Chapter 25
Measuring Women's Empowerment and Gender Equality Through the Lens of Induced Innovation

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Abstract Using the lens of the theory of induced innovation, we reflect on the development of metrics for women's empowerment and gender equality. The Women's Empowerment in Agriculture Index (WEAI), launched in 2012, was used to monitor women's inclusion in agricultural sector growth. Demand by WEAI users and the supply of tools and methods from researchers shaped the ongoing evolution of the tool to a shorter version and to another that reflected what agricultural development projects deemed meaningful to judge project success. Eventual modifications reflected user demand: a greater interest in market inclusion and value chains stimulated the development of specialized modules for market inclusion. WEAI-related metrics have demonstrated the importance of women's empowerment for development outcomes, helping governments and civil society organizations design and implement gender-sensitive agricultural development programs. Finally, the adoption of SDG5 on women's empowerment and gender equality created a demand for a measure of women's empowerment for use by national statistical systems. Whether such a metric will be adopted globally will depend on the demand from, and utility to, stakeholders as well as existing capacity, capacity-building efforts, a belief in the intrinsic value of women's empowerment, and the commitment of resources to attaining this goal.

25.1 Introduction

The inclusion of gender equality and women's empowerment as the fifth Sustainable Development Goal (SDG 5) requires that progress be monitored using valid and comprehensive measures. Although several indices of gender equality exist, like the Gender Gap Index (World Economic Forum 2021) and Gender Inequality Index (UNDP 2020), it is only fairly recently that direct measures of women's empowerment have been developed (Elias et al. 2021). The growth in empowerment

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metrics reflects innovation in the conceptualization and measurement of women's empowerment, a process that can be viewed through the lens of induced innovation.

This Festschrift to honor Professor Keijiro Otsuka, an esteemed colleague, mentor, and friend, provides us the opportunity to reflect on the development of women's empowerment metrics using the lens of the theory of induced innovation. The Hayami-Ruttan theory of induced innovation is often used to analyze technological change in the context of agricultural development. In this theory, technological and institutional innovations are viewed as endogenous to the development process rather than exogenous factors operating independently (Hayami and Ruttan 1985). These innovations, in turn, shape the trajectory of development, involving "a complex pattern of institutional evolution in order to create an economic and social environment conducive to the effective response by individuals, private firms, and public agencies to the new technical opportunities" (Hayami and Ruttan 1971, p. 2). Applying the induced innovation lens to the development of empowerment metrics, we view the development of empowerment metrics as endogenous to the development process, influenced by both the demand for and supply of empowerment metrics. Policymakers and donors 'demand' empowerment metrics to monitor progress toward women's empowerment and gender equality since these have been recognized as important development goals. Researchers, both theoretical and applied, 'supply' empowerment measures based on theories of empowerment and the development of qualitative and quantitative methods for measuring empowerment. As new empowerment metrics are developed, used, and adapted to specific contexts, they draw attention to the importance of women's empowerment and how development interventions affect empowerment outcomes. The growth in different types of users may create demands for different variants of the original measure, which in turn spurs the development of new empowerment metrics. Such has been our experience as codevelopers of the Women's Empowerment in Agriculture Index (WEAI) (Alkire et al. 2013) and the project-level WEAI (pro-WEAI) (Malapit et al. 2019).

25.2 Origins of the WEAI

We celebrated the tenth anniversary of the WEAI in February 2022. Over the past 10 years, the adoption of WEAI and its variants has grown beyond our expectations (Fig. 25.1, top panel). The solid arrows represent the linkages between the original WEAI and those versions derived directly from it. The other empowerment metrics in dashed boxes are adaptations of the original WEAI, developed in parallel by other research teams and therefore not direct 'descendants' of the WEAI. From the original WEAI to its many variants, the number of organizations adopting the index has grown from 4 to 231, and the number of countries has increased from 3 to 58 (Fig. 25.1, bottom panel).

The launching of the US Feed the Future (FTF) Initiative in 2010 spurred the development of the original WEAI to measure women's inclusion in agricultural growth. The United States Agency for International Development (USAID) needed

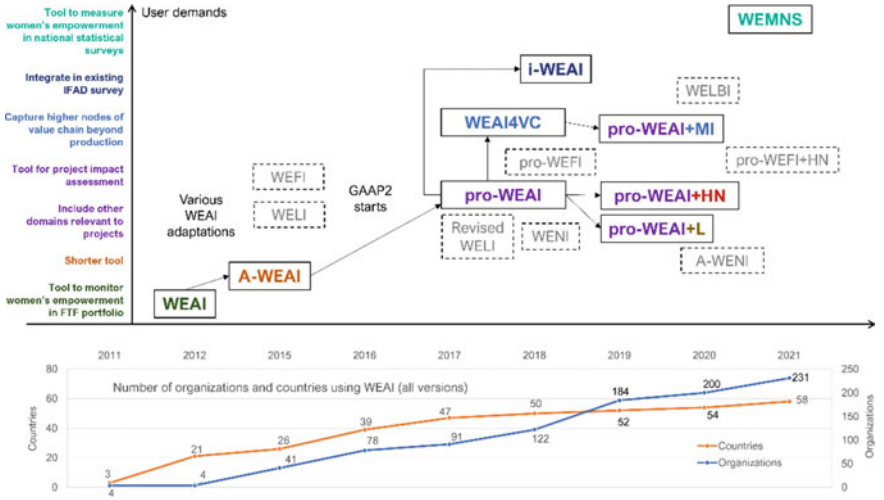

Fig. 25.1 Evolution of WEAI tools, user demands, and number of users. (Authors' records). *Note* Systematic tracking of WEAI users began in 2015; no data for 2013–14

a high-level measure, similar to those used to monitor poverty and malnutrition, to monitor progress toward women's empowerment in agriculture. However, the existing measures at the time, such as those based on the decision-making module in the Demographic and Health Surveys, did not measure empowerment in the productive sphere. Other indicators of economic participation were based on formal employment, which did not reflect informal employment in agriculture. Feminist scholars had developed a rich set of theories and definitions of empowerment, but they had yet to inform data collection and measurement. One of the most influential definitions was that of Kabeer (1999), who defined empowerment as the process by which people expand their ability to make strategic life choices, particularly in contexts in which this ability had been denied to them. In Kabeer's definition, the ability to exercise choice encompasses three dimensions: resources (defined to include not only access but also future claims to material, human, and social resources); agency (including processes of decision-making, negotiation, and even deception and manipulation); and achievements (well-being outcomes). Kabeer's definition was attractive because it lent itself to empirical measurement. There were already well-established ways to measure resources and achievements, but measures of agency were less well-developed.

When USAID approached the International Food Policy Research Institute (IFPRI) and the Oxford Poverty and Human Development Initiative (OPHI) to co-develop a measure of women's empowerment, we decided to focus on developing a better measure of agency. USAID wanted a metric relevant to women in the agricultural sector and covered domains that FTF programming could affect. OPHI provided the theoretical underpinnings of the index, adapting the Alkire-Foster methodology (Alkire and Foster 2011a, b). The resulting WEAI measures women's empowerment

in the agricultural sector directly by focusing on women's agency using individual-level data collected from male and female household members in a household survey designed for this purpose.

The WEAI is an aggregate index reported at the country or subnational level and comprises two sub-indices. The first sub-index, 5DE, assesses the degree to which respondents are empowered in five domains of empowerment in agriculture, namely, decisions about agricultural production, access to and decision-making power about productive resources, control of the use of income, leadership in the community, and time allocation (Alkire et al. 2013). These domains were chosen based on the programming priorities of the FTF Initiative. It reflects the percentage of women and men who are empowered and, among those who are not, the percentage of domains in which they achieve a pre-defined threshold for adequacy in empowerment. The second sub-index, the Gender Parity Index (GPI), measures gender parity. The GPI reflects the percentage of women who are empowered or whose achievements are at least as high as the men in their households. For those households that have not achieved gender parity, the GPI shows the empowerment gap that needs to be closed for women to reach the same level of empowerment as men in their households (Alkire et al. 2013). The original WEAI with five domains and 10 indicators was launched in 2012 and was first fielded in the 19 focus countries of the FTF Initiative as part of their population-based surveys.

The data collection instrument on which the WEAI was based reflects learnings from several years of research on intrahousehold allocation and gender dynamics. We drew on our research on gender and assets, particularly the characterization of asset ownership as sole and joint (Johnson et al. 2016). Our previous research also emphasized the importance of different forms of capital, such as social capital embodied in women's groups and community organizations. Findings on the importance of workload and women's productive and reproductive tasks shaped the time allocation module. Our OPHI colleagues were very interested in concepts of autonomy as captured in the Relative Autonomy Index. So, in a sense, the original WEAI was a blend of the different knowledge and experiences of its codevelopers and the demand from potential users of the WEAI.

Although the WEAI is a quantitative measure, qualitative work went into trying to understand what the WEAI captured. Following preliminary results from the pilot surveys, the second round of quantitative and qualitative data collection was undertaken to validate, contextualize, and explore concepts of empowerment, particularly to deepen our understanding of the five hypothesized domains of empowerment (Alkire et al. 2013). The narrative guides for this exercise included applying the individual pilot questionnaire interspersed with semi-structured narratives. One objective was to explore individuals' understanding of empowerment, and respondents were also asked to show how they understood the ways questions were phrased or to give views surrounding assumptions made in coding the quantitative results. The same individuals interviewed for the second round of quantitative data collection were also asked a series of questions to validate whether the people identified as empowered or disempowered according to the quantitative measures matched their own feelings or self-assessment. Although this 'ground-truthing' yielded valuable insights and was

an important part of WEAI development, it is fair to say that the first attempt to develop the WEAI was primarily driven by quantitative researchers.

25.3 Adaptation in Response to User Demand

As the WEAI was rolled out, the practicalities of fielding a complicated questionnaire quickly became evident. Data collection teams accustomed to interviewing only one household representative (usually the household head) now had to interview two respondents, male and female primary decision-makers, which created logistic and staffing challenges, particularly in settings where there were not enough female enumerators available to interview female respondents. Contrary to our pilot estimates of 30 min per respondent interview, field teams reported that the actual interview time for the WEAI module alone took much longer, adding to an interview that included other lengthy modules on consumption and nutrition. Respondent fatigue was a common concern. Some field teams, reluctant to add the WEAI module to an already long questionnaire, did not administer it in the same surveys conducted to assess agricultural production, limiting the ability to analyze relationships between women's empowerment and agricultural productivity. Some WEAI submodules were particularly difficult to field. For example, speaking in public was particularly sensitive to ask about in Cambodia and was therefore not collected. In the case of autonomy in production, questions included abstract concepts that were difficult to translate and understand. The 24-h recall time use module used in the WEAI was also problematic because it was an unfamiliar tool that required extensive enumerator training and took a lot of time to implement (about half the WEAI interview time was spent collecting time use).

The demand for a shorter, leaner module was loud and clear. We took on board many of the suggestions we received, such as streamlining skip patterns and sequencing related questions to minimize redundancy (for example, decision-making questions on production and income could be asked together in one section). To address the problems with the autonomy questions, which were too abstract, we developed vignettes to illustrate the concepts around the motivations for decision-making in more concrete terms. We explored alternative ways to reduce the time use module by dropping the collection of secondary activities and collecting information on work-related activities only, rather than the full set. To test these modifications, we conducted a second round of pilots in Bangladesh and Uganda, paying close attention to the ease of implementation and time saved with respect to the interview length. These pilots informed the development of the Abbreviated WEAI or the A-WEAI (Malapit et al. 2017). The A-WEAI retained the five-domain structure of the WEAI but with only six indicators and took about 20% less time to implement than the original WEAI.

The development of A-WEAI also marked the first time we included cognitive interviewing techniques as part of our instrument development process. Cognitive

interviewing is an established technique for assessing whether respondents understand survey questions as intended and, hence, elicit valid information (Willis 2005). While the technique is used widely in psychology and other disciplines, it is less well known among economists. Johnson and Diego-Rosell (2015), who led the team that implemented the Haiti FTF baseline survey in 2012, strongly recommended conducting cognitive interviews routinely as part of the implementation of the WEAI. Because it is a new tool, they felt that it was important to evaluate the cognitive validity of questions used in the WEAI and identify areas of particular concern in the Haiti context. They found that the WEAI questions were generally well understood. However, their analysis also revealed cognitive difficulties that can be addressed by simplifying language, standardizing questions, providing country-specific examples, and incorporating cognitive testing in field implementation to ensure locally-appropriate translation (Johnson and Diego-Rosell 2015). Their findings on Haiti were extremely influential in the evolution of WEAI metrics, as cognitive interviewing became standard practice in developing subsequent WEAI versions.

Along with the roll-out of WEAI to the 19 FTF countries, other organizations, including those which implemented agricultural development projects, gradually became interested in using the WEAI to measure the empowerment impacts of their projects. Many of these projects had explicit objectives to empower women; they were interested in indicators that mattered to project success, not necessarily the five domains and 10 indicators in the original WEAI. For example, they were interested in the possibility of a backlash against women through increased intimate partner violence or whether project participation affected relationships within the household. They wanted to know whether restrictions on women's mobility prevented them from participating in market-oriented activities. Beyond impact assessments, researchers began using WEAI to examine relationships between women's empowerment and other factors (e.g., the market orientation of farming systems) (Gupta et al. 2017). Making data publicly available also spurred further analysis of women's empowerment. For example, the Bangladesh Integrated Household Survey (BIHS) 2011–2012, which is representative of rural Bangladesh, collected the WEAI and was made publicly available soon after data collection. This led to many studies being written on Bangladesh by non-IFPRI researchers.

Between 2013 and 2015, different adaptations of the WEAI emerged as users experimented with adding questions on domains not covered (e.g., political participation, mobility, decisions over reproductive health, etc.); modifying thresholds for achieving adequacy for different indicators to better suit the context; and in some cases, interviewing only women to cut costs. Interviewing women only, however, prevents us from assessing gender equality. Although the WEAI includes livestock and aquaculture activities, two notable adaptations were developed to provide greater depth in these sectors, the Women's Empowerment in Livestock Index (WELI), developed by the International Livestock Research Institute (ILRI) and Emory University (Galiè et al. 2019) and the Women's Empowerment in Fisheries Index (WEFI) developed by WorldFish (Cole et al. 2018).

The rapid growth in the use of the WEAI demonstrated the pent-up demand for such a tool. However, it was also clear that the uncoordinated development of various adaptations piloted in different settings with different designs made it difficult to synthesize lessons learned, both in terms of the validity of the tool as well as the evidence it generated on whether and what types of interventions can impact women's empowerment.

Because of the growing demand from projects for a metric for project use, the Bill & Melinda Gates Foundation funded the Gender, Agriculture, and Asset Project Phase 2 (GAAP2), which was also supported by USAID and the Consultative Group on International Agricultural Research Research Program for Agriculture, Nutrition, and Health (CGIAR A4NH).[1] GAAP2 was a portfolio of 13 agricultural development projects that co-developed and field-tested a project-level WEAI (pro-WEAI) and used it in impact evaluations. The projects were selected based on a call for expressions of interest; criteria for selection included being gender-aware or gender-sensitive in project design, with a solid monitoring and evaluation (M&E) framework, and a well-designed impact evaluation plan based on quantitative data and plans (or willingness) to undertake qualitative data collection. At the project's inception workshop in early 2016, participating projects reviewed the existing WEAI and A-WEAI tools and identified indicators they thought should be included in pro-WEAI. Despite overall feedback that the WEAI was too long, projects identified several new indicators of empowerment that they wanted to be included. Hence, the list of potential indicators, and consequently the baseline data collection instrument for the pro-WEAI pilot, was even longer than in the WEAI. The final 13 projects selected in the GAAP2 portfolio focused on either crops or livestock and had income-oriented or nutrition-oriented objectives (though, in practice, many projects included both crops and livestock, income, and nutrition objectives). These projects provided input in designing the questionnaire. Ultimately, they fielded the pilot pro-WEAI survey instrument for their impact evaluation efforts. The projects also undertook qualitative work to validate the concepts of empowerment in each context, using protocols adopted throughout the portfolio (Meinzen-Dick et al. 2019).

The development of pro-WEAI included more qualitative methods to inform the construction of the quantitative indicators and provide contextual information for interpreting the findings of each project or research study. The qualitative research teams developed a set of protocols for key informant interviews, community profiles, focus group discussions, and life histories. These qualitative instruments provided projects with guidance but can be adapted to each project's needs. The qualitative data on emic understandings of empowerment showed, for example, that both women and men did not value women having 'power over' others, so the index does not include indicators on coercive agency. Qualitative data, such as key informant interviews with project staff, can help identify whether project staff understand and support women's empowerment, while seasonality diagrams help understand whether the time use data are from the busy or slack seasons.

[1] This description of the GAAP2 process draws from Malapit et al. (2019).

Pro-WEAI follows the same Alkire-Foster methodology as the original WEAI. However, unlike the original WEAI domains informed by FTF programming, pro-WEAI domains were explicitly linked to concepts of agency: intrinsic, instrumental, and collective.

25.4 Further Development of Metrics for Specialized Uses

It is not unusual for different types of innovations to spin off from the original innovation or for related innovations to develop in parallel. This is illustrated by the development of add-on modules for pro-WEAI. The variety of projects included in GAAP2—projects with crops, livestock, income, and nutrition objectives—unsurprisingly led to an expressed demand for add-on modules tailored to specific project objectives. Because the existing WEAI tools covered crop and income decisions sufficiently, the team developed add-on modules for livestock and health and nutrition projects. The pro-WEAI livestock module was developed in consultation with the ILRI team that developed the WELI, along with specific recommendations for the type of projects that should be using the module. Projects that were primarily livestock-focused were encouraged to use the revised version of the WELI, which now integrated pro-WEAI, whereas projects that worked in mixed crop-livestock farming systems could use the pro-WEAI with the livestock module (pro-WEAI + L). Unlike pro-WEAI + L, which embedded additional livestock questions within the existing pro-WEAI questionnaire, the pro-WEAI health and nutrition module (pro-WEAI + HN) is a separate questionnaire that covers agency over health and nutrition administered to women beneficiaries of nutrition interventions. Similarly, the Women's Empowerment in Nutrition Index (WENI) was developed by Narayanan et al. (2019) to measure what they define as 'nutritional empowerment.' Although also an Alkire-Foster index, WENI involved a different methodology for index development and was validated in India; ongoing work is validating this index in Samburu County, northern Kenya. Responding to similar demands for a shorter tool, an abridged WENI (A-WENI) has also been developed using machine learning techniques (Saha and Narayanan 2020).

The WEAI and pro-WEAI were designed with agricultural producers in mind. Increased interest in value chain development and entrepreneurship as potential avenues for women's empowerment led to a demand for an empowerment metric suitable for value chain projects. This led to the development of the WEAI for Value Chains (WEAI4VC), which used a modified version of the pro-WEAI that collected information by commodity across the value chain and more details on entrepreneurship and wage work. IFPRI piloted the WEAI4VC in two countries in Asia (Bangladesh and the Philippines), and later two more pilots were conducted in Africa (Benin and Malawi), all with very different sociocultural contexts. We have since renamed the instrument, now called pro-WEAI for Market Inclusion (pro-WEAI + MI), to emphasize that it collects the core pro-WEAI module together with complementary information related to market inclusion. All the pro-WEAI add-on modules are designed to measure the core pro-WEAI, plus a dashboard of indicators

for market inclusion (pro-WEAI + MI), health and nutrition (pro-WEAI + HN), and livestock (pro-WEAI + L), respectively. Given the strong demand for the pro-WEAI + MI, this tool is furthest along in terms of development. Pro-WEAI + MI also built on the pro-WEAI protocols, gender, and agricultural value chain approaches to identify emic meanings of 'empowerment' and provide a greater understanding of the empowerment environment. These enhancements to pro-WEAI + MI increase its ability to measure and contextualize empowerment and inclusion across value chains.

Along with developing the pro-WEAI and its multiple add-on modules, other parallel metrics also evolved. The ILRI team revised the WELI to nest the pro-WEAI questionnaire to facilitate comparability and is developing a Women's Empowerment in Livestock Business Index (WELBI), expanding the scope beyond livestock production to livestock business. Researchers at WorldFish developed a project-level analog called pro-WEFI and are developing a health and nutrition version that draws on the pro-WEAI + HN.

Despite the continuing development (or 'supply') of specialized modules for pro-WEAI, potential users still thought that it was too long—it had the required level of detail for impact evaluations but was not streamlined enough for use in regular M&E. With funding from the Walmart Foundation, IFPRI is currently developing a short M&E version of pro-WEAI + MI to meet the need for progress checks on the status of women's empowerment interventions. Similar to the portfolio approach used in developing pro-WEAI, Applying New Evidence for Women's Empowerment (ANEW) is working with a portfolio of projects to develop new empowerment metrics to meet the needs of market inclusion interventions, expand the evidence base on empowerment, and increase the capacity of implementing partners to use these metrics.

Other organizations have addressed the need to streamline survey instruments in different ways. One innovation, the integrated WEAI (i-WEAI), was implemented by IFPRI and the International Fund for Agricultural Development (IFAD). The pro-WEAI modules include a long list of questions on assets and decision-making on those assets, similar to questions already included in the extensive household questionnaire used by IFAD in its impact assessments. The IFAD i-WEAI integrates the pro-WEAI questions into the standard IFAD impact assessment questionnaire. Pro-WEAI variables could be collected by modifying the existing IFAD household questions on decision-making, asset ownership, financial services, group membership, and control over the use of income to link responses to individuals in the household roster. The remaining indicators could be collected with only 29 additional questions plus the time use module.

25.5 What's Measured Matters

As with agricultural innovations, innovations in measuring women's empowerment are not an end in themselves. WEAI-related metrics have shown their value in

demonstrating the importance of women's empowerment for a range of development outcomes. Using the nationally-representative data from Bangladesh, Sraboni et al. (2014) found a positive association between women's empowerment, production diversity, household calorie availability, and household dietary diversity. Other research using the same dataset found aspects of women's empowerment contributing to crop diversification from cereals to the production of fruits and vegetables (De Pinto et al. 2020). While the original demand for WEAI was for a high-level number, the fact that it could be deconstructed into separate indicators and its data further disaggregated by other population characteristics was crucial for these types of analyses, as well as for providing guidance to projects on the areas where women (and men) had the greatest disempowerment, and how interventions could contribute to empowerment. Indeed, the findings from Sraboni et al. (2014) were used to inform the design of a nutrition- and gender-sensitive agricultural project, the Agriculture, Nutrition, and Gender Linkages (ANGeL) project, which was designed by IFPRI, and implemented by the Ministry of Agriculture of the Government of Bangladesh (Quisumbing et al. 2021). Plans are being made to scale up this project nationwide. At the project level, discovering sources of disempowerment can spur organizations to revise their programming. For example, one of the GAAP2 partner projects in Tanzania found that attitudes toward intimate partner violence toward women were a major source of disempowerment in their project site. Although it was too late to be included in the specific project that was part of GAAP2, they were able to obtain funding to address this issue in a future project.

With the adoption of SDG 5 on women's empowerment and gender equality, there is a growing demand for a measure of women's empowerment that can be adopted as a part of national statistical systems. Although the WEAI and its variants have been fielded in 58 countries and 231 organizations as of December 2021, the demand for a shorter, more streamlined instrument that can be adopted by national statistical systems is unmet. IFPRI is currently working with the World Bank's Living Standards Measurement Study and Emory University to develop a women's empowerment metric for national statistical systems (WEMNS) designed to be implemented as part of a large multi-topic, population-based survey. Working with the 50 × 2030 Initiative, the proposed metric will draw from the SDG framework and inputs from stakeholders in Africa, Asia, and Latin America and build on the lessons learned from developing and using WEAI. Owing to the pandemic, the first round of piloting, which took place in 2021, was conducted using phone surveys. The team is using psychometric techniques to develop a shorter, leaner instrument that can be more easily integrated into national surveys; we plan to field the revised instrument in face-to-face surveys in 2022.

Although the development of WEMNS has been informed by the lessons learned from WEAI, we do not know whether and to what extent it will resemble the WEAI. Like many innovations, the development of a metric for use by national statistical agencies is subject to its own 'supply' and 'demand' forces. Researchers can provide questionnaire modules based on theory and psychometric analysis, but in the final analysis, whether such a metric will be adopted and taken up will depend on the

demand from, and utility to, stakeholders, who include governments, staff of statistical agencies, civil society organizations, and those who represent the women and men whose empowerment is being assessed. This take-up, in turn, depends on existing capacity, capacity-building efforts, the belief that measuring women's empowerment matters to attaining women's empowerment and gender equality, and the commitment of resources to attaining this goal.

Recollections of Professor Keijiro Otsuka

I first met Kei when I was an assistant professor at the University of the Philippines, Los Baños, between 1985–1987, and he was about to start working at the International Rice Research Institute. But we did not work together until land reform and agrarian unrest in the Philippines attracted the attention of Yujiro Hayami as an interesting and relevant topic to research. My collaboration with Kei and Professor Hayami started in Los Baños and continued after I went to the University of the Philippines School of Economics and the Economic Growth Center at Yale. Kei suggested that I do my postdoc fieldwork in his and Cristina David's study sites in Central Luzon and Panay. His analysis of changes in land tenure in those sites helped ground my own analysis of gender differences in inheritance customs. We started working together more closely when we were both at the International Food Policy Research Institute. Kei was working on a multi-country study of the relationship between property rights and natural resource management. He was puzzled by his observations in Ghana and Sumatra, both areas with matrilineal inheritance systems, where gender differences in inheritance and property rights were important to tree-planting decisions. But Kei was not a gender researcher, so he asked me to work with him on the project. Through our joint research, Kei realized that it was important to look at gender issues, as they can shape many processes and outcomes. I have often said that Kei is my most famous convert to gender research, and I am happy that I have had the chance to work on gender issues with many of his colleagues and students in the Philippines and Japan. I am honored and privileged to contribute to this collection to celebrate his life and work.

References

Alkire S, Foster J (2011a) Counting and multidimensional poverty measurement. J Public Econ 95(7/8):476–487

Alkire S, Foster J (2011b) Understandings and misunderstandings of multidimensional poverty measurement. J Econ Inequal 9:289–314

Alkire S, Meinzen-Dick R, Peterman A, Quisumbing A, Seymour G, Vaz A (2013) The Women's Empowerment in Agriculture Index. World Dev 52:71–91

Cole SMC, McDougall A, Kaminski M, Kefi AS, Chilala A, Chisule G (2018) Postharvest fish losses and unequal gender relations: drivers of the social-ecological trap in the Barotse Floodplain fishery, Zambia. Ecol Soc 23(2):18

De Pinto A, Seymour G, Bryan E, Bhandari P (2020) Women's empowerment and farmland allocations in Bangladesh: evidence of a possible pathway to crop diversification. Clim Change 163(2):1025–1043

Elias M, Cole SM, Quisumbing A, Paez Valencia AM, Meinzen-Dick R, Twyman J (2021) Assessing women's empowerment in agricultural research. In: Pyburn R, van Eerdewijk A (eds) Advancing gender equality through agricultural and environmental research: past, present, and future. International Food Policy Research Institute, Washington, DC. http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/134684/filename/134902.pdf

Galiè A, Teufel N, Korir L, Baltenweck I, Webb Girard A, Dominguez-Salas P, Yount KM (2019) The Women's Empowerment in Livestock Index. Soc Indic Res 142:799–825

Gupta S, Pingali PL, Pinstrup-Andersen P (2017) Women's empowerment in Indian agriculture: does market orientation of farming systems matter? Food Secur 9:1447–1463

Hayami Y, Ruttan V (1971) Induced innovation in agricultural development. Discussion Paper No. 3. Center for Economics Research, Department of Economics, University of Minnesota, Minneapolis, MN

Hayami Y, Ruttan V (1985) Agricultural development: an international perspective, 2nd edn. Johns Hopkins University Press, Baltimore

IFPRI (International Food Policy Research Institute) (2020) Pro-WEAI for market inclusion. International Food Policy Research Institute (IFPRI), Washington, DC. https://ebrary.ifpri.org/digital/collection/p15738coll2/id/134345

Johnson KB, Diego-Rosell P (2015) Assessing the cognitive validity of the Women's Empowerment in Agriculture Index instrument in the Haiti multi-sectoral baseline survey. Surv Practice 8(3)

Johnson NL, Kovarik C, Meinzen-Dick R, Njuki J, Quisumbing AR (2016) Gender, assets, and agricultural development: lessons from eight projects. World Dev 83:295–311

Kabeer N (1999) Resources, agency, achievements: reflections on the measurement of women's empowerment. Dev Change 30(3):435–464

Malapit H, Pinkstaff C, Sproule K, Kovarik C, Quisumbing AR, Meinzen-Dick R (2017) The Abbreviated Women's Empowerment in Agriculture Index (A-WEAI). IFPRI Discussion Paper 1647. IFPRI, Washington, DC

Malapit H, Quisumbing A, Meinzen-Dick R, Seymour G, Martinez EM, Heckert J, Rubin D, Vaz A, Yount KM, Gender Agriculture Assets Project Phase 2 (GAAP2) Study Team (2019) Development of the project-level Women's Empowerment in Agriculture Index (pro-WEAI). World Dev 122:675–692

Meinzen-Dick RS, Rubin D, Elias M, Mulema AA, Myers E (2019) Women's empowerment in agriculture: lessons from qualitative research. IFPRI Discussion Paper 1797. IFPRI, Washington, DC

Narayanan S, Lentz E, Fontana M, De A, Kulkarni B (2019) Developing the Women's Empowerment in Nutrition Index in two states of India. Food Policy 89:101780

Quisumbing A, Ahmed A, Hoddinott J, Pereira A, Roy S (2021) Designing for empowerment impact: experimental evidence from the Agriculture, Nutrition, and Gender Linkages (ANGeL) Project in Bangladesh. World Dev 146:105622

Saha S, Narayanan S (2020) A simplified measure of nutritional empowerment using machine learning to abbreviate the Women's Empowerment in Nutrition Index (WENI). Indira Gandhi Institute of Development Research, Mumbai Working Paper Series, WP-2020–031, October 2020

Sraboni E, Malapit HJ, Quisumbing AR, Ahmed AU (2014) Women's empowerment in agriculture: what role for food security in Bangladesh? World Dev 61:11–52

UNDP (United Nations Development Program) (2020) Human development report 2020. The next frontier: human development and the anthropocene. UNDP, New York. https://hdr.undp.org/sites/default/files/hdr2020.pdf

Willis GB (2005) Cognitive interviewing: a tool for improving questionnaire design. Sage, Thousand Oaks, CA

World Economic Forum (2021) Global gender gap report 2021. World Economic Forum, Geneva. https://www3.weforum.org/docs/WEF_GGGR_2021.pdf