the National Time Accounts, as these surveys elucidate work in the informal sector, and characterize actual assets in employed within the household, instead of solely labor in the wage economy. This paper may be useful in illustrating the necessity of time surveys in order to proxy asset availability within the household and therefore tangible pathways for policy development.

Sinha, A., and N. Sangeeta. 2000. *Gender in a Macro Economic Framework: A CGE Model Analysis*. 2nd Annual Meeting of the Gender Planning Network.

Similar to Fontana et al. 2000, except examines structural adjustment shocks in India.

Valodia, I., and R. Devey. 2005. Gender, Employment and Time Use: Some Issues in South Africa (*work in progress*), Global Conference on the Unpaid Work and the Economy: Gender, Poverty and the Millennium Development Goals, October 1-3, 2005, Bard College: New York.

Using the South African time use survey conducted in 2001, the authors provide descriptive statistics to show the differences in time dedicated to paid, unpaid, and non-productive activities by men and women of differing socio-economic classes. The SA time survey includes time spent collecting firewood and water, including travel distance, disaggregated by gender. By describing casual relationships in the data, women in rural poor household could spend 10.2 time units on paid work versus 2.5 if they did not have to collect both fuel and water.

Statistics South Africa (Stat SA). 2001. *A Survey of Time Use*. Pretoria: Statistics South Africa.

INSAE/PNUD. 1998. Enquete employ du temps au Benin: Methodologie et resultats. Cotonou. Annexes

INSTAT-DSM/PNUD-MAG/97/00 EPM. 2001. Module Emploi du Temps. Antananarivo.

Ghana Statistical Service. 2000. Ghana Living Standards Survey, Report of the 4<sup>th</sup> Round (GLSS 4), Accra, 192p.

UNRISD website [www.unrisd.org](http://www.unrisd.org) houses the project 'The political and social economy of care,' which contains both published and unpublished papers.

### **2.2.3. Rural transport**

Barwell, I. 1996. *Transport and the village: Findings from African village-level travel and transport surveys and related studies*. Africa Region Series Discussion Paper No. 334. Washington, DC: The World Bank.

Barwell synthesizes the descriptive studies of the rural household transportation surveys conducted in Burkina Faso, Uganda and Zambia by the World Bank. By analyzing the time use in transport relative to overall household labor allocation, the author identifies time saving opportunities for reproductive (firewood/water collection), productive (agricultural product transport) and access to services (clinics/schools). The author quantifies potential annual time savings for women (e.g. women and girls could save 900 hours a year with the implementation of woodlots) and recommends policies for local, national and bi-lateral agencies.

This paper could be used to demonstrate the how providing these physical assets can save labor and enable the use of other, more productive assets aimed at income generation.

Cooke, P., G. Kohlin, and W. Hyde. 2008. Fuelwood, forests and community management – evidence from household studies, *Environment and Development Economics* 13: 103–135

Discusses the links between fuel wood scarcity, carbon sequestration, hunger, and indoor air pollution.

Malmberg-Calvo, C. 1994. *Case study on the role of women in rural transport: Access of women to domestic facilities*. SSATPP Working Paper No. 11, Technical Department, Africa Region. The World Bank.

Malmberg-Calvo examines women's access to firewood, water, and grinding mills by analyzing four household surveys from Ghana, Tanzania and Zambia. Daily time spent by adult females in domestic transport ranges from one hour to two hours and 20 minutes. For water collection, female adults spend 22 to 93 hours per year and carry 12 to 68 kilos per kilometer per day. Households collected firewood approximately every other day spending a minimum of 38 minutes and a maximum of 98 minutes. Firewood transport time is dependent on trip-chaining, agro-ecological zone, population density, and cooking techniques. The author advocates using water supply projects, woodlots, wood-burning stoves, and provisioning



grinding mills closer to households in order to free labor. Yet, the decision to dedicate time to productive activities depends on a number of factors, including intrahousehold relations, net income, and the perceived state of well-being.

The results of the time use surveys can be used to characterize the nature of women's work, including suggested policy interventions.

Oxaal, Z. 1997. Bibliography on gender and rural transport.  
<<http://www.bridge.ids.ac.uk/reports/bb5c.pdf>

This bibliography is intended as background information for a project seeking to identify the priorities for women in rural transport.

Porter, G. 2007. Transport, (im)mobility and spatial poverty traps: Issues for rural women and girl children in sub-Saharan Africa. A paper prepared for the international workshop "Understanding and addressing spatial poverty traps: an international workshop" 29 March 2007, Spier Estate, Stellenbosch, South Africa. Hosted by the Chronic Poverty Research Centre and the Overseas Development Institute.

Porter presents the results of qualitative surveys conducted in Ghana and Malawi concerning girls' access to rural services, including schooling, health care, and markets. She also quotes a few quantitative studies, including one in Morocco that shows that paved roads increase school attendance by 54 percent. Girls in Ghana mentioned a number of reasons for not walking the long distances (up to 8 km) to school, including seasonally impassable roads, tardiness due to household chores, fear of rape, fear of snakes and ghosts, and muddied appearance from dusty conditions. From a policy perspective, the author suggests improving roads, providing IMTs, including bicycles and carts, and service provision, including water and woodlots as a way of freeing time (cites Malmberg-Calvo 1994).

Turner, J., and P. Fouracre. 1995. Women and transport in developing countries. *Transport-Reviews* 15(1): 77-96.

*Transport is an essential element in women's lives. It determines access to a range of essential resources and activities such as employment, health care, education, and child care. The purpose of this paper is to review what is known and to assess, in general terms, whether and how transport could contribute more positively to women's interests. The paper examines the roles of women in society and identifies the ways in which transport impinges on these roles. Quantitative evidence is presented on the way in which women use transport and some of the short-comings of transport, in this respect, are identified. What is clear is that most planning and development decisions are undertaken by men with little or no regard paid to women's needs. There is a need for a greater awareness throughout all aspects of transport - engineering and planning, urban and rural - of its development impact on the triple role of women in society. The inclusion of more comprehensive gender-awareness into all fields of transport research can help to explore ways of correcting bias, and provide a sounder basis for policy advice.*

## Labor saving infrastructure

Barnes, D., and M. Sen. 2003. "The Impact of Energy on Women's Lives in Rural India." Washington, D.C.: UNDP/World Bank Energy Sector Management Assistance Programme.

In India, 500,000 premature deaths—mostly children and women—from exposure to smoke from biomass use. Reviews the biomass, LPG and kerosene markets in India, differentiating between rural and urban use patterns. Finds that rural household that gain income will continue to favor wood instead of healthier technologies, including LPG and kerosene. Urban households, on the other hand, need to purchase all fuels and may be more likely to consume gases if they were competitive with fuelwood. Between 1999-2000, 90 percent of rural households used no gases, only wood and dung.

Chattopadhyay, R., and E. Duflo. 2004. Women as policy makers: Evidence from a randomized policy experiment in India. *Econometria* 72(5): 1409-43.

Cosgrove, W. J., and F. R. Rijsberman. 1998. Creating a vision for water, life and the environment. *Water Policy* 1(1): 115-122.

Africans spend 40 billion hours carrying water each year. Also, 4 million children die of water-borne illness every year.

Fong, M.S., W. Wakeman, and A. Bhushan. 1996. *Toolkit on gender in water and sanitation*. Gender Toolkit Series 2, World Bank: Washington, D.C.

Glick, P., R. Saha, and S.D. Younger. 2004. Integrating gender into benefit incidence and demand analysis. A report prepared by Cornell University Food and Nutrition Policy Program. Ithaca, N.Y.: Cornell University.

This paper discusses the link between public expenditure and gender equity. It examines a number of public works projects, including water infrastructure, health services and education. It contains water collection times for a number of SSA countries.

Gross, B., C. van Wijk, and N. Mukherjee. 2001. *Linking sustainability with demand, gender, and poverty: A study in community managed water supply projects in fifteen countries*. Water and Sanitation Program Report. Delft: International Water and Sanitation Centre.

Hutton, G. and L. Haller. 2004. *Evaluation of the costs and benefits of water and sanitation improvements at the global level*. Water, Sanitation, and Health Protection of the Human Environment. Geneva: WHO.

This study from the WHO calculates hours saved as a result of five different water and sanitation interventions (assumes a household saves 90 minutes a day with piped water access). It's not gender differentiated, but it does make basic assumptions on time savings for different regions. This paper helps to characterize the potential time savings for women in order to advocate better rural service provision.

Ilahi, N., and F. Grimard. 2000. Public infrastructure and private costs: Water supply and time allocation of women in rural Pakistan. *Economic Development and Cultural Change* 49(1): 45-75

The paper discusses a negative relationship between water infrastructure developments in rural Pakistan and women's time burden. It argues that water infrastructure development can increase time available for women to do income generating activities.

Khosla, P., and R. Pearl. 2003. Untapped Connections: Gender, Water and Poverty: Key Issues, Government Commitments And Actions for Sustainable Development. WEDO. [http://www.wedo.org/files/untapped\\_eng.pdf](http://www.wedo.org/files/untapped_eng.pdf)

This paper presents an overview of the relationship between gender, poverty and water. The first section explores how, in every corner of the globe, women play a central role in managing water supply and distribution. It also examines how access to water and sanitation has implications for women's health and economic activities. Case studies highlight water projects and initiatives that have succeeded in elevating women's status.

Lenton, R., A. M. Wright, and K. Lewis. 2005. *Health, dignity, and development: what will it take?* UN Millennium Project Task Force on Water and Sanitation. London: Earthscan.

One MDG is to ensure that boys and girls have equal access to attend school. As a result, water and sanitation improvements are a means to reach that end. In Chapter 2 of this report, the authors draw on theories that relate poverty alleviation to water supply improvement, especially labor saving for women. They highlight the gender-differentiated uses and roles of water. While they quote Cosgrove and Rijsberman (1998) reporting 40 billion hours could be saved by women carrying water in Africa, this paper is not itself quantitative. It can be used to discuss how water and sanitation services are a means to achieve equal access to education (an MDG).

Lewis, K., and N. Havaligi. 2007. Gender mainstreaming: A key driver of development in environment and energy. UNDP, Accessed online 23 October 2007 <http://www.energyandenvironment.undp.org/undp/indexAction.cfm?module=Library&action=GetFile&DocumentAttachmentID=2315>

The authors give a conceptual overview of the gender focus that energy and environment development requires through a characterization of women's role in the development and management of natural resources, including access to energy and water services. The authors draw upon some literature in order to characterize women's roles.

Modi, V. 2004. "Energy and Transport for the Poor." Paper commissioned for the U.N. Millennium Project Task Force 1. New York: Earth Institute and Columbia University, Department of Mechanical Engineering.

Moriarty, P., J. Butterworth, and B. van Koppen. 2004. *Beyond domestic: Case studies on poverty and productive uses of water at the household level*. Technical Paper Series no. 41. Delft, the Netherlands: IRC International Water and Sanitation Centre.

A compilation of case studies to evaluate the time savings and income gains as a result of water infrastructure development and the resulting application of water as an input in women's micro enterprises.

Perez, J.C., and M. Castresana. 2004. Productive uses of water at the household level: evidence from Bushbuckridge, South Africa. In *Beyond Domestic: Case Studies on Poverty and Productive Uses of Water at the Household Level*. Ed. Moriarty, P., J. Butterworth, and B. van Koppen. Technical Paper Series no. 41. Delft, the Netherlands: IRC International Water and Sanitation Centre.

While not quantitative, the paper describes South African villages with accessible and reliable water service that were found more likely to have vegetable gardens, fruit trees, micro enterprises like beer making and hairdressing, and own livestock—all traditionally women's sectors—in comparison to villages that had no reticulated water supply.

Verhagen, J., A. J. James, C. van Wijk, R. Nanavatty, M. Parikh, and M. Bhatt. 2004. Linking water supply and poverty alleviation: The impact of women's productive use of water and time on household economy and gender relations in Banaskantha District, Gujarat, India. Delft, the Netherlands: IRC International Water Center.

Using case studies and secondary census data, the IRC characterizes the extent that time savings in water transport by women in rural India leads to productivity gains in micro-enterprises. The authors find that, on average, women could free between 45 and 152 work days if they spent only one hour per day fetching water. Instead, women on average spent 3 hours a day fetching water, and the total household spent 5 hours a day even in areas where piped water is available. Yet, by decreasing the amount of time women in drought prone rural areas in India fetch water to under one hour per day, annual earnings from micro enterprises could improve between 750 to 5,520 rupees per woman, depending on craft.

WASH. 2006. For her it's the big issue: Putting women at the centre of water supply, sanitation and hygiene. Water, Sanitation and Hygiene (WASH) Evidence Report.  
[http://www.wsscc.org/pdf/publication/FOR\\_HER\\_ITs\\_THE\\_BIG\\_ISSUE\\_Evidence\\_Report-en.pdf](http://www.wsscc.org/pdf/publication/FOR_HER_ITs_THE_BIG_ISSUE_Evidence_Report-en.pdf)

This report is a collection of evidence, brief examples highlighting the effect and benefits of placing women at the core of planning, implementation and operations of WASH programs. The experiences also show how women's empowerment and the improvement of water supply, sanitation facilities and hygiene practice are inextricably linked. One cannot be successfully achieved without the other.

Water Aid. 2006. Gender aspects of water and sanitation. Accessed on 8/08/07 from  
[http://www.wateraid.org/international/what\\_we\\_do/policy\\_and\\_research/4602.asp?Keywords=158&Subject=gender&Author=&Country=0&Language=0&Sort=Date&Display=results](http://www.wateraid.org/international/what_we_do/policy_and_research/4602.asp?Keywords=158&Subject=gender&Author=&Country=0&Language=0&Sort=Date&Display=results)

Water Aid draws on the literature concerning the importance of providing water and sanitation to meet the MDG 3, target 4: eliminating gender disparity in primary and secondary educational attainments. The authors cite labor and time savings (Hutton and Haller 2004), as well as safety and health reasons for improved infrastructure. Based on this synthesis of the literature, the authors make programmatic recommendations to DFID. The paper supports the position that water and sanitation services are means to achieve equal access to education (an MDG).

Whittington, D., M. Xinming, and R. Roche. 1990. "Calculating the value of time spent collecting water: Some estimates for Ukunda, Kenya. *World Development* 18(2): 269-280.

### **2.3. Gender and technology adoption**

World Bank. 2008. *Gender in agriculture sourcebook*. World Bank: Washington, D.C.

#### **2.3.1. Impacts on productivity**

Alderman, H., L. Hoddinott, L. Haddad and C. Udry. 2003. Gender differentials in farm productivity: Implications for household efficiency and agricultural policy. In *Household decisions, gender, and development: A synthesis of recent research*, ed. A. Quisumbing. IFPRI: Washington, D.C.

Using panel data of 150 poor households in Burkina Faso, the authors compare women and men's crop yields by controlling for plot differences and inputs. The results show that, while women have lower yields, the differences are attributed to differential access and intensity of fertilizer and labor inputs. As a result, the authors determine that reallocating these inputs to women leads to a 10 to 20 percent increase in total household yield. The policy intervention here would be gender-targeted input allocation.

Arndt, C., and F. Tarp. 2000. Agricultural technology, risk, and gender: A CGE analysis of Mozambique. *World Development* Vol. 28, Issue 7: 1307-1326.

*Interactions between agricultural technology improvements, risk-reducing behavior, and gender roles in agricultural production in Mozambique are examined. The analysis employs, computable general equilibrium (CGE) model that explicitly incorporates key features of the economy. These include: detailed accounting of marketing margins, home consumption, risk, and gender roles in agricultural production. Our results show that agricultural technology improvements benefit both male and female occupants of rural households. Due to economic interactions, agricultural technology improvements are particularly compelling when combined with marketing system improvements. Moreover, technological change in cassava appears to be a particularly strong lever for increasing female and overall household welfare, especially when risk is considered.*

Ay, P. 1990. *Women in Food Processing: Traditional Palm Oil Production and Changes through the Introduction of Appropriate Technology*. Ibadan: UNDP/ILO/FRARD and Book Builders Ltd.

Bhagowalia, P., S. Chen and G. Shively. 2007. Short Term Investment in Agriculture: Is There a Gender Bias? American Agricultural Economics Association, Annual Conference, Portland, OR: July 31.

By examining cross-sectional household data from rural India, the authors find that the amount of boy children in a household has positive effects on input intensity, mainly fertilizer and manure. In addition, there is a positive correlation between land holdings and boy children.

Doss, C. R. 2001. Designing agricultural technology for African women farmers: Lessons from 25 years of experience. *World Development* 29 (12): 2075-2092.

Reviews the factors that influence the gender-differentiated access to technology, including land, existence and efficacy of extension services and labor availability, but does not address empirical studies that measure any productivity gains as a result of gender targeted programs. In addition, the studies are analyzed by addressing potential well-being gains for women specifically, instead of productivity gains at the household level. Overall, the review frames considerations that need to be made in the design of policies targeted to increase women's and, as a result, household well-being. This study helps to characterize the problems resulting from gender-differentiated access to technology and inputs.

Doss, C. and M.L. Morris. 2001. How does gender affect the adoption of agricultural innovations? The case of improved maize technology in Ghana. *Agricultural Economics* 25(1): 27-39.

Doss and Morris seek to explain differing rates of maize production technology adoption between women and men in Ghana. By analyzing maize farmer surveys conducted in 1997 to 1998 using econometric techniques, the authors discover that gender, per se, is not a significant explanatory variable. However, technology adoption could be explained by levels of access to resources, including land, extension services and labor, all of which women were found to have less of. As a result, the authors suggest "increasing women's access to key resources" as the obvious policy option.

Gilbert, R. A., W. Sakala, and Todd D. Benson. 2002. Gender analysis of a nationwide cropping system trial survey in Malawi. *African Studies Quarterly* 6(1).  
<<http://web.africa.ufl.edu/asq/v6/v6i1a9.htm>>

*The majority of farmers in sub-Saharan Africa are female, yet women often have limited access to extension information and agricultural inputs. Designing improved agricultural research and extension services for women in Africa is a challenging task since female farmers defy simple characterizations, and the effect of gender versus income levels relative to quality of extension services received is difficult to disentangle. The accurate characterization of farmers targeted by extension on a large scale supports efforts to quantify potential impacts of extension programs in Africa. A nationwide trial comparing legume cropping systems to fertilized and unfertilized maize controls was implemented at approximately 1400 on-farm sites by the Malawian extension service and cooperator farmers in the 1998-99 cropping season. In addition to agronomic yield data collection, extension agents conducted a socioeconomic*

*survey of the farmers involved in the trial. The objective of the survey was twofold: to determine socioeconomic characteristics of the farmers collaborating with the extension service, and to assess farmer opinions regarding the cropping systems being promoted. Of the 1385 sites, only 270 (19 percent) involved female farmer cooperators, although women constitute 69 percent of the full-time farmer population in Malawi. The 1115 male farmers had significantly greater experience as head of household, used more fertilizer, and devoted a greater area to cash crops. There were no significant gender differences across crop yields when inputs were supplied, indicating that female farmers were as productive as their male counterparts. Farmer ranking and rating of the cropping systems were remarkably similar between the genders. Mucuna pruriens was perceived as having the lowest overall labor requirements, while fertilized maize had the highest food production rating. Unfertilized maize and local control plots fared poorly in both farmer rating and ranking of treatments. Overall, these results suggest that the extension service skewed the trials toward “well-to-do” male farmers. However, the extension service was able to implement a complex trial that included field days attended by over 106,000 farmers. Thus the national extension service in Malawi may well be suited to collaborate with and “scale-up” locally significant NGO efforts which may target more representative farmers.*

Naved, R.T. 2000. *Intrahousehold Impact of Transfer of Modern Agricultural Technology: A Gender Perspective*, Food Consumption and Nutrition Division Discussion Paper 85. Washington D.C: IFPRI.

This study recounts narratives from women participants in NGO diffused vegetable production program. The women’s overall well-being improved by substituting home grown vegetables instead of purchasing; however, did not report direct income as a result of program.

Njiro, E. 2006. The gender variable in agricultural technology: a case study of rural farmers in Machakos District, Eastern Kenya. ATPS Working Paper No. 44.  
<<http://www.atpsnet.org/content/files/documents/working%20paper%20series%2038.pdf>

*Judged by the usual economic measures tea and coffee production have in the past been Kenya’s most successful examples of transfer of technology among small scale farmers, but while ample technical, financial and legal information exists, there has been inadequate information about the effect that the adoption of this technology has had on gender roles within the communities concerned.*

*Kiambu District in the Central Province of Kenya was selected as the study site because it was among the first to pioneer tea and coffee production by African farmers, and also because it has typically heavy participation by female farmers in tea and coffee production. This study proposed to assess the effects of the adoption of an entire package of technology on gender roles in Kiambu District with the intention of positively influencing policy.*

*Specific objectives were to assess:*

*§ The effect the adoption of agriculture technology has had on the socio-economic status of males, females and different age groups § The impact that the adoption of this technology has*

*had on division of labour § The extent to which support services for this package of technology are gender sensitive § The impact that this technology has had on gender roles with respect to post harvest activities.*

*This study used a survey instrument, literature search, and direct observation, to collect data from small scale farmers, regarding the effects of tea and coffee production on gender roles in the Kiambu district of the Central province of Kenya. Focussed group discussions and key informants were used to validate the data collected. During the survey 338 respondents were interviewed using purposive random sampling of the six divisions that make up Kiambu district. Of these 36 percent were women and 64 percent were men. The respondents were further broken down into three types of households, male-headed (77 percent), female-headed (18 percent) and female-operated households (4 percent), based on the de jure and de facto heads of the household. They were also broken down according to the two crops. Analysis was done for socio-economic status, division of labour, access to support services, social affiliation and marketing.*

*The results showed gender disparities among the sexes, age groups and types of household. Tea earnings are higher and more reliable than those of coffee, yet coffee farmers enjoy a higher standard of living than tea farmers. Participation in production by those under 30 years of age was negligible.*

*Female-headed households have less access to resources, education, support services, and postharvest services. Such disparities need to be addressed if the performance of small-scale cash crop farmers is to improve.*

Saito, K. A., H. Mekonnen, and D. Spurling. 1994. *Raising the productivity of women farmers in Sub-Saharan Africa*. Washington, DC: The World Bank.

*This overview volume presents the findings of a UNDP-funded, World Bank-executed project on Women's Agricultural Productivity in Africa (WAPIA). The overview is based primarily on four countries - Burkina Faso, Kenya, Nigeria, and Zambia. These studies document women's roles in agriculture, identify and evaluate the key constraints they face in attempting to raise their productivity, and recommend various policies, programs and projects to remove these constraints. All four country studies entailed some field work and benefited from specialized studies undertaken by local researchers. The report is also based on the evidence from household field surveys in Kenya and Nigeria. This rich body of information has enabled difference in output between male and female farmers to be analyzed and explained. For example, this analysis shows that extension contact in Kenya contributes significantly and positively to output on male-managed plots, but not on female-managed plots, giving an insight into the effectiveness of current extension systems in at least one large country in sub-Saharan Africa (SSA).*

This study helps to characterize the problems resulting from gender-differentiated access to technology and inputs.



Rossi, A., and Y. Lambrou. 2008. Gender and equity issues in liquid biofuels production: minimizing the risks to maximize the opportunities. Rome: Food and Agriculture Organization of the United Nations.

Udry, C. 1996. Gender, agricultural production, and the theory of the household. *Journal of Political Economy*, 104, 1010-1046.

This uses the same household survey from Burkina Faso from Alderman et al (2003). ]

Zwarteveen, M. 1997. A plot of one's own: Gender relations and irrigated land allocation policies in Burkina Faso. International Irrigation Management Institute (IIMI).

<http://www.iwmi.cgiar.org/pubs/pub010/REPORT10.PDF>

*Land allocation policies in command areas<sup>1</sup> of new irrigation systems rarely allow women to obtain an irrigated plot. Plots are normally given to heads of households only, the majority of whom are men. Even though a number of studies suggest that allocation of irrigated plots to men only is one of the causes for the disappointing performance of irrigation projects in West Africa (e.g., Carney 1988; Dey 1990; Jones 1986), the normal practice in Burkina Faso continues to be the allocation of plots to male-headed households only. The reluctance to allocate plots to women stems from a number of implicit and explicit assumptions about the intra-household organization of agricultural production, and about the roles of men and women in this organizational setup. In particular, (1) there is fear among policy makers and project planners that the allocation of plots to both men and women will result in lower overall irrigated agricultural productivity, and (2) the need for allocating plots to women is not clear, because it is assumed that women will benefit from the plots of their husbands. Also, unless plot sizes are varied, allocating more than one plot to a single household will be inequitable as it will lead to a situation where fewer households will have access to irrigation.*

### **2.3.2. Impacts on nutrition and food security**

Chavas, J-P., and A. Uriarte. 1999. Agricultural Policy, Employment and Resource Access: Micro Foundations for Sustainable Nutritional Improvements. Madison, WI: University of Wisconsin-Madison.

Johnson-Welch, C., and B. Alemu. 2000. Improving Household Food Security: Institutions, Gender, and Integrated Approaches. Madison: Land Tenure Center, University of Wisconsin-Madison.

Johnson-Welch, Charlotte, K. MacQuarrie, and Sandra Bunch. 2005. A Leadership Strategy for Reducing Hunger and Malnutrition in Africa: The Agriculture Nutrition Advantage, Washington, D.C.: International Center for Research on Women (ICRW).

A summary of the agriculture and nutrition linked, gender-informed project in SSA. Drawing on literature that provides evidences that women's income more than men's is used toward family well-being, the authors argue for a gender-informed approach to nutrition improvement programs. Gender-informed strategies suggested include extension services, preferential crop varieties and women-targeted productive technologies. The main focus of the report is to

summarize the capacity building workshops performed with various stakeholder groups, including governmental and non-governmental groups. Useful bibliography.

Mulokozi, G., and L. Mselle. 2001. Reducing subclinical vitamin a deficiency through women's adoption of appropriate technologies in Tanzania. *Food and Nutrition Bulletin* 22 (4): 400-407.

The paper reviews a program that specifically developed technology for women to improve nutrition as it recognized their role in food provision.

Quisumbing, A., and L. Haddad. 1998. Gender Issues for food security in developing countries: Implications for project design and implementation. *Canadian Journal of Development Studies* 19 (special issue): 185-208.

Ramirez, R. 2002. *Effectiveness of small-scale agriculture interventions on household food security: A review of the literature (Phase 1, Part 2)*. Gatineau, Quebec: Canadian Foodgrains Bank; Inter Pares; Partners in Rural Development; Program Against Hunger, Malnutrition and Disease; and Canadian International Development Agency.

The authors use the Sustainable Livelihoods Approach (SLA) as a narrative, highlighting the different assets that can be regenerated and supported by small-scale agricultural interventions.

#### **2.4. Women's education**

Avotri, R., L. Owusu-Darko, H. Eghan, and S. Ocansey. 1999. Gender and primary schooling in Ghana. Sussex: Institute of Development Studies, October 1999.

This is a book, but there is also Research Report #37. There are many country studies from the other all project "Gender and Primary Schooling in Africa".

Birdsall, N. and R. Levine. 2005. Toward universal primary education: Investments, incentives, and institutions. UN Task Force on Education and Gender Equality. London: Earthscan.

Birdsall, N. 1993. *Social development is economic development* Working Paper 1123, Policy Research Department. Washington, D.C.: The World Bank.

This is a transcript of a presentation made to the UN General Assembly making four points, namely that social development is the key to economic development. Birdsall focuses on the returns to education, especially women's education, in increasing well-being. It compiles econometric studies from Summers (1992) and shows how women's education has a strong negative correlation with infant mortality and fertility rates.

Chernikovsky, D. 1985. Socio-economic and demographic aspects of school enrollment and attendance in rural Botswana. *Economic Development and Cultural Change* 33: 319-32.

DeTray, D. 1988. Government policy, household behavior and the distribution of schooling: A case study of Malaysia. In *Research in Population Economics: A Research Annual*, ed. T.P. Schultz. Vol. 6: 303-36. Greenwich, CT: JAI Press.

Glick, P. 2006. "Policy Impacts on Schooling Gender Gaps in Developing Countries: the Evidence and a Framework for Interpretation," <<http://www.cfnpp.cornell.edu/images/wp196.pdf>>

*In many regions of the developing world girls continue to receive less education than boys. This paper reviews the evidence on the effects of policies in the education sector and outside it on household schooling investments in girls and boys, distinguishing between policies that are ostensibly gender neutral and those that explicitly target girls. It is frequently (but certainly not universally) found that the demand for girl's schooling is more responsive than boys' to gender neutral changes in school cost or distance as well as quality. Although these patterns can be interpreted in terms of parental preferences, this paper shows that they can also plausibly be explained within a human capital investment framework through assumptions about the nature of schooling cost and returns functions. Among these policies, increasing the physical accessibility of schools emerges as a measure that may result in disproportionate enrollment gains for girls. Where gender gaps are large or persistent, however, direct targeting of girls is probably necessary. Formal evidence from a number of demand or supply side interventions, including subsidies to households and to schools to enroll girls and the provision of girls-only schools, suggests the potential for targeted measures to yield substantial gains for girls. Many other policies, such as subsidized childcare or flexible school scheduling that address the opportunity costs of girls' time, hold promise but for the most part have yet to be subject to rigorous assessment. The paper discusses methodological problems in such assessments and concludes with suggestions for future research on policies to close schooling gender gaps.*

Hannum, E., and C. Buchmann. 2005. Global education expansion and socio-economic development: An assessment of findings from the social sciences. *World Development* 33(3): 333-354.

This offers an excellent review of the theoretical and empirical literature.

Herz, B., K. Subbarao, M. Habib, and L. Raney. 1991. *Letting girls learn: Promising approaches in primary and secondary education*. World Bank Discussion Paper No. 133. Washington, DC: World Bank.

This is a review of the theoretical literature that implicates education to fertility declines, increased productivity, decreased poverty, and improved health of children and mothers. The paper details a number of policy options and their expected outcomes and limitations.

Hill, M.A., and E.M King. 1993. Women's education in developing countries: An overview. In *Women's education in developing countries: Barriers, benefits, and policies*, ed. E.M. King and M.A. Hill. Baltimore, MD: Johns Hopkins University Press.

*Dependent variable(s) estimated: economic growth; mortality; life expectancy.*

The authors find both the absolute level of female enrollment rates and the ratio of female to male enrollment have a negative relationship with life expectancy, infant mortality, adult mortality and fertility. In addition the authors find that female education has strong positive impact on levels of GNP.

King, E., and R. Bellew. 1991. Gains in the education of Peruvian women, 1940-1980. In, *Women's Work, Education and Family Welfare in Peru*. ed. Herz, B. and S. Khandker. World Bank Report No 116. Washington, D.C.: World Bank.

Schultz, T.P. 1989. Returns to Women's Education. Working Report, PHRWD No 001. Washington, D.C.: World Bank.

Summers, L. 1994. *Investing in all the people*. Washington, DC: The World Bank.

Summers, L.H. 1992. *Investing in all the people*. Development Economics Working Paper No. 905. Washington, DC: The World Bank.

Presented to the Pakistan Society of Development Economists in order to inspire a commitment to girls education in order to decrease infant mortality birth rates and increase well-being. Summers says that girls' education is the most critical undertaking in human development. Compiles statistics from other [not yet located] studies in order to provide economic data on the returns to girls education investment.

#### **2.4.1. Impact on growth**

Abu-Ghaida, D., and S. Klasen (2004). The Costs of Missing the Millennium Development Goal on Gender Equity. *World Development*, 32 (7), 1075-1107.

*Dependent variable(s) estimated:* **economic growth; fertility; child mortality; malnutrition.**

The authors use World Bank data on school enrollments from 1999 in order to project the impact of failing to meet the MDG of gender equality in education by 2005 on economic growth, child mortality, under nutrition, and mortality. A description of the data indicates that of 155 countries, 77 are on track, 33 off track and 45 lack data. One half of the counties off track are in the Middle East, Africa and South Asia. Using the estimated equations developed by Knowles et al. (2002) and Klasen (2002) for growth, own estimates for fertility, Schultz (1994) for child mortality, and Smith and Haddad (1999) for malnutrition, the authors find that for countries projected not to meet the 2005 goal, an average annual loss of 0.4 percent in growth can be expected through 2005 to 2015. For the same countries eliminating gaps in education could have reduced fertility by 0.6 percent fewer children per women by 2015, and reduced child deaths by 20 to 32 per 1,000 live births.

Specifically for fertility, the authors eliminate child mortality from the estimated equation in order to measure the total effect of female education on fertility. The authors estimate two specifications of education: male and female years of schooling and male and female male ratio of years of schooling. Significant explanatory variables include per capita income, and regional dummy variables.

Forbes, K. 2000. A reassessment of the relationship between inequality and growth. *American Economic Review* 90: 869-887.

Dependent variable(s) estimated: **economic growth.**

The author updates an estimated equation found in the literature using GMM techniques. The main independent variables are Gini coefficient, GNP/capita, average years of schooling separately for male and females, and a proxy for investment levels. All data are on the country level and averaged over five year intervals from 1960 to 1995. Data are available for 45 countries, none of which are in SSA, although the author conducts a sensitivity analysis. The result of the regression shows a negative relationship between gender inequality in education and growth with all variations of the estimated equation.

Klasen, S. 1999. *Does gender inequality reduce growth and development? Evidence from cross-country regressions*. World Bank Policy Research Report Working Paper No. 7. Washington, DC: The World Bank.

*Dependent variable(s) estimated: economic growth; fertility; child mortality.*

The author estimates a number of equations in a path analysis, each with different proxies for female education and other explanatory variables to explain differences in growth rates for 109 countries between 1960 and 1990. In addition, the author estimates separate equations to determine the impact of female education on fertility and child mortality. The results indicate a significant negative relationship between growth and education, fertility and child mortality. Finally, the author determines that differences in levels of female schooling can explain growth rates across regions and countries and gives specific examples in Africa.

Klasen, S. 2000. *Malnourished and surviving in South Asia, better nourished and dying young in Africa: What can explain this puzzle?* SFB Discussion Paper 214, University of Munich.

Klasen, S. 2002. Low schooling for girls, slower growth for all? Cross-country evidence on the effect of gender inequality in education on economic development. *World Bank Economic Review* 16(3): 345–373.

*Dependent variable(s) estimated: economic growth.*

Empirical results show that 0.4 to 0.9 percent of differences in growth rates between geographic regions can be explained by gender gaps in education. Data are from national surveys conducted between 1960 and 1992.

Klasen, S., and Lamanna, F. 2003. The impact of gender inequality in education and employment on economic growth in the Middle East and North Africa. Mimeographed, University of Munich

Knowles, S., P.K. Lorgelly and P.D. Owen. 2002. Are educational gender gaps a brake on economic development? Some cross-country empirical evidence. *Oxford Economic Papers* 54: 118–149.

*Dependent variable(s) estimated: economic growth.*

The authors estimate the Solow neo-classical growth model with female and male levels of education as explanatory variables. Used in Abu-Ghaida and Klasen (2004) in order to compare to their own estimated growth projections.

Schultz, T.P. 1993. “Returns to Women’s Education” in *Women’s education in developing countries: Barriers, benefits, and policies*. Baltimore, MD: Johns Hopkins University Press.

*Dependent variable(s) estimated: economic growth.*

The authors discuss the private and social returns to education, including a review of the quantitative literature and estimation considerations. An example is provided using data from Thailand in order to demonstrate techniques for sample selection bias. In addition, non-market returns to education are presented along with descriptive statistics for factors including fertility, child mortality and contraceptive use. Finally, the study includes an appendix that dedicated to estimation issues for returns to schooling.

#### **2.4.2. Impact on fertility**

Ainsworth, M., K. Beegle, and A. Nyamete. 1996. The impact of female schooling on fertility and contraceptive use: A study of 14 Sub-Saharan countries. *The World Bank Economic Review* 10(1): 85-122.

*Dependent variable(s) estimated: fertility; contraceptive use.*

Authors present empirical results of DHS in 14 SSA countries. The studies show that for all countries, average levels of education are lower for women and girls, ranging from less than two years to six. The authors estimate two equations, one with cumulative fertility (i.e. children ever born) as the dependent variable and the other with a dummy variable to capture to current usage of modern contraception. Four different measures of female schooling are tested, as well as running separate equations for rural versus urban cohorts, and to test the influence of male education on these decisions. Empirical results show a negative relationship with primary education and fertility, increasing with the number of years of schooling. In addition, years of schooling was shown to have a positive relationship with contraception use across all cohorts. The author, however, indicates that there is large variation in magnitude of these effects over the countries surveyed. Data are from the early 1990s.

Benefo, K.D., and P.T. Shultz. 1994. *Determinants of fertility and child mortality in Cote d'Ivoire and Ghana*. LSMS Working Paper No. 103, World Bank: Washington, D.C.

*Dependent variable(s) estimated: fertility; child mortality.*

Using a subset of the Living Standards Measurement Study from Ghana and Cote d'Ivoire from three year time periods in the 1980s, the authors estimate the impacts of female education and many other explanatory variables, including regional, community and price dummies, on fertility and child mortality. The results indicate that female education is the most significant explanatory variable across countries for fertility, while less significant in predicting child mortality. Cross-country variation exists, especially when examining the effects of income.

Castro Martín, T. 1995. Women's education and fertility: Results from 26 Demographic and Health Surveys. *Studies in Family Planning* 26(4): 187-202.

*This article presents an updated overview of the relationship between women's education and fertility. Data from the Demographic and Health Surveys for 26 countries are examined. The analysis confirms that higher education is consistently associated with lower fertility. However, a considerable diversity exists in the magnitude of the gap between upper and lower educational strata and in the strength of the association. In some of the least-developed countries, education might have a positive impact on fertility at the lower end of the*

*educational range. Yet, compared with patterns documented a decade ago, the fertility-enhancing impact of schooling has become increasingly rare. The study also examines the impact of female education on age at marriage, family-size preference, and contraceptive use. It confirms that education enhances women's ability to make reproductive choices.*

Castro Martín, T. 1995b. The impact of women's education on fertility in Latin America: Searching for explanations. *International Journal of Planning Perspectives* 21(2) 52-80.

Not an empirical study, this article describes data from nine Latin American countries from 1985-89 showing a negative correlation with years of education and number of children.

Cochrane, S. 1979. Education and fertility: What do we really know? World Bank Study No 26. Washington, D.C.: World Bank.

Derose, L. F., and O. Kravdal. 2007. "Educational Reversals and first-birth timing in sub-Saharan Africa: A dynamic multilevel approach," *Demography* v44, n1: 59-77.

As a result of decreases in educational attainments in the 1980s and 1990s in SSA, the negative relationship between fertility and educational level could not be sustained in the presence of relatively higher educated community cohort. As a result, fertility has increased relative to previous cohorts.

Duraiswamy, P. 1989. Fertility and child schooling in rural India: Evidence from aggregate panel data. Presented at the Conference on the Family, Gender Differences, and Development, Economic Growth Center, Yale University, 4-6 September 1989.

Hirschman, C., and P. Guest. 1990. Multilevel Models of fertility determination in four southeast Asian countries: 1970 and 1980. *Demography* 27:369-96.

Jejeebhoy, S.J. 1995. *Women's Education, autonomy, and reproductive behaviour: Experience from developing countries*. Oxford: Clarendon Press.

Lam, D., and S. Duryea. 1999. Effects of schooling on fertility, labor supply, and investments in children, with evidence from Brazil. *Journal of Human Resources* 24:160-92.

*We explore the mechanisms driving the negative relationship between parents' schooling and fertility. Brazilian data demonstrate strong negative effects of women's schooling on fertility over the first eight years of schooling. We observe no increase in women's labor supply, however, in spite of rapidly rising wages, suggesting that reservations wages rise as fast as market wages over this range. We find strong effects of parental schooling on children's schooling and survival. We conclude that the effects of early years of schooling on fertility work primarily through increased investments in child quality, with only a minor role played by rising women's wages.*

Murthi, M. 2002. Fertility change in Asia and Africa. *World Development*, 30(10): 1769-1778.

Murthi, M., A.-C. Guio, and J. Dreze. 1995 Mortality, fertility, and gender bias in India: A district-level analysis. *Population and Development Review* 21: 745–782.

Murthi, M., and J. Dreze. 2001. Fertility, education, and development: Evidence from India. *Population and Development Review* 27: 33–63.

Osili, U. O. and B.T. Long. 2007. Does female schooling reduce fertility? Evidence from Nigeria. NBER Working Paper No. W13070

Osili, U.O. and B.T. Long. 2008. Does female schooling reduce fertility? Evidence from Nigeria. *Journal of Development Economics* 87: 57-75

*The literature generally points to a negative relationship between female education and fertility. Citing this pattern, policymakers have advocated educating girls and young women as a means to reduce population growth and foster sustained economic and social welfare in developing countries. This paper tests whether the relationship between fertility and education is indeed causal by investigating the introduction of universal primary education in Nigeria. Exploiting differences by region and age, the paper uses differences-in-differences and instrumental variables to estimate the role of education in fertility. The analysis suggests that increasing education by one year reduces fertility by 0.26 births.*

*As showing the result of the Universal Primary Education Program in Nigeria, an analysis of a 1999 Demographic and Health Survey show that for everyone one year increase of female education, fertility declines by 0.26 births.*

Panopoulou G. and P. Tsakloglou. 1999. Fertility and economic development: theoretical considerations and cross-country evidence. *Applied Economics* 31 (11):1337-1351.

*The paper presents a theoretical background for the analysis of the relationship between fertility and a number of socioeconomic factors associated with the process of economic development and analyses empirically this relationship within a cross-country framework. Fertility is found to be negatively related with female education, urbanization and family planning and positively related with the levels of infant mortality and economic development, whereas no significant relationship between fertility and female labour force participation is established. Sensitivity analysis is performed and the policy implications of the empirical findings are briefly discussed.*

Schultz, T. P. 1994. Human capital, family planning, and their effects on population growth. *American Economic Review* 84(2): 255–260.

*Dependent variable(s) estimated: **fertility; child mortality.***

The author uses a cross-section of data from 68 low-income countries for the years 1972, 1982, and 1989. Using a number of explanatory variables, including women's education and family planning, the author estimates a fixed-effects model to predict the effects on fertility and child mortality, and the resulting population impacts. The preferred model shows that female



education is the single most significant predictor, while family planning programs do not impact the dependent variables significantly.

Schultz, T. P. 1997. Demand for children in low income countries. In *Handbook of population and family economics*, ed. M. Rosenzweig and O. Stark. Amsterdam: Elsevier.

*Dependent variable(s) estimated:* **fertility; child mortality; family planning activity.**

This study updates Schultz (1994) and are the estimation techniques used in Abu-Ghaida and Klasen (2004). Comprehensive review of demographic drivers from 1750 onwards. Includes an in-depth discussion of the micro foundations of household behavior in order to develop related reduced form equations for evaluation with econometric techniques. Estimates various equations, including treating fertility and child mortality as endogenous and using 2SLS regression techniques. Point estimates are given for each equation.

Schultz, T. P. (2002). Why governments should invest more to educate girls. *World Development* 30: 207–225.

Subbarao, K., and L. Raney. 1995. Social gains from female education: A cross-national study. *Economic Development and Cultural Change* 44(1): 105–128.

*Dependent variable(s) estimated:* **fertility; infant mortality.**

Using data from 72 developing countries covering 95 percent of the population, the authors estimate the effects of female gross secondary school enrollment rates on fertility; and infant mortality. The authors note that the first equation does not reflect the mechanism through which female schooling reduces fertility (i.e. through delay of marriage, breast-feeding, reduction in child mortality, contraception use). Each dependent variable is found to have a significant and negative relationship with female secondary education. In addition, the authors calculate elasticity and projects how a doubling of school enrollment (1975 value), holding family planning levels constant, would have resulted in 29 percent less births compared to 1985 values. The authors perform similar projections for infant mortality.

#### **2.4.3. Impact on infant mortality**

Beenstock, M. and P. Sturdy. 1990. Determinants of infant mortality in regional India. *World Development* 18: 443-53.

Mensch, B., H. Lentzner, and S. Preston. 1986. Socio-economic differentials in child mortality in developing countries. New York: United Nations

#### **2.4.4. Impact on maternal and child health**

Cochrane, S., O'Hara, D. and J. Leslie. 1980. The effects of education on health. World Bank Staff Working Papers No. 405. Washington, D.C.: World Bank.

Murthi, M., Guio, A.-C., and Dreze, J. (1995). Mortality, fertility, and gender bias in India: A district-level analysis. *Population and Development Review* 21: 745–782.

Smith, L., and L. Haddad. 1999. *Explaining child malnutrition in developing countries*. International Food Policy Research Institute Research Report No. 111. Washington, DC: International Food Policy Research Institute.

#### **2.4.5. Impact on contraception use**

Ainsworth, M., K. Beegle and A. Nyamete. 1995. *The impact of female schooling on fertility and contraceptive use: a study of 14 sub-Saharan countries*. LSMS working paper no.110. World Bank: Washington DC.

Authors present empirical results of DHS in 14 SSA countries. The studies show that for all countries, average levels of education are lower for women and girls, ranging from less than two years to six.

Dang, A. 1995. Differentials in contraceptive use and method choice in Vietnam. *International Family Planning Perspectives* 21: 2–5.

Lloyd, C., C. Kaufman, and P. Hewett. 2002. The spread of primary schooling in Sub-Saharan Africa: Implications for fertility change. *Population and Development Review* 26: 483–515.

#### **2.4.6. Impact on timing of first-birth**

Derose, L. F., and O. Kravdal. 2007. Educational reversals and first-birth timing in Sub-Saharan Africa: A dynamic multilevel approach. *Demography* 44: 59-77.

*In many areas throughout sub-Saharan Africa, young adult cohorts are less educated than their predecessors because of declines in school enrollments during the 1980s and 1990s. Because a woman with little education typically becomes a mother earlier and has more children than one with better education, and because of a similar well-established relationship between current education and current fertility at the societal level, one might expect such education reversals to raise fertility. However, if there is an additional negative effect of low educational level among currently young women compared with that in the past, which would accord with ideas about the impact of relative deprivation, the total effect of an education reversal may run in either direction. This possibility has not been explored in earlier studies, which have taken a more static approach. We focus on the initiation of childbearing. Using Demographic and Health Survey data from 16 sub-Saharan African countries with multiple surveys, we estimate a fixed-effects multilevel model for first births that includes the woman's own education, community education, and community education relative to the past. There are negative effects of individual and community education, but no effect of relative education. Thus we conclude that education reversals do seem to speed up entry into parenthood.*

Murphy, E., and D. Carr. 2007. *Powerful partners: Adolescent girls' education and delayed childbearing*. Washington, DC: Population Reference Bureau.

#### **2.4.7. Impact on timing of marriage**

Mensch, B.S., S. Singh, and J. Casterline. 2005. *Trends in the timing of first marriage among men and women in the developing world*. Population Research Division Working Paper No. 202. New York: The Population Council.

#### **2.4.8. Demographic shifts**

Iyigun, M., and R. P. Walsh. 2007. Endogenous gender power, household labor supply and the demographic transition. *Journal of Development Economics* 82 (1): 138-55: 138-155.

*We present a microeconomic model of the household in which there exists no difference in spousal preferences but childrearing is more time costly for women. Bargaining between the wife and the husband forms the basis of household decisions. Marital bargaining power is determined according to the incomes of the spouses, which in turn help to determine their reservation utility levels outside the marriage. The endogeneity of bargaining power introduces a non-cooperative element to the couples' decision-making problem because both the husbands and the wives take into account how their pre-marital education decisions affect their marital power and the share they extract from household resources in the future. The model predicts that wives invest more than is Pareto efficient in their education in order to increase their bargaining power in marriage. As a consequence, couples have fewer children and consume more when exogenous structural changes lead women to invest more in education. A corollary of the model is that empowering women directly through social reforms such as a lower gender wage gap leads to lower fertility and higher spousal consumption and leisure.*

Klasen, S., & Wink, C. 2002. A turning point in gender bias in mortality? An update on the number of missing women. *Population and Development Review* 28(2): 285–312.

The authors review previous projections and the methodologies used in order to calculate the number of missing women in the world due to differences in mortality rates and their causes. In addition, the authors estimate their own projections for countries like India and China, and other SSA where the number of women is disproportional.

Lutz, W., Goujon, A., & Doblhammer-Reiter, G. 1998. Demographic dimensions in forecasting: Adding education to age and sex. In *Frontiers of population forecasting*, ed. W. Lutz, J.W. Vaupel, & D. A. Ahlburg. *Population and development review*. Supplement to Volume 24

#### **2.4.9. Impact on non-farm employment**

Herz, B. and S. Khandker. 1991. *Women's work, education and family welfare in Peru*. World Bank Working Paper No 116. Washington, D.C.: World Bank.

Schultz, T. Paul. 1999. Health and schooling investments in Africa. *The Journal of Economic Perspectives* 13, (3): 67-88.

*Dependent variable(s) estimated: wages; migration; child and adult health measures.*  
The author uses national data from a few SSA countries in order to run these regressions.

#### **2.4.10. Impact on HIV/AIDS**

De Walque, D. 2007. How does the impact of an HIV/AIDS information campaign vary with educational attainment? Evidence from rural Uganda. *Journal of Development Economics* 84: 686-714.

Empirical results show a negative relationship between educational achievement and HIV risk among young women in Uganda.

#### **2.5. Other key microeconomic linkages**

Canagarajah, S., C. Newman and R. Bhattamishra 2001 Non-farm income, gender and inequality: evidence from rural Ghana and Uganda. *Food Policy* 26 (4): 405-420.

Chavas, Jean-Paul, Regan Petri, and Michael Roth. 2005. Farm household production efficiency: evidence from the Gambia. *American Journal of Agricultural Economics*, 87 (1):160-179.

This article reports on a household level farm efficiency study in The Gambia. The results of a Tobit analysis show that gender has significant impacts on allocation efficiency for the household. Even though men are involved in off-farm employment, women are not able to make decisions for the farm in a way that would improve efficiency. This study could be used to argue that greater efficiencies could be gained through gender-targeted programs in peri-urban areas in The Gambia.

Haddad, L., J. Hoddinott, and H. Alderman, eds. 1997. *Intrahousehold resource allocation in developing countries: Models, methods, and policy*. Baltimore, MD, USA: John Hopkins University Press for the International Food Policy Institute.

Quisumbing, Agnes R., J. Estudillo, K. Otsuka. 2004. *Land and schooling: Transferring wealth across generations*. Johns Hopkins University Press: Baltimore.

Quisumbing, Agnes R. 2003b. Policies and interventions: Overview. In *Household decisions, gender, and development*. Quisumbing, Agnes R., ed., IFPRI: Washington, D.C.

Policy design needs to account for intrahousehold gender relations. As a result, planners need to design projects based on possible gender-differentiated effects instead of assuming the project is gender neutral. The types of projects that warrant gender targeting include macro level trade policies, economic policy, cash-transfer programs, microcredit schemes, school feeding programs, livestock transfer programs, etc.

Quisumbing, Agnes R. 2003a. What have we learned from research on intrahousehold allocation? In *Household decisions, gender, and development*. Quisumbing, Agnes R., ed. IFPRI: Washington, D.C.

The effect on household education expenditures has been positive, even across countries, when women control resources; however, the underlying mechanisms that affect individual outcomes differ widely.

**Annex C: Workshop Agenda, “Modeling Gender within a Micro-Macro Framework”**

**September 15-16, 2009**

**IFPRI headquarters, Washington DC**

**Tuesday, September 15**

- 9:00–9:15** Welcome and agenda-setting for the day, *Siwa Msangi*
- 9:15-9:45** Overview of IFPRI activities on modeling gender, *Siwa Msangi/Julia Behrman*
- 9:45-10:15** Key priorities for the gender group at the World Bank, *Rui Benfica*
- 10:15-10:45** Capturing “care economies” within macro-modeling framework, *Elissa Braunstein*
- 10:45-11:15** Coffee/Tea Break
- 11:15-11:45** Capturing the institutional context when modeling gender and decision-making under risk and uncertainty, *Maria Floro*

***Present Results/Insights from CIDA-funded project on gender-focused interventions***

- 11:45-12:15** Key areas of literature that were used, *Mandy Ewing*
- 12:15-12:45** Overall conceptual framework for macro study, *Siwa Msangi and Mandy Ewing*
- 12:45-13:00** Key analytical results from sub-components of the IMPACT model, *Siwa Msangi*
- 13:00– 14:00** ***Lunch Break***

***Results/insights from CIDA-funded project on gender-focused interventions (cont.)***

- 14:00-14:30** Time use results from Tanzania, *Mandy Ewing*
- 14:30-15:00** Results from Dominican Republic, *Mateusz Filipski*
- 15:00-15:30** Shortcomings and areas to expand, *Siwa Msangi + group*
- 15:30-16:00** Coffee/Tea Break
- 16:00-16:30** Where to go from here – what’s missing? *Group discussion*
- 16:30-17:30** Improving the conceptual model/framework *Group discussion*

## Wednesday, September 16

### *Moving towards a better framework*

- 9:00–9:30**            The advantages of using a DREM approach, *Ed Taylor*
- 9:30-10:00**        New insights based on CGE modeling for Mozambique, *Rui Benfica*
- 10:00-10:30**        Other aspects of globalization and gender we might be missing, *Elissa Braunstein*
- 10:30-11:15**        The modeling components that need to be developed, *Group discussion*
- 11:15-11:45**        Coffee/Tea Break
- 11:45-12:30**        The kinds of data we need, *Group discussion*
- 12:30-12:45**        Setting an agenda for the future – key partnerships and priorities, *Siwa + group*
- 12:45-13:00**        Wrap-up with vote of thanks, *Siwa Msangi*

## Annex D: Workshop Participants

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## **Annex E: Notes on regional definitions used in the conceptual overview**

### **Regions**

**Africa Region (AFR) D:** Algeria, Angola, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria, Sao Tome And Principe, Senegal, Seychelles, Sierra Leone, Togo

**Africa Region (AFR) E:** Botswana, Burundi, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic Of The Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe

**South East Asia Region (SEAR) B:** Indonesia, Sri Lanka, Thailand

**South East Asia Region (SEAR) D:** Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Maldives, Myanmar, Nepal

**Western Pacific Region (WPR) B:** Cambodia, China, Lao People's Democratic Republic, Malaysia, Mongolia, Philippines, Republic Of Korea, Viet Nam Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia (Federated States Of), Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu

### **Category codes:**

B = low adult, low child mortality

C = high adult, low child mortality

D = high adult, high child mortality

E = very high adult, high child mortality

## **Annex F: Notes on the Methodology of the Tanzania Time Use Study**

### **1. Full list of activity codes**

#### **A. Employment for establishments (Fixed structures such as a shop, office, factory, mine)**

- 111 First job or employment on full or part time basis other than domestic work
- 112 Outworkers/home based work for an establishment
- 113 Paid domestic and personal services produced by domestic work
- 114 Work as employer/self-employed for an establishment
- 115 Paid (whether cash or in kind) domestic and personal services produced by domestic work
- 130 Working in apprenticeship, internship, and related positions
- 140 Short breaks and interruptions from work
- 150 Seeking employment and related activities
- 180 Travel to and from work
- 188 Waiting to travel to and from work
- 190 Employment in establishments not included/classified elsewhere

#### **B. Primary Production activities not for establishments**

- 210 Crop farming and market/kitchen gardening: planting, weeding, harvesting, picking, etc.
- 220 Tending animals and fish farming
- 230 Hunting fishing, gathering of wild products and forestry
- 236 Collecting firewood or dung
- 240 Digging, stone cutting, splitting and carving
- 250 Collecting water
- 258 Waiting to collecting water
- 261 Purchase of (inputs) goods for primary production activities not for establishment
- 262 Sale of products arising from primary production activities not for establishment
- 270 Travel related to primary production activities (not for establishments)
- 290 Primary production activities (not for establishments) not included/ classified elsewhere

#### **C. Services for income and other production of goods not for establishments**

- 310 Food processing and preservation activities: grain processing, butchering, preserving, curing
- 318 Waiting to Food processing and preservation activities: grain processing, butchering, preserving, curing
- 320 Preparing and selling food and beverage, preparation, baking, making sweets/confectionery and related activities
- 330 Making and selling bricks, textiles, leather, and related craft: weaving, knitting, sewing, shoemaking, tanning, and products of wood
- 338 Waiting to Making and selling bricks, textiles, leather, and related craft: weaving, knitting, sewing, shoemaking, tanning, and products of wood

- 340 Building and extensions of dwelling: laying bricks, making a pole frame for walls, plastering thatching, roofing, repairing buildings, cutting grass, plumbing, painting, carpentry, electric wiring
- 348 Waiting to Building and extensions of dwelling: laying bricks, making a pole frame for walls, plastering thatching, roofing, repairing buildings, cutting grass, plumbing, painting, carpentry, electric wiring
- 351 Petty trade, street/door-to-door vending, selling water in carts, selling charcoal, selling airtime, roadside food selling shoe-cleaning and other similar services in fixed structure
- 352 Petty trade, street/door-to-door vending, selling water in carts, selling charcoal, selling airtime, roadside food selling shoe-cleaning and other similar services not in fixed structure
- 360 Fitting, installing, tool setting, sharpening knives, maintaining and repairing tools
- 370 Provision of services for income such computer services, telephone services, transport (buses, taxis, carts, etc), hairdressing, cosmetic treatment, baby sitting, massages, prostitution
- 378 Waiting for Provision of services for income such computer services, telephone services, transport (buses, taxis, carts, etc), hairdressing, cosmetic treatment, baby sitting, massages, prostitution
- 380 Travel related to services for income and other production of goods (not for establishment)
- 388 Waiting to Travel related to services for income and other production of goods (not for establishment)
- 390 Services for income and other production of goods (not for establishments) not included/classified elsewhere
- 398 Waiting to Services for income and other production of goods (not for establishments) not included/classified elsewhere

**D. Household maintenance, management, and shopping for own household**

- 410 Preparing food and cooking where cannot distinguish
- 411 Preparing food (grinding, milling, cutting, heating water, chopping wood)
- 412 Cooking, making drinks, setting tables and serving
- 413 Cleaning up after meal
- 418 Waiting to prepare food
- 420 Cleaning house and surroundings
- 430 Care of clothes and other textiles (sheets, curtain, etc): washing, ironing, mending and ordering clothes and linen
- 440 Shopping for personal and household goods
- 441 Accessing government services: Collecting government pension, going to the post office, social welfare, police
- 448 Waiting to access government services
- 450 Household management: planning, supervising, paying bills, buying pre-paid electricity (luku) etc.
- 460 Do it yourself home improvements and maintenance, installation servicing and repair of personal and household goods (repair of watch, bicycle, fridge)
- 470 Pet care
- 480 Travel related to household maintenance, management and shopping
- 488 Waiting to access the travel related to household maintenance, management and shopping

- 490 Household maintenance, management, and shopping not included/classified elsewhere
- 491 Chopping wood, lighting fire, and heating water not for immediate cooking

**E. Care of children, the sick, elderly and disabled for own household**

- 510 Physical care of children: washing dressing, feeding including breast feeding
- 520 Teaching, training and instruction of children in household
- 530 Accompanying children to places: school, sports. Lessons
- 538 Waiting to access the accompanying children to places: school, sports. Lessons
- 540 Physical care of the sick, disabled, elderly: washing, dressing, feeding, Helping
- 541 Physical care of sick adults
- 542 Physical care of disabled adults
- 543 Physical care of elderly adults
- 551 Accompanying sick adult to receive personal care services
- 552 Accompanying disabled adult to receive personal care services
- 553 Accompanying elderly adult to receive personal care services
- 558 Waiting to access to receive personal care services
- 561 Supervising children needing care
- 562 Supervising sick adult needing care
- 563 Supervising disabled needing care
- 564 Supervising elderly needing care
- 581 Travel related to care of children
- 582 Travel related to care of sick adult
- 583 Travel related to care of disabled adult
- 584 Travel related to care of elderly adult
- 588 Waiting to access to travel related to care of sick, disabled and elderly adult
- 590 Care of children, the sick, elderly and disabled in the household

**F. Community services and help to other Household**

- 610 Community organized construction and repair.
- 618 Waiting for community organized construction and repair.
- 615 Cleaning of public buildings
- 620 Community organized work.
- 628 Waiting for community organized work.
- 630 Volunteering with or for an organization
- 650 Participation in meetings of local government and informal groups, associations, union
- 658 Waiting to participation in meetings of local government and informal groups, associations, unions
- 660 Involvement in civic and related responsibilities
- 661 Participating in the ILFS/TUS
- 671 Caring for non-household children
- 672 Caring for non-household sick adult
- 673 Caring for non-household disabled adult
- 674 Caring for non-household elderly adult

- 675 Other informal help to other households
- 680 Travel related to community services
- 688 Waiting to travel related to community services
- 690 Community services not included/classified elsewhere

## **G. Learning**

- 710 School, technical institute, college or university attendance
- 718 Waiting to school, technical institute, college or university attendance
- 720 Homework, home studies and course review for general education
- 730 Additional study, non-formal education, and courses during free time
- 740 Work related training
- 780 Travel related to media use
- 788 Waiting to travel related to media use
- 790 Learning not included/classified elsewhere

## **H. Social and Cultural Activities**

- 810 Participating in cultural activities, weddings, funerals, births and other celebrations
- 818 Waiting to participating in cultural activities, weddings, funerals, births and other celebrations
- 820 Participating in religious activities, religious services, practices, rehearsals, etc.
- 828 Waiting to participating in religious activities, religious services, practices, rehearsals, etc.
- 831 Socializing with family (visiting family, eating out with family, visiting places together)
- 832 Socializing with non-family (visiting namely, eating out with family, visiting places together)
- 838 Waiting to socializing
- 840 Arts, making music, hobbies, and other related courses
- 850 Indoor and outdoor sports participation and related courses (Kutembea)
- 860 Games (e.g. cards, chess, draughts, etc.) and other pastime (not related to media) activities
- 870 Spectator to sports, exhibitions (e.g. saba saba), museums, cinema/theatre/shows/and other performances
- 880 Travel related to social, cultural, and recreational activities
- 888 Waiting to travel related to social, cultural, and recreational activities
- 890 Social, cultural and recreational activities not included/classified elsewhere

## **I. Mass Media Use**

- 910 Reading
- 920 Watching television and videos
- 930 Listening to music/radio
- 940 Accessing information by computer
- 948 Waiting to accessing information by computer
- 950 Visiting library
- 958 Waiting to library services
- 980 Travel media use
- 988 Waiting to travel media services
- 990 Media use not included/classified elsewhere

**J. Person care and self-maintenance**

- 010 Sleep and related activities
- 011 Having sex
- 012 Lying down/rest related to illness
- 020 Eating and drinking
- 028 Waiting to eating and drinking
- 021 Drinking alcohol & related
- 030 Personal hygiene and health
- 038 Waiting to personal hygiene and health
- 041 Receiving medical treatment and personal care from professionals (including traditional healers)
- 042 Receiving medical treatment and personal care from household members
- 043 Receiving medical and related treatment from non-household members including home & community based care worker
- 048 Waiting for medical care
- 050 Doing nothing, rest and relaxation
- 060 Individual religious practices and meditation
- 080 Travel related to personal care and self-maintenance
- 088 waiting to Travel related to personal care and self-maintenance
- 090 Personal care and self-maintenance not included/classified elsewhere
- 999 Not stated

## 2. Aggregations and activity codes

<i>Activity</i>	<i>Activity codes - aggregations</i>
<b>Employment for establishments</b>	
Wage employment	111
Self-employment and home based work	112+114
Paid domestic and personal services produced by domestic work	113+115
Travel	180+188
Other*	130+140+150+190
<b>Primary production activities not for establishments</b>	
Crop farming	210
Tending animals and hunting	220+230
Collecting firewood or dung	236
Collecting and waiting to collect water	250+258
Travel	270
Other	240+261+262+290
<b>Services for income and other production of goods not for establishments</b>	310 to 398
<b>Household maintenance, management and shopping for own household</b>	
Activities related to food preparation	410+411+412+413+418
Cleaning house and care of clothes	420+430
Do it yourself	460
Chopping wood	491
Travel	480+488
Other	440+441+448+450+470+490
<b>Care for children, the sick, elderly and disabled for own household</b>	all sub-activities aggregated (510 to 590)
<b>Community services and help to other households</b>	all sub-activities aggregated (610 to 690)

## 3. Aggregations and activity codes for the travel category

<i>Aggregations</i>	<i>Activity codes</i>
Formal and non-agricultural informal sector work	180+188+380+388
Primary production activities (not for establishments)	270
Household management, care activities and community services	480+488+581+582+583+584+588+680

## 4. Methodology

### *Data description (TUS/ILFS 2006)*

This paper is based on the time use module of the Tanzanian Integrated Labour Force Survey (ILFS). The TUS 2006 is the first of its kind in Tanzania. One out of every five households who took part in the ILFS was interviewed for the time use module as well. The sample consists of 10,553 individuals aged 5 years or above (corresponding to more than 3,000 households) weighted in order to be representative at the country level. Respondents were interviewed for 7 consecutive days<sup>1</sup> and asked what they had done during the 24 hours (a unique time slot was created for the night hours 12am-4am). The data contains 20-1 hour time-slots per day in which respondents could name up to five activities indicating whether the activities were carried out simultaneously or separately from other activities (Budlender 2008). Refer to section 1 above for the detailed categorization of activities.

### *Aggregation of activities: rationale*

For the purpose of this paper we have aggregated activities into broader categories. The aggregations are shown in the preceding sections 1-3 of Annex E.

First of all, given the TUS sample is rather small if compared to the real population (aged 5 years and above) disaggregations that were too detailed would not generate reliable results (Budlender, 2008). This is one of our reasons for aggregating activities: activities were either aggregated or highlighted with a star to indicate that caution in interpretation of the results whenever activities were carried out by less than 5% of the population.

Moreover, the main aim of the paper, as well as that of the TUS, is to single out activities where gender distribution is the most skewed. Analyzing those activities which are often not included in the standard definition of employment and are usually carried out by women is vital considering the important role that they play for the welfare of the country. Aggregation of activities was carried out in such a way as to highlight such gender patterns.

### *Calculation of activities in a day, and how to deal with simultaneity*

Two measures of time are available within the TUS: the 24 hour and the full time approach. The latter approach assigns the full duration to each activity without taking into consideration that activities might have been carried out simultaneously; this approach leads to total hours in a day to exceed 24 hours. On the contrary, the 24 hour approach always produce total times that adds up to 24 hours (or 1440 minutes); when more activities are carried out simultaneously during a definite period, each activity is attributed the time of that slot of time equally divided by the number of simultaneous activities.

Neither of these approaches is necessarily better than the other one. In our analysis we have used throughout all the 24 hour approach; the major risk when using this kind of approach is to undercount activities which are done simultaneously (the use of the 24 hour approach is somehow under-representing simultaneous activities skewing data towards activities which occur less frequently simultaneously). This can create a potentially gender bias since it is women who usually report more



often simultaneous activities. These differences are not very big however and the 24-hours approach was preferred for its simplicity.

***Participation rates, mean among participants, and among population: definition, computation, and caveats***

The computations of participation rates and average minutes (for all population or only actors) involve the use of weights; definitions and formulas used are as follows:

**Average minutes per day.**  $\bar{T}_j$ , the average number of minutes per day spent by a given population engaging in activity j, is given by

$$\bar{T}_j = \frac{\sum_i wgt_i T_{ij}}{\sum_i wgt_i}$$

where  $T_{ij}$  is the amount of time spent in activity j by respondent i, and  $wgt_i$  is the weight for respondent i.

**Participation rates.**  $P_j$ , the percentage of the population engaging in activity j on an average day, is computed using

$$P_j = \frac{\sum_i wgt_i I_{ij}}{\sum_i wgt_i}$$

where  $I_{ij}$  is an indicator that equals 1 if respondent i engaged in activity j and 0 otherwise, and  $wgt_i$  is the weight for respondent i.

**Average minutes per day of participants.**  $T_j^p$ , the average number of minutes spent per day engaged in activity j by people who participated in that activity on that day, is given by

$$T_j^p = \frac{\sum_i wgt_i I_{ij} T_{ij}}{\sum_i wgt_i I_{ij}}$$

where  $T_{ij}$  is the amount of time spent in activity j by respondent i,  $wgt_i$  is the final weight for respondent i, and

$I_{ij}$  is an indicator that equals 1 if respondent i participated in activity j during the reference day and 0 otherwise.

When computing the mean time per day spent on a certain activity, it was considered that respondents were not always interviewed for the same number of days (7). In order to avoid bias or to weight more those respondents who had been interviewed for more days means were first computed at the individual level (mean time spent per day on activity per person) and only then averaged among all the (sub)population or participants.

Moreover, as already highlighted earlier on, the TUS has been weighted in order to be representative of the population aged 5 years and above. When computing the average of the time spent on a certain activity over all respondents the use of weights renders the TUS sample representative of the population and so the computed mean. However, when estimating the mean over different sub-samples (i.e., female population, etc.), different weights should be used. Given that recalculating the weights for each subgroup under scrutiny was not possible, the same weights were used on the assumption that they are still better than working without any weight at all.

Finally, given the design of the survey (respondents were interviewed for around 7 days and not only for one day, as in similar time surveys conducted in other countries) participation rates are higher than usual; as the Tanzanian Survey covers more days it is more likely that the respondent will report to have been involved in an activity.

### ***Simultaneity measures***

Two measures have been used to take into account the simultaneity of activities in the same time slot. The first measure has been computed as follows:

1 – the average time spent per person on the activity under scrutiny was computed:

- when accompanied by other activity/ies (simultaneous) and
- when not accompanied by other activity/ies (not simultaneous)

2 – the average time spent per day per person on the activity under scrutiny was added up among subgroups (female-activity simultaneous, female-activity non simultaneous, male-activity simultaneous, female-activity non simultaneous), using personal weights, so as to obtain the total time spent on a day on average.

In the dataset two variables are included ‘full\_time’ and ‘mins2\_24’. ‘full\_time’ gives the actual duration of the activity whereas ‘mins2\_24’ adjusts the time reported in each slot in order for the day to add to 24 hours. To detect simultaneity a variable which takes into account of discrepancies between full\_time and mins2\_24 was created<sup>2</sup>.

The second measure which was used to take into account the simultaneity of activities is the simultaneity ratio; this is computed as the simple ratio of the ‘full time’ spent on the activity under scrutiny over the ‘24 hour minute’ time spent on the same activity<sup>3</sup>.

### ***Overburdened and top decile definition***

The overburdened are those who spend more time than average (among participants) on a certain activity. We also calculated the top decile, which roughly consists of the one tenth of the population who is most heavily overburdened. We decided not to report results for the top decile of the overburdened as this was often too small a group to generate any reliable outcome.

### ***Computation of total hours***

In estimating the total number of hours spent on SNA and extended SNA activities by the population aged 5 years and above in a year the following procedure was followed:

- We took into consideration 8 subgroups of the population age 5 years and above:
  - Women rural poor

- Women rural non poor
  - Women urban poor
  - Women urban non poor
  - Men rural poor
  - Men rural non poor
  - Men urban poor
  - Men urban non poor
- We computed the number of minutes spent on average on SNA and extended SNA on a day per subgroup, converted them into hours (dividing by 60) and multiply them by 365 to get the total amount of hours spent by subgroups in a year;
  - We computed the Tanzanian population aged 5 years and above in each subgroup<sup>4</sup>;
  - Finally, we multiplied each population subgroup by the number of hours spent by each subgroup in a year.

## Annex G: Notes on the Methodology of the DREM for the Dominican Republic

### Accounts in the SAM of the Dominican Rural Sector

Agricultural Activities					
Sector	Definition	Sector	Definition	Sector	Definition
<b>ARRO</b>	Rice	<b>PAPA</b>	Potatoes	<b>TOMI</b>	Tomatoes (Industrial)
<b>CANA</b>	Sugar Cane	<b>BATA</b>	Sweet Potatoes	<b>BANA</b>	Banana
<b>TABA</b>	Tobacco	<b>YUCA</b>	Cassava	<b>OFRU</b>	Other Fruits
<b>CAFÉ</b>	Coffee	<b>CEBO</b>	Onion	<b>HORT</b>	Vegetables
<b>FRIJ</b>	Beans	<b>AJOO</b>	Garlic	<b>PLAT</b>	Plantains

Livestock Activities	
Sector	Definition
<b>BOVC</b>	Beef
<b>PORC</b>	Pork
<b>AVIA</b>	Poultry
<b>BOVL</b>	Milk
<b>HUEV</b>	Eggs

Non-Agricultural Activities	
Sector	Definition
<b>CONS</b>	Construction
<b>HOTE</b>	Hotels and Restaurants
<b>TRAN</b>	Transportation
<b>OSER</b>	Other Services
<b>COME</b>	Commerce
<b>FINA</b>	Financial Services

Migration Activities	
Code	Definition
<b>MNAC</b>	Migration to urban sector
<b>MEXT</b>	Migration abroad

(Continued)

### Accounts in the SAM of the Dominican Rural Sector (continued)

Factors of Production	
Factor	Definition
	Dominican Hired Females
	Dominican Hired Males
	Haitian Hired Females
<b>LMUJ</b>	Haitian Hired Males
<b>LHOM</b>	Female Family labor
<b>LFAM</b>	Male Family labor
<b>KAPI</b>	Capital

Households	
Code	Definition
<b>APDM</b>	Agricultural households, poor, headed by a Dominican female
<b>APDH</b>	Agricultural households, poor, headed by a Dominican male
<b>ANDM</b>	Agricultural households, non-poor, headed by a Dominican female
<b>ANDH</b>	Agricultural households, non-poor, headed by a Dominican male
<b>NPDM</b>	Non-Agricultural households, poor, headed by a Dominican female
<b>NPDH</b>	Non-Agricultural households, poor, headed by a Dominican male
<b>NNDM</b>	Non-Agricultural households, Non-poor, headed by a Dominican female
<b>NPDH</b>	Non-Agricultural households, Non-poor, headed by a Dominican female
<b>HAIM</b>	Households headed by a Haitian female
<b>HAIJ</b>	Households headed by a Haitian female

Savings and Investment Accounts	
Code	Definition
<b>AHAN</b>	Purchase/Sale of Animals
<b>AHTI</b>	Purchase/Sale of Land
<b>AHVI</b>	Investment in Home-Improvement
<b>AHOT</b>	Investments in other Physical Capital
<b>AHED</b>	Investments in Education
<b>AHSA</b>	Investments in Health

Exogenous Accounts – Out of the Rural Sector	
(1) Transformation of Agricultural Products	
Sector	Definition
<b>PARR</b>	Rice Processing
<b>PAZU</b>	Sugarcane Processing
<b>PALI</b>	Food Industry
<b>PTAB</b>	Tobacco Industry

(2) Other	
Code	Definition
<b>GOBI</b>	Government
<b>RPAI</b>	Rest of the Country
<b>HAIT</b>	Haiti
<b>RMUN</b>	Rest of the World

**Matrix for the Dominican Rural Sector, Reduced Form (actual matrix features 61 rows and columns)**

Cuentas	Actividades agrícolas	Actividades no agrícolas	Comercio	Factores	Hogares	Inversiones/A horro	Migración	Industria	Gobierno	Resto del País	Resto del Mundo	TOTAL
Actividades agrícolas	3,374		135,180		71,221	77,936		1,250,786		286,859	106,356	1,931,712
Actividades no agrícolas		37,670	118,447		515,601			19,132		1,336,532		2,027,381
Comercio	288,637				3,098,283							3,386,920
Factores	1,154,976	1,434,140	517,662					485,877	163,516			3,756,172
Hogares				3,756,172	31,258	18,899	407,126		2,520	82,221	45,720	4,343,916
Inversiones/A horro	117,681	53,873	71,057		567,750			41,499				851,861
Migración										78,018	329,108	407,126
Industria			958,010					198,356		1,297,735	94,390	2,548,490
Gobierno		667	162		3,188			381		161,638		166,036
Resto del País	367,043	501,031	1,586,402		56,046	755,026		552,459				3,818,008
Resto del Mundo					569					575,005	569	576,142
<b>TOTAL</b>	<b>1,931,712</b>	<b>2,027,381</b>	<b>3,386,920</b>	<b>3,756,172</b>	<b>4,343,916</b>	<b>851,861</b>	<b>407,126</b>	<b>2,548,490</b>	<b>166,036</b>	<b>3,818,008</b>	<b>576,142</b>	

## Equations in the DREM for the Dominican Rural Sector

Production Technology	
Goods Produced by Household $h$ , $Q_i^h$ , $i=1,\dots,v$	$Q_i^h = a_i^h (FL_i^h)^{\alpha_{FL,i}^h} (L_i^h)^{\alpha_{L,i}^h} (T_i^h)^{\alpha_{T,i}^h} (\bar{k}_i^h)^{1-\alpha_{FL,i}^h-\alpha_{L,i}^h-\alpha_{T,i}^h}$ ; $i = 1,\dots, v$
Goods Not Produced by Household $h$	$Q_i^h = 0$ ; $i = v+1,\dots, I$
Assumption ( $Y^H =$ Total Income, $I^H =$ Exogenous Income)	$Y^H = \sum_i (p_i Q_i^h - w L_i^h - p_x X) + w \bar{L}^h + REM^h + I^h = \sum_i p_i c_{hi}$
Factor Demands	
Family Labor, $FL_i^h$	$FL_i^h = \frac{\alpha_{FL,i}^h \cdot p_i \cdot Q_i^h}{\omega^h}$
Hired Labor, $L_i^h$	$L_i^h = \frac{\alpha_{L,i}^h \cdot p_i \cdot Q_i^h}{w}$
Land $T_i^h$ and Capital $k_i^h$	$T_i^h = \bar{T}_i^h$ , $k_i^h = \bar{k}_i^h$
Consumption Demands, $c_i^h$	$c_i^h = \frac{\beta_i^h Y^h}{p_i}$
General Equilibrium Conditions for Factors	
Family Labor (Determines Shadow Wage, $\omega^h$ )	$\sum_i FL_i^h + MIG_{FL,NAT}^h + MIG_{FL,EXT}^h = \bar{FL}^h$
Hired Labor (Determines Wages, $w$ )	$\sum_h \sum_i (L_i^h) = \sum_h (\bar{L}S^h - MIG_{L,NAT}^h - MIG_{L,EXT}^h)$

Land (Determines Shadow Rents, $r_i^h$ , for Each Household)	$r_i^h = p_i \frac{\partial Q_i^h(FL_i^h, L_i^h; \bar{k}_i^h, T_i^h)}{\partial T_i^h}, \quad \bar{T}_i^h = T_i^h \quad \forall i$
Migration	
National, $MIG_{FL,NAT}^h$	$r_i^h = p_i \frac{\partial Q_i^h(FL_i^h, L_i^h; \bar{k}_i^h, T_i^h)}{\partial T_i^h}, \quad \bar{T}_{FL,NAT}^h = T_i^h \frac{REM_{FL,NAT}^h}{\varpi^h}, \quad MIG_{L,NAT}^h = \frac{\gamma_{L,NAT}^h \cdot REM_{L,NAT}^h}{w}$ (Marginal Remittance is Equal to Wage)
Abroad, $MIG_{FL,NAT}^h$ (Exogenous)	$MIG_{FL,NAT}^h = \overline{MIG}_{FL,NAT}^h, \quad MIG_{L,NAT}^h = \overline{MIG}_{L,NAT}^h$
Remittances, $REM_{FL,NAT}^h$ y $REM_{L,NAT}^h$	$REM_{FL,NAT}^h = \gamma_{0,FL,NAT}^h MIG_{FL,NAT}^h$ $REM_{L,NAT}^h = \gamma_{0,L,NAT}^h MIG_{L,NAT}^h$
General Equilibrium Conditions for Goods	
Tradable Goods ( $MS_i^h$ Net Marketed Surplus, Sold at Market Price, $p_i$ )	$Q_i^h - c_i^h = MS_i^h$
Non-Tradable Goods (Marketed Surplus = 0; Determines Shadow Price, $\rho_i^h$ , for Subsistence Goods)	$Q_i^h - c_i^h = 0$
Model Parameters	$a_i^h, \alpha_{i,f}^h, \beta_i^h, \gamma_{0i}^h, \gamma_{f,NAT}^h, \gamma_{f,EXT}^h$



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<sup>1</sup> Not all respondents have been interviewed for the same number of days; diary information on activities is reported for most of the respondents for 6 or 7 days.

<sup>2</sup> Small data errors exist but are few. For example, full-time should always be equal or bigger than mins2\_24; however this is not always the case. As a rule I considered the activity to be carried out simultaneously with at least another one whenever min2\_24 and full-time diverge.

<sup>3</sup> As respondents were interviewed for a different number of days mean per person were first computed (using the full time and the 24 hour approach) and only then the means per day per person per activity were added up over the subgroups.

<sup>4</sup> We used the Tanzanian population data from UNDATA for 2006. From the ILFS we computed the percentages of each subgroup in the total population and we used them to get the actual numbers of the population per groups.