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Gender determines scientists' sustainability assessments of food-securing upgrading strategies

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ABSTRACT

Perception of the social, ecological and economic aspects of food security differs depending on the gender of the evaluating expert. Understanding these differences is key to developing upgrading strategies (UPS) that can help stabilise and enhance food security. This is highly relevant for research on food value chains (FVCs) in sub-Saharan Africa, where subsistence farmers are highly exposed to food insecurity. Prior to their implementation, however, the potential social, ecological and economic impacts of UPS in the target areas should be carefully assessed.

This article reports on gender-based differences in perception and evaluates these differences using ex-ante impact assessments on the social, ecological, and economic aspects of food security and 13 UPS in the Tanzanian FVC that were carried out by agricultural scientists. The work is embedded in a larger multi-disciplinary research project. We find that impact assessments differed based on the gender of experts to various extents and depended on the types of criteria assessed. Female scientists were more careful during assessment, limiting themselves more strictly to the UPS and to criteria they were most knowledgeable in. Additionally, female respondents perceived the impacts of UPS on the economic and social sustainability of food security to be lower compared to their male colleagues. We therefore conclude that perceptions of female and male agricultural experts in strategy selection and implementation should be differentiated based on their gender. This may help reduce gender-specific challenges faced by African farmers.

1. Introduction

Gender plays a key role in food security research because of the gender-specific roles in traditional food systems (FAO, 2011; Mwangi et al., 2014; Polar et al., 2015). This is particularly relevant in sub-Saharan Africa, which is affected by declines in natural production and resources (Shemdoe, 2011) as well as climate change (Müller et al., 2011; Kangalawe and Lyimo, 2013). Other important pressures include changing economic systems driven by trade liberalisation and globalisation, population growth, and various governance factors (Lotze-Campen et al., 2010; Riisgaard et al., 2010; von Braun, 2007). Most of these factors reduce the land and food available per capita and have led to increasing food insecurity (FAO et al., 2013; Foley et al., 2011; Van Rooyen and Sigwele, 1998). To cope with these challenges, food-securing upgrading strategies (UPS) and/or frameworks and policies should be developed or implemented (Coulter and Onumah, 2002; Graef et al., 2014; Kimenye and Bombom, 2009; Shemdoe, 2011). These strategies, however, often do not achieve greater gender equality in food security (Arora-Jonsson, 2014). Therefore, they need to be adapted to local socio-cultural settings, with an emphasis on the gender-specific differences in roles and perceptions in stakeholders' food systems (Grimble and Chan, 1995; Okonya and Kroschel, 2014). According to Arora-Jonsson (2014), each research and development context first requires "efforts to define what gender is." Other gender-focused research (FAO, 2011; Graef et al., 2018; Mnimbo et al., 2017) has also emphasised variations and differences in perception depending on experience, age, nationality, rural lives, priorities, and needs. Ochola et al. (2010) recommend applying analytical frameworks on gender influencing factors by asking "What is getting better? What is getting worse? Who does/has/needs what? What does an innovation deliver to narrow the gender gap?"

Ex-ante impact assessments of UPS by local stakeholders and scientists can help avoid a mismatch between UPS impacts and the intended positive effects on food security. In particular, the UPS may have various effects on the gender-specific roles in the food system (Kalinda et al., 2000; Mwangi et al., 2014; Polar et al., 2015). In developing countries, for instance, a high woman's educational level and age has a positive influence on agricultural efficiency and productivity

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(Croppenstedt et al., 2013; Najjar et al., 2013), agricultural extension contacts (Emerole et al., 2014), and decision-making in many food-related tasks, such as food preparation and cooking (El Tayeb and Mukhtar, 2003). Women can benefit from value-chain participation, in particular due to increased reputation, which can translate into employment and payment (Kowalski et al., 2015). Implementing a UPS, thus is likely to alter the social and gender-specific fabric in one way or another.

Therefore, gender integration in food security impact assessments and in implementing food-securing UPS should follow a systematic framework; one example systematically integrating gender in sustainability impact assessments for both local stakeholders and scientists was suggested by Graef et al. (2018). In particular, such a gender framework should consider differences in the gender of the assessors (Schindler et al., 2016; Schneider et al., 2014), given that assessments may follow gender-specific patterns depending on the assessors' perspectives on and sensitivity to gender-related topics. The term "gender" considers the social and cultural differences between men and women rather than biological differences alone.

For this study, within the framework of a large interdisciplinary research project in Tanzania, 13 food-securing UPS across the food value chain (FVC) were selected in a participatory process that involved both local subsistence farmers and Tanzanian and German scientists. Based on our prior findings, we hypothesised that the scientists' assessments would differ between genders depending on the type of UPS and the criteria under consideration. We assumed that gender-differentiated UPS assessments would enable us to draw a more complete picture of scientists' perspectives, as well as helping us to fine-tune potential follow-up activities in a gender-balanced (or at least a gender-focused) way. This paper presents the gender-differentiated UPS and food security criteria assessments. We aim to further the understanding of the gender-specific requirements and limitations of this type of large, complex, multi-disciplinary research and development project, with more than 100 scientists and non-scientists from five Tanzanian, seven German, and two international institutions.

2. Study area and food systems

This study was carried out within a food security research project implementing UPS in two poor and rural regions of Tanzania. The first region is in the predominantly sub-humid Morogoro region (Kilosa District, 600–800 mm annual precipitation) and includes both food-secure and food-insecure areas. The food systems are primarily based on the production of maize, legumes, sorghum, rice, and horticulture. The second region is in the semi-arid Dodoma region (Chamwino District, 350–500 mm annual precipitation), where people are mainly food-insecure, and the food systems are primarily based on the production of sorghum and millet, with a significant presence of livestock (Mnenwa and Maliti, 2010; Liwenga, 2003). Land pressure in both regions is high as is the number of growth-stunted children under five years of age, which is an indicator of food insecurity. Post-harvest processing of the main food crops is generally achieved on a low-technology level, though a few small threshing, shelling and milling enterprises are present. Local markets are accessible, generally within five kilometres, but subsistence farming predominates. Agriculture provides the main income and employment for most of the village residents.

In the sub-humid region, the focal crops of our research and impact assessments were maize and sesame intercropped with pigeon peas; in the semi-arid region, the focal crops were millet and sunflower intercropped with groundnuts.

3. Methods

We found gender-specific differences between farmers' perceptions throughout the various steps of this project (Mnimbo et al., 2017; Graef et al., 2018). A balanced set of nine social, ecological and economic food security criteria and indicators were first co-developed in a stepwise approach with local stakeholders on the community level (Schindler et al., 2016). Those steps generally followed the participatory approach of Morris et al. (2011) that was developed for the European stakeholders' context. Each of the three dimensions of sustainability (social, economic, and environmental) was addressed by three of these criteria and their respective indicators (Brundtland et al., 1987), summing up to nine food security criteria altogether. These criteria, grouped by the three sustainability dimensions, are listed below; their respective indictors are shown in parentheses:

a) social sustainability: food diversity (sufficient, safe, nutritious food), social relations (socio-cultural acceptance), and working conditions (working hours and quality);
b) economic sustainability: production (agricultural yield, in kg), income (household income), and market participation (surplus sold at markets or inputs purchased); and
c) environmental sustainability: soil fertility (chemical soil properties), available soil water (available water for plants over the growing season), agro-biodiversity (number of crops grown and wild species).

As demonstrated by Schindler et al. (2016), these criteria also represent the four food security dimensions (food availability, access, utilisation, and stability), though not in a balanced way. We consider these nine food security criteria to be suitable for impact assessments of food-securing UPS. Thirteen FVC upgrading strategies were selected from the FVC components (natural resource management and food production; post-harvest processing, biomass and energy supply; markets and income generation; and consumption) by both local stakeholders and Tanzanian and German scientists (Table 1). This participatory action research process involved screening and inventorying the UPS at the case study sites, as well as expert-based specification and prioritisation of the UPS and stakeholder-based prioritisation of the 13 UPS for implementation. The prioritised UPS were used for this ex-ante impact assessment. Assessing their impact required multi-disciplinary background information, which was available or provided by the UPS fact sheets.

We applied the scaling up assessment tool for food security, "ScalA-FS," adapted from Sieber et al. (2015), for use in a food security context (Agol et al., 2014; FAO et al., 2013; Graef et al., 2017). The tool includes the nine sustainability criteria mentioned above. We used a Likert bipolar assessment scale (Harpe, 2015) ranging from −3 to +3 (−3 indicates high negative impact, −2 medium negative impact, −1 minor negative impact, 0 no impact, +1 minor positive impact, +2 medium positive impact, and +3 high positive impact). The experts were asked how UPS would affect the criteria and their related indicators in Dodoma and Morogoro up to the year 2020.

The ScalA-FS tool was converted to a questionnaire and the UPS fact sheets were shared with 50 project consortium experts in sub-Saharan agriculture to assess the UPS. Thirty-two experts responded to the questionnaire but three of them were dropped due to incomplete data, yielding a total of 29 completed questionnaires. Table 2 exhibits the experts' gender and nationality. From both countries, the number of junior scientists (25–40 years of age; PhD students, post-doctoral scholars, and other staff) was equal to the number of senior scientists (above 40 years of age). Their scientific background included at least one and usually more than one component of the FVC. There was no indication that either male or female scientists had broader scientific education or experience compared to the other gender. Half of the respondents had some background in gender-related research, and the male respondents tended to have more background in engineering science. Especially among the Tanzanians, the availability of female agricultural scientists for project participation was very low, so we were not able to achieve a gender-balanced assessment; in a few cases (*by-*