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Gender- and youth-sensitive data collection tools to support decision making for inclusive sustainable agricultural intensification

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ABSTRACT

To achieve equitable sustainable agricultural intensification (SAI), it is essential to understand differential access and control over agricultural resources by women and youth, and to assess how intensification interacts with gendered and age-dependent relationships. Existing packages for assessing women's empowerment in agriculture tend to be large-scale surveys that do not provide timely results, nor are they easily integrated into a gender-transformative process. This paper applies concepts from Kabeer on gender analysis and empowerment to evaluate promising tools available for assessing inequities in SAI and supporting a gender-transformative approach. We interviewed decision makers in Malawi and Ghana to understand their needs and practices for equityanalysis. We evaluated, adapted and tested tools to detect inequities from SAI. Our results demonstrate the suitability of tools to decision makers' needs for *ex-ante* assessment and early detection of disparities. We synthesize information from the testing and adaptation of tools about the resources required, the equity issues they can reveal and their potential role in a gender-transformative approach. The use of the tools needs to be part of an inclusive and culturally specific process for identifying gaps and facilitating a more equitable sharing of SAI responsibilities and benefits through iterative cycles of action and learning.

KEYWORDS

Gender equity; participatory tools; sustainable intensification

1. Introduction

Sub-Saharan Africa (SSA) has a high population growth rate (UNFPA, 2014; United Nations Population Division, 2019) and a wide gap between actual and potential yields for cereals (Benin, 2016; FAOSTAT, 2019). These conditions have driven a movement towards sustainable agricultural intensification (SAI) as one potential strategy for averting anticipated dual catastrophes of widespread hunger and severe land degradation (Conway et al., 2019; Cook et al., 2015). The concept of SAI has often been loosely defined, and agricultural researchers with a biophysical focus have tended to emphasize increasing productivity in an environmentally sound manner (Petersen & Snapp, 2015) with little regard for elements of social sustainability, such as gender equity (Zurek et al., 2015, p. 39). For instance, it is well established that men disproportionately control the resources for agriculture and enjoy a greater share of the benefits (Bezner Kerr, 2008; Croppenstedt et al., 2013; Kilic et al., 2015). Accordingly, scholars increasingly stress the need for a more inclusive SAI, with adequate consideration of fairness and justice (Loos et al., 2014), including how the labour requirements for intensification will be distributed

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as well as gendered and age-biased land access and crop rights (Snyder & Cullen, 2014; Zimmerer et al., 2015).

The case for emphasizing inclusive SAI stems from the long recognition of the critical role women play in agriculture and the growing attention to the role of youth in agriculture. Although accurate figures of women's contributions remain debatable (Doss et al., 2018), evidence suggests that women provide considerable labour for food production. Also, increasing the participation of youth in SAI has great potential given the global drive to reap the demographic dividend from higher levels of youth engagement in economic activities, including agriculture (Bloom et al., 2017; Yeboah, 2018). But, for that to happen, SAI decision makers must consider the needs and priorities of the youth and channel their strengths for sustainable agricultural changes (Djurfeldt et al., 2019; Sumberg et al., 2017).

Another argument for more inclusive SAI is supported by evidence that gender and youth inclusiveness are important determinants of the adoption of intensified practices (Doss & Morris, 2000; Ellis-Jones et al., 2012; Ndiritu et al., 2014). For several decades, the importance of farmer participation and the integration of local knowledge has been emphasized for improved agricultural development (e.g. Pretty, 1997; Mendez et al., 2017). A critical enabling condition for SAI is for women and youth to have the power to make decisions about how to use productive resources (land, livestock, finances, etc.), which will require fundamental changes in the gendered norms governing those decisions. In addition, SAI technologies must be developed with explicit consideration of how changes in labour requirements will impact various ages and genders. Inclusive SAI will require having data collection tools that can be used to: (1) anticipate the social impacts of agricultural changes, (2) clarify how to adapt interventions to support transformed gender and youth relations, (3) monitor progress toward that goal, and (4) evaluate SAI projects based on their contribution towards transformed institutions and norms supportive of gender and youth equity.

Recent efforts by Musumba et al. (2017a) led to an assessment framework to better understand 'sustainable intensification' (SI) through measurable indicators across five domains: productivity, environment, economic, human condition, and social. However, their findings indicate that the social domain, including indicators for gender and youth (in)equity, was typically neglected in programs in SSA (Musumba et al., 2017a). The main limitations in collecting this information included concerns about data quality, the cost of data collection, and the training needed for available data-collection tools (Grabowski et al., 2016 unpublished data).

The best-known tools for assessing equity in agriculture are generally time consuming, expensive, and do not provide timely results for adapting project activities. For example, the Women's Empowerment in Agriculture Index (WEAI – Alkire et al., 2013) and the Agri-gender Statistics Toolkit (FAO, 2016) are excellent resources that provide valuable information about analysing quantitative data for gender inequities, but require household surveys and statistical analysis that may be beyond the reach of small projects. Survey methods typically take months for analysis and thus do not provide decision makers with *ex-ante* appraisal of a technology's social suitability and do not provide communities with ownership of the information to inform a transformation of norms for gender and age equity.

Effective use of data collection tools for gender and youth assessment needs to be embedded in a long-term inclusive development process. Leach et al. (2010) present principles for designing inclusive pathways towards sustainable development, as follows: (1) include a diversity of knowledges through participatory engagement; (2) extend scope and enable choice; (3) take a dynamic perspective, accept incomplete knowledge; (4) attend to rights, equity and power; and (5) be reflexive. We contend that building on these principles can guide and enhance data collection tools to significantly contribute to the developmental ideal of inclusive SAI. In that regard, a range of participatory methods are already available for assessing gender issues (e.g. the Gender and Action Learning Systems, CARE's gender toolkit, and others) and integrating them into development efforts toward a gender transformative approach. These tools could also be a better match with the resource requirements of decision makers and provide them with timely analysis. While many of these tools have been applied to agricultural development, they have not been evaluated specifically regarding SAI.

This paper evaluates existing and adapted gender and youth analysis tools in terms of their suitability for decision makers involved in inclusive SAI. We summarize the information we learned about low-cost tools that allow *ex-ante* assessment and early detection (through on-going monitoring) of gender and

youth inequities in SAI and how they can support a gender-transformative approach. We focus on tools that match the resource requirements and the quality of information needed by SAI decision makers in Ghana and Malawi. Thus, we do not claim to offer a comprehensive list of gender and youth analysis tools; rather, we synthesize information about existing tools and our adaptations of some of them, based on key criteria for decision makers.

In the next section, we present the research methods, including the underlying conceptual framework, data-collection methods, and analysis. Section 3 introduces decision makers' contextual needs to better foster inclusive SAI. Section 4 presents the reviewed gender and youth inequity assessment tools. Section 5 synthesizes the information to guide the selection of appropriate data-collection tools. We discuss considerations about facilitation and power relations in Section 6 before concluding in Section 7.

2. Methods

2.1. Conceptual framework for gender and youth

Conceptually, we categorize equity into various components about the interactions between gendered relationships and agricultural changes. Following the SI assessment framework manual, Musumba et al. (2017b) rely on Kabeer (1999) to identify the following categories for both age and gender equity indicators:

- Resources: The allocation of physical resources and the need to measure differential access to resources, especially land, livestock, and equipment.
- Capacity: The differential access to information about training resources, markets or agricultural practices.
- Agency: The differential levels of control over resources, with observable indicators such as time allocation, management control and market participation.
- Achievements: Differences in income, food security, nutrition, and health.

Furthermore, there is growing evidence of the need to go beyond detecting and accommodating the current gender imbalances, which is what happens when programs simply work around inequitable gendered norms. Instead, a gender transformative approach promotes critical analysis of those norms and seeks to change them for greater equity. Kabeer (1994) presents a 'social relations approach', emphasizing the analysis of gender equity across four institutional domains where social norms may limit empowerment of women: the household, the community, the market, and the government (Fischer et al. 2020).

In the description of each tool, we highlight how they can be applied to specific categories of equity indicators (such as resources, capacity, agency, and achievements) across the four institutional domains. We also note the role each tool can play in a gender transformative approach in terms of revealing inequities, facilitating reflection on root causes, and encouraging dialogue about how to transform norms (synthesized in Table 2).

2.2. Data and analysis

This study uses both primary and secondary data about data-collection tools for detecting gender and youth inequities, including the demand for the tools, their requirements, and the information they provide. The data was collected through the research project '*Achieving equitable benefits from sustainable agricultural intensification through more effective tools and metrics*' carried out from 2016 to 2019 in northern Ghana and central and northern Malawi through the SAIRLA (Sustainable Agricultural Intensification Research and Learning in Africa) programme. The countries and contexts were chosen based on the potential to learn about gender and youth issues faced by the on-going Africa RISING (Research in Sustainable Intensification for the Next Generation) project, which has been working to develop new cropping system technologies with thousands of smallholder farmers in both locations.

The data comes from a wide range of stakeholders in Ghana and Malawi who participated in interviews, meetings, and/or testing of tools. The Africa RISING project and other SAIRLA-funded research projects, including a group in each country known as the National Learning Alliance, provided a useful starting point for identifying SAI stakeholders (researchers, policy makers, private sector leaders, and rural development professionals) to include in our interviews and meetings. Using 'snowball sampling', we expanded beyond that network by asking prominent decision makers related to SAI to identify additional stakeholders.

First, we carried-out semi-structured interviews with 54 decision makers in Malawi and Ghana regarding their experience with gender and youth analyses. We purposively sampled and interviewed decision makers about gender and youth issues in agriculture, including policy makers, managers at NGOs and in the private sector. We asked what information decision makers seek regarding the inclusiveness of SAI, how best they could efficiently collect such information, and what gender and youth analysis tools they know or use.

Second, we reviewed and analysed a wide range of literature on gender-analysis tools and participatory data-collection tools for women's empowerment in agriculture, including resources from the Gender Action Learning System (GALS), the Socio-Economic and Gender Analysis Programme (SEAGA) of the United Nations Food and Agriculture Organization (UN-FAO), the YouthPower Network, and many others referenced below. We summarized how to implement the tools in the '*Decision makers' guide to inclusive SAI*' (Grabowski et al., 2019),[1] which also provides other tools for decision making to enable effective use of the data collected from gender and youth analysis tools.

Finally, the testing of data-collection tools for gender and youth analysis was carried out by various partners in Malawi and Ghana. Through these experiences, we collected additional information about the benefits, costs, implementation time, training needs, and quality of information from seven tools. Two NGOs tested three tools (the Leaky Bucket, Activity Profile and Gender and Youth Balance Tree) in Upper West region of Ghana with small focus groups (5 people) of men and women, separately. Africa RISING researchers in Ghana tested two tools (Activity profile and Drudgery score) in Northern, Upper West and Upper East regions. The Department of Agricultural Extension Services (DAES) in Malawi, shared their experiences in Dedza and Ntcheu using the Activity Profile, Daily Time Use and Gender Balance Tree tools. The authors of the paper tested a tool adapted to understand youth access to land in Dedza and Mzimba, Malawi, using three focus groups per community (male youth, female youth, and mixed gender community leaders). We used the themes of the youth tool to develop an interview guide (see below for results and Grabowski et al. (2019) for details). The discussions during the focus groups in Malawi were audio recorded, transcribed in Chichewa, and translated into English before their content analysis. The lead author also conducted the Gender Sensitive Value Chain Analysis in collaboration with World Renew, an NGO in Eastern Zambia.

3. Decision-making context and decision makers' needs

Decision makers' in Ghana and Malawi said that to foster inclusive SAI, they need *ex-ante* assessment tools to explore the potential gendered impacts of SAI interventions. Most decision makers said they do not have sufficient capacity to utilize analytical tools effectively. They requested information and capacity building for such tools, while also mentioning their financial, human resource and time resource limitations.

The respondents represent a diversity of experiences and institutions (senior government officials (7 male and 7 female), project officers and directors of development agencies (19 male and 11 female), business managers (4 males), and gender and youth specialists (3 male and 3 female)). Most of our respondents' experience with gender or youth analysis came from baseline reports (many of which used PRA methods in Malawi), disaggregated monitoring and evaluation (M&E) reports, and institutional gender audits (Table 1). Participatory tools were not mentioned by respondents in Ghana but were used by over half the respondents in Malawi, whose extension service has embraced a household methodology that relies on participatory tools. The WEAI method was rarely used in either country, suggesting the resource requirements were beyond the scope of most decision makers. While many more respondents had participated in gender analysis than youth analysis, a significant portion had participated in neither.

In general, decision makers found gender and youth disaggregated information helpful in eliciting critical issues, such as who participates, who benefits, the needs of each group and the constraints to women's participation. For example, one M&E specialist in Ghana explained that a gender report identified gaps in women's participation in microfinance training and leadership, pointing to the need to monitor the quality of their contributions to decision-making. In Malawi, a decision maker mentioned the significant influence of a report documenting the cost of gender gaps in agriculture, which motivated him to address gender issues more seriously. However, there was also criticism from

Table 1. Decision makers' experience with gender analysis and youth analysis.

		Gender Analysis Experience						
	Responses	Any	PRA	WEAI	Audit	Other	Youth Analysis	Neither
Malawi	25 (11F, 14M)	52%	52%	4%	28%	44%	16%	24%
Ghana	29 (10F, 19M)	34%	0%	3%	3%	28%	14%	48%
Combined	54	43%	24%	4%	15%	31%	15%	37%

Source: IITA Africa RISING SAIRLA Project (2018) – Decision makers' needs assessment interviews; PRA = Participatory Rural Appraisal and its many variants; WEAI = Women's Empowerment in Agriculture Index; 'Audit' refers to gender audits as part of a workplace gender mainstreaming effort, 'Other' includes gender-focused surveys, focus group discussions, value chain analysis, vulnerability assessments, and more.

nine of the 24 decision makers who had used gender reports. Some reports were technically flawed, did not specify the methods, did not relate to the project targets or made claims beyond what the data can say. One respondent said,

> some [gender reports] are not practical; they are theoretical and abstract; the conclusions are too expected and vague; concrete steps to fill gender gaps are sometimes not forthcoming. Some innovative suggestion on how to take advantage of opportunities that exist already for women and youth is needed.

Finally, decision makers in Malawi and Ghana identified several promising gender-sensitive participatory tools. The 'gender balance tree' tool was the most recommended, followed by participatory mapping, activity profile, and gender-specific value chain analysis. For youth analysis, decision makers were not able to identify specific tools, mentioning instead M&E activities and focus group discussions. Here, we use the United Nations (UN) definition of the youth as those aged 14-25, but there are local conceptualizations of youth that are important to understand, such as dependent (unmarried) youth and independent (married) youth (addressed in a separate manuscript). We did not find data-collection tools in the literature that specifically measure youth contributions to agriculture or assess the impacts of agriculture interventions, but we adapted gender tools for that purpose and we adapted a tool for analysing youth access to land.

4. Review of gender- and youth- sensitive data collection tools

The tools we present here are what we found to be the most promising for collecting data to inform gender and youth equity analysis without the use of large-scale surveys. Based on decision makers' priorities, we focused on tools that are affordable, can provide timely assessment, are feasible in terms of human resources, are useful for *ex-ante* analysis, and can support gender transformative approaches. We present a comparative analysis of the tools, rather than a complete detailed description of their use, which is provided in the '*Decision makers' guide to inclusive SAI*' (Grabowski et al., 2019). We organize the tools into three categories related to potential inequities that could results from SAI: (1) the risk of increasing the workload by one or more gender and age group, (2) the potential of exacerbating uncertain rights to access and use of agricultural resources, notably lack of secure land tenure, and (3) changes in technologies and markets may exacerbate inequities.

4.1. Tools to assess gender-differentiated risk of increase in workload

4.1.1. Tools to analyse time allocation

Observing differences in how men, women, adults, and youth spend their time can illuminate the level of agency in the household and community domains. The difference in hours of leisure time has been suggested as a key indicator of gender labour inequities (Rao, 2016). Stakeholders in Malawi affirmed the importance of assessing the amount of leisure time by gender and age as an important motivation for assessing time allocation. Data on time use also provides critical information for decision makers about how a new technology would affect each group differently.

When inquiring about the time required for daily tasks, the best quality of information can be obtained by asking about all activities from the preceding one or two days. Questions only about specific activities (e.g. carrying water, weeding, collecting firewood) are susceptible to significant reporting errors (Harvey and Taylor, 2000). The best way to estimate an 'average' day is to average responses about all activities in the previous day.

Resources to facilitate collecting daily time use data include the Women's Empowerment in Agriculture

Table 2. Summary of the relative performance of tools across decision makers' criteria and the type of information they typically provide.

Tool	Affordability[1]	Timely collection & analysis[2]	Feasibility (human resources)	Potential for *ex-ante* assessment	Domains of institutional analysis most applicable	Equity indicator categories where most applicable	Role in a Gender Transformative approach
Activity profile (March et al., 1999)	$134-$250	C: 1.5 h A: 1 h	Minimal training	Strong *(quantitative)*	Household, Community	Agency	Revealing inequities
Daily time use (CARE, 2015)	$161	C: 0.5 h A: 0.5 h	Minimal training	Strong *(quantitative)*	Household, Community	Agency	Revealing inequities
Drudgery score (G.Fischer (IITA), personal communication 2019)	$243	C: 1.5 h A:1 d	Skilled analysis of scores and transcripts	Weak *(better for early monitoring)*	Household, Community	Agency	Revealing inequities; Facilitating reflection
Participatory mapping (ground or sketch)	est. $800	C: 1 d A: 0.5 d	Minimal training	Strong *(spatial)*	Community, Market	Resources, Agency and Achievements	Revealing inequities; Facilitating reflection; Encouraging dialogue
Gender and youth balance tree (Mayoux, 2012)	$200	C: 1.5 h A: 2 h	Skilled facilitation	Medium *(qualitative)*	Household	Resources, Agency and Achievements	Revealing inequities; Facilitating reflection; Encouraging dialogue
Youth access to land – focus groups (adapted from YLRC)	$815	C: 1.5 h A: 2 d	Minimal training	Strong *(detailed transcripts)*	State, Market, Community and Household	Resources and Agency	Revealing inequities; Facilitating reflection; Encouraging dialogue
Ratings of technologies	est. $250	C: 1.5 h A: 1.5 h	Skilled analysis of scores and transcripts	Weak *(better for early monitoring)*	Community, Market, Household	Agency	Revealing inequities; Facilitating reflection
Gender- and youth-sensitive value chain analysis (Mutua et al., 2014)	$2520	C:2 d A: 2 d	Design, facilitation and analysis	Weak *(better for early monitoring)*	Market, State, Community and Household	Resources, Capacity, Agency and Achievements	Revealing inequities; Facilitating reflection; Encouraging dialogue
Leaky bucket (Cunningham, 2011)	$250	C: 2 h A: 2 h	Skilled facilitation	Strong *(quantitative & qualitative)*	Household, Market, Community	Resources, Capacity, Agency and Achievements	Revealing inequities; Facilitating reflection; Encouraging dialogue

[1]All cost estimates are for one community, exclude transportation to the field and are based on rates for staff time and materials from 2019 in Ghana and Malawi

[2] C = Collection, A = Analysis, d = day, and h = hour. Data collection times are for each group; Analysis times refer to the time spent after field work is completed to be able to use the data. Analysis time assumes data from 1 to 3 groups will be analysed together.

Index (WEAI) survey, which has a form with predefined activities, and 15-minute intervals from the previous day to early morning of the interview (Alkire et al., 2013). Another method to aid with low literacy and rare use of clocks, uses counters for each 20-minute interval, and respondents allocate the periods into predefined categories represented on coloured cards (Masuda et al., 2014).

Group exercises on daily time use can also be valuable for data collection and to raise awareness of differences and foster discussion about fostering equity. In CARE's 'daily clock' exercise (CARE, 2015) gender disaggregated groups list all the activities they do on a 'typical day' and the duration of each activity. They then come together, share their lists and discuss how and why there are differences. Similarly, a facilitator can use two circles (one for day and one for night) to have a group of respondents draw pie-shaped pieces to represent time spent on various activities, highlighting the most demanding tasks, the most enjoyable ones or the ones that provide the best opportunities to share information (Jost et al., 2014).

Most agricultural work varies greatly by season and this is not covered in the daily time-use methods just outlined. Alkire et al. (2013) note this as a major shortfall of the WEAI method. However, asking respondents to recall an entire farming season raises concerns about the accuracy of recall. Stakeholders in Malawi cautioned that questions should be asked as soon after harvest as possible (Zulu et al., 2020). Our experience is that reasonable estimates are possible by walking with farmers to particular fields and asking them to recall how many days (or portions of days) they spent doing major tasks in that place over the past growing season (noting how many people, by gender and age). Measuring the area of the field with a GPS device allows for comparability by calculating hours per hectare.

One way to reduce the problem of recall is by asking respondents to record information in a diary. Pictorial options for diaries are available for low literacy contexts (Masuda et al. 2014). Though more robust, diaries place an extra burden on respondents and appropriate compensation for their effort should be considered.

Alternatively, the gender-sensitive seasonal calendar is a simple tool for gaining a basic understanding of how tasks vary seasonally by gender and age group. Facilitators create a matrix, with months or seasons as columns and the agricultural activities as rows and ask participants to place markers showing who (male, female, youth, adults) does each activity and which months each is carried out. Next, the facilitator can ask about other seasonal variables, such as rainfall, prices, availability of water, etc.

To estimate the gendered impact of new agricultural technologies, it may not be necessary to quantify the hours spent on seasonal or daily tasks, but rather to simply know who does which tasks. The Activity Profile tool (March et al., 1999) is a useful method for understanding how the amount of work for specific tasks is shared across household members. This can provide the basis for exploring who would benefit from or be over burdened by changes in those activities. Facilitators create a matrix with the activities as rows and the household members (or categories of members) as columns. Respondents then distribute 10 pebbles across the household, representing how the total amount of time for each task is shared. Some findings from our testing of the tool in Ghana show that it can be effective at identifying gendered norms for agricultural tasks (e.g. men hoeing maize fields; women tending groundnuts and processing shea) and also for highlighting age-related issues (e.g. school-going girls being unavailable to plant groundnuts but available to weed during vacation; school-going boys being unavailable to care for livestock).

There is more information from these exercises than just the allocation of counters for various activities. The discussion during the exercise contains valuable information about how the participants think about the various tasks and might indicate other conflicts or challenges not captured directly. Detailed notes or recordings help to capture such information. Although the primary focus is to reveal differences in time allocation across gender and age, the discussion in the community can facilitate reflection on the root causes of inequities and catalyze dialogue for taking action to change the norms perpetuating them.

4.1.2. Participatory drudgery score

When assessing agency in the household or community domain, it is important to consider the difficulty of each task in addition to the time spent on a task. The Participatory Drudgery Score exercise, developed by the International Institute of Tropical Agriculture (IITA) through the Africa RISING project (Fischer, personal communication) is a straightforward tool for obtaining information on how tiresome tasks are.

The facilitator creates a matrix with the tasks as rows (e.g. planting, weeding, harvesting) and the columns as the technologies being compared (e.g. maize with and without cowpeas as a living mulch). The facilitator then asks the participants to allocate counters based on the level of drudgery of each task. Ten counters represent the most taxing agricultural task and one the easiest.

The group then discusses why certain activities are more or less labour-intensive, for whom are they more or less labour-intensive, and to what extent the new technology increases the labour of any group. There can also be rich plenary discussion about differences in results across women's and men's results. Perspectives on drudgery can also be assessed using a survey with a Likert scale (very tiresome, somewhat tiresome, etc).

4.2. Tools to assess gender-differentiated access and use of agricultural resources

4.2.1. Participatory mapping

Participatory mapping is one of the most widespread Participatory Rural Appraisal (PRA) tools (Chambers, 2006) and is often carried out to understand the community domain of empowerment by detecting gendered aspects of spatial resources, including use, access, control and ownership. The groups making maps can be categorized by interest, age and gender to understand differential resource-use patterns. Information about achievements (food security, nutrition, etc.) can easily be added to maps as described below.

Participatory mapping can be implemented in various ways. With hands-on mapping, the simplest technique, participants create maps on the ground with local materials to depict the features of interest, such as major landmarks, fields, houses, water points, etc. Preliminary data-collection tools, such as transect walks, can provide detailed information from the area. Deeper analysis is possible by adding visual elements, for example, placing different coloured stones for land managed by men, women, and youth. The final map can be transferred to a large sheet of paper and copied with a photograph.

'Sketch mapping' is another option for smaller groups, skipping the placing of materials on the ground. Maps do not need to be drawn to scale or to represent directionality. For example, sketch mapping was used to trace gendered perspectives on the pathways of pesticides used in a household (from purchase to disposal of container), which illuminated various gendered risks to family health (Christie et al., 2015).

A more technical option includes printing aerial or satellite images of the community, laminating them, and asking community members to draw on them with different coloured markers. This approach was used to apply a gender lens to nutrition sources in the landscape in Zambia (Estrada-Carmona, 2014). Baker et al. (2015) created three-dimensional relief maps for use in participatory exercises to obtain gendered perspectives on water. Combining participatory mapping with the work of technical experts, such as surveyors and cartographers, can help maps to be accepted in more formal settings (IFAD, 2009).

However, the technical skill required in formal mapping may create a power imbalance that has potential to undermine empowerment. Participatory mapping can be used for more than data collection and support empowerment (Braden & Nelson, 1999; Brinhurst et al., 2017). For example, in Kenya, women caregivers for people living with HIV used participatory mapping to document where widows had been kicked out of their homes and lost access to land, thereby initiating a process to help resettle the widows (Farnworth et al., 2013).

Combinations of methods are also possible, allowing for deeper insights. Westervelt (2018) obtained a gendered perspective on land-use changes over 30 years by combining remote sensing data with participatory sketch mapping, interviews and transect walks near a protected forest in Kenya.

4.2.2. Gender and youth balance tree

The Gender and Youth Balance Tree (GYBT) represents a more comprehensive tool that can detect inequities in resources, agency, and achievements with a primary focus on the household domain. It involves an interactive exercise where participants draw a tree (Figure 1) to represent symbolically the work of each gender and age group in a household (the roots) and the rewards to each member of the household members (the branches). Originally developed as the Gender Balance Tree (GBT) tool in the Gender Action Learning System -GALS (Mayoux, 2012; Mayoux & Oxfam Novib, 2014), the analogy of the household as a tree creates a powerful image of the need to work for the common good. The GBT can be used to quickly obtain information about various dimensions of equity within the household, such as daily time allocation, resource

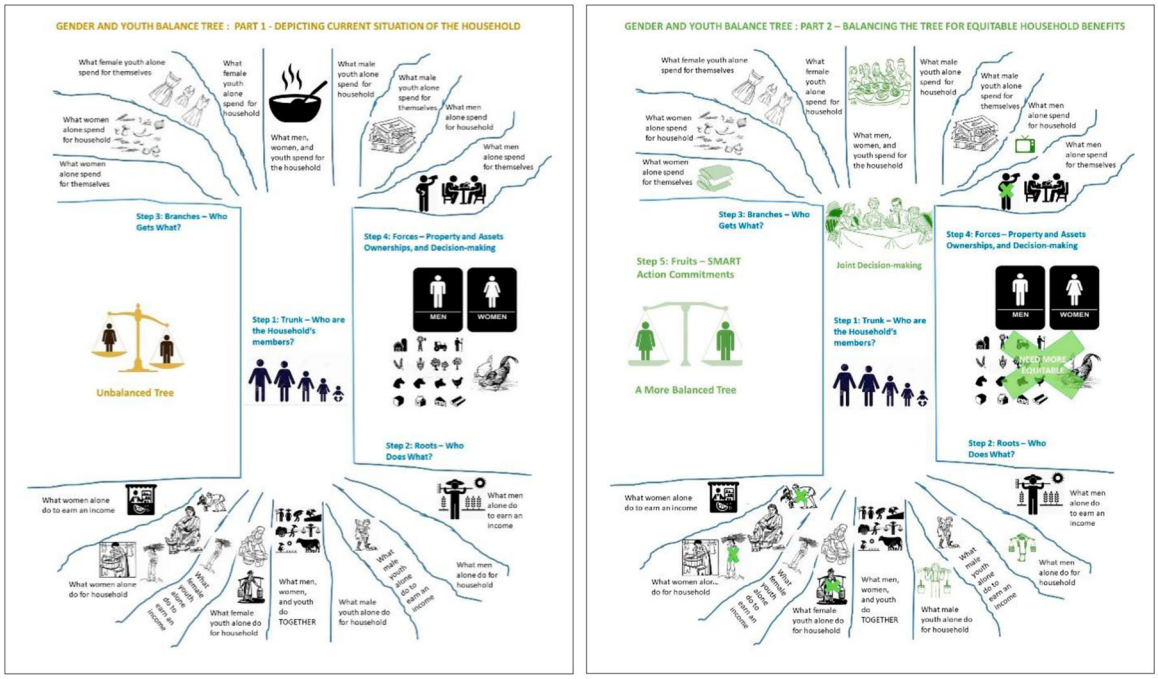

Figure 1. Symbolic example of a gender and youth balance tree – from an unbalanced to a balanced tree. Source: Authors' adaptation of the original gender balance tree filled in with plausible examples of drawings.

control, income control, and beliefs and perceptions about roles and responsibilities of household members. The GBT is already a key component of the Malawi Extension Service's 'Household Methodology Approach', but the tool was new to the decision makers in Ghana. We added the youth component by structuring the tree to have branches and roots separate for male and female youth in the household, and then tested how that adaptation worked for collecting data related to inclusive SAI.

In addition to detecting inequities, the Gender and Youth Balance Tree has proven to be a powerful awareness-raising tool, revealing comprehensive gender imbalances to participants, and creating space to outline strategies to address the gender issues identified. During the testing of the tool in Ghana, the facilitators reported that they found it useful for facilitating conversations about the need to share tasks and increase women's access to land. They also found it raised issues about how men spend money on alcohol and girlfriends. A senior decision maker in agricultural extension in Malawi said that the GYBT tool *'will tell you who is participating between men, women and youth in a household or community … who is not benefiting and how are the benefits used.'* Another gender specialist in Malawi liked how even illiterate people can understand the GYBT easily because they can draw pictures instead of writing words, allowing them to participate meaningfully. Challenges mentioned during the testing include the limited space to draw the access and control of resources and the difficulty of drawing symbols for abstract concepts among the illiterate.

Farnworth et al. (2016) found that households whose members had participated in the GALS programme in Malawi were more likely to share the work and the benefits from agriculture. That study also adapted the Gender Balance Tree into survey questions to quantify differences between the intervention and control households. The use of the tree for data collection was also published in a paper on gender and tea plucking in Indonesia, showing that men do more of the mechanical work while women do more of the manual labour and leverage their contribution to household income to increase their decision-making power (Sita & Herawati, 2017).

In summary, the GYBT is a tool that quickly provides an overview of many gender-related issues while

simultaneously facilitating reflection about gender inequities and encouraging dialogue among participants about how to change norms for improved equity (i.e. how to balance the tree). Follow-up interviews can be used to gather more detailed information and a tool called 'ideal man and ideal woman' (De Zwaan & Feenstra, 2015) can be used to generate discussion about changing expected gender roles.

4.2.3. Youth-specific tools to detect inequities in SAI: the Youth and Land Responsiveness Criteria tool

We reviewed the literature on youth and agriculture in Africa looking for data collection tools. The International Fund for Agricultural Development (IFAD) developed a 'How to do note' on youth access to rural financial services (Hamp et al., 2015) providing an excellent resource. The Youth Livelihoods Development (YLD) Program Guide (James-Smith, 2008) offers practitioners of youth-oriented programs a practical set of suggestions and reference materials to improve youth-livelihood development practices. However, neither of these provided specific analysis tools.

The Youth and Land Responsiveness Criteria (YLRC) tool is an appropriate method to analyse a critical resource, youth access to land, across various institutional domains, including the state, market, community and to some extent, the household (Markicevic & Ying, 2015). This tool can provide information on the needs for land by different categories of youth, the level of access and control of land, and how to address sustainable management of that land.

The YLRC tool is designed to inquire about five different themes: (1) youth recognition (how youth are seen) (2) land information (youth's access to understandable information) (3) land governance (youth participation in decision-making) (4) land policies (how government and community integrate youth) and (5) land use and access (youth needs and purposes for land).

We adapted the YLRC tool by creating a focus group discussion guide, tested in two locations in Malawi. Our findings highlighted the discrepancy between the perspectives of community leaders (that youth can access land through parents) and those of the youth (e.g. young men described their lack of reliable access to land in the matrilineal context). Such information could guide decision makers as they work for inclusive benefits from SAI by demonstrating the need to address the issue at the household and community level. Thus, an NGO could present to those who decide about land the potential benefits of youth having access to and control over land, facilitating a dialogue on how to achieve that, using the data to specify the needs and opportunities identified by the youth, while safeguarding respondent confidentiality.

4.3. Tools to assess the equity impacts of changes in technologies and markets

4.3.1. Ratings of technologies by gender

One of the most straightforward ways to understand gendered perspectives of agricultural technologies is to ask men and women separately about how they evaluate technologies. This information is foundational for understanding agency across the community, market and household institutional domains. Some researchers use gendered ratings extensively as technologies are being developed (e.g. in participatory plant breeding).

Researchers can predetermine the criteria or participants can be asked to generate a list of their criteria. For example, to compare new bean varieties, agronomists may ask farmers' perception of yield, time to maturity, and pest resistance, while those who cook may rate the varieties according to cooking time, flavour, nutrition, etc. The final list of criteria, which could be a combination of those from researchers and participants, are the rows in the matrix. The technologies (such as bean varieties) are the columns. Respondents are then asked to use counters to rate each variety (e.g. between 1 and 5), with the higher score being more desirable. Use of such ranking in Malawi showed that women's evaluation of legume intercrops varied widely from one community to another (Snapp et al., 2018). A simple alternative is to create a scale (on paper or the ground) for each criterion where respondents place a uniquely coloured marker for each technology on the line. This allows for a clear ordered ranking of each technology (for example if both are quite good, but one is slightly better) as well as the rating.

This exercise can be carried out individually or in disaggregated groups. There can be useful plenary discussion to learn about differences in how each group rated technologies, which aids in reflection and awareness about gender norms.

4.3.2. Gender- and youth-sensitive value chain analysis

Value chain analysis is a process of mapping the actors involved in producing a product and quantifying the value addition at each stage (Mutua et al. 2014). Value chain analysis has been used widely to learn how to improve coordination in commercial agriculture, from inputs to final processing. The analysis can identify bottlenecks that limit the amount of a commodity produced. The goal is typically to find win-win situations and facilitate coordination vertically (across stages in the value chain) or horizontally (such as through collective action by actors in the same stage). By documenting value addition, it is also possible to analyse the equity of the commercial arrangements and advocate for policies that support equitable distribution of benefits.

Gender- and youth-sensitive value chain analysis asks who is involved, directly or indirectly, in each stage of the value chain, and how gender and age groups can equitably benefit from value addition. This tool can reveal gender inequities in agency, resources, achievement, and capacity. It does so in a way that explores gender norms in the market, the community, the state, and to some extent the household as well. Empowerment does not require equal numbers of men and women being involved in each activity, but rather equal ability to choose. Thus, any observed dominance by one group raises the question of whether underrepresented groups, actually have the ability to participate or not. Gender-sensitive value chain analysis can then be applied to overcoming entry barriers.

Most of the available tools for gender-sensitive value chain analysis are participatory exercises for rapid assessment. Senders et al. (2012) provide valuable instructions and examples of approaches to improve equity in value chains. One step in the exercise emphasizes how to 'make visible' women's contributions, even in value chains dominated by men. During our training sessions with decision makers in Malawi and Ghana, they found this concept very helpful and were able to identify hidden contributions in value chains that they were familiar with. For example, one respondent in Ghana explained how in the mango value chain, it is the children who gather mango pits for planting in the nursery. Value chain mapping has been used in the context of GALS programs (Reemer & Makanza, 2014) and crop and livestock value chains (Mutua et al., 2014; Rubin et al., 2010)

We adapted and combined the tools from Senders et al. (2012), Reemer and Makanza (2014) and unpublished interview guides from the NGO World Renew (C. Fabiano, personal communication, 2019) to guide decision makers to make a gender- and youth-sensitive value chain map. We found that a team of five staff can carry out focus groups of producers in four communities (each having separate groups of older men, older women, male youth and female youth) and key informant interviews with other actors to develop a well-rounded understanding of the value chain with four days of fieldwork. A Malawi extension worker tested this tool with a credit group and found it useful for facilitating discussion about inefficiencies from women's underrepresentation at higher levels of value chains. Larger projects can add brief household surveys for quantifying labour contributions, production, and prices. Direct observations of gender roles in each market setting helps to verify the focus groups and survey information.

4.3.3. Leaky bucket tool

The 'Leaky Bucket' tool is an exercise designed for low literacy exploration of economic dynamics in the household or community (Cunningham, 2011). It provides opportunities to analyse gender norms in the market, community, and household with information about agency, resources, achievements and capacity. The group exercise is centred on a drawing of a leaky bucket, where there are inflows related to income and outflows related to expenses. When a household reduces expenses, the 'water level' in the bucket goes up, signifying increased availability of cash. It can serve as a budgeting tool and Peters et al. (2012) found that in Ethiopia it encouraged gardening to replace purchased vegetables and compost production to reduce fertilizer expenses. By documenting inputs and expenses from an 'average' plot, this exercise has been used in groups to investigate how to improve profitability of agricultural products (Ratner & Wyckoff, 2015). At the community level, the discussion aims to encourage raising the level of the water through local purchases, value addition and reducing wasteful expenses to the outside.

For gender and youth analysis, separate groups by age and gender carry out the Leaky Bucket exercise and discuss differences. It can provide detailed information about production, prices, costs, and the perspectives of each group on the local economy. The goal is not to plug the holes (reduce expenses), some of which may even need to be increased, such

as education or health care. Instead it is to consider ways to raise the water level (increase the size of the local economy), such as by reducing unnecessary expenditure, generating new streams of income or increasing the cycling of money within the community.

During our tool testing, NGOs in Ghana found the Leaky Bucket tool helpful to discern differences across genders in perceived production costs and marketing strategies. Men tended to have less profitable groundnut production than women in Upper West because men sold at low prices at harvest for immediate cash needs and spent more on their inputs (e.g. providing *pito*, a sorghum drink, for workers and purchasing seed from the market). This led to the suggestion that women should be allocated more land for groundnuts, which should be explored with information from other tools before acting.

5. Synthesis for selecting appropriate tools

The tools we evaluated largely met decision makers' needs and can be used to support a gender transformative approach. The selection of a tool for collecting information about gender and youth equity depends upon the suitability of the tool for obtaining the desired information and the appropriateness of the tool given resource constraints. Findings from the decision makers' needs assessment showed the importance of matching the tool to staff knowledge, staff capacity, and resources, including funding and time. The decision makers' needs assessment also showed a clear need for tools that can be used for *ex-ante* assessment and early monitoring. We collected indicative information from the literature and field-testing of the tools, and we present it in Table 2 to assist decision makers in appropriate tool selection.

All the tools we tested were significantly less costly than large-scale surveys, and they provide more timely data collection and analysis. In many cases, two or three tools could be combined in a one-day community visit, which would reduce transportation costs. However, an agricultural researcher in Malawi pointed out that participatory tools, while effective, can be costly because they take so much time with the community. This comment affirms the principle that quality participatory work often requires preparatory meetings or an on-going relationship with the community. The gender- and youth-sensitive value chain analysis requires multiple days of fieldwork, making it more costly, but it also provides more detailed and robust information than the other tools covered.

In terms of timeliness, the implications drawn from the data collection tools can be available to decision makers a few days after the fieldwork is completed. Timeliness is directly related to cost as staff time is the primary expense for both data collection and data analysis. The time requirement for the analysis of data from a community may be only a few hours (for compiling notes and comparing diagrams) or it may take a few days (to transcribe recordings and categorize the qualitative data into themes).

Regarding feasibility, all of these tools can be used even by small organizations with minimal or targeted training. Many of the tools we present are relatively straight forward to implement and do not require advanced analytical skills before the results inform decision-making. Some training is needed for proper analysis of the scores from participatory ratings and the drudgery scores, but that does not require statistical software. Special attention needs to be given to power dynamics during facilitation, which we discuss below. The results from the Leaky Bucket and GYBT are especially sensitive to the quality of facilitation, and having staff observe or participate in a skilled facilitation first is recommended.

Many of the tools are appropriate for *ex-ante* assessment of inequities by providing quantitative or qualitative information about how gender and age groups might be affected by a change in technology. These are listed as 'strong' in Table 2. We categorized the GYBT as 'medium' because it provides a very broad overview of household decision-making, which may only be adequate on its own for *ex-ante* assessment of some interventions (e.g. household responsibilities for crops and livestock). We recommend it as an excellent starting point in *ex-ante* gender analysis that can be complemented by other tools. The drudgery score, participatory rating, and gender-sensitive value chain analysis are rated as 'weak' because they are better suited for providing early monitoring of a technology once respondents have some experience using it.

In the last columns of Table 2 we present the domains of the 'social relations approach' (Kabeer, 1994) and the categories of empowerment indicators (based on Kabeer, 1999) that each tool is strongest at revealing as well as the role each tool can play in a gender transformative approach.

The 'time allocation' tools can be used primarily to reveal inequities in agency within the household and community domains. Community members may not realize how differently gender or age groups are using their time, which can spark awareness that change for improved equity is possible. Furthermore, the Drudgery score is designed to culminate with discussion about inequities, thereby facilitating reflection, a key step in a gender transformative approach. Any of the tools can be followed by plenary sessions where respondents reflect on time-related inequities and discuss how to address them.

Participatory mapping is well-suited for the community domain, though it could also be used to explore markets. Mapping can be applied to a wide range of equity indicators, though it most naturally fits with how resources are allocated. Agency can also be explored, such as by mapping mobility. Inequities in achievements may be explored spatially as well, such as health, food security and wealth rankings. The GYBT focuses primarily on the household domain and directly links agency, resources, and achievements through the listing of activities (roots), benefits (fruits) and assets (listed by the trunk). The tool on youth access to land intentionally spans all four domains of social relations and focuses on one particular resource (land) and the agency of youth related to that resource. Participatory mapping, the GYBT and the youth land tool can be easily supportive of a gender transformative approach because they not only reveal inequities but are designed for reflection on the root causes and dialoguing about solutions.

The rating of technologies tool is most applicable to revealing inequities in agency within the household, community, and market domains. Its primary use is to reveal inequities, though it can be used similarly to the time-related tools as part of a community discussion about addressing inequities with or in using technologies. Comparisons of ratings across gender and age groups can be particularly useful in recognizing differing priorities and values from each group.

The gender- and youth-sensitive value chain and the Leaky Bucket tools are unique in focusing on gendered norms in the market domain. All categories of empowerment can be assessed through these tools because market participation itself is a sign of agency, market performance often indicates capacity levels and access to resources and results in a key achievement – income. Both tools can be supportive of a gender transformative approach in that they are designed to not only collect data but also to foster action by community members.

Together these tools can reveal the complex realities of gender and youth inequities and foster dialogue about how to address the root causes across domains of social relations.

6. Discussion

The process of implementing the tools will largely determine how well their use contributes to inclusive SAI. Using them requires thoughtful preparation, skilled facilitation, and the humility to learn from community members. First, participatory engagement involves significant preparation time and the need to schedule data collection at times and locations where men, women and youth can give their full attention to the process. Second, skilful facilitation is also necessary for effectiveness. Attitudes and behaviours of the facilitators are important determinants of the quality of results. Consequently, facilitators also need to be supported with training to increase awareness of their own gender biases and the need for patience and persistence. For example, a leader of a research project in Malawi cautioned that men and even some women did not understand gendered participatory tools very well, saying they were so immersed in their culture that they could not imagine different gendered relations. Another senior decision maker in agricultural extension in Malawi confirmed this, saying that, 'The tools worked but with a lot of effort. Facilitating participatory tools is not easy, especially for communities to grasp your ideas'.

Decision makers using these tools will have to navigate the power relations regarding knowledge being collected and generated. For example, some youth may be pressured to work in agriculture and end up being marginalized in terms of reduced opportunity to attend school. Utilizing information from such vulnerable populations requires careful consideration of their risks and protecting their confidentiality.

The concerns of power relations also relate to how knowledge is recorded through the tools, including: (1) the threat of experts codifying their 'expert' knowledge rather than local/community knowledge, (2) the power imbalance from the literate over illiterate contributors, and (3) the potential to minimize gender and intergenerational differences in data collected. With the participatory mapping tool, in particular,

the technical requirements allow the powerful to bias the results (intentionally or not) through a wide range of decisions such as selecting mapping scale, erasing or hiding dynamics occurring at the social scale, and over-privileging knowledge that is easily converted into a digital format compared to other forms of information. But as Brinhurst et al. (2017) aptly contend, the process of data collection itself can be a valuable means of learning and empowerment for the community as well as the facilitators, and it is important for facilitators to keep those goals in mind as they work towards collecting and analysing data about gender and youth inequities.

In summary, the tools presented here match the needs of decision makers – in at least Ghana and Malawi – and support the complex and potentially (gender and youth) transformative process of working towards inclusive SAI. When used appropriately, these tools can help fill the gap in feasible methods for assessing social sustainability in agricultural intensification.

7. Conclusion

This paper summarizes the learning from our efforts to provide decision makers with effective tools for anticipating and assessing gender and age disparities in SAI interventions in a way that supports transforming the norms responsible for such inequities. The data collection tools we have presented support a fundamental first step towards inclusive SAI by helping decision makers to foresee differentiated effects of agricultural interventions. For most agricultural projects, gendered differences in SAI impacts are age-specific, and so we suggest adapting gender tools to detect youth and gender inequities together, especially when lacking a youth-specific analysis tool.

The testing of these tools demonstrates the feasibility of their use by a wide range of actors, including small NGOs, large businesses, government officers and community-based organizations. Excellent implementation of the tool in the field is only one component of the process that starts with decision makers choosing the most appropriate tool and contextualizing indicators for local conditions (Zulu et al., 2020) to use with the tools. That process culminates with using the data from the tools to inform specific projects and to improve interventions.

It is important to clarify that mere use of the tools will not improve gender and youth equity. Transforming the norms that perpetuate inequities will require using the tools as part of a long-term development process. This could be accomplished through on-going efforts to foster critical re-evaluation of gender norms, such as through radio sessions, community dialogue, household methodologies etc. We contend that following the principles of inclusive sustainable development from Leach et al. (2010) can enhance attainment of these broader, gender transformative and youth inclusive development processes. The principles are: participatory engagement that includes a diversity of knowledges from the community; an opening up of the scope of analysis and the set of options available to the community; special attention to power dynamics; and reflexivity by decision makers who recognize their incomplete knowledge. Also, an on-going effort for a gender-transformative approach requires community-level participation so that grassroots support guides the transformation process in all social spheres (i.e. household, community, state, and market) and provides the strength to handle resistance to change.

Note

1. This guide is one of the research products from the project that contributed to the broader development impacts.

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